THE SOUTH BEND MACHINE SH COURSE

FOR APPRENTICE TRAINING

Book No. 39-B

TWELVE PROJECTS

SOUTH BEND LATHE WORKS

SOUTH BEND 22, INDIANA, U. S. A.

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THE SOUTH BEND MACHINE SHOP COURSE

For Apprentice Training

The projects illustrated and described in this machine shop course book are intended to help the students in vocational and industrial schools in learning basic machining skills. Project 13, the 1-inch bolt and nut, is a practical example. The drawing shows the assembly and details of the bolt and nut; the description shows the operations and sequence that the student follows. The procedure is similar to that used in industrial plants throughout the country, not only in training students but in regular production work.

If the instructions are followed carefully it will be but a short time before the student who shows considerable aptitude for the work can enter the shop as a learner and helper to the machinist, toolmaker or die maker.

The book "How to Run a Lathe" is to be used in conjunction with this machine shop course, for it gives necessary instructions for the various operations called for in the course book.

Rough stock required for each project is listed opposite the drawing. This material can be obtained from any supply house.

Mission (4-2)

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South Bend Lathe Works

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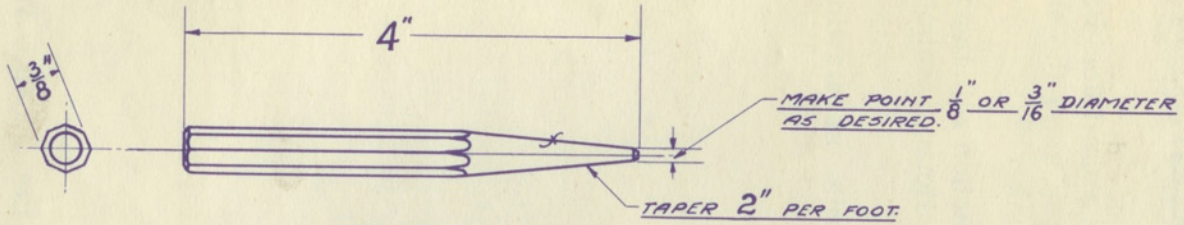
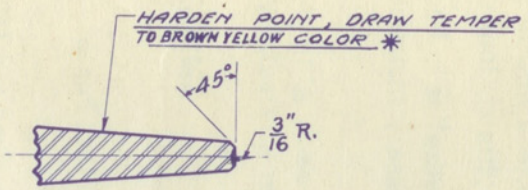
SOUTH BEND LATHE WORKS, SOUTH BEND 22, INDIANA, U. S. A.



NAIL SET

STOCK 3/8" OCTAGON x 4 1/16" LONG. - T.S.
1 REQ'D.



DETAIL OF POINT

NAIL SET.

T.S. = TOOL STEEL

$\not$ = FINISHED SURFACE

* SEE "HOW TO RUN A LATHE."

SOUTH BEND MACHINE SHOP COURSE.					
PROJECT № 1	DRAW. NO. 1				
PART NAIL SET					
SCALE	COMPLETE IN ONE DRAWING				
SOUTH BEND LATHE WORKS SOUTH BEND, IND., U.S.A.					
DRAWN BY	C'KD. BY	TRACED BY	APRD. BY	DATE	
O.P.S.	N.J.	E.P.K.	O.B.	11-23-38	

NAIL SET

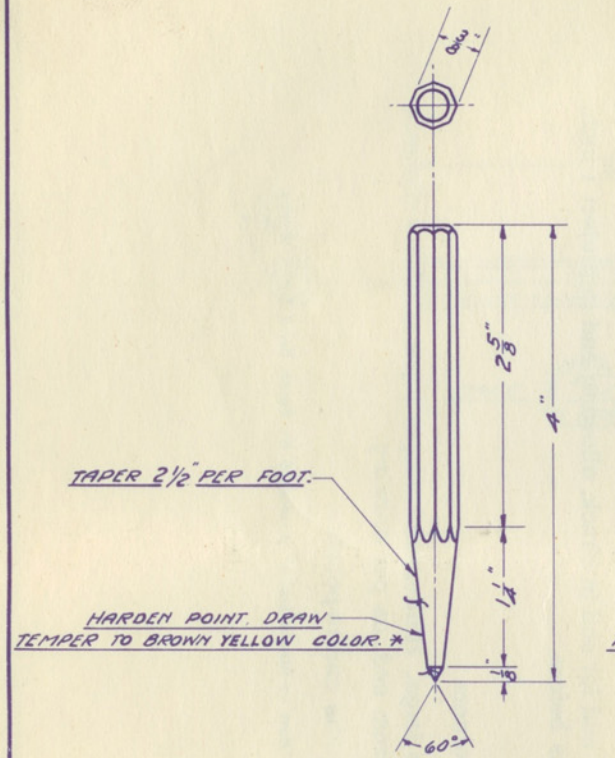
MATERIAL REQUIRED:

Tool steel ⅜" octagon x 4 1/16" long. One required.

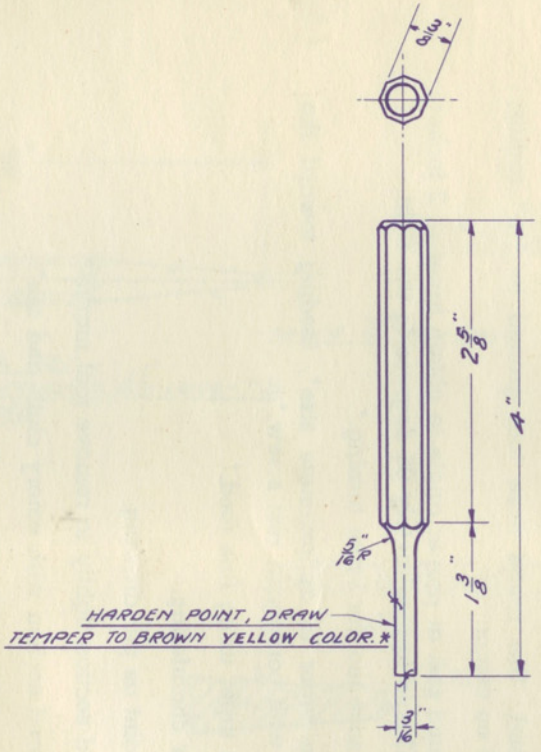
OPERATIONS:

1. Select stock as per drawing.
2. Place steel in 4-jaw independent chuck, with end projecting 2 inches. Adjust jaws so stock runs true.*
3. Arrange belt for proper spindle speed.*
4. Set lathe tool for facing.*
5. Face end.*
6. Concave end. Use round nose tool ground to 3/16" radius, setting tool on center.
7. Set compound rest at proper angle to obtain taper of 2 inches per foot. This is approximately 95 degrees to the right.
8. Set round nose tool for taper turning.*
9. Rough turn taper to approximate size*, feeding toward the headstock with compound rest screw.*
10. Finish turn taper using fine feed.*
11. Set tool for chamfering.
12. Chamfer point as per drawing.
13. File tapered section lightly to remove tool marks.*
14. Polish tapered section with emery cloth and oil.*
15. Turn stock end for end in chuck, allowing end to project 1 inch, and true as before.
16. Face end.
17. Chamfer corners.
18. Transfer to forge. Harden and temper taper end*, for distance of 1 inch from end, as per drawing.
19. Return to lathe and re-polish.

*See book "How to Run a Lathe" published by South Bend Lathe Works.



№ 1 CENTER PUNCH
3/8" OCTAGON TOOL STEEL
4 1/16 LONG.



№ 2 DRIFT PUNCH
3/8" OCTAGON TOOL STEEL
4 1/16 LONG.

CENTER PUNCH

DRIFT PUNCH

X = FINISHED SURFACE.

* "SEE HOW TO RUN A LATHE."

SOUTH BEND MACHINE SHOP COURSE				
PROJECT № 2	DRAW. NO. 1			
PART: PUNCHES				
SCALE	COMPLETE IN ONE DRAWING			
SOUTH BEND LATHE WORKS, SOUTH BEND, IND., U.S.A.				
DRAWN BY	C'KD. BY	TRACED BY	APRD. BY	DATE
E.L.C.	N.D.J.	A.P.S.	O.B.	11-23-38

A SET OF PUNCHES

MATERIAL REQUIRED:

Tool Steel ⅜" octagon x 4 1/16" long. Two required.

PART NO. 1—CENTER PUNCH

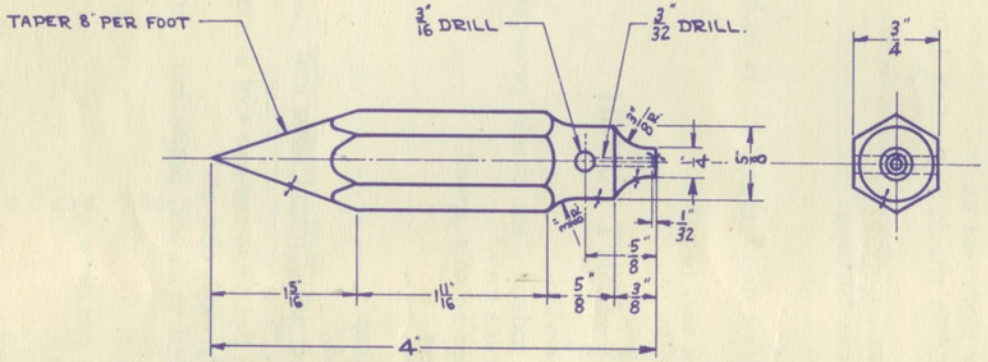
OPERATIONS:

1. Select stock as per drawing.
2. Place stock in 4-jaw independent chuck, projecting 2 inches. Adjust jaws so stock runs true.*
3. Arrange belt for proper spindle speed.*
4. Set compound rest at proper angle to obtain taper of 2½ inches per foot. This is approximately 96 degrees to the right.
5. Set tool for taper turning.*
6. Rough turn taper, using round nose tool and feeding toward headstock with compound rest screw.*
7. Finish turn taper using fine feed for smooth finish.*
8. Set compound rest 120 degrees to the right. Turn angle of point using same tool.
9. File machined section lightly to remove tool marks.*
10. Polish with fine emery cloth and oil.*
11. Turn stock end for end in chuck, projecting 1 inch, and true as before.
12. Set lathe tool for facing.*
13. Face end to length as per drawing.*
14. Set tool for chamfering.
15. Chamfer corner.
16. Transfer to forge, harden and temper* for ½ inch from point, as per drawing.
17. Replace in lathe chuck and re-polish.

PART NO. 2—DRIFT PUNCH

1. Select stock as per drawing.
2. Place stock in 4-jaw independent chuck, projecting 2 inches. Adjust jaws so stock runs true.*
3. Arrange belt for proper spindle speed.*
4. Set lathe tool for facing.*
5. Face end.*
6. Set lathe tool for turning.*
7. Rough turn punch end.*
8. Finish turn punch end using round nose tool ground to form fillet at shoulder.
9. File machined section lightly to remove tool marks.*
10. Polish with fine emery cloth and oil.*
11. Turn stock end for end in chuck, projecting 1 inch, and true as before.
12. Set lathe tool for facing.
13. Face end to length as per drawing.
14. Set tool for chamfering.
15. Chamfer corners.
16. Transfer to forge. Harden and temper* for 1¾" back from punch end.
17. Return to lathe chuck and re-polish.

*See book "How to Run a Lathe" published by South Bend Lathe Works.



PLUMB BOB

ONE

STOCK 3/4" HEX. X 4 1/16" LONG. C.D.S.

ASSEMBLY OF PLUMB BOB

C.D.S. = COLD DRAWN STEEL *

f = FINISHED SURFACE

* SEE "HOW TO RUN A LATHE"

SOUTH BEND MACHINE SHOP COURSE				
PROJECT No. 3	DRAW. NO. 1			
PART: PLUMB BOB				
SCALE	COMPLETE IN ONE DWG.			
SOUTH BEND LATHE WORKS, SOUTH BEND, IND., U.S.A.				
DRAWN BY	CKD. BY	TRACED BY	APRD. BY	DATE
O.P.S.	N.D.J.	O.P.S.	O.B.	11-23-38

PLUMB BOB

MATERIAL REQUIRED:

Cold drawn steel ¾" hex. x 4¼" long. One required.

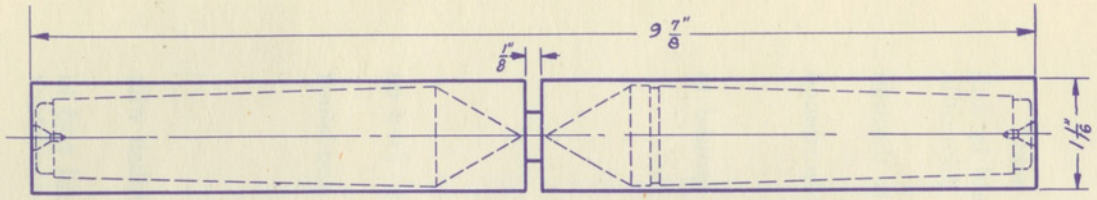
OPERATIONS:

1. Select stock as per drawing.
2. Lay out and center punch the 3/16" hole near the end of stock as per drawing. In locating this hole allow for 1/32" to be faced off at end of stock.
3. Transfer work to drill press. Drill hole through center of diameter as per drawing. (See footnote A.)
4. Transfer work to lathe. Place stock in a 3-jaw universal chuck with drilled end extending 1½". Adjust so stock runs true.*
5. Arrange belt for proper spindle speed.*
6. Set lathe tool for facing.*
7. Face end.*
8. Center end of stock with centering tool held in tool post.*
9. Center drill end as per drawing, with center drill held in drill chuck in tailstock spindle. Use center drill with 3/32" pilot drill. (See footnote B.)
10. Drill 3/32" hole in end of stock to intersect 3/16" hole through diameter as per drawing.
11. Remove drill chuck from tailstock spindle and insert hardened center in its place.*
12. Adjust tailstock so it will suport end of work.*
13. Set lathe tool for turning, using a round nose tool ground to form fillet at end of cut as per drawing.*
14. Rough turn large diameter section.*
15. Rough turn small diameter section.
16. Finish turn large diameter section.*
17. Finish turn small diameter section.
18. Round corner at end with file.
19. Polish machine surfaces with emery cloth.*
20. Turn stock end for end in chuck with 1¾" extending. True as before.
21. Set compound rest at an angle of 108° (reading from headstock side) with handle toward tailstock.
22. Set lathe tool for taper turning.*
23. Rough turn point.
24. Finish turn point.
25. File tapered section* lightly to remove tool marks. Polish with fine emery cloth.*

NOTE A: Drilling can be done in the lathe using drill pad in tailstock spindle, and drill held in drill chuck in headstock spindle.*

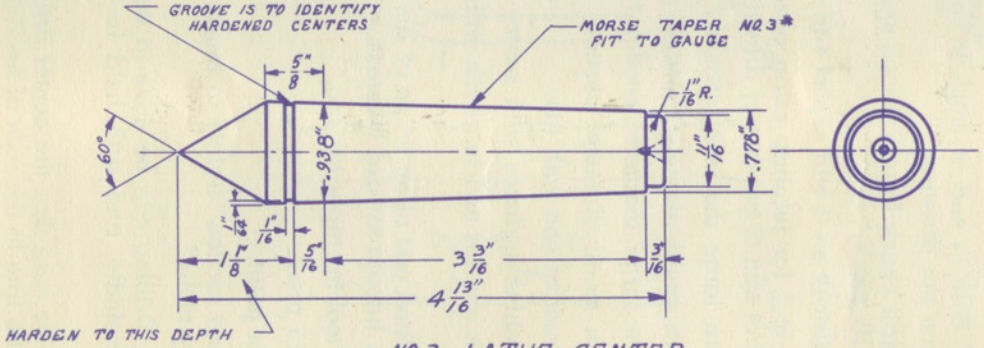
NOTE B: Be sure that the center drill starts true so the center hole will be true to the axis of headstock spindle.

*See book "How to Run a Lathe" published by South Bend Lathe Works.



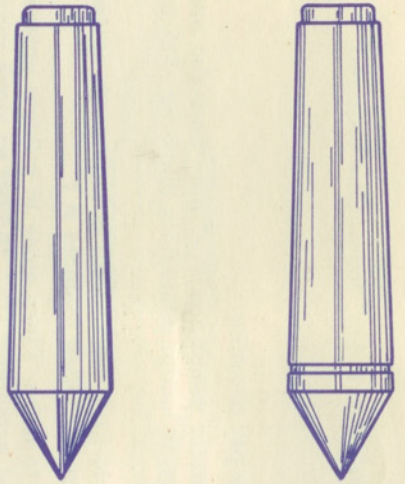
STOCK FOR PAIR OF CENTERS

STOCK 1 1/16" DIA. X 9 3/8" LONG T. S.



NO.3 LATHE CENTER

FINISH ALL OVER
ONE FOR HEADSTOCK SOFT.
ONE FOR TAILSTOCK HARDEN
AND DRAW TEMPER TO DARK
STRAW COLOR*



SOFT
HEADSTOCK CENTER

HARDENED
TAILSTOCK CENTER

T.S. = TOOL STEEL

* = SEE "HOW TO RUN LATHE"

SOUTH BEND MACHINE SHOP COURSE				
PROJECT NO-6	DRAW. NO. 1			
PART CENTERS				
SCALE	WORK TO FIGURES			
SOUTH BEND LATHE WORKS SOUTH BEND, IND., U.S.A.				
DRAWN BY O.P.S.	C'KD. BY	TRACED BY E.S.O.	C'KD. BY A.R. 11-23-38	DATE 11-23-38

SOUTH BEND LATHE WORKS, SOUTH BEND 22, INDIANA, U. S. A.

60° LATHE CENTERS, NO. 3 MORSE TAPER

MATERIAL REQUIRED:

Tool steel $1\frac{1}{16}$" diam. x $9\frac{7}{8}$" long. One required.

OPERATIONS:

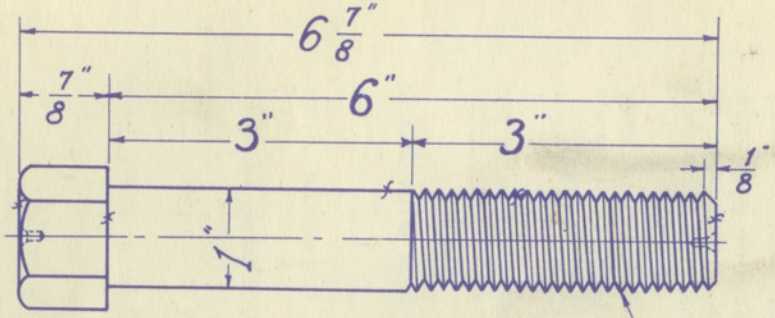
1. Select stock as per drawing.
2. Lay off and center ends.*
3. Place on centers in lathe; drive with common lathe dog.* (See footnote A.)
4. Arrange belt for proper spindle speed.*
5. Set lathe tool for facing.*
6. Face end.*
7. Turn stock end for end between centers.
8. Face end to length as per drawing.
9. Arrange lathe for taper turning.*
10. Set lathe tool for taper turning.*
11. Take a light trial cut over tapered section.
12. Test the taper in a No. 3 Morse Taper hole.*
13. If taper is not correct, adjust setting to correct error.
14. Take second cut and test as before. Repeat until you have taper correct.
15. Rough turn taper, allowing .020" stock for finishing cut.*
16. Turn stock end for end between centers.
17. Rough turn taper on other end allowing stock for finish as before.
18. Finish turn tapers to diameter, (as per drawing) on both ends, allowing .003" for filing. (See footnote B.) Soft brass should be placed around small end of taper to prevent marring of finished surface when lathe dog is attached.*

    NOTE: When taper shank is finished and inserted in taper gauge there should be a space of $\frac{5}{8}$" between end of gauge and beginning of 60° angle on center point. See drawing.
19. Rearrange lathe for straight turning.*
20. Undercut both ends for clearance at small end of taper as per drawing. Round corners with file.
21. Cut ring mark on one center as per drawing.
22. File tapered section lightly to correct any slight error and to remove tool marks.*
23. Set $\frac{1}{8}$" tool for cutting off.
24. Lay off and mark location of $\frac{1}{8}$" recess in the middle of the stock.
25. Remove face plate and live center from headstock spindle.* Place taper shank in spindle and cut centers in two.*
26. Set compound rest at an angle of 60 degrees to the left.
27. Set lathe tool for taper turning.*
28. Turn the angle on center point which is 30° from center, both parts.
29. Test angle of point with thread center gauge.*
30. Harden and temper tailstock center (with ring mark).*
31. Polish tailstock center with emery cloth.*

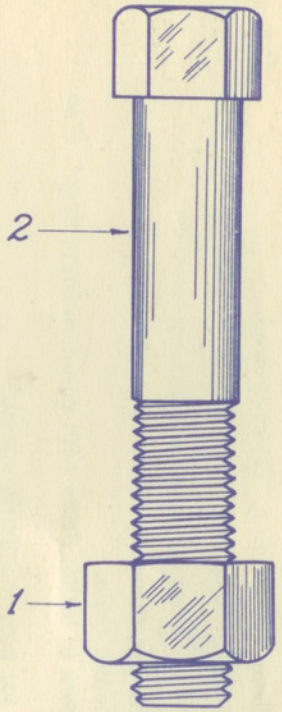
    NOTE A: A relieved center would simplify the facing operation.*

    NOTE B: If it is desired to finish taper by grinding, allow .010" for finishing.

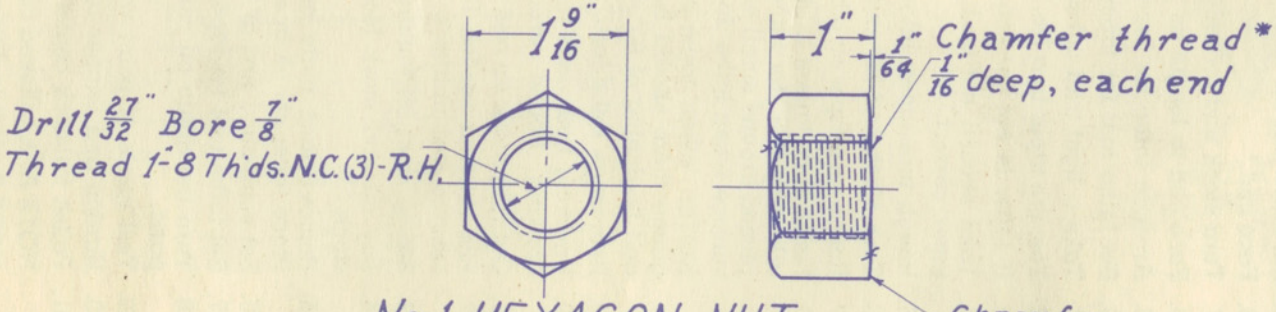
*See book "How to Run a Lathe" published by South Bend Lathe Works.



No. 2 HEXAGON HEAD BOLT
One. Stock 1 1/4" hex. X 6 15/16" long C.D.S.



ASSEMBLY
of
BOLT and NUT



No. 1 HEXAGON NUT
One Stock 1 9/16" hex. X 1 1/8" long C.D.S.

N.C. = NATIONAL COARSE*
C.D.S = COLD DRAWN STEEL*
R.H. = RIGHT HAND
f = FINISHED SURFACE
(3) = CLASS 3 FIT
* SEE "HOW TO RUN A LATHE"

SOUTH BEND MACHINE SHOP COURSE				
PROJECT NO. 13	DRAWING NO. 1			
BOLT AND NUT				
SCALE -	COMPLETE IN ONE DRAWING			
SOUTH BEND LATHE WORKS SOUTH BEND, IND.				
DRAWN BY W.J.G	C'K'D BY M.P.J	TRACED - A.S.T	APR'D BY O.B	DATE 11-23-38

1" BOLT AND NUT

MATERIAL REQUIRED:

Part No. 1 Cold drawn steel—$1\frac{9}{16}$" hex. x $1\frac{1}{8}$" long. One required.
Part No. 2 Cold drawn steel—$1\frac{1}{4}$" hex. x $6\frac{15}{16}$" long. One required.

PART NO. 1—HEXAGON NUT

OPERATIONS:

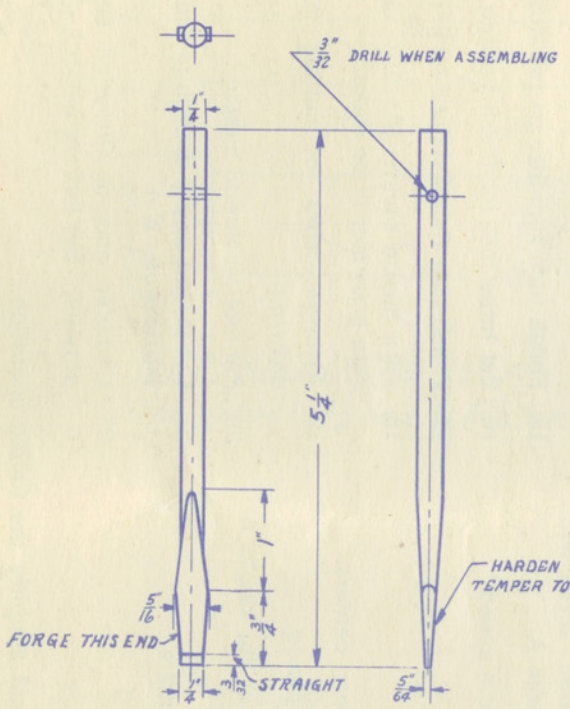
1. Select stock as per drawing.
2. Place stock in 3-jaw Universal chuck with ¼" extending and running true.*
3. Arrange belt for proper spindle speed.*
4. Set lathe tool for facing.*
5. Face end.*
6. Center end of stock. Use centering tool held in tool post.*
7. Rough drill hole through stock as per drawing, with drill held in drill chuck in tailstock spindle.*
8. Set tool for boring.*
9. Bore hole to size as per drawing.
10. Arrange gears for cutting thread as per drawing.*
11. Set tool for thread cutting.*
12. Cut thread, leaving .005" stock for tap to remove.*
13. Finish thread to size with tap, holding tap with wrench and guiding with tailstock center.*
14. Chamfer thread as per drawing.
15. Chamfer outside corners lightly as per drawing.
16. Turn stock end for end in chuck, truing as before.
17. Face end to length as per drawing.
18. Chamfer thread as per drawing.
19. Chamfer corners as per drawing. Set tool at an angle of approximately 45 degrees.

PART NO. 2—HEXAGON HEAD BOLT

1. Select stock as per drawing.
2. Lay off and center ends.*
3. Place stock on centers in lathe;* drive with clamp lathe dog.* (See footnote A.)
4. Arrange belt for proper spindle speed.*
5. Set lathe tool for facing.*
6. Face end.*
7. Turn stock end for end between centers.
8. Face end to length as per drawing.
9. Chamfer corners. Set tool at an angle of approximately 45 degrees.
10. Turn stock end for end on centers.
11. Set lathe tool for turning.*
12. Rough turn round section.*
13. Rough face shoulder at end of round section. Use same tool.
14. Set lathe tool for facing.
15. Finish face shoulder as per drawing.
16. Set lathe tool for finish turning.
17. Finish turn round section as per drawing.*
18. Turn thread section (A) .010" undersize to insure a perfect fit on thread.
19. Arrange gears for cutting thread as per drawing.*
20. Set tool for thread cutting.*
21. Cut thread as per drawing,* fitting to Part No. 1—Hexagon Nut.
22. Chamfer end of threaded section as per drawing. Set tool as before.

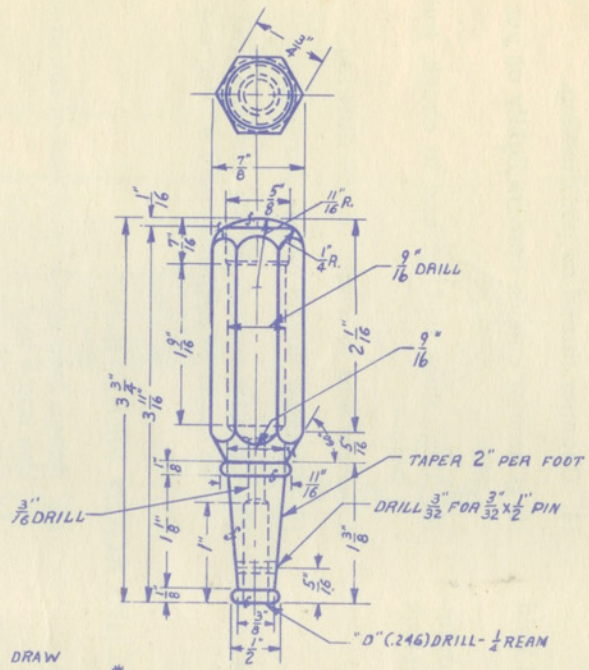
NOTE A: A relieved center would simplify the facing operation.

*See book "How to Run a Lathe" published by South Bend Lathe Works.



NO. 1 SHANK

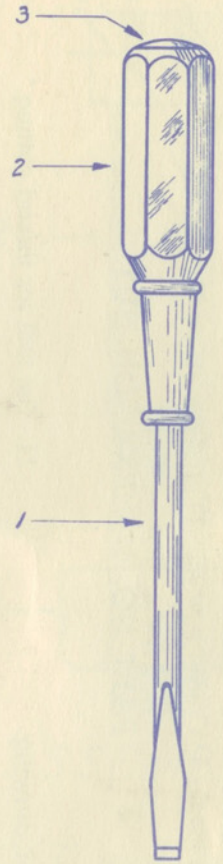
ONE REQ'D STOCK 1/4 DIA. X 5 3/4 LONG DRILL ROD



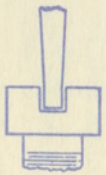
NO. 2 HANDLE

ONE REQ'D STOCK 3/4" HEX. 3 3/4" LONG C.D.S.

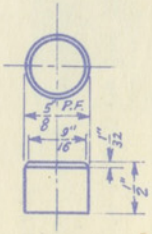
HANDLE ASSEMBLED WITH PLUG



ASSEMBLY OF SCREW DRIVER



DETAIL OF POINT



NO. 3 PLUG

ONE REQ'D FINISH ALL OVER

STOCK 3/4" DIA. X 3" LONG M.S.

DRILL ROD = TOOL STEEL "COLD DRAWN"
M.S. = MACHINE STEEL
C.D.S. = COLD DRAWN STEEL
F = FINISHED SURFACE
* = SEE HOW TO RUN A LATHE

SOUTH BEND MACHINE SHOP COURSE

PROJECT NO. 15 | DRAW. NO. 1

PART SCREW DRIVER.

SCALE | WORK TO FIGURES

SOUTH BEND LATHE WORKS
SOUTH BEND, IND. U.S.A.

DRAWN BY	C'KD. BY	TRACED BY	C'KD. BY	DATE
W.J.C.		E.S.O.		11-23-38

SCREW DRIVER

MATERIAL REQUIRED:

Part No. 1 Drill rod ¼" diam. x 5¼" long. One required.
Part No. 2 Cold drawn steel ¾" hex. x 3¾" long. One required.
Part No. 3 Machinery steel ¾" diam. x 3" long. One required.
Part No. 4 Cold rolled steel 3/32" diam. x 9/16" long. One required.

PART NO. 1—SHANK

OPERATIONS:

1. Select stock as per drawing.
2. Forge end to shape as per drawing.
3. File or grind to smooth finish.
4. File flat surfaces at point parallel for 3/32" as per enlarged section of drawing.
5. Harden and draw temper for 1" back from end as per drawing.*

NOTE: Do not drill pin hole in round end until instructed.

PART NO. 2—HANDLE

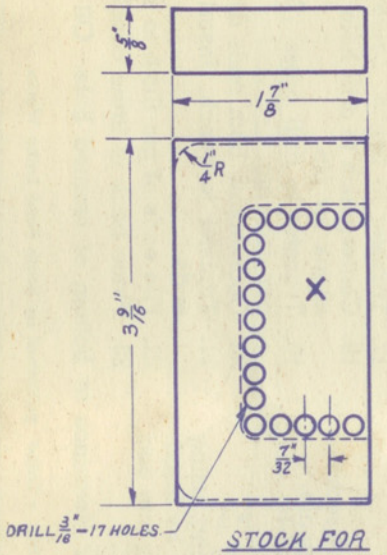
1. Select stock as per drawing.
2. Place steel in 3-jaw chuck with 2 inches projecting and running true.*
3. Arrange belt for proper spindle speed.*
4. Set lathe tool for facing.*
5. Face end.*
6. Set small round nose tool for taper turning.*
7. Rough turn outside diameter of bead at large end of taper, using longitudinal hand carriage feed.*
8. Rough turn outside diameter of bead at small end. Use longitudinal hand carriage feed.
9. Set compound rest to secure the required taper, which is approximately 95 degrees with handle toward the tailstock.
10. Rough turn taper between beads, feeding toward the headstock with compound rest screw.*
11. Finish turn outside diameter of both beads.*
12. Finish turn tapered section using fine feed.
13. Chamfer corner between large diameter bead and hexagon section. Use a broad nose tool.
14. Round corners of both beads with a forming tool and file.
15. Center end of stock for drilling, with centering tool held in tool post.*
16. Drill hole in end of stock as per drawing, with drill held in drill chuck in tailstock spindle.*
17. Insert machine reamer in drill chuck in place of drill.*
18. Ream hole in end for a light drive fit in Part No. 1—Shank, as per drawing.*
19. File machined surfaces lightly to remove tool marks.*
20. Polish machined surfaces with emery cloth and oil.*
21. Turn stock end for end in chuck, with 1 inch projecting and true as before.
22. Set lathe tool for facing.*
23. Face end to length as per drawing.*
24. Center end for drilling, with centering tool held in tool post.*
25. Drill 9/16" hole in handle to depth as per drawing.
26. Continue through handle with 3/16" drill to meet ¼" hole in tapered end.
27. Set tool for boring.*
28. Bore end of handle for plug as per drawing, leaving .010" to ream.
29. Ream as per drawing. Use chucking reamer held in tailstock spindle.*

PART NO. 3—PLUG

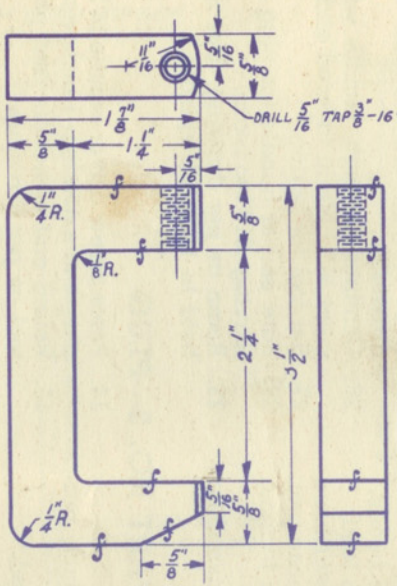
1. Select stock as per drawing.
2. Place steel in 3-jaw chuck with 1 inch projecting and turning true.*
3. Arrange belt for proper spindle speed.*
4. Set lathe tool for facing.*
5. Face end.*
6. Set lathe tool for turning.*
7. Rough turn diameter.*
8. Finish turn diameter for driving fit into reamed hole in large end of Part No. 2—Handle.
9. Set tool for chamfering.
10. Chamfer end as per drawing.
11. Set tool for cutting off.
12. Cut plug off to length as per drawing, using oil in work and feeding tool slowly by hand.
13. Transfer work to bench. Drive plug into end of handle. (See footnote A.)
14. Place screw driver handle in lathe chuck with plug end extending 1 inch, and true as before.
15. Round end of handle and plug with forming tool as per drawing.
16. File lightly to remove tool marks and polish with fine emery cloth and oil.*
17. Transfer to bench. Drive shank into handle.
18. Centerpunch to drill hole through handle and shank for pin.
19. Transfer to drill press. Drill hole for pin as per drawing.
20. Countersink both ends of hole slightly.
21. Transfer to bench. Insert pin and rivet both ends.
22. File ends of pin flush to surface of handle.
23. Place back in lathe chuck and re-polish.

NOTE A: End of plug is chamfered for clearance at bottom of reamed hole. Oil plug and drive in chamfered end first.

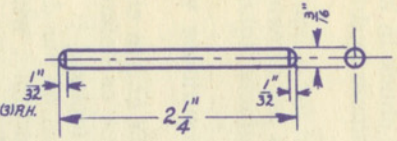
*See book "How to Run a Lathe" published by South Bend Lathe Works.



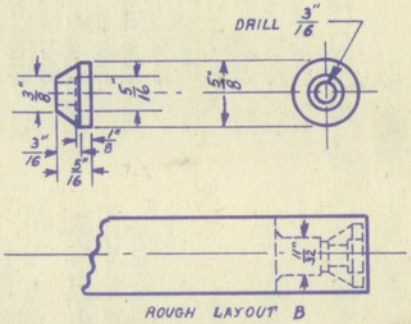
STOCK FOR
NO. 1 FRAME LAYOUT A
STOCK 5/8" X 1 7/8" X 3 9/16" LONG C.D.S.



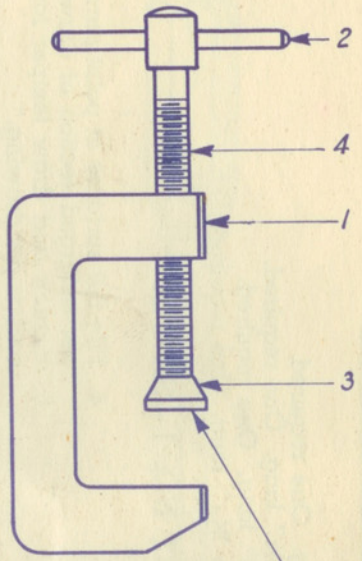
NO. 1 - CLAMP FRAME
ONE REQ'D. CASEHARDEN ALL OVER *



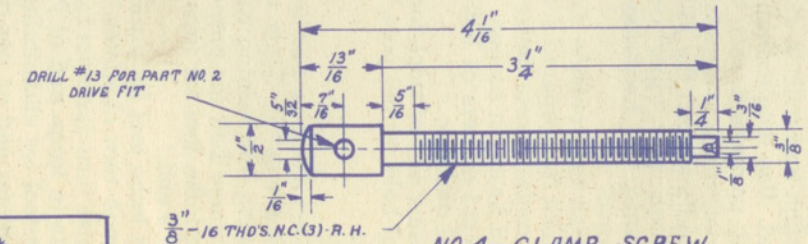
NO. 2 - CLAMP SCREW HANDLE
ONE REQ'D. STOCK 3/16 DIA. X 2 5/16 LONG C.R.S.



NO. 3 - CLAMP SCREW SWIVEL
ONE REQ'D. - FINISH ALL OVER
STOCK 3/4" DIA. X 3" LONG M.S.



ASSEMBLY OF "C" CLAMP
PEEN END OF SCREW INSIDE SWIVEL



NO. 4 - CLAMP SCREW
ONE REQ'D. - FINISH ALL OVER
STOCK 7/16" DIA. X 4 1/8" LONG C.R.S.

M.S. = MACHINE STEEL *
N.C. = NATIONAL COARSE
R.H. = RIGHT HAND
C.R.S. = COLD ROLLED STEEL
C.D.S. = COLD DRAWN STEEL
* = SEE HOW TO RUN A LATHE
(3) = CLASS 3 FIT

SOUTH BEND MACHINE SHOP COURSE	
PROJECT NO 18	DRAW. NO. 1
PART "C" CLAMP	
SCALE	WORK TO FIGURES
SOUTH BEND LATHE WORKS SOUTH BEND, IND., U.S.A.	

DRAWN BY	CKD. BY	TRACED BY	APRD. BY	DATE
E.P.K.		C.S.O.		11-23-38

"C" CLAMP

MATERIAL REQUIRED:

Part No. 1—Cold drawn steel 5/8" x 1 7/8" x 3 9/16" long. One required.
Part No. 2—Cold rolled steel 3/16" diam. x 2 5/16" long. One required.
Part No. 3—Machinery steel 3/4" x 3" long. One required.
Part No. 4—Cold rolled steel 9/16" diam. x 4 1/8" long. One required.

PART NO. 1—FRAME

OPERATIONS:

1. Select stock as per drawing. This cold drawn steel is stock size 5/8" x 1 7/8", and can be purchased on the market.
2. Square ends to length as per drawing layout A by planing or filing.
3. Lay off finish lines inside of blank as per drawing.
4. Lay off and centerpunch to drill for removing stock X. See drawing layout A.
5. Transfer to drill press. Drill to remove stock X as per drawing layout A. (See footnote A.)
6. Transfer to bench. Saw or drift and chip out light sections between holes to remove stock X.
7. Transfer to shaper. Place stock in vise with open side up. Set work square, and plane out inside of blank as per drawing. (See footnote B.)
8. Transfer to bench. Finish inside of blank with a file. Use a round file for fillets in corners.
9. Lay off and centerpunch to drill hole to be tapped for Part No. 4—Screw.
10. Lay off rounded outside corners and ends as per drawing.
11. Lay off to plane angle on anvil end of frame.
12. Transfer to drill press. Drill hole for Part No. 4—Screw as per drawing. (See footnote C.)
13. Transfer to grinding wheel. Rough grind rounded outside corners and ends.
14. Transfer to bench. Finish rounded outside corners and ends with a file.
15. Tap hole for Part No. 4 Clamp Screw. Start thread with a taper tap and finish with a plug tap.
16. Transfer to shaper, and plane angle on anvil end of frame.
17. Remove burrs and sharp corners with a fine file.
18. File surfaces smooth. Polish with emery cloth.*
19. Transfer to forge and caseharden all over.*

PART NO. 2—HANDLE

1. Select stock as per drawing.
2. Place stock in drill chuck in headstock spindle.
3. Arrange belt for proper spindle speed.*
4. Face and round end with forming tool in one operation.
5. File and polish end with emery cloth.*
6. Turn stock end for end in chuck.
7. Face end to length as per drawing and round end.
8. File and polish end with emery cloth.*

PART NO. 3—SWIVEL

1. Select stock as per drawing.
2. Place stock in 3-jaw universal chuck, projecting 1 inch and running true.*
3. Arrange belt for proper spindle speed.*
4. Set lathe tool for facing.*
5. Face end.*
6. Set small round nose tool for turning.*
7. Rough turn large diameter section to 21/32" in diameter.*
8. Set compound rest at an angle of 55 degrees to the right.
9. Set small round nose tool for taper turning.*
10. Turn off surplus stock back of taper as per rough layout B.
11. Rough turn angle on swivel, feeding with compound rest screw.*
12. Finish turn angle on swivel feeding as before.*
13. Finish turn large diameter section as per drawing. Use same tool and feed with longitudinal feed.
14. Center end of stock for drilling with centering tool held in tool post.
15. Drill into end of stock 1/2" deep, with 3/16" drill held in drill chuck in tailstock spindle.
16. Counterbore to depth as per drawing. Use 5/16" counterbore with 3/16" pilot.
17. File machined surfaces lightly to remove tool marks. Polish with emery cloth.*
18. Set right hand tool and cut off swivel to length as per drawing.* Put oil on work. Feed tool slowly by hand.
19. Remove burr from ends of hole with a file, and hand scraper.

PART NO. 4—CLAMP SCREW

1. Select stock as per drawing.
2. Lay off and center ends.*
3. Place stock on centers in lathe.* Drive with common lathe dog.* (See footnote D.)
4. Arrange belt for proper spindle speed.*
5. Set lathe tool for facing.*
6. Face end.*
7. Turn stock end for end on centers.
8. Face end to length as per drawing.
9. Set lathe tool for turning.*
10. Rough turn diameter of section to be threaded.*
11. Turn stock end for end on centers.
12. Rough turn diameter of head section.
13. Finish turn diameter of head section.*
14. Round end of head section with forming tool.
15. Turn stock end for end on centers. Place soft sheet brass around work to prevent marring of finished surface by lathe dog.*
16. Set tool for turning.*
17. Finish turn stock to 3/8" in diameter as per drawing.
18. Finish turn diameter of section to be threaded .010" undersize to insure a perfect fit on thread.
19. Set tool for facing.*
20. Face shoulder of head section.
21. Arrange gearing for thread cutting.*
22. Set tool for thread cutting.*
23. Cut thread to fit into tapped hole in Part No. 1—Frame.
24. Set tool for turning.*
25. Rough turn small diameter or pilot section.
26. Finish turn small diameter or pilot section for running fit in Part No. 3—Swivel, and to length as per drawing.
27. Set tool for facing.
28. Face shoulder of threaded section.
29. Transfer to bench. Lay off and centerpunch to drill hole through head section.
30. Transfer work to drill press.
31. Drill hole through section for driving fit for Part No. 2—Handle. (See footnote E.)

ORDER OF ASSEMBLY

1. Put oil on Part No. 2—Handle and drive same into hole in head of Part No. 4—Screw.
2. Screw Part No. 4 into Part No. 1—Frame.
3. Place Part No. 3—Swivel on pilot section of Part No. 4—Screw and peen end of screw. Swivel should turn freely after end of Part No. 4 is peened.

NOTE A: Drilling can be done in the lathe, using drill pad in tailstock spindle and drill held in drill chuck in headstock spindle.*

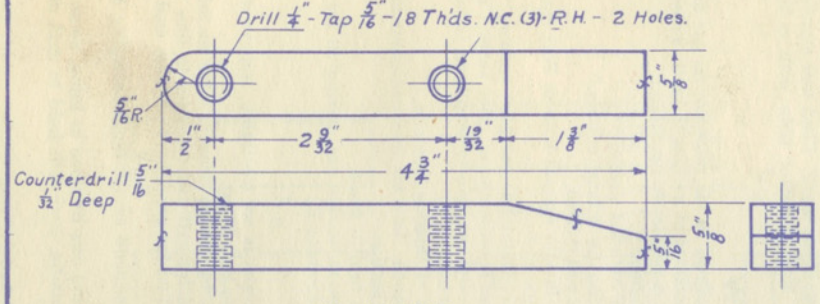
NOTE B: If shaper is not available, remove stock by grinding or chipping and filing.

NOTE C: Drilling can be done in lathe as follows: Lay off and centerpunch anvil end of frame in line with center of hole to be drilled for part No. 4—Screw, and drill between center.*

NOTE D: A relieved center would simplify the facing operation.*

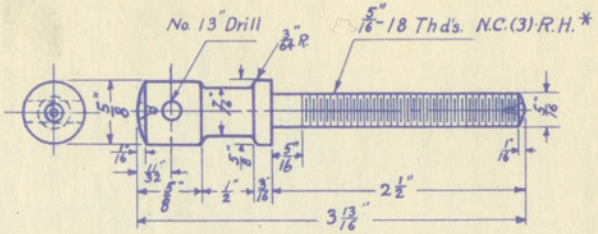
NOTE E: Drilling can be done in lathe, using crotch center in tailstock spindle, and drill held in drill chuck in headstock spindle.*

*See book "How to Run a Lathe" published by South Bend Lathe Works.



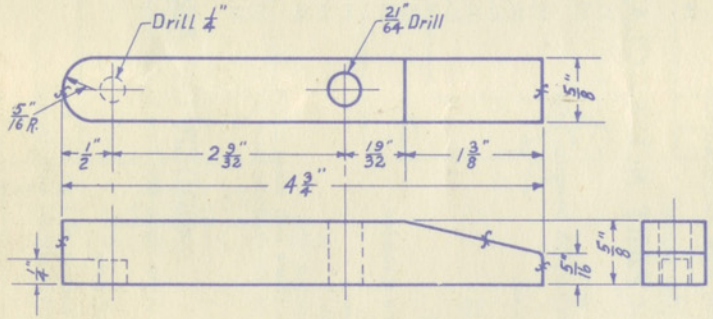
No. 1 - JAW.

One. - Case harden all over
Stock. 5/8" X 5/8" X 4 13/16" C.D.S



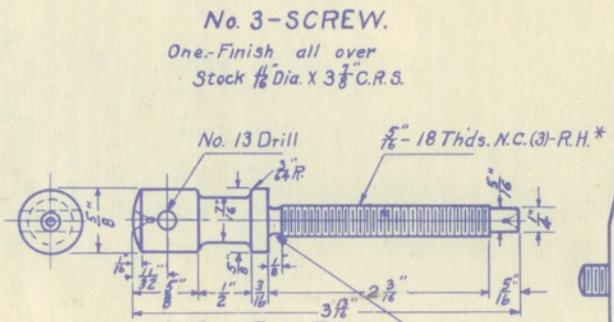
No. 3 - SCREW.

One. - Finish all over
Stock 11/16" Dia. X 3 7/8" C.R.S.



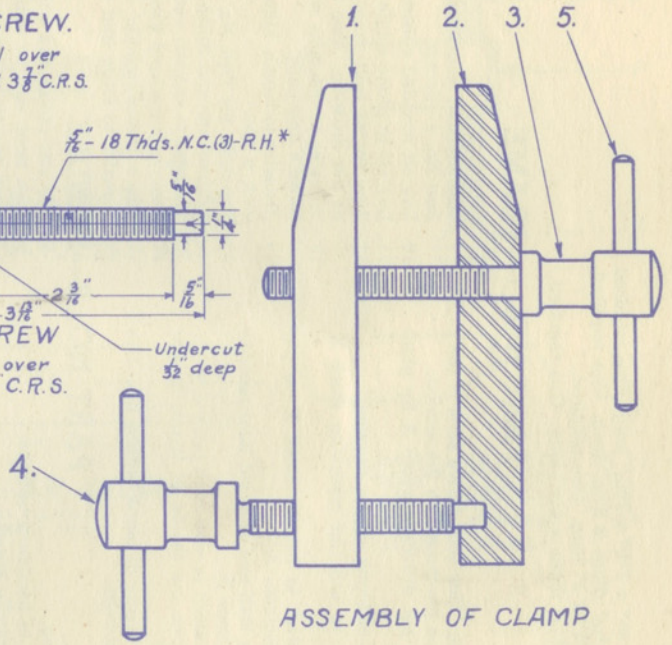
No. 2 - JAW.

One. - Case harden all over
Stock. 5/8" X 5/8" X 4 13/16" C.D.S.

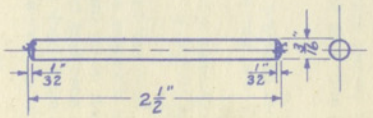


No. 4 - PILOT SCREW

One. - Finish all over
Stock 11/16" Dia. X 3 7/8" C.R.S.



ASSEMBLY OF CLAMP



No. 5 PIN

Two - Stock 3/16" Dia. X 2 9/16" Long C.R.S.

N.C. = National Coarse
(3) = Class 3 Fit
R. H. = Right Hand.
C.R.S. = Cold Rolled Steel *
C.D.S. = Cold Drawn Steel *
* See "How To Run A Lathe"

SOUTH BEND MACHINE SHOP COURSE				
PROJECT No. 20	DRAWING No. 1.			
MACHINIST CLAMP				
Scale	Complete in one Drawing			
SOUTH BEND LATHE WORKS SOUTH BEND, IND.				
DRAWN BY W. J. G.	C'K'D. BY N. J.	TRACED BY E. P. K.	APR'D. BY M. S. R.	DATE 11-23-38

MACHINIST'S CLAMP

MATERIAL REQUIRED:

Parts Nos. 1 and 2. Cold drawn steel 5/8" x 5/8" x 4 13/16" long. Two required.

Parts Nos. 3 and 4. Cold rolled steel 1 1/16" diam. x 3 7/8" long. Two required.

Part No. 5. Cold rolled steel 3/16" diam. x 2 9/16" long. Two required.

PARTS NOS. 1 and 2—JAWS

OPERATIONS:

1. Select two pieces of stock as per drawing. Perform following operations on both parts except as directed otherwise.
2. Place stock in 4-jaw chuck with 1 inch projecting. Adjust jaws so stock runs true.*
3. Arrange belt for proper spindle speeds.*
4. Set lathe tool for facing.*
5. Face one end only.*
6. Transfer work to bench.
7. Lay off bevel at faced end of stock.
8. Transfer to shaper and plane beveled section. (See footnote A.)
9. Transfer to bench. Lay off and file rounded ends to shape as per drawing.
10. Lay off and centerpunch to drill for screw holes in jaw No. 1.
11. Place jaw No. 1 on top of jaw No. 2 in position they will occupy when assembled and clamp them together.
12. Transfer to drill press. Drill hole for tap at beveled end, drilling through both pieces.* (See footnote B.)
13. Drill hole for tap at opposite end through jaw No. 1 and part way into jaw No. 2 as per drawing.
14. Redrill hole through jaw No. 2 at beveled end as per drawing.
15. Square bottom of blind hole in jaw No. 2 using a drill ground flat at point.
16. Transfer to bench vise. Tap holes through jaw No. 1.
17. Transfer to drill press. Countersink tapped hole in jaw No. 1 with a 5/16" drill to depth of 1/2 thread.
18. Transfer to bench vise. Break sharp corners with a file. File and polish all surfaces.
19. Transfer to forge. Caseharden all over.*

PARTS NOS. 3 and 4—SCREWS

1. Select two pieces of stock as per drawing. Perform following operations on both parts except as directed otherwise.
2. Lay off and center ends.*
3. Place on centers in lathe.* Drive with common lathe dog.* (See footnote C.)
4. Arrange belt for proper spindle speed.*
5. Set lathe tool for facing.*
6. Face end.*
7. Turn stock end for end on centers.
8. Face end to length as per drawing.
9. Set lathe tool for turning.*
10. Rough turn section to be threaded.*
11. Turn work end for end on centers.
12. Rough turn large diameter section to rough size for shoulder.
13. Rough turn recess section, using round nose tool.
14. Finish turn large diameter section.*
15. Finish turn recessed section, using small round nose tool ground to form fillets at shoulders.*
16. Set form facing tool and form radius on head end.
17. File radius on collar as per drawing. File machined surfaces lightly to remove tool marks and break sharp corners.*
18. Polish finished section with emery cloth and oil.
19. Turn work end for end on centers. Place soft sheet brass around finished work to prevent marring by lathe dog.*
20. Set tool for turning.*
21. Finish turn section to be threaded. Turn .010" undersize to insure a perfect fit.
22. Cut threading recess on No. 4 Screw as per drawing with narrow round nose tool. Face shoulder as per drawing.
23. Arrange gears for cutting thread as per drawing.*
24. Set tool for thread cutting.*
25. Cut thread to fit tapped holes in jaw No. 1.*
26. Round end of Screw No. 3 with forming tool.
27. Turn small section at end of thread on screw No. 4 for pilot. This should be a running fit in blind hole in jaw No. 2.
28. Transfer to bench. Centerpunch to drill hole through head section.
29. Transfer to drill press. Drill hole through head section for driving fit for Part No. 5—Pin. (See footnote D.)

PART NO. 5—PIN

1. Select stock as per drawing.
2. Place stock in drill chuck in headstock spindle with 1 inch projecting.
3. Round end with forming tool as per drawing.

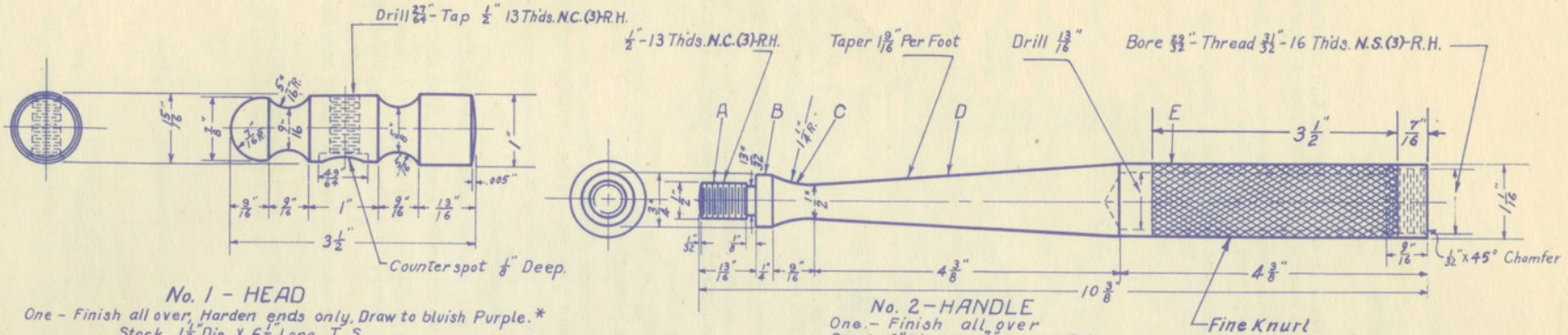
   NOTE A: If shaper is not available stock may be removed by drilling, or grinding and filing.

   NOTE B: Drilling can be done in the lathe using drill pad in tailstock spindle, and drill held in drill chuck in headstock spindle.*
4. Turn stock end for end projecting as before.
5. Round end as before.
6. Transfer to bench. Assemble clamp as per drawing.

   NOTE C: A relieved center would simplify the facing operation.*

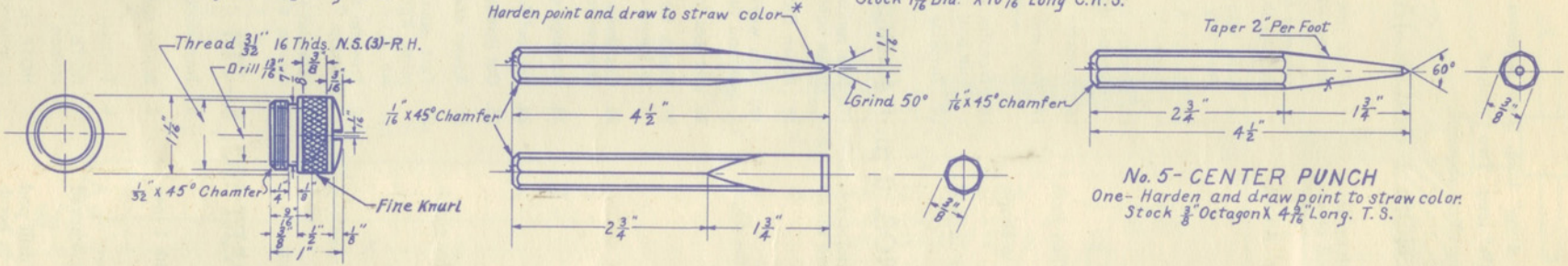
   NOTE D: Drilling may be done in lathe using crotch center in tailstock spindle and drill held in drill chuck in headstock spindle.*

*See book "How to Run a Lathe" published by South Bend Lathe Works.



No. 1 - HEAD
One - Finish all over, Harden ends only, Draw to bluish Purple. *
Stock 1 1/8" Dia. X 6 1/2" Long T. S.

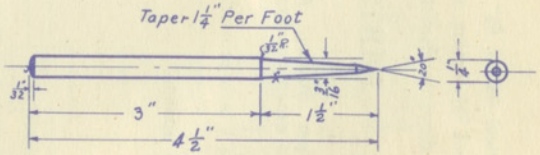
No. 2 - HANDLE
One - Finish all over
Stock 1 3/16" Dia. X 10 7/16 Long C.R.S.



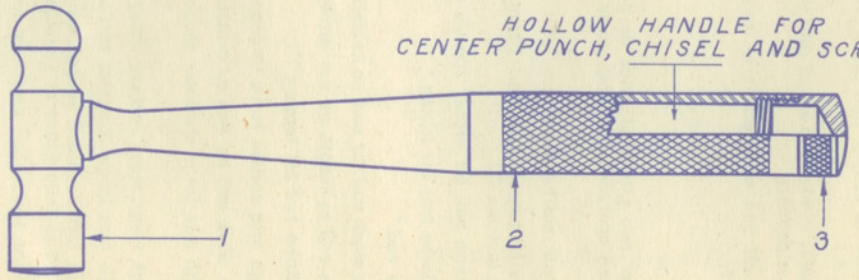
No. 3 - CAP
One - Finish all over
Stock 1 3/16" Dia. X 3 1/2" Long C.R.S.

No. 4 - COLD CHISEL
One - 3/8" Octagon x 4 1/16" Long. T.S.

No. 5 - CENTER PUNCH
One - Harden and draw point to straw color.
Stock 3/8" Octagon X 4 9/16" Long. T. S.



No. 6 - SCRIBE
One - Harden and draw Point to Straw Color.
Stock 1/4" Dia. X 4 9/16 Long Drill Rod.



ASSEMBLY OF
MACHINISTS HAMMER KIT.

N.C. = National Coarse *
N.S. = " Special
(3) = Class 3 Fit
C.R.S. = Cold Rolled Steel
T.S. = Tool Steel
* See "How To Run A Lathe"

SOUTH BEND MACHINE SHOP COURSE				
PROJECT No. 24.	DRAWING No. 1			
MACHINISTS HAMMER KIT.				
Scale	Complete in one Drawing			
SOUTH BEND LATHE WORKS SOUTH BEND, IND.				
DRAWN BY	C'KD. BY	TRACED BY	APPD. BY	DATE
E.P.K.	N.J.	E.P.K.	M.S.B.	11-22-38

MACHINIST'S HAMMER KIT

MATERIAL REQUIRED:

Part No. 1 Head. Tool steel 1⅛" diam. x 6½" long. One required.
Part No. 2 Handle. Cold rolled steel 1 3/16" diam. x 10 7/16" long. One required.
Part No. 3 Cap. Cold rolled steel 1 3/16" diam. x 3½" long. One required.
Part No. 4 Cold Chisel. Tool steel ⅜" octagon x 4 1/16" long. One required.
Part No. 5 Center Punch. Tool steel ⅜" octagon x 4 9/16" long. One required.
Part No. 6 Scribe. Drill rod ¼" diam. x 4 9/16" long. One required.

PART NO. 1—HEAD

OPERATIONS:

1. Select stock as per drawing.
2. Place stock in 4-jaw independent chuck, with 4½" projecting. Adjust jaws so stock runs true.*
3. Arrange belt for proper spindle speed.*
4. Set lathe tool for facing.*
5. Face end.*
6. Center drill end of stock with center drill held in drill chuck in tailstock spindle.*
7. Remove drill chuck and place hardened center in tailstock spindle.*
8. Adjust tailstock to support end of work.*
   NOTE: The ball end of this part is to be formed on end of stock supported by tailstock. Allow 5/16" stock on ball end for removing the center when the ball is formed.
9. Set lathe tool for turning.*
10. Rough turn large diameter section.
11. Rough turn diameter of center section.
12. Rough turn small diameter section.
13. Finish turn the three diameters as per drawing. File lightly to remove tool marks. Polish with emery cloth.*
14. Lay off and mark location of the concave grooves as per drawing.
15. Rough turn both grooves, using a round nose tool.
16. Finish turn both grooves as per drawing, using a forming tool. Polish grooves with emery cloth.
17. Place center-rest in position with jaws in line with 15/16" diameter section of work and clamp center-rest to lathe bed.*
18. Adjust center rest jaws to center up on 15/16" diameter section and withdraw tailstock. Put oil on work to lubricate jaws.
19. Set round nose tool for facing.
20. Face end to length as per drawing. This operation should remove the center hole from end of work.
21. Rough turn ball with same tool.
22. Finish turn ball with forming tools. File ball lightly and polish with emery cloth.*
23. Remove center rest from lathe.
24. Set right hand tool for cutting off.*
25. Cut off work to length as per drawing, plus 1/32" for finishing the end.
26. Place work in lathe chuck. Use 1/32" sheet brass around work to prevent marring of surface by chuck jaws. Grip on center section, allowing large end to project 1", and true as before.
27. Set lathe tool for facing.
28. Face end to length as per drawing.
29. Round face as per drawing.
30. File face to remove tool marks. Polish with emery cloth.*
31. Transfer to bench. Lay off and centerpunch to drill, tap and counterbore for Part No. 2 Handle.
32. Transfer to drill press. Drill and counterbore as per drawing. (See footnote A.)
33. Transfer back to bench. Tap hole as per drawing. Start thread with taper tap, and finish with a plug tap.
34. Transfer to forge. Harden ends only. Draw temper as per drawing.*

PART NO. 2—HANDLE

1. Select stock as per drawing.
2. Lay off and center ends.*
3. Place stock on centers in lathe. Drive with common lathe dog.* (See footnote B.)
4. Arrange belt for proper spindle speed.*
5. Set lathe tool for facing.*
6. Face end.*
7. Turn stock end for end on centers.
8. Face end to length as per drawing.
9. Set lathe tool for turning.
10. Rough turn section E.*
11. Turn work end for end on centers.
12. Rough turn section B.
13. Rough turn section A.

*See book "How to Run a Lathe" published by South Bend Lathe Works.

MACHINIST'S HAMMER KIT

PART NO. 2—HANDLE (Continued)

OPERATIONS:

14. Arrange lathe to obtain a taper of $1\frac{9}{16}$" per foot.*
15. Set lathe tool for taper turning.*
16. Take light trial cut over tapered section D.
17. Caliper at both ends of section D to test accuracy of taper. If taper is not correct adjust setting to correct error.
18. Rough turn tapered section D.
19. Rough turn fillet C at small end of tapered section D.
20. Finish turn tapered section D, as per drawing.*
21. Finish turn fillet C with a forming tool.
22. Arrange lathe for straight turning.*
23. Turn work end for end on centers.
24. Finish turn and knurl section E.
25. Turn work end for end on centers. Place soft sheet brass around finished end to prevent marring of surface by lathe dog.*
26. Finish turn section B.
27. Finish turn section A .010" undersize to insure a perfect fit on thread.
28. Set lathe tool for facing.*
29. Face shoulder of section B.
30. Set tool for recessing.*
31. Cut threading recess between sections A & B.
32. Arrange gearing for cutting thread as per drawing.*
33. Set tool for thread cutting.*
34. Cut thread to fit into tapped hole in Part No. 1 —Head. Round end of threaded section with forming tool, as per drawing, not touching center hole.
35. Turn work end for end on centers. Drive with dog attached to ½" nut screwed onto threaded end of handle.*
36. Place center rest into position with jaws ½" from end of section E.*
37. Adjust jaws to center up on diameter of section E. Put oil on work to lubricate jaws.
38. Arrange belt lacing around lathe dog and through slots of face plate, for holding work against the live center.*
39. Withdraw tailstock. Remove hardened center and insert drill chuck in tailstock spindle.*
40. Center end of handle for drilling, with centering tool held in tool post.*
41. Drill end of handle as per drawing, holding drill in drill chuck in tailstock spindle.*
42. Set small tool for boring.*
43. Bore end of handle for thread as per drawing.
44. Arrange gearing for cutting internal thread as per drawing.*
45. Set tool for internal thread cutting.*
46. Cut thread to size as per drawing.*
47. Set tool for chamfering.
48. Chamfer end of thread as per drawing.

PART NO. 3—CAP

1. Select stock as per drawing.
2. Place stock in 4-jaw independent chuck with stock projecting 1½". Adjust jaws so stock runs true.*
3. Arrange belt for proper spindle speed.*
4. Set lathe tool for facing.*
5. Face end.*
6. Center end for drilling, with centering tool held in tool post.*
7. Drill hole in end of cap with drill held in drill chuck in tailstock spindle. (See drawing.)
8. Set lathe tool for turning.*
9. Rough turn large diameter section.*
10. Rough turn small diameter section.
11. Finish turn and knurl large diameter section.*
12. Finish turn small diameter section.
13. Set tool for facing.*
14. Face shoulder of large diameter section.
15. Set tool for recessing.*
16. Cut recess for threading.
17. Arrange gearing for cutting thread as per drawing.*
18. Set tool for thread cutting.*
19. Cut thread on small diameter section to fit into threaded hole in large end of Part No. 2 —Handle.*
20. Set tool for chamfering.
21. Chamfer end of thread as per drawing.
22. Remove drill chuck and place hardened center in tailstock spindle.*
23. Screw Part No. 2 — Handle into place on thread of cap. Adjust tailstock to support small end of handle.*
24. File machined surfaces of handle and cap to remove tool marks. Polish with emery cloth.*
25. Withdraw tailstock. Unscrew and remove handle from lathe.
26. Set right hand tool for cutting off.*
27. Cut off cap to length as per drawing, plus $\frac{1}{32}$" for finishing the end. Put oil on work and feed tool slowly by hand.

*See book "How to Run a Lathe" published by South Bend Lathe Works.

MACHINIST'S HAMMER KIT

PART NO. 3—CAP (Continued)

OPERATIONS:

28. Screw cap into handle. Place handle in lathe chuck with cap end projecting ½", and true as before. Wrap emery cloth around handle to prevent marring finished surface.
29. Set lathe tool for facing.*
30. Face end of cap to length as per drawing.
31. Round end of cap with forming tool.
32. File end of cap to remove tool marks. Polish with emery cloth.*
33. Transfer to milling machine.
34. Saw screw driver slot in end of cap as per drawing. (See footnote C.)

PART NO. 4—COLD CHISEL

1. Select stock as per drawing.
2. Forge end to shape as per drawing.
3. Grind and file to smooth finish.
4. Transfer to lathe.
5. Place stock in 4-jaw independent chuck, with hexagon end projecting ¼". Adjust jaws so stock runs true.*
6. Set tool for facing.*
7. Face end to length as per drawing.
8. Set tool for chamfering.
9. Chamfer corners as per drawing.
10. Transfer to forge. Harden point for 1 inch back from end. Draw temper as per drawing.*
11. Grind cutting edge to proper angle as per drawing.

PART NO. 5—CENTER PUNCH

1. Select stock as per drawing.
2. Place stock in 4-jaw independent chuck projecting 2 inches. Adjust jaws so stock runs true.*
3. Arrange belt for proper spindle speed.*
4. Set compound rest at proper angle to obtain taper of 2 inches per foot. This is approximately 95 degrees to the right.
5. Set tool for taper turning.*
6. Rough turn taper, using round nose tool and feeding toward headstock with compound rest screw.*
7. Finish turn taper using fine feed for smooth finish.
8. Set compound rest at an angle of 120 degrees to the right. Turn angle of point using same tool.
9. File machined section lightly to remove tool marks. Polish with fine emery cloth.*
10. Turn work end for end in chuck with work projecting 1 inch, and true as before.
11. Set lathe tool for facing.*
12. Face end to length as per drawing.
13. Set tool for chamfering.
14. Chamfer corners as per drawing.
15. Transfer to forge, harden for ½" back from point and draw temper as per drawing.*
16. Place back in lathe chuck and re-polish.

PART NO. 6—SCRIBE

1. Select stock as per drawing.
2. Place stock in 3-jaw universal chuck projecting 1¾" and running true.*
3. Arrange belt for proper spindle speed.*
4. Set compound rest at proper angle to obtain taper of 1¼" per foot. This is approximately 93 degrees to the right.
5. Set tool for taper turning.*
6. Rough turn taper using round nose tool and feeding toward headstock with compound rest screw.*

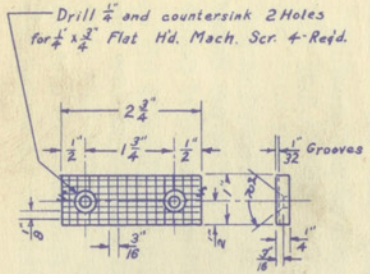
NOTE A: Drilling can be done in lathe, using crotch center in tailstock spindle and drill held in drill chuck in headstock spindle.

NOTE B: A relieved center would simplify the facing operation.*

7. Finish turn taper to $\frac{1}{32}$" in diameter at point, using fine feed for smooth finish. File to sharp point using fine file.
8. Turn work end for end in chuck, projecting ½" and true as before.
9. Set tool for facing.*
10. Face end to length as per drawing.*
11. Round end with a file. Polish with emery cloth.*
12. Transfer to forge. Harden point for 1" back from end. Draw temper as per drawing.*
13. Place back in lathe chuck and polish.

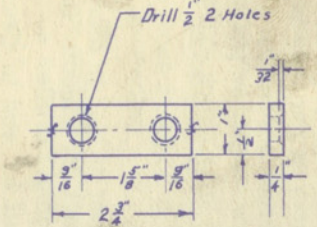
NOTE C: If milling machine is not available, transfer work to bench and saw slot with a hack saw.

*See book "How to Run a Lathe" published by South Bend Lathe Works.



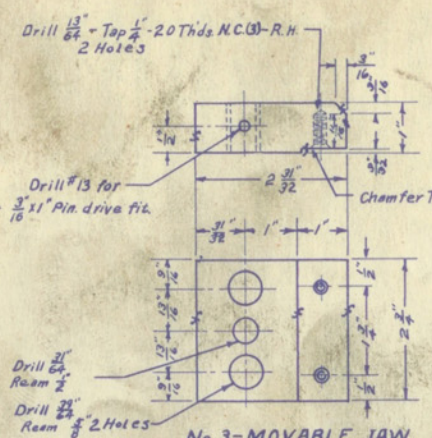
No. 1 - JAW INSERT

Two - Casehardan all over *
Stock 1/4" x 1" x 2 13/16" Long - C. D. S.



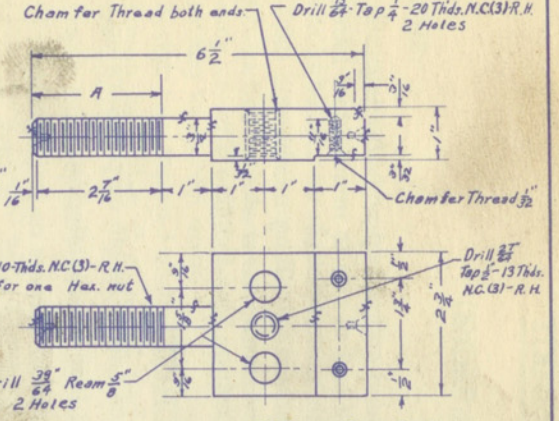
No. 2 - SPACER

One - Stock 1/4" x 1" x 2 13/16" Long.
C. D. S.



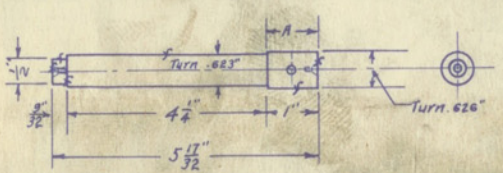
No. 3 - MOVABLE JAW

One - Stock 1" x 2 3/4" x 3 1/32" Long - C. D. S.



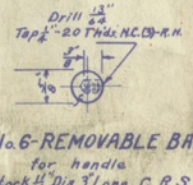
No. 4 - STATIONARY JAW

One - Stock 1" x 2 3/4" x 6 5/16" Long C. D. S.



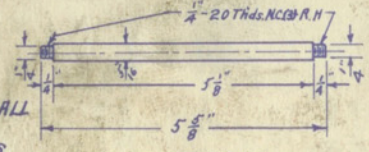
No. 5 - GUIDE BAR

Two - Stock 3/4" Dia. x 5 13/32" Long M. S.



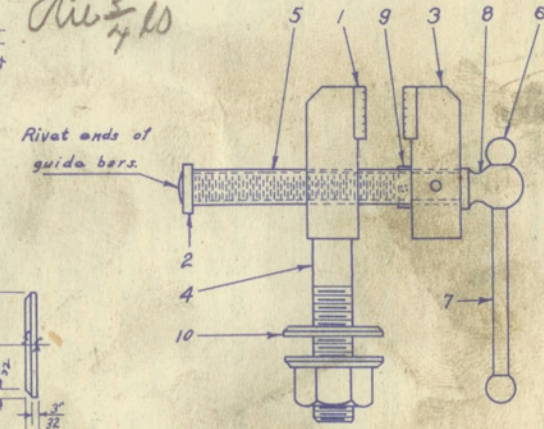
No. 6 - REMOVABLE BALL

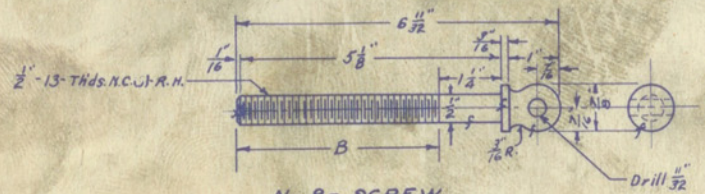
for handle
Two - Stock 11/16" Dia 3" Long C. R. S.



No. 7 - HANDLE

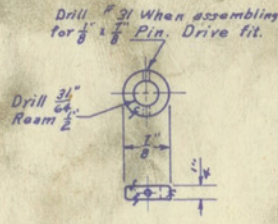
One - Stock 5/16" Dia. x 5 11/16" Long C.R.S.





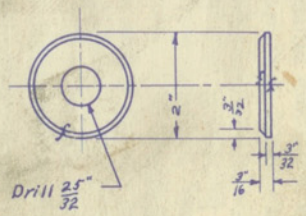
No. 8 - SCREW

One - Stock 1" Dia x 6 23/32" Long - C.R.S.



No. 9 - COLLAR

One - Stock 15/16" Dia x 1/4" Long
C. R. S.



No. 10 - WASHER

Two - Stock 2 1/16" Dia. x 3" Long
C. R. S.

N.C. = National Coarse.
C.D.S. = Cold Drawn Steel.*
M.S. = Machinery Steel.*
$ = Finished Surface.
(3). = Class 3 Fit
C.R.S. = Cold Rolled Steel.
* See "How To Run A Lathe"

SOUTH BEND MACHINE SHOP COURSE				
PROJECT No. 39	DRAWING No. 1			
2 3/4" MACHINISTS VISE				
Scale	Complete in one Drawing			
SOUTH BEND LATHE WORKS SOUTH BEND, IND.				
DRAWN BY E.P.K.	C'K'D. BY N.J.	TRACED BY L.S.Z.	AP'RD. BY N. J.	DATE 11-23-38

SMALL BENCH VISE

MATERIAL REQUIRED:

Part No. 1 Jaw Insert. Cold drawn steel ¼" x 1" x 2 13/16" long. Two required.
Part No. 2 Spacer. Cold drawn steel ¼" x 1" x 2 13/16" long. One required.
Part No. 3 Movable Jaw. Cold drawn steel 1" x 2¾" x 3 1/32" long. One required.
Part No. 4 Stationary Jaw. Cold drawn steel 1" x 2¾" x 6 9/16" long. One required.
Part No. 5 Guide Bar. Machinery steel ¾" diam. x 5 19/32" long. Two required.
Part No. 6 Removable Ball. Cold rolled steel 1 1/16" diam. x 3" long. One required.
Part No. 7 Handle. Cold rolled steel 5/16" diam. x 5 11/16" long. One required.
Part No. 8 Screw. Cold rolled steel 1" diam. x 6 23/32" long. One required.
Part No. 9 Collar. Cold rolled steel 1 5/16" diam. x 5/16" long. One required.
Part No. 10 Washer. Cold rolled steel 2 1/16" diam. x 3" long. One required.
Flat Hd. Mach. Screws ¼" diam. x ¾" long. Four required
Cold Rolled Steel Pins 3/16" diam. x 1" long. Two required.
Cold Rolled Steel Pin ⅛" diam. x 1 5/16" long. One required.
Hex. Nut ¾" U. S. S.—R. H. One required.

PART NO. 1—JAW INSERT

OPERATIONS:

1. Select two pieces of stock as per drawing. Perform following operations on both parts.
2. Finish ends to length by planing or grinding and filing.
3. Lay off, centerpunch, drill and countersink as per drawing. (See footnote A.)
4. Lay off and plane grooves as per drawing. (See footnote B.)
5. Case-harden all over.*

PART NO. 2—SPACER

1. Select stock as per drawing.
2. Finish ends to length by planing or grinding and filing.
3. Lay off, centerpunch, drill holes and countersink as per drawing. (See tootnote A.)

PART NO. 3—MOVABLE JAW

1. Select stock as per drawing.
2. Finish ends to length by planing or grinding and filing.
3. Lay off location of shoulder next to offset surface.
4. Set work square in shaper vise. Plane offset surface and square shoulder as per drawing.
5. Turn stock over and chamfer outside corner as per drawing.
6. Lay off, centerpunch and drill 31/64" and 39/64" holes as per drawing. (See footnote A.) Do not ream until instructed.
7. Clamp Jaw Insert, Part No. 1 and Movable Jaw, Part No. 3, together as per assembly drawing.
8. Using Part No. 1 as a jig, spot location of screwholes on Part No. 3.
9. Drill screw holes in Part No. 3 as per drawing. (See footnote A.)
10. With the parts still clamped togetner, tap screw holes in Part No. 3 as per drawing, using holes in Part No. 1 to guide tap.
11. After both holes have been tapped and the screws fitted, Part No. 1 should be removed until the vise is assembled. (See footnote C.)
12. Chamfer thread as per drawing.
13. Remove burrs and sharp corners. File and polish all surfaces except the offset surface.*

PART NO. 4—STATIONARY JAW

1. Select stock as per drawing.
2. Lay off and center ends.*
3. Face ends to length as per drawing.* (See footnote D.)
4. Rough turn round section and rough face shoulder.
5. Finish turn round section as per drawing.*
6. Turn thread section (A) .010" undersize.
7. Face shoulder to length as per drawing.
8. Arrange gearing for cutting thread as per drawing.*
9. Set lathe tool for thread cutting.*

*See book "How to Run a Lathe" published by South Bend Lathe Works.

SMALL BENCH VISE

PART NO. 4—STATIONARY JAW (Continued)

OPERATIONS:

10. Cut thread,* fitting to hex. nut as per drawing. Chamfer end of thread.
11. Lay off location of shoulder next to offset surface.
12. Set work square in shaper vise. Plane offset surface and square shoulder as per drawing.
13. Turn stock over and chamfer corner as per drawing.
14. Clamp Part No. 3 Movable Jaw and Part No. 4 Stationary Jaw together, as per assembly drawing.
15. Using Part No. 3 as a jig, spot location of center hole in Part No. 4 with $^{31}/_{64}$" drill.
16. Drill center hole through Part No. 4 as per drawing. (See footnote A.)
17. With parts still clamped together, tap center hole in Part No. 4, using hole in Part No. 3 to guide tap.
18. Ream center hole in Part No. 3 as per drawing.
19. Chamfer ends of threaded hole in Part No. 4 as per drawing.
20. Place parts back together and clamp with a ½" screw through center hole.
21. Using Part No. 3 as a jig, drill the $^{39}/_{64}$" holes through Part No. 4. Ream ⅝" through both parts.
22. Clamp Jaw Insert, Part No. 1 and Part No. 4 together, and perform drilling, tapping and chamfering operations as performed on Part No. 3.
23. File all surfaces smooth. Polish all surfaces except offset surface.*

PART NO. 5—GUIDE BAR

1. Select stock as per drawing.
2. Lay off and center ends.*
3. Face ends to length as per drawing.* (See footnote D.)
4. Rough turn small diameter section.*
5. Rough turn large diameter section.
6. Finish turn section (A) of large diameter, as per drawing,* allowing .003 for filing to diameter.
7. Finish turn remainder of large diameter section as per drawing, allowing .003" for filing as before.
8. Finish turn small diameter section for slip fit into holes in Part No. 2—Spacer.
9. Face shoulder to length as per drawing.
10. File section A of large diameter section for press fit into Part No. 3—Movable Jaw and remainder of large diameter section for sliding fit in Part No. 4—Stationary Jaw.
11. Do not drill hole through diameter of section A until instructed.

PART NO. 6—REMOVABLE BALL

1. Select stock as per drawing.
2. Place stock in lathe chuck.*
3. Face ends to length as per drawing.*
4. Center end of stock for drilling.*
5. Drill to size and depth as per drawing.*
6. Tap hole as per drawing.*
7. Cut off work to length as per drawing, plus $^{1}/_{32}$" for finishing end when ball is formed.
8. Make second ball by repeating above operations No. 4 to No. 7 inclusive.

NOTE: Stop work on Part No. 6—Removable Ball. Take up and complete Part No. 7 Handle. Then use Part No. 7 as a stub arbor for finishing Part No. 6.

PART NO. 7—HANDLE

1. Select stock as per drawing.
2. Place stock in lathe chuck.
3. Face ends to length as per drawing.*
4. Turn section to be threaded .010" undersize.
5. Face shoulder to length as per drawing.
6. Arrange gearing for cutting thread as per drawing.*
7. Set lathe tool for thread cutting.*
8. Cut thread,* fitting to tapped hole in Part No. 6 Removable Ball.
9. Turn and thread other end by repeating above operations No. 4 to No. 8 inclusive.

PART NO. 6—REMOVABLE BALL (Continued)

9. Screw one of the partly finished (Removable Balls) on threaded end of Part No. 7 Handle.
10. Rough turn ball with round nose tool and finish with forming tools.
11. Screw second ball on opposite end of handle. Rough and finish turn ball as before.
12. File and polish both Removable Balls and polish the handle.*

*See book "How to Run a Lathe" published by South Bend Lathe Works.

SMALL BENCH VISE

PART NO. 8—SCREW

OPERATIONS:

1. Select stock as per drawing.
2. Lay off and center ends.*
3. Face ends to length as per drawing,* plus 5/16" stock for removing the center hole in ball end. (See footnote D.)
4. Rough turn small diameter section.*
5. Rough turn large diameter section.
6. Rough turn fillet between collar and ball end.
7. Finish turn large diameter section.*
8. Finish turn ½" diameter section, allowing .003" for filing to diameter.
9. Turn thread section B .010" undersize.
10. Face shoulder to length as per drawing.
11. File ½" diameter section for running fit in ½" reamed hole in Part No. 3 Movable Jaw.*
12. Arrange gearing for cutting thread as per drawing.
13. Set lathe tool for thread cutting.*
14. Cut thread,* fitting to tapped hole in Part No. 4 Stationary Jaw.
15. Chamfer end of thread as per drawing.
16. Place work in lathe chuck with ball end projecting.
17. Face end to length as per drawing, removing the center hole.
18. Rough turn ball with round nose tool and finish with forming tools.
19. Lay off, centerpunch and drill hole through diameter of ball. (See footnote E.)

PART NO. 9—COLLAR

1. Select stock as per drawing.
2. Place stock in lathe chuck.*
3. Rough face and center stock for drilling.*
4. Drill through stock with 31/64" drill.*
5. Ream hole as per drawing.*
6. Press ½" arbor into work. (See footnote F.)
7. Rough face unfinished side of work.
8. Finish face sides of work to width as per drawing.
9. Turn diameter as per drawing. File and polish diameter.* File corners.

PART NO. 10—WASHERS

1. Select stock as per drawing.
2. Place stock in lathe chuck.*
3. Face end* and center stock for drilling.*
4. Drill into stock ¾" deep with 25/32" drill.*
5. Rough and finish turn diameter and chamfer corner as per drawing.
6. Cut off washer to length as per drawing.
7. Face end of stock, chamfer corner and cut off second washer as before.

ASSEMBLING INSTRUCTIONS

1. Press the Draw Bars, Part No. 5 into the ⅝" reamed holes in Part No. 3 Movable Jaw. (See assembly drawing.)
2. Lay off, centerpunch and drill pin holes as per drawing. Oil pins and drive same into place.
3. Assemble Part No. 3 Movable Jaw, Part No. 8 Screw and Part No. 9 Collar, as per assembly drawing.
4. Centerpunch and drill pin hole through Parts No. 8 and No. 9 as per drawing. Oil pin and drive same into place.
5. Assemble vise as per assembly drawing.

NOTE A: Drilling can be done in lathe, using drill pad in tailstock spindle and drill held in drill chuck in headstock spindle.*

NOTE B: If shaper is not available, saw slots with a hacksaw.

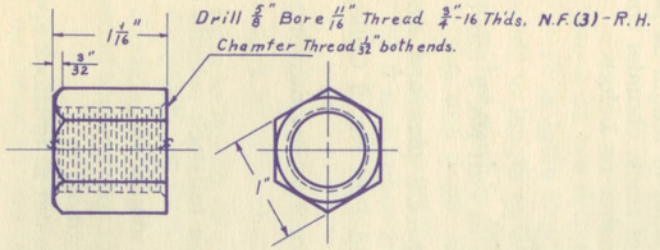
NOTE C: Before removing the Jaw Insert, mark both parts for convenience in assembling.

NOTE D: A relieved center would simplify the facing operation.*

NOTE E: Drilling can be done in the lathe, using crotch center in tailstock spindle and drill held in drill chuck in headstock spindle.*

NOTE F: Before pressing arbor into work, remove dirt and put oil in hole. Also clean and oil the arbor.

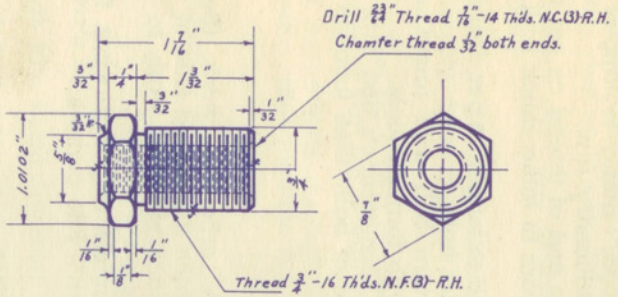
*See book "How to Run a Lathe" published by South Bend Lathe Works.



No. 1 - BASE

One. Case harden *

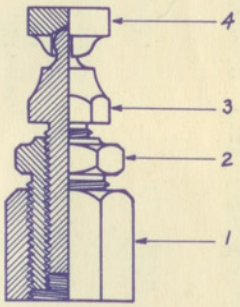
Stock 1" Hex. X 1 1/8" Long C.D.S.



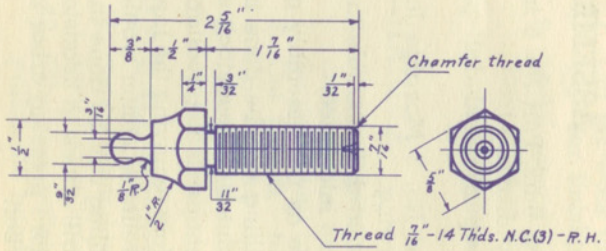
No. 2 - SLEEVE

One. Caseharden *

Stock 7/8" Hex. X 4" Long C.D.S.



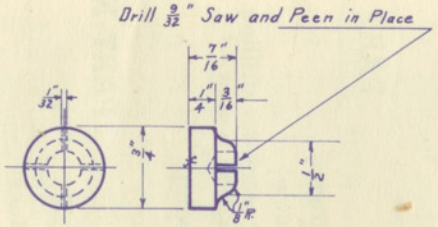
ASSEMBLY OF
MACHINISTS JACK SCREW



No. 3 - SCREW

One. Case harden *

Stock 5/8" Hex. x 2 11/16" Long C.D.S.



No. 4 - SWIVEL

One. Caseharden *

Stock 13/16" Dia. X 3" Long C.R.S.

N.C. = National Coarse
R.H. = Right Hand
C.D.S. = Cold Drawn Steel
N.F = National Fine
(3) = Class 3 Fit
* See "How To Run A Lathe"

SOUTH BEND MACHINE SHOP COURSE				
PROJECT No. 42	DRAWING No. 1			
MACHINISTS JACK SCREW				
Scale	Complete in one Drawing			
SOUTH BEND LATHE WORKS SOUTH BEND, IND.				
DRAWN BY	C'KD. BY	TRACED BY	AP'RD. BY	DATE
E.P.K.	N.J.	E.P.K.	O.B.	11-23-38

MACHINIST'S JACK SCREW

MATERIAL REQUIRED:

Part No. 1 Base. Cold drawn steel 1" Hex. x 1⅛" long. One required.

Part No. 2 Sleeve. Cold drawn steel ⅞" Hex. x 4" long. One required.

Part No. 3 Screw. Cold drawn steel ⅝" Hex. x 2 11/16" long. One required.

Part No. 4 Swivel. Cold rolled steel 1 3/16" dia. x 3" long. One required.

PART NO. 1—BASE

OPERATIONS:

1. Select stock as per drawing.
2. Place stock in lathe chuck.*
3. Face ends to length as per drawing.*
4. Center end of stock for drilling.*
5. Drill through stock as per drawing.*
6. Bore hole as per drawing.
7. Arrange gearing for cutting thread as per drawing.*
8. Set lathe tool for internal thread cutting.*
9. Cut thread* as per drawing, allowing .005" stock for tap to remove. (See footnote A.)
10. Finish thread to size with a tap before removing work from lathe.*
11. Chamfer corners of hex. and ends of thread as per drawing.

PART NO. 2—SLEEVE

1. Select stock as per drawing.
2. Place stock in lathe chuck.*
3. Face end.*
4. Rough turn diameter to be threaded.*
5. Face shoulder and cut threading recess as per drawing.
6. Center end of stock for drilling.*
7. Drill into stock as per drawing to depth of 1 9/16".*
8. Start thread with tap as per drawing to depth of ½".* Chamfer end of thread as per drawing.
9. Finish turn section to be threaded .010" undersize.
10. Arrange gearing for cutting thread as per drawing.*
11. Set lathe tool for thread cutting.*
12. Cut thread fitting to threaded hole in Part No. 1—Base.*
13. Chamfer outside corners of hex. section and end of thread as per drawing.
14. Cut work off to length as per drawing, plus 1/32" stock for finishing the end.
15. Place work in bench vise and finish tapping by hand.
16. Screw Part No. 2—Sleeve into Part No. 1—Base, with shoulder of sleeve against top of base. Place work in lathe chuck, gripping on Part No. 1—Base.
17. Face end, and rough face shoulder.*
18. Finish face shoulder, using tool ground to form fillet. File corner.
19. Chamfer outside corners of hex. section and end of thread as per drawing.

NOTE: Screw Part No. 2—Sleeve out of Part No. 1—Base, allowing the base to remain in the chuck to be used again for finishing ball end of Part No. 3—Screw.

PART NO. 3—SCREW

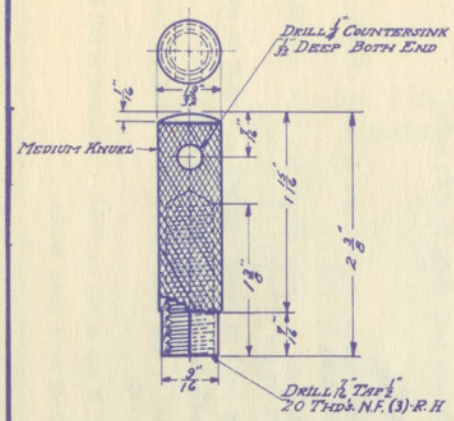
1. Select stock as per drawing.
2. Lay off and center ends.*
3. Face ends to length as per drawing,* plus 5/16" stock for removing center hole in ball end.
4. Rough turn diameter to be threaded.*
5. Face shoulder and cut threading recess as per drawing.
6. Finish turn section to be threaded .010" undersize.
7. Arrange gearing for cutting thread as per drawing.*
8. Set lathe for thread cutting.*
9. Cut thread,* fitting to tapped hole in Part No. 2—Sleeve. Chamfer end of thread as per drawing.
10. Screw Part No. 3—Screw into Part No. 2—Sleeve, with shoulder of screw against top of sleeve. Screw Part No. 2—Sleeve into Part No. 1—Base which is still in the lathe chuck.
11. Rough turn diameter of ball allowing 5/16" stock for facing end to remove center hole.
12. Turn fillet next to hex. section using a forming tool.
13. Face shoulder and form fillet in one operation, using forming tool.*
14. Face end to length as per drawing, removing center hole.
15. Finish turn ball, using forming tools.

PART NO. 4—SWIVEL

1. Select stock as per drawing.
2. Place stock in lathe chuck.*
3. Face end.*
4. Rough turn diameter.*
5. Center end of stock for drilling.*
6. Drill into end of stock as per drawing.*
7. Finish turn diameter as per drawing.*
8. Face shoulder and form fillet in one operation.*
9. Round end as per drawing, with a file. File corner.
10. Cut off work to length as per drawing, allowing 1/32" stock for finishing the end.
11. Place work in lathe chuck and face unfinished end to length as per drawing. File corner.
12. Place work in bench vise and saw slots as per drawing.
13. Case-harden the four parts all over.*
14. Assemble the jack and peen swivel as per assembly drawing.

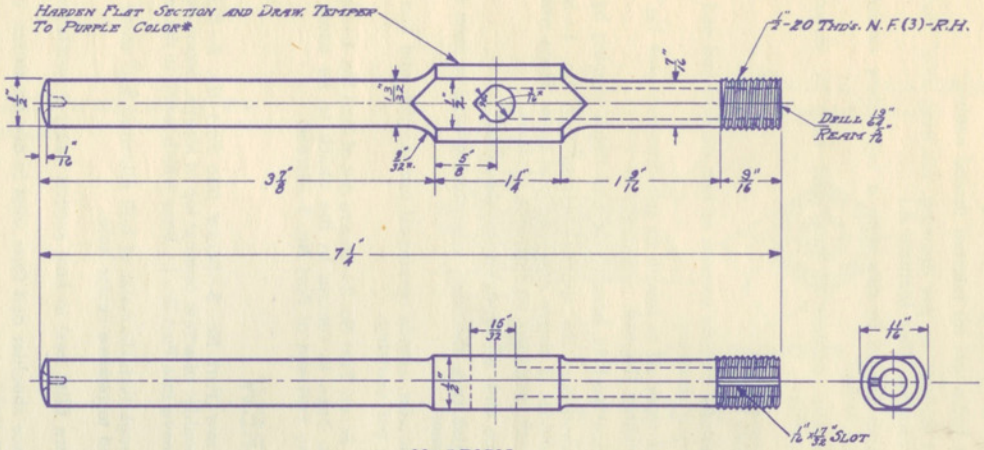
NOTE A: If tap is not available cut thread to full depth.

*See book "How to Run a Lathe" published by South Bend Lathe Works.



No. 1 ADJUSTING SLEEVE

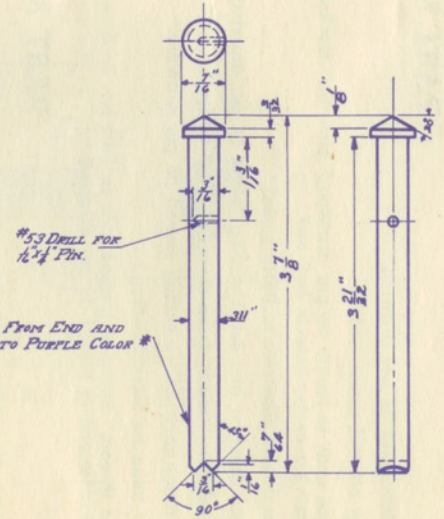
One – Finish All Over
Stock 1 1/16 Dia. x 5" Long – C.R.S.



No. 2 BODY

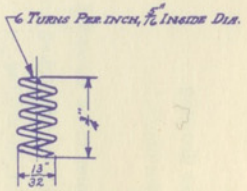
One – Finished All Over
Stock – 3/4 Dia. x 7 1/4 Long T.S.

Assembly of Tap Wrench



No. 3 PLUNGER

One-Finished All Over
Stock – 1/2 Dia. x 4 1/4 Long T.S.



No. 4 SPRING

One – Stock 18 Gage Music Wire .047" Dia.

N.F. = National Fine
(3) = Class 3 Fit
C.R.S. = Cold Rolled Steel
R.H. = Right Hand
T.S. = Tool Steel
* See "How to Run a Lathe"

SOUTH BEND MACHINE SHOP COURSE				
PROJECT NO. 47	DRAWING NO. 1			
TAP WRENCH				
SCALE –	COMPLETE IN ONE DRAW.			
SOUTH BEND LATHE WKS. SOUTH BEND, IND.				
DRAWN BY	CK'D BY	TRACED BY	APVD BY	DATE
L.S.Z.	C.B.J.	C.M.L.	C.B.J.	11-23-38

ADJUSTABLE TAP WRENCH

MATERIAL REQUIRED:

Part No. 1 Adjusting Sleeve. Cold rolled steel $1\frac{1}{16}$" dia. x 5" long. One required.

Part No. 2 Body. Tool steel $\frac{3}{4}$" dia. x $7\frac{5}{16}$" long. One required.

Part No. 3 Plunger. Tool steel $\frac{1}{2}$" dia. x $4\frac{3}{16}$" long. One required.

Part No. 4 Spring. Music wire (18 gage .047" dia.) $2\frac{1}{8}$" required for each spring.

PART NO. 1—ADJUSTING SLEEVE

OPERATIONS:

1. Select stock.
2. Place stock in lathe chuck.*
3. Face end.* Center drill and adjust tailstock to support end of work.
4. Rough turn diameters,* allowing $\frac{1}{64}$" stock for finishing cut.
5. Finish turn and knurl large diameter section.*
6. Finish turn small diameter section. File corner. File and polish small diameter section.*
7. Center end of work for drilling.*
8. Drill into end of work with tap drill to depth.*
9. Tap hole to size, supporting and guiding tap with tailstock center.*
10. Cut off work to length, plus $\frac{1}{32}$" stock for finishing the end.
11. Place work in lathe chuck,* using sheet brass strips to protect knurled surface. Face and round end to length. File and polish rounded end.*
12. Lay off, centerpunch, drill and countersink hole through diameter.

PART NO. 2—BODY

1. Select stock.
2. Lay off and center ends.*
3. Face ends to length.*
4. Rough turn all diameters,* allowing $\frac{1}{64}$" stock for finishing cut. Rough turn fillets at shoulders.*
5. Finish turn all diameters and form fillets at shoulders.*
6. Cut thread,* fitting to tapped hole in Part No. 1—Adjusting Sleeve.
7. Plane or mill flat surfaces of center section.
8. Lay off, centerpunch and drill hole through center of flat section.
9. Arrange lathe to support work with center rest, on $\frac{7}{16}$" diameter section.*
10. Center end of work for drilling.*
11. Drill and ream hole through handle to meet drilled hole through flat section.*
12. Saw $\frac{1}{16}$" slot through threaded section.
13. File 90° notch in side of hole through flat section. File and polish all machined surfaces.
14. Harden flat section and draw temper.* Re-polish all machined surfaces.

PART NO. 3—PLUNGER

1. Select stock.
2. Lay off and center ends.*
3. Face ends to length,* plus $\frac{5}{8}$" stock for removing the center holes.
4. Rough turn diameters,* allowing $\frac{1}{64}$" stock for finishing cut, and $\frac{5}{16}$" on each end for removing the center holes.
5. Face shoulder to length.
6. Finish turn diameters,* allowing .003" stock on small diameter for filing to size. File for slip fit in reamed hole through handle of Part No. 2—Body.
7. Place work in lathe chuck* with small end projecting and face end to length, removing the center hole.
8. Turn work end for end and face large end to length, removing center hole as before.
9. Turn 30° angle on large diameter section.*
10. File 90° notch and 45° angles on end of small diameter section.
11. Lay off, centerpunch and drill hole for $\frac{1}{16}$" pin.
12. Harden $\frac{1}{2}$" back from small end and draw temper.*

PART NO. 4—SPRING

1. Select a $\frac{1}{4}$" cold rolled steel rod 4" long and drill a hole through diameter $1\frac{1}{2}$" from end with a No. 66 drill.
2. Place rod in lathe chuck with drilled end projecting $1\frac{3}{4}$".
3. Centerdrill and support end of rod with tailstock center.*
4. Run music wire (18 gage) between two wood fibre blocks clamped in tool post. Bend a hook on end of wire $\frac{1}{4}$" long and at right angles.
5. Place hook through hole in rod (from bottom side) and run cross slide back until wire is stretched tight.
6. Throw in back gears and shift belt to large step of spindle cone.*
7. Arrange lathe to cut 6 threads per inch, left hand.*

   NOTE: The wire should be stretched at right angles to the rod when winding of spring begins. When spring is wound, back lathe spindle up by hand until tension is relieved, before cutting the wire.
8. Wind spring the same as cutting a left hand thread.
9. Cut wire close to hook and remove spring from rod. Cut spring to length and grind ends.
10. Harden in oil. Burn oil off three times to draw temper.

*See book "How to Run a Lathe" published by South Bend Lathe Works.

HOW TO RUN A LATHE

A Practical Handbook on Lathe Operation

"How to Run a Lathe" is a complete reference book and manual on the care and operation of the back-geared screw-cutting lathe. It is a practical handbook for the machinist, lathe operator, apprentice, or shop student. Clearly written in simple, non-technical language, the instruction material is easy for the beginner to understand. This authoritative text is illustrated with more than 360 photographs, diagrams, and sketches.

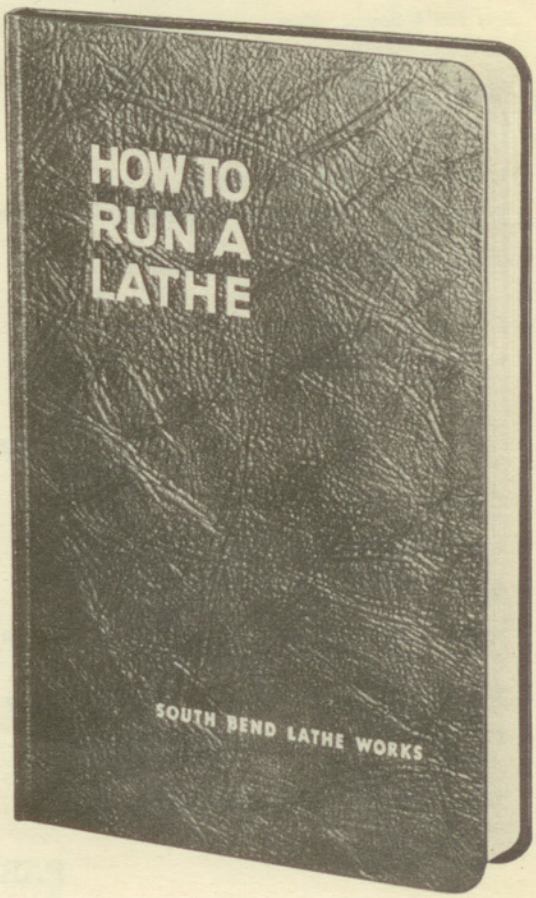
This book has been improved and perfected by suggestions, criticisms, and ideas that have been submitted by hundreds of practical shop men. The latest shop practices and methods used in modern industry are accurately described.

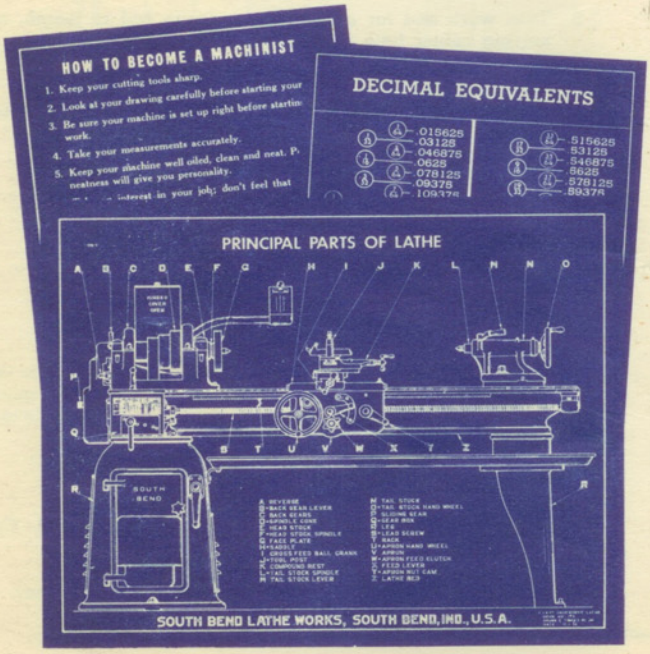
PARTIAL LIST OF CONTENTS

History of the Lathe
Erecting and Leveling the Lathe
Operation of Lathe Controls
Lathe Tools and Their Application
How to Take Accurate Measurements
Machining Work Between Centers
Chuck Work
Taper Turning and Boring
Drilling, Reaming and Tapping
Cutting Screw Threads
Special Classes of Work

How to Run a Lathe—128 pages 5⅛" x 7⅞", more than 360 illustrations. Price postpaid to any address 25¢ in paper binding, $1.00 in leatherette binding. Sample copy will be mailed without charge on request from any school shop instructor or director.

Note: "How to Run a Lathe" is printed in the English, Spanish, Portuguese, and French languages. State language wanted if other than English.





Blueprint Wall Charts

For School and Industrial Shops

These six wall charts have been prepared for school and industrial shop use. They are printed on heavy paper, deep blue with white lines to simulate blueprints and are suitable for framing. Sample copies will be mailed without charge on request to any school shop instructor or director.

Wall Chart 250-BP, "How to Become A Machinist." Size 13" wide by 22" high. Printed in English. Price each postpaid..10¢

Wall Chart 777-BP, "Decimal Equivalents." Size 13" wide by 19" high. Printed in English. Price each postpaid.....10¢

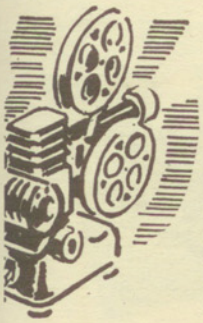
Wall Chart 890-BP, "Principal Parts of Lathe." Size 22" wide by 18" high. Printed in English. Price each postpaid.....10¢

Wall Chart 199-BP, "Tap Drill Sizes." 13" wide by 19" high. Printed in English. Price each postpaid.....10¢

Wall Chart 891-BP, "Partes Principales Del Torno." Size 22" wide by 17" high. Printed in Spanish. Price each postpaid..10¢

Wall Chart 800-BP, "Como Llegar A Ser Un Maquinista." Size 15½" wide by 20" high. Printed in Spanish. Price each postpaid.....10¢

"HOW TO RUN A LATHE" FILM SERIES



16 mm sound films produced in full color
Adapted from the book "How to Run a Lathe"

Get your shop classes off to a good start by using South Bend motion pictures. These interesting films demonstrate the best shop practice and methods in elementary lathe operation. They show what the lathe is for, how it operates, the principal lathe operations, and their application on representative jobs. Used by the Army, the Navy, and by hundreds of schools and universities and industrial plants.

Film No. I, "The Metal Working Lathe," introduces the student to the standard Back-Geared Screw-Cutting Lathe by familiarizing him with the name of each principal lathe part, its purpose, and operation. It is ideally suited for showing to beginners before they operate a lathe for the first time. After seeing the film, the student may be allowed to manipulate the various lathe controls, as demonstrated in the picture. The film may then be shown again to answer the many questions that are bound to arise after his first experience with a lathe. This method of instruction shortens the training period and reduces the amount of individual instruction. Approximately 800 feet of 16 mm sound film in full color. Showing time, 20 minutes.

Film No. II, "Plain Turning", clearly illustrates all of the operations involved in the machining of a shaft held between the lathe centers. It teaches many of the basic procedures encountered in all lathe work. Among these are measuring with calipers and micrometers, locating and drilling center holes, selecting the proper cutting tools, facing, rough turning, and finish turning. Approximately 800 feet of 16 mm sound film in full color. Showing time, 20 minutes.

Film No. III, "Grinding and Use of Basic Lathe Tool Cutter Bits", shows how to grind cutter bits for various lathe operations including rough and finish turning, facing, and thread cutting. Many extremely clear close-ups make it easy for the beginner to understand how to grind the correct clearance and rake angles. The adjustment of the tool in the tool post, and the action of the tool when taking a cut are also shown. Approximately 800 feet of 16 mm sound film in full color. Showing time, 20 minutes.

HOW TO SECURE THESE MOTION PICTURES

Free Loan Basis

The South Bend motion pictures may be borrowed without charge by industrial organizations, industrial and vocational schools, colleges, universities, Army and Navy training schools, industrial apprentice schools, and other recognized organizations teaching machine shop practice.

When films are supplied on a free loan basis, the borrower pays the shipping charges both ways and agrees to handle the films carefully, to return them promptly after showing, and to fill in and sign a report card which is furnished with the films.

Films are shipped express collect and may be returned express prepaid or by insured parcel post. Return labels are supplied. The shipping charges are very reasonable. As examples, the approximate total express charges for shipping the three films both ways are: Chicago $1.07, New York $1.63, and San Francisco $2.78.

When requesting films on a free loan basis, always give alternate dates in addition to your first choice. An order blank and envelope are enclosed for your convenience.

All films supplied on a free loan basis are 16 mm sound films in full color. No black and white films are available for this purpose.

Outright Purchase

Those who desire to keep these films permanently may purchase them at our net cost for the copy print. Both black and white, and color films are available for outright purchase. We recommend the color films, but the black and white films can be supplied at a lower cost. All prices shown are net, f.o.b. South Bend.

Selling Prices of Sound Films

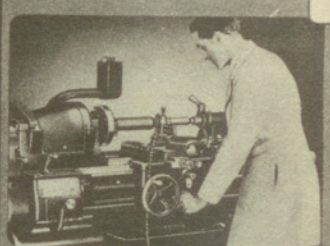
Subject	Color Films		Black and White Films	
	Catalog Number	Price	Catalog Number	Price
Film No. I, "The Metal Working Lathe"	1620C	$100.00	1620B	$40.00
Film No. II, "Plain Turning"	1621C	110.00	1621B	43.00
Film No. III, "Grinding Cutter Bits"	1663C	115.00	1663B	47.00

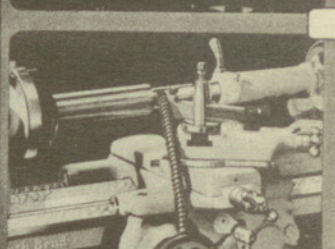
SOUTH BEND LATHE WORKS, SOUTH BEND 22, INDIANA, U. S. A.

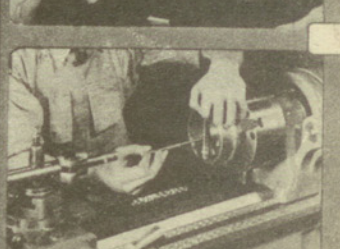
How to Run a LATHE Film Series

Based on the Book of the same title

Two reels of 16 mm. sound film in color now completed





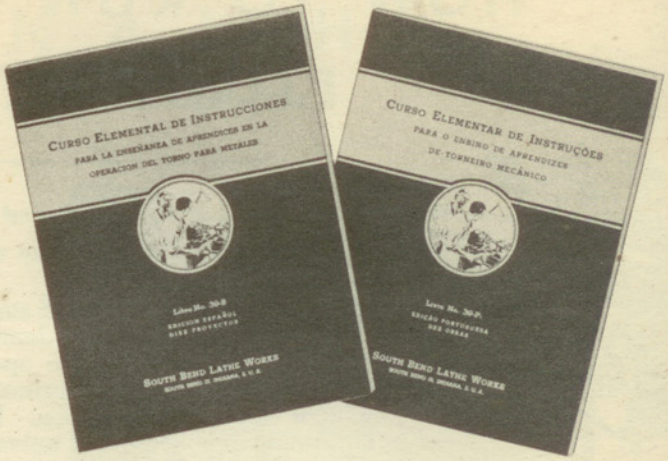


MODERN SCHOOL SHOPS

This booklet has been prepared for those who are interested in modern school shops and the machinery with which they are equipped. Many illustrations of excellent installations are shown. All types of school shops, small and large, are included. 32 pages, 11″ x 8½″. Mailed to shop instructors or supervisors on request.

SOURCES OF SUPPLY FOR PROJECTS
BLUEPRINTS • CASTINGS • MATERIALS

A list of approximately fifty sources of supply for projects, blueprints, castings, accessories, and materials, for models, machines, gunsmithing, etc., has been prepared and will be supplied on request. Ask for Circular No. 1017, "Source of Supply."



SOUTH BEND MACHINE SHOP COURSE
SPANISH AND PORTUGUESE EDITIONS

The South Bend Machine Shop Course is published in the Spanish and Portuguese languages for use in schools where those languages are spoken. These books are similar to this English edition, except that they contain only ten projects, as follows:

Nail Set	Lathe Centers
Punches	Bolt & Nut
Plumb Bob	Screw Driver
Mandrel	Machinist's Clamp
Tap Wrench	Machinist's Jack Screw

Book No. 39-S, South Bend Machine Shop Course in Spanish, 24 pages 8½″ x 11″.
Price per copy postpaid, 25¢ in U. S. money.

Book No. 39-P, South Bend Machine Shop Course in Portuguese, 24 pages 8½″ x 11″.
Price per copy postpaid, 25¢ in U. S. money.

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