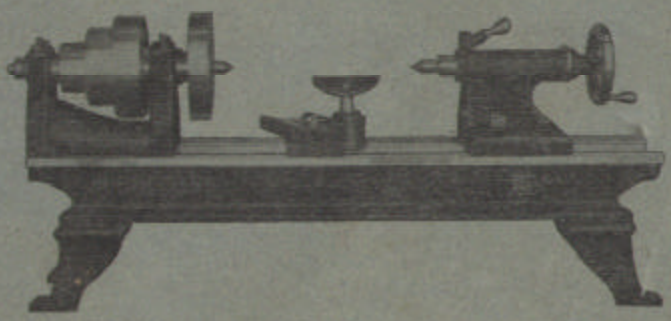
How to Make *an* 8-inch Bench Lathe *in the* School Shop

Price 10 cents, Postpaid



SOUTH BEND LATHE WORKS :: SOUTH BEND, INDIANA

MACHINISTS WANTED

The demand for machinists is so great and the supply so limited in almost every city in the United States that many manufacturers have a standing offer with Vocational and Industrial Schools for the employment of all young men who have finished the machine-shop course.

More than 500 Schools in the United States are using South Bend Lathes

TEXT BOOK No. 4

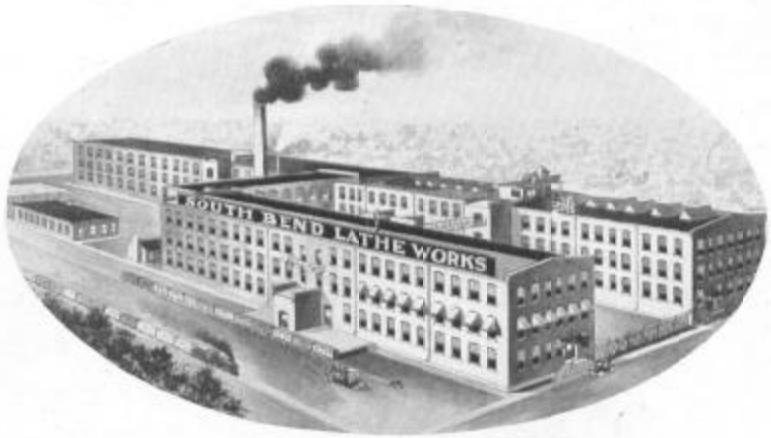
How to Make an 8-inch Bench Lathe *in the* School Shop

Prepared for Students in Technical, Vocational and Industrial Schools, and for the Apprentice in the Shop

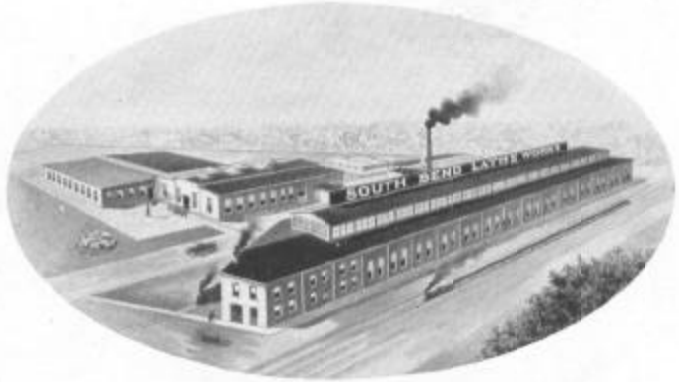
The 8-inch Bench Lathe makes a useful, practical, and interesting project for the school shop that is in a position to build a lathe of this kind.

This Bench Lathe may be used in groups for wood turning in the Manual Training Department.

South Bend Lathe Works, South Bend, Indiana, U. S. A.
428 East Madison Street

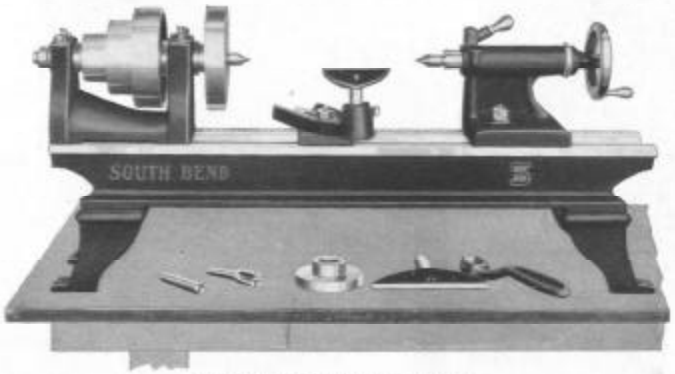


East Madison Street Plant, South Bend, Indiana



Fellows Street Plant, South Bend, Indiana

The South Bend Lathe Works was Established in 1906

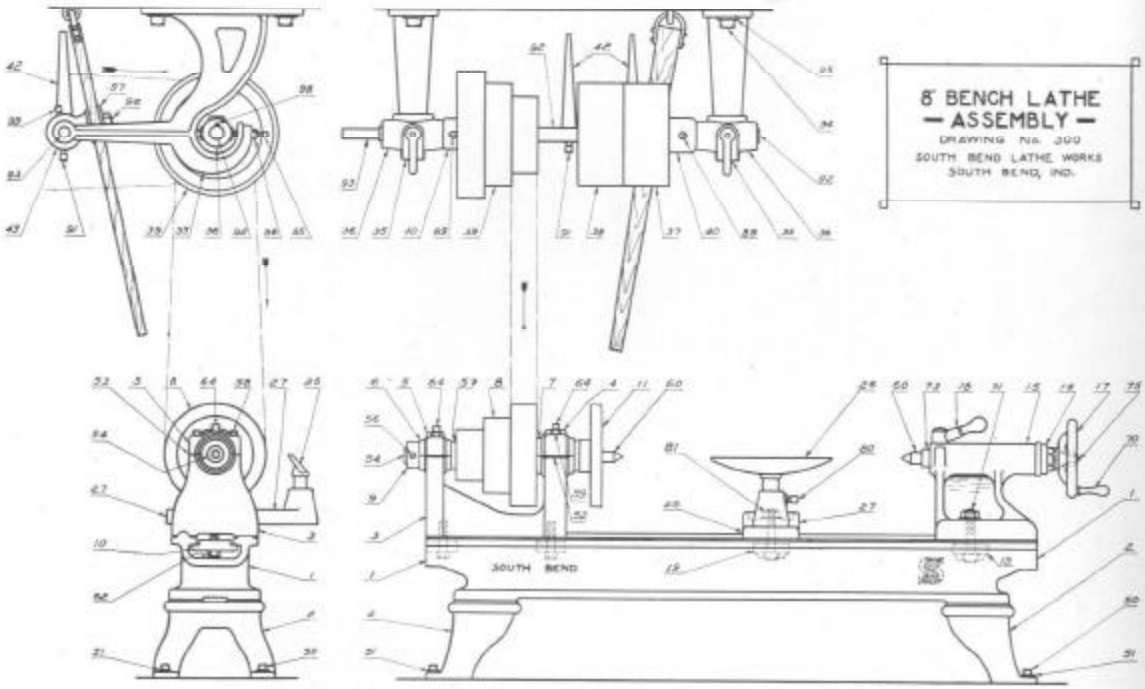


8-INCH BENCH LATHE

A Useful and Practical Lathe in any Shop

The above illustration shows an 8" Bench Lathe complete with spur and cup centers, hand rest and face plate for wood turning. To schools interested in this project we can furnish, if desired, all the material necessary to build the lathe and countershaft. Lathe takes 14" between centers, the spindles are equipped with No. 1 Morse Taper, head spindle has a ⅜" hole its entire length, bearings are of phosphor bronze and are adjustable, belt on spindle cone 1¼", weight of lathe finished without countershaft, 80 pounds; weight of countershaft finished, 60 pounds.

The instruction plan for building this 8" Bench Lathe has been arranged to follow closely the methods used in modern shop practice, so that the student who makes this Lathe intelligently will be familiar with many of the fundamentals when he starts out on his first job in the industrial machine shop.



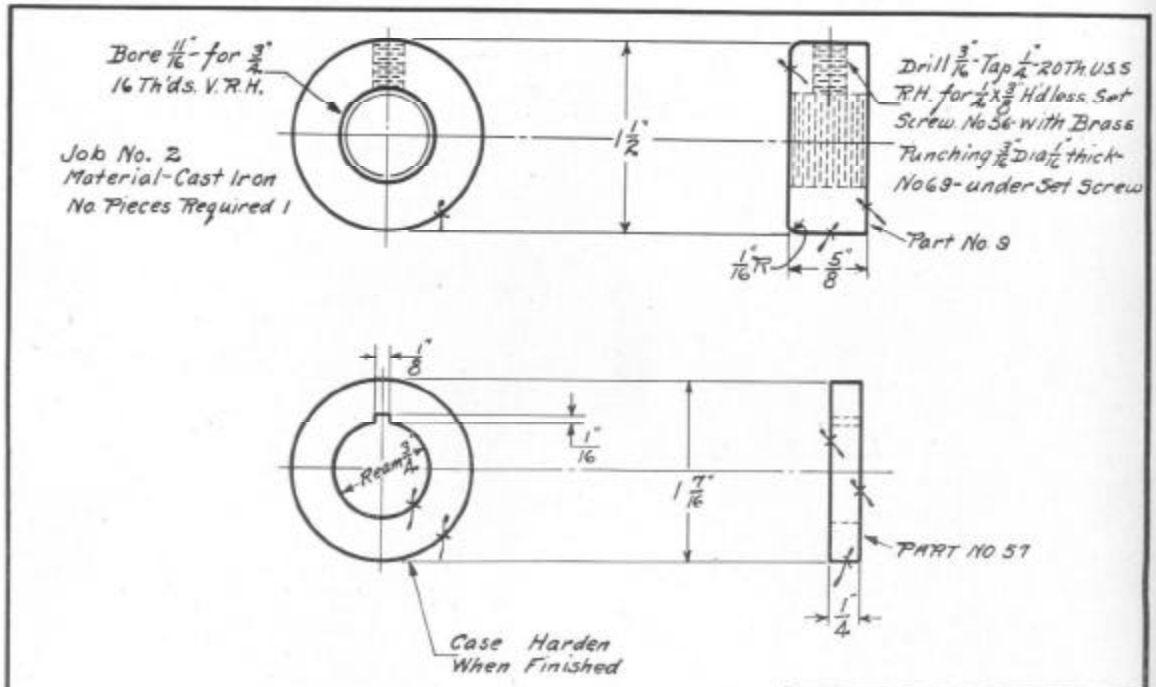
8-inch Bench Lathe Parts Numbered

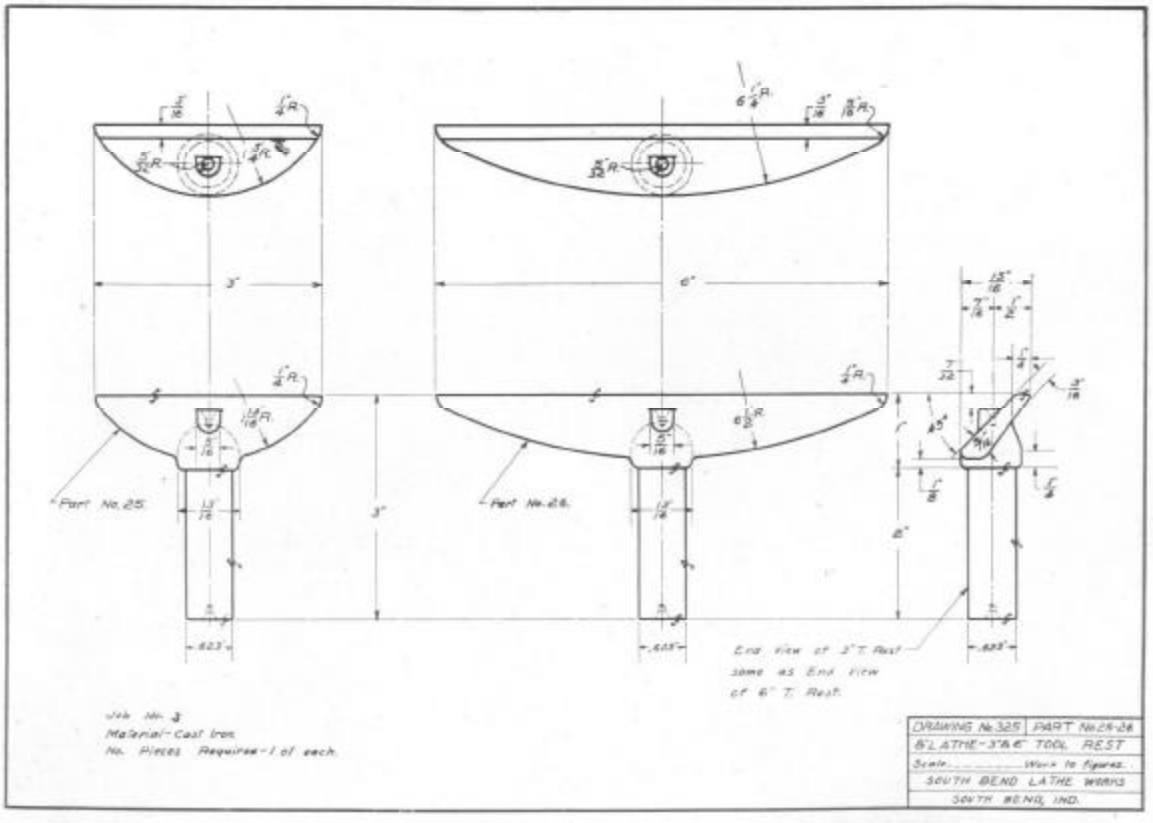
NAME AND PART NUMBERS OF 8-INCH BENCH LATHE

On page 4 is shown an assembly drawing of the 8" Bench Lathe. Each part is numbered and the name of each part is shown in tabulated list below.

Part No.	Name.
1	Bed Casting (1)
2	Leg Castings (2)
3	Headstock Casting (1)
4	" large Cap Casting (1)
5	" small " " (1)
6	" " Bronze Box Castings (2)
7	" large " " " (2)
8	" Spindle Cone Casting (1)
9	" Take-up Nut Casting (1)
10	" Clamp Castings (2)
11	" Small Face Plate Casting (1)
12	" " Drive " " (1)
15	Tailstock Casting (1)
16	" Nut Casting (1)
17	" Hand Wheel Casting (1)
18	" Binding Lever Casting (1)
19	" Clamp Casting (1)
20	" and Tool Rest Wrench Casting (1)
25	3" Tool Rest Casting (1)
26	6" " " " (1)
27	" " Socket Casting (1)
28	" " " Plate Casting (1)
29	" " Clamp Casting (1)
35	C. S. Hanger Castings (2)
36	" " Box " (2)
37	" " Loose Pulley Casting (1)
38	" " Tight " " (1)
39	" " Cone " " (1)
40	" " Collars Castings (2)
41	Shipper Rod Collar Castings (2)
42	Belt Shifting Finger Castings (2)

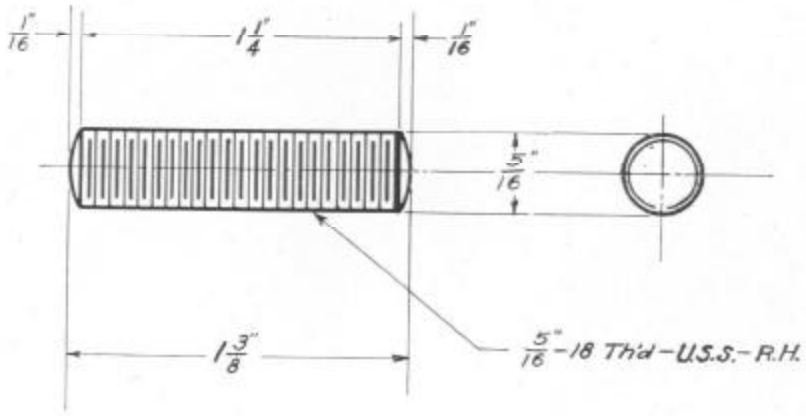
Part No.	Name.
43	C. S. Shipper Nut Casting (1)
50	Lag Screws (4)
51	Washers (6)
52-53	Steel Shims (16)
54	Headstock Steel-Rough Spindle (1)
55	Headless Set Screw (1)
56	R'd. H'd. Mach. Screw take-up Nut. (1)
57	Steel for Thrust Collar (1)
58-59	Hex. H'd. Cap Screws (13)
60	Tool Steel for Centers (2)
61-62	Steel Pins (3)
64	Finished Oilers for Bearings (2)
67-78	Spur & Cup Center Steel (2)
70	Drop Forged Machine Handle (1)
81-71	Machine Bolts (2)
72	Hex. Nuts (3)
73	T. S. Spindle Steel (2)
74	Key for T. S. Spindle Steel (1)
75	T. S. Screw Steel (1)
76	" " B'dg. Lever Stud Steel (1)
77	" " H'd. Wheel Key " (1)
80	Sq. H'd. S. S. for Tool Rest Socket (1)
82	Wrench for Tool Rest Socket S. S. (1)
86	Hex. Nuts (2)
	Sq. H'd. Set Screws (9)
89	H'dless Set Screws (2)
92	C. S. Shaft Steel (1)
93	" " Shipper Rod Steel (1)
94	Lag Screws (4)
97-95	Washers (5)
96	Hex. H'd. Cap Screw
98	Cotton Wick (2)


Bore 11/16" for 3/4" 16 Th'ds. V.R.H.
Job No. 2
Material-Cast Iron
No. Pieces Required 1
1 1/2"
Drill 3/16" Tap 1/4"-20Th. U.S.S. R.H. for 1/4" x 3/8" Hd less. Set Screw. No 56 with Brass Punching 3/16" Dia 1/16" thick- No 69- under Set Screw
Part No 9
1/16" R
5/8"
1/8"
1/16"
Ream 3/4"
1 7/16"
PART NO 57
1/4"
Case Harden When Finished
Job No 1
Material-Hot Rolled Steel
No Pieces Required-1.
DRAWING No 309
Part No 8-57
8" LATHE- Take Up Nut for Thrust Collar
Scale_____ Work to figures
SOUTH BEND LATHE WORKS
SOUTH BEND, IND.



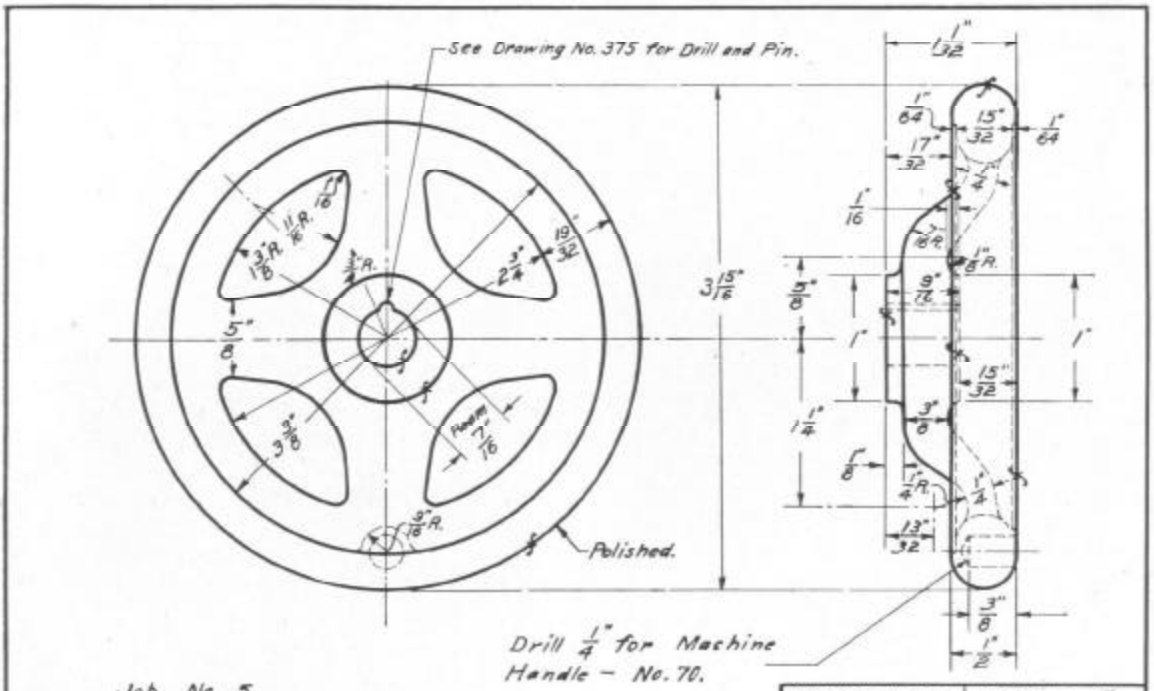
Job No. 3
Material - Cast Iron.
No. Pieces Required - 1 of each.

DRAWING No. 325	PART No. 25-26
6" LATHE - 3" & 6" TOOL REST	
Scale..... Work to figures.	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	



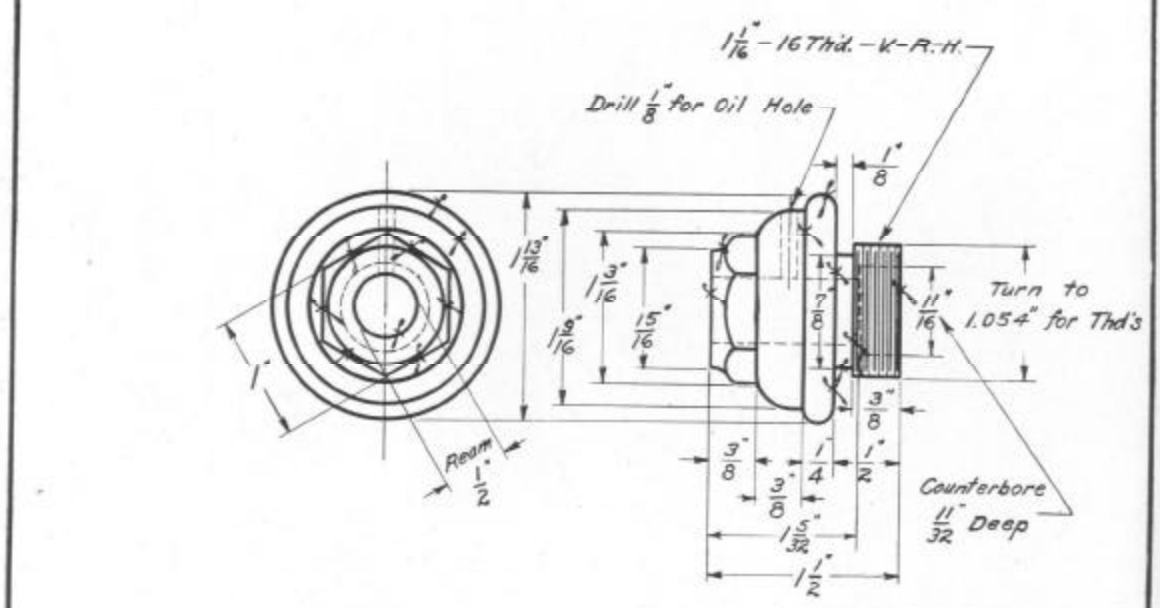
Job No. 4.
Material – Cold Rolled Steel
No. Pieces Required – 1.

DRAWING No. 376	PART No. 76
8" LATHE – BINDING LEVER STUD	
Scale _____ Work to figures	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	



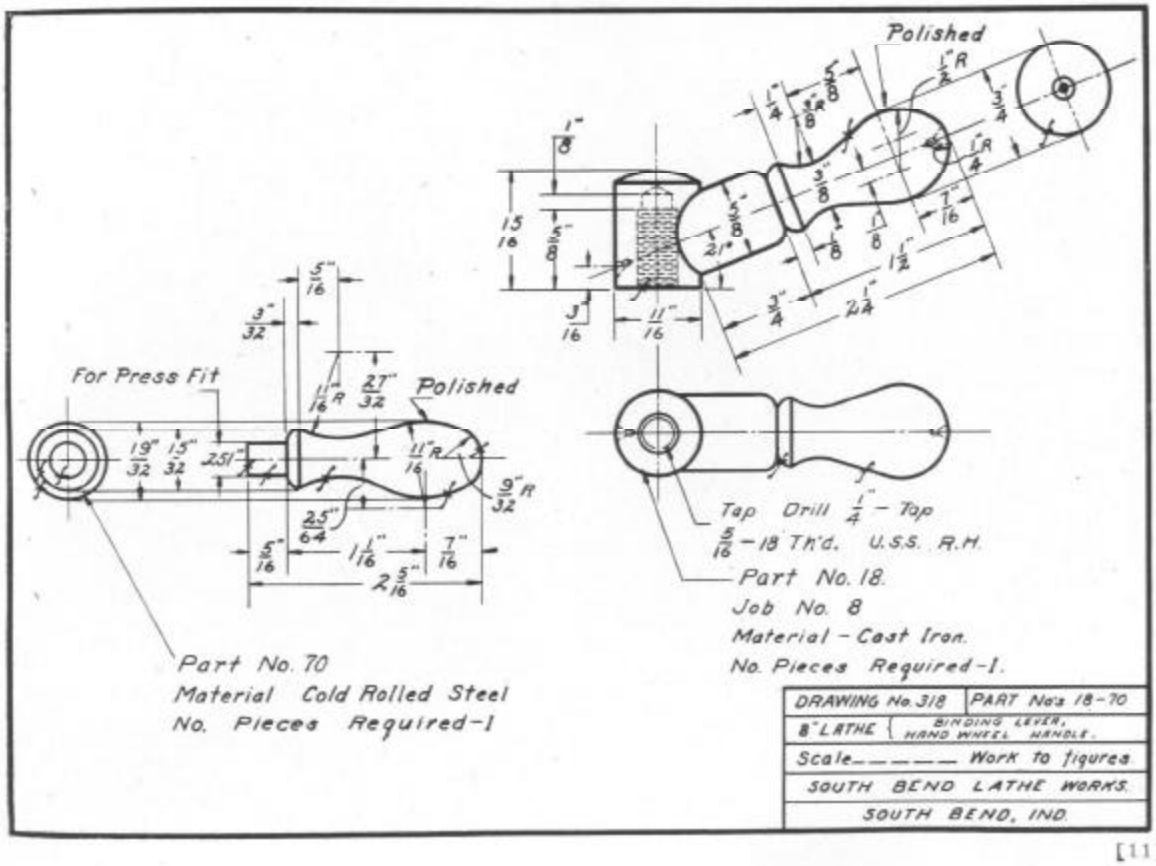
Job No. 5.
Material – Cast Iron.
No. Pieces Required – 1.

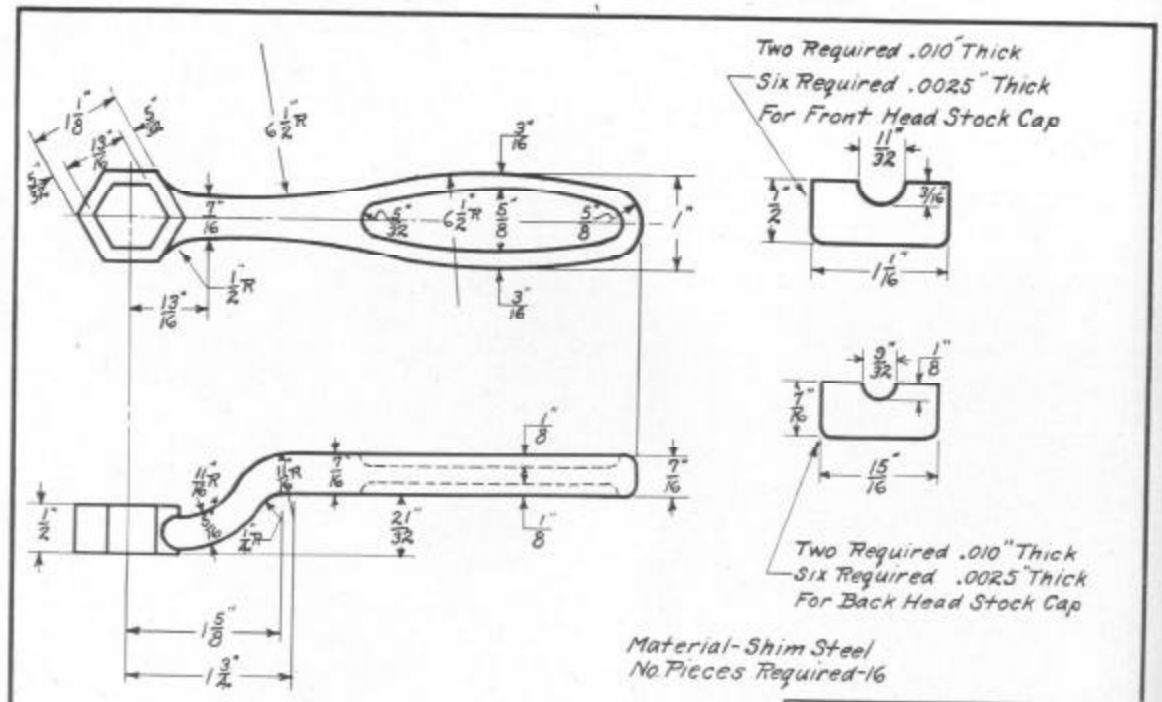
DRAWING No. 317	PART No. 17
8" LATHE – HAND WHEEL	
Scale _____ Work to figures	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	

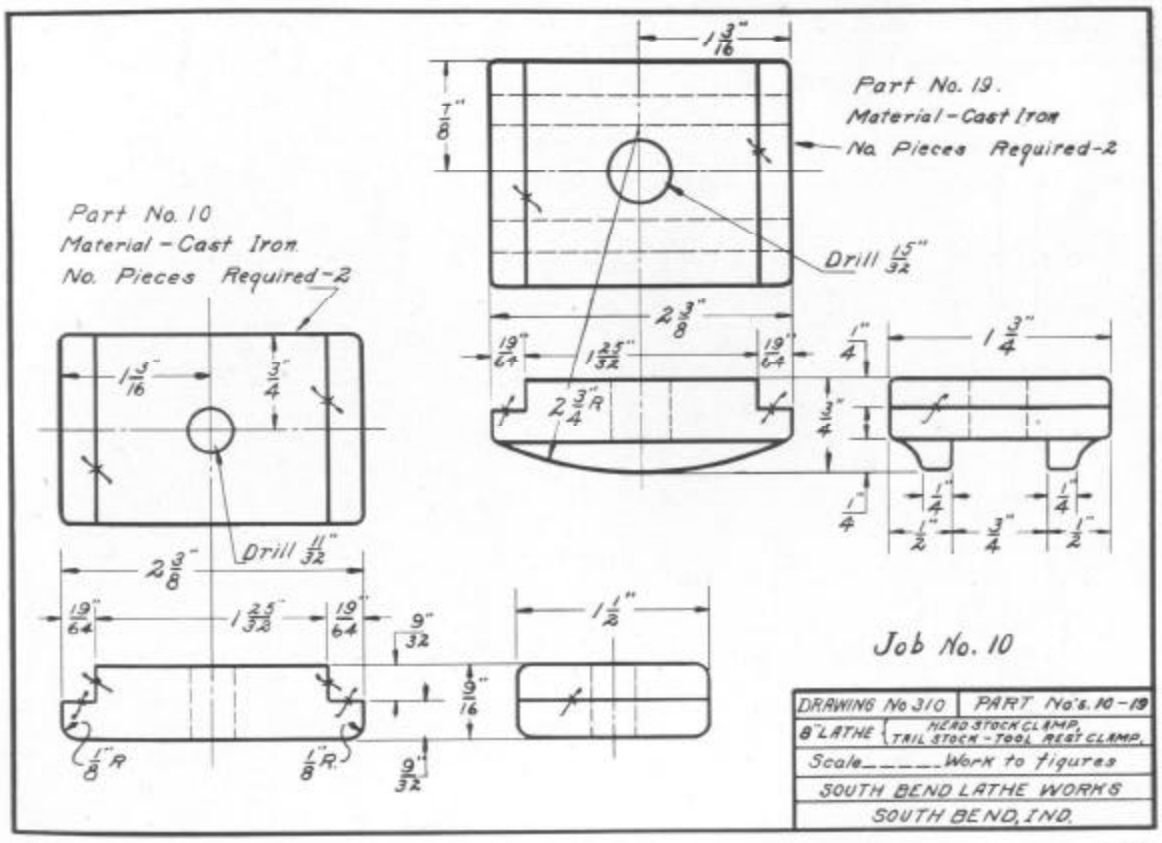


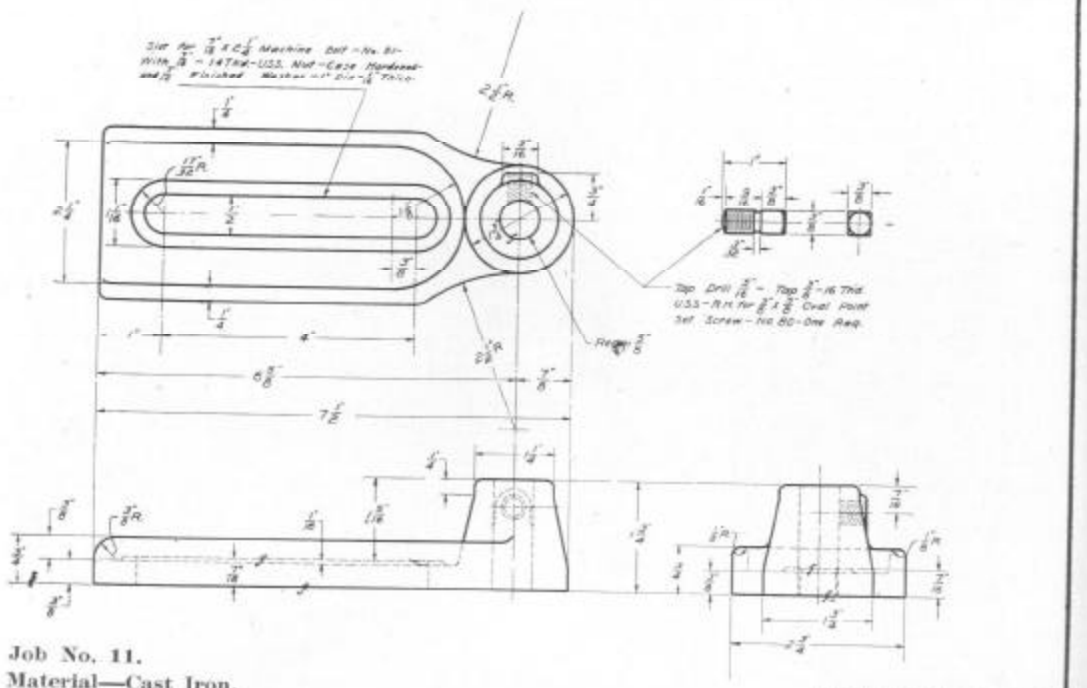
Job No. 6
Material — Cast Iron
No. Pieces Required-1

DRAWING No. 316	Part No. 16
8" LATHE - TAIL STOCK NUT	
Scale..... Work to figures	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	


Polished
For Press Fit
Polished
Tap Drill 1/4 – Top
5/16 – 18 Th'd. U.S.S. R.H.
Part No. 18.
Job No. 8
Material – Cast Iron.
No. Pieces Required – 1.
Part No. 70
Material Cold Rolled Steel
No. Pieces Required – 1
DRAWING No. 318
PART Nos 18 – 70
8" LATHE { BINDING LEVER, HAND WHEEL HANDLE.
Scale – – – – – – Work to figures
SOUTH BEND LATHE WORKS.
SOUTH BEND, IND.

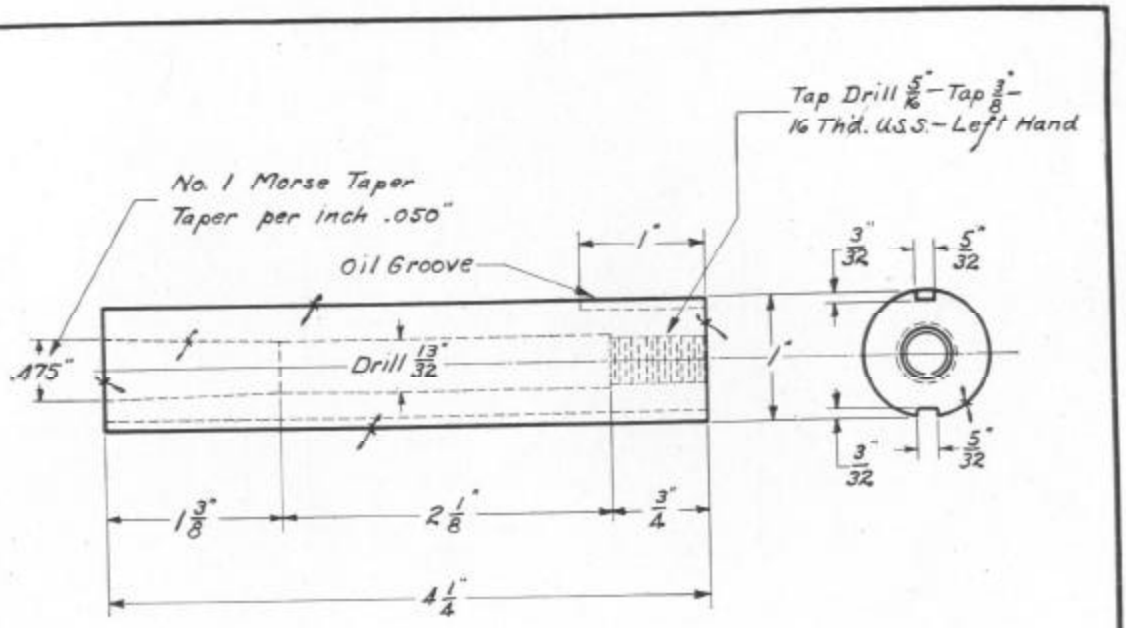

Two Required .010" Thick
Six Required .0025" Thick
For Front Head Stock Cap
Two Required .010" Thick
Six Required .0025" Thick
For Back Head Stock Cap
Material-Shim Steel
No. Pieces Required-16
Job No. 9.
Material-Cast Iron
No. Pieces Required-1
DRAWING No. 320
PART No. 3 20-32
8" LATHE
H.S. Cap Shims
Tool Rest
T.S. Wrench
Scale_____Work to figures
SOUTH BEND LATHE WORKS
SOUTH BEND, IND.


Part No. 19.
Material - Cast Iron
No. Pieces Required - 2
Drill 15/32"
Part No. 10
Material - Cast Iron
No. Pieces Required - 2
Drill 11/32"
Job No. 10
DRAWING No 310
PART No's. 10 - 19
8" LATHE
HEAD STOCK CLAMP, TAIL STOCK - TOOL REST CLAMP.
Scale _____ Work to figures
SOUTH BEND LATHE WORKS
SOUTH BEND, IND.



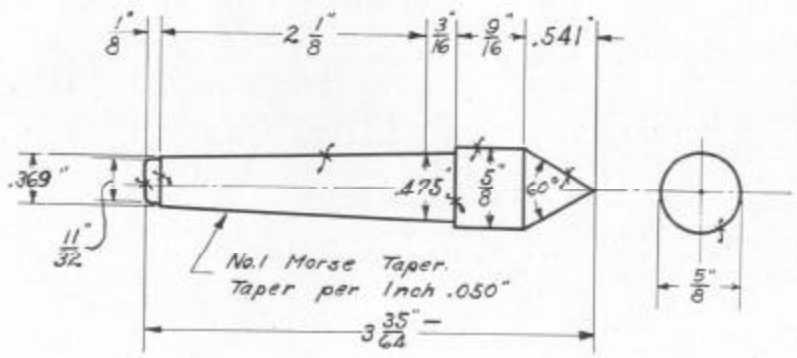
Job No. 11.
Material—Cast Iron.
No. Pieces Required—1.

DRAWING NO. 87	SHEET NO. 27
TOOL REST SOCKET	
Scale..... Work to figures.	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	



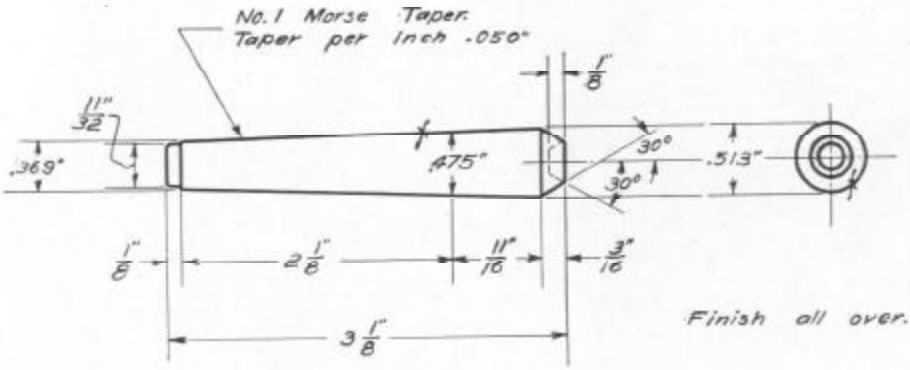
Job No. 12
Material—Cold Rolled Steel
No. Pieces Required—1.

DRAWING No. 373	PART No. 73
8 LATHE – TAIL STOCK SPINDLE	
Scale_____ Work to figures	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND	



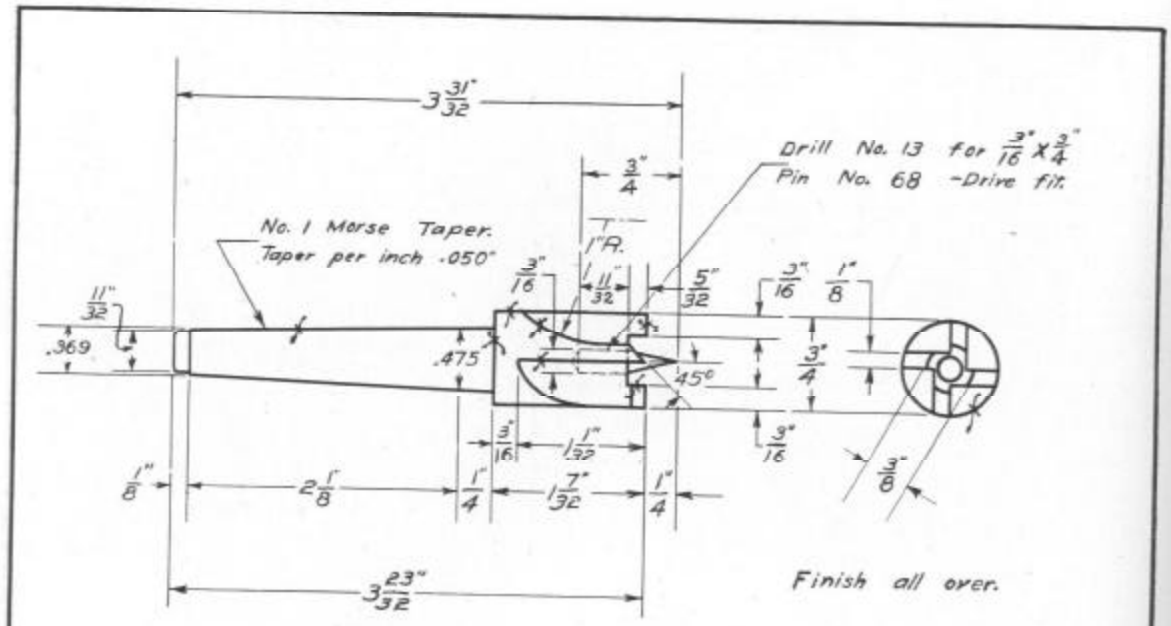
Job No. 13
Material—Tool Steel
No. Pieces Required—2
One Hardened for Tail Stock.

DRAWING No. 360	PART No. 60
8" LATHE— 60° CENTER	
Scale——————Work to figures	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	



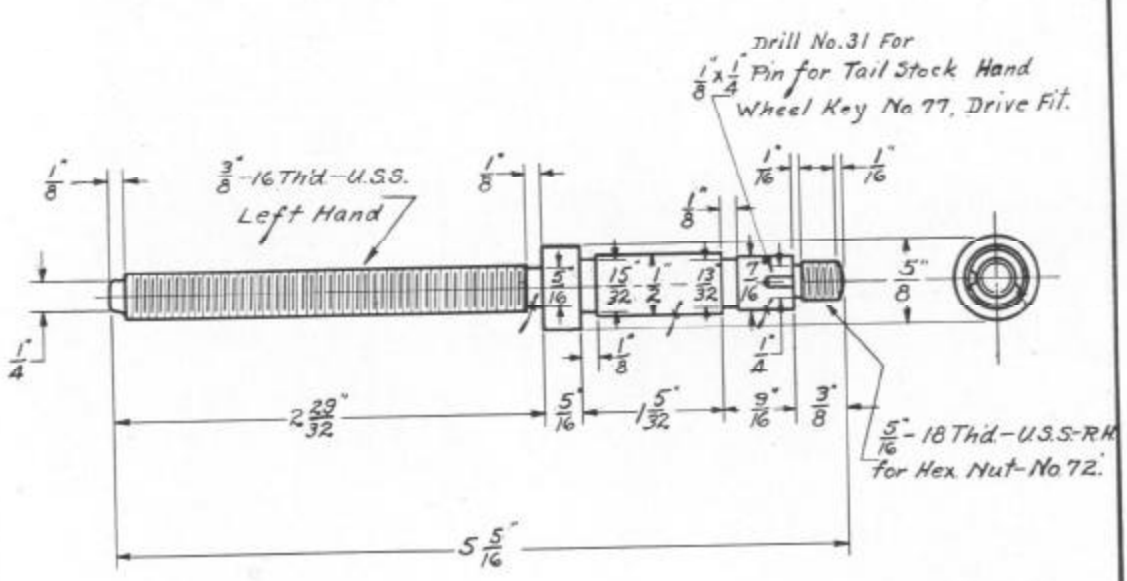
Job No. 14.
Material—Cold Rolled Steel.
No. Pieces Required—1.

DRAWING No. 378	PART No. 78
8" LATHE — CUP CENTER	
Scale ——— Work to figures	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	



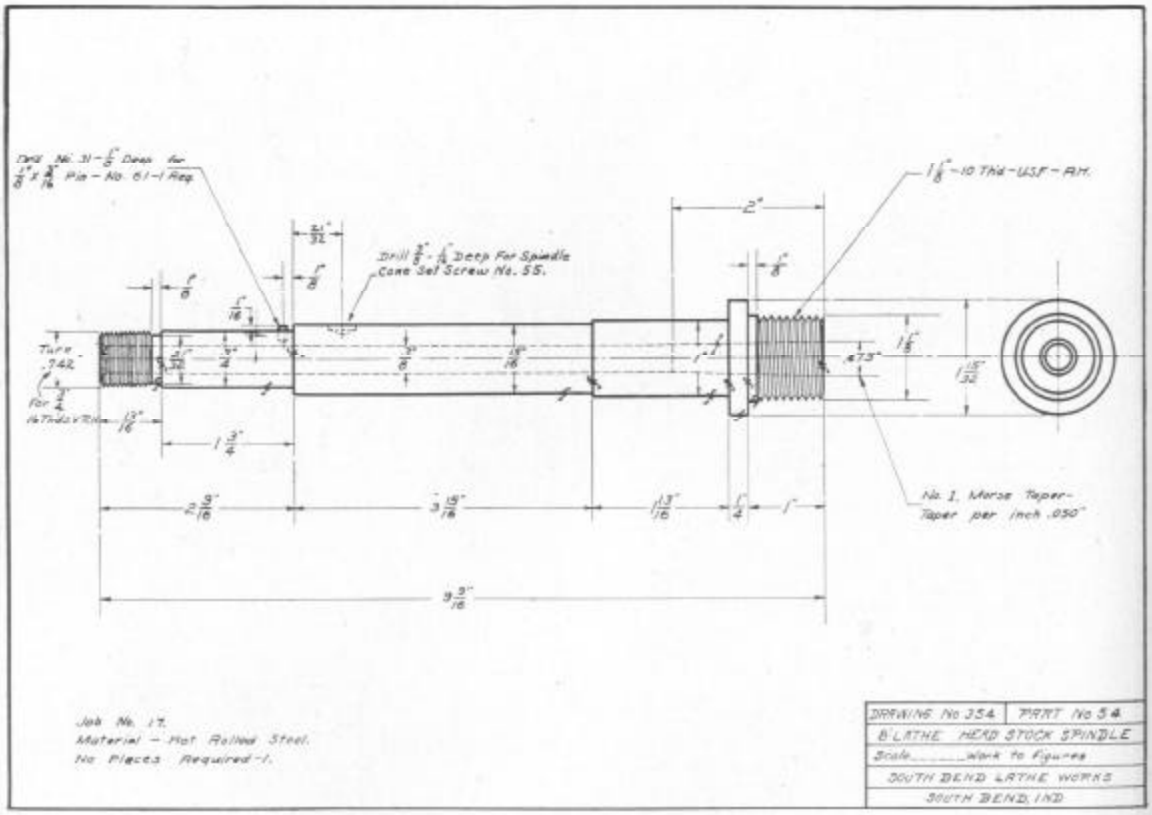
Job No. 15.
Material—Cold Rolled Steel.
No. Pieces Required—1.

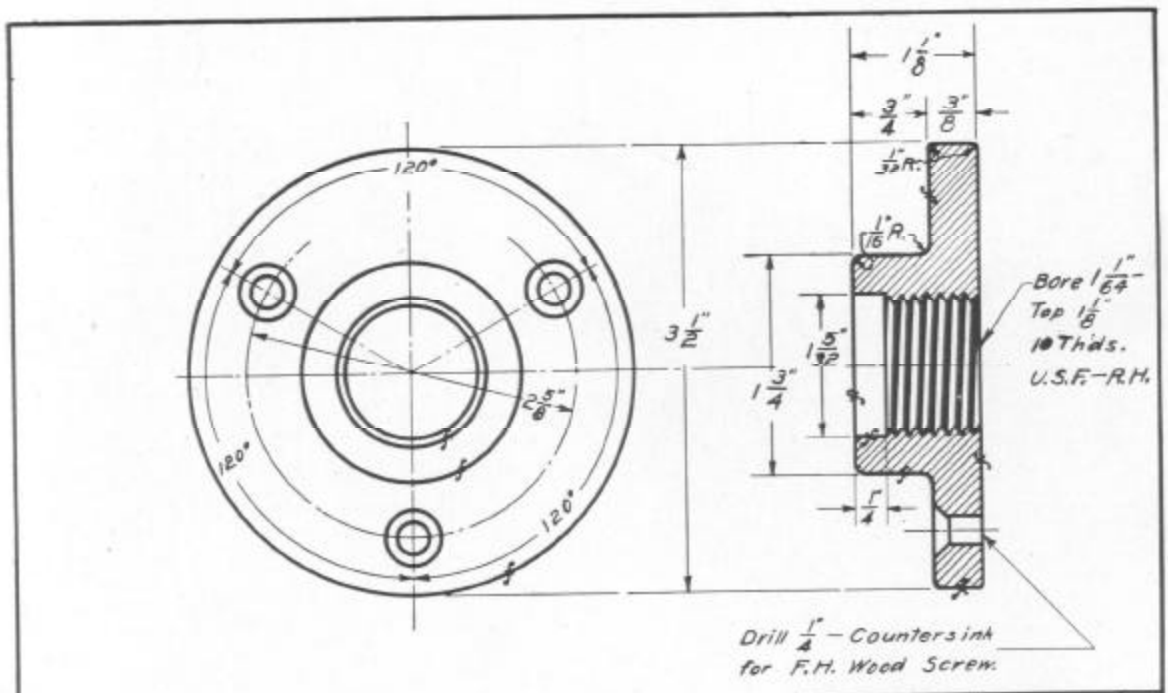
DRAWING No. 367	PART No. 67
8" LATHE—SPUR CENTER	
Scale———Work to figures	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	



Job No. 16.
Material—Cold Rolled Steel.
No. Pieces Required—1.

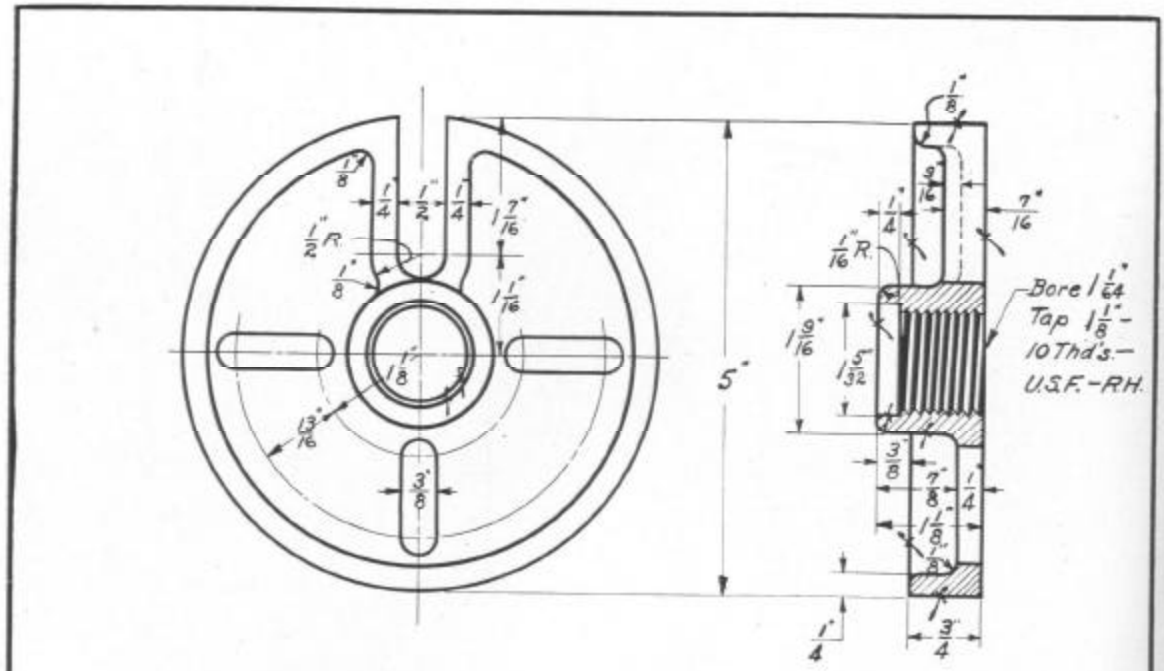
DRAWING No. 375	PART No 75
8" LATHE- TAIL STOCK SCREW	
Scale_____Work to figures	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	


Drill No. 31 - 5/64 Deep for 1/8" x 3/16 Pin - No. 61-1 Req.
Drill 3/8" - 1/2" Deep For Spindle Cone Set Screw No. 55.
1 5/8" - 10 Thd - U.S.F. - R.H.
2"
No. 1 Morse Taper - Taper per inch .050"
Turn .742 For 3/4" - 16 Thds. v Rim
2 9/16"
3 15/16"
9 3/16"
Job No. 17.
Material - Hot Rolled Steel.
No Pieces Required - 1.
DRAWING No 354. PART No 54.
6" LATHE HEAD STOCK SPINDLE
Scale Work to Figures
SOUTH BEND LATHE WORKS
SOUTH BEND, IND.



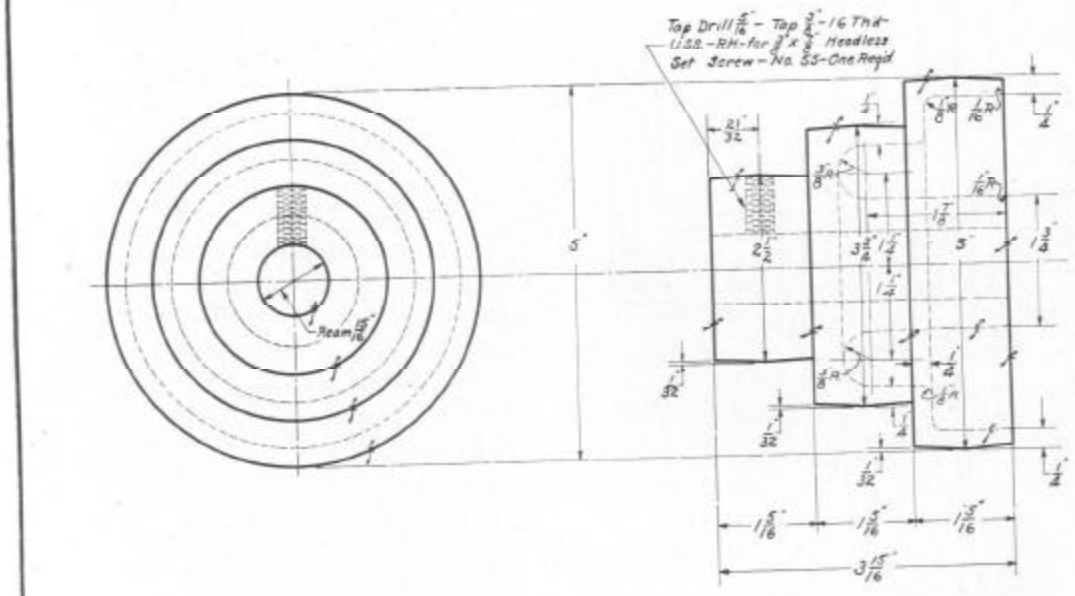
Job No. 18
Material - Cast Iron.
No. Pieces Required - 1.

DRAWING No. 311	PART No. 11
8" LATHE - FACE PLATE	
Scale _____ Work to figures	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	



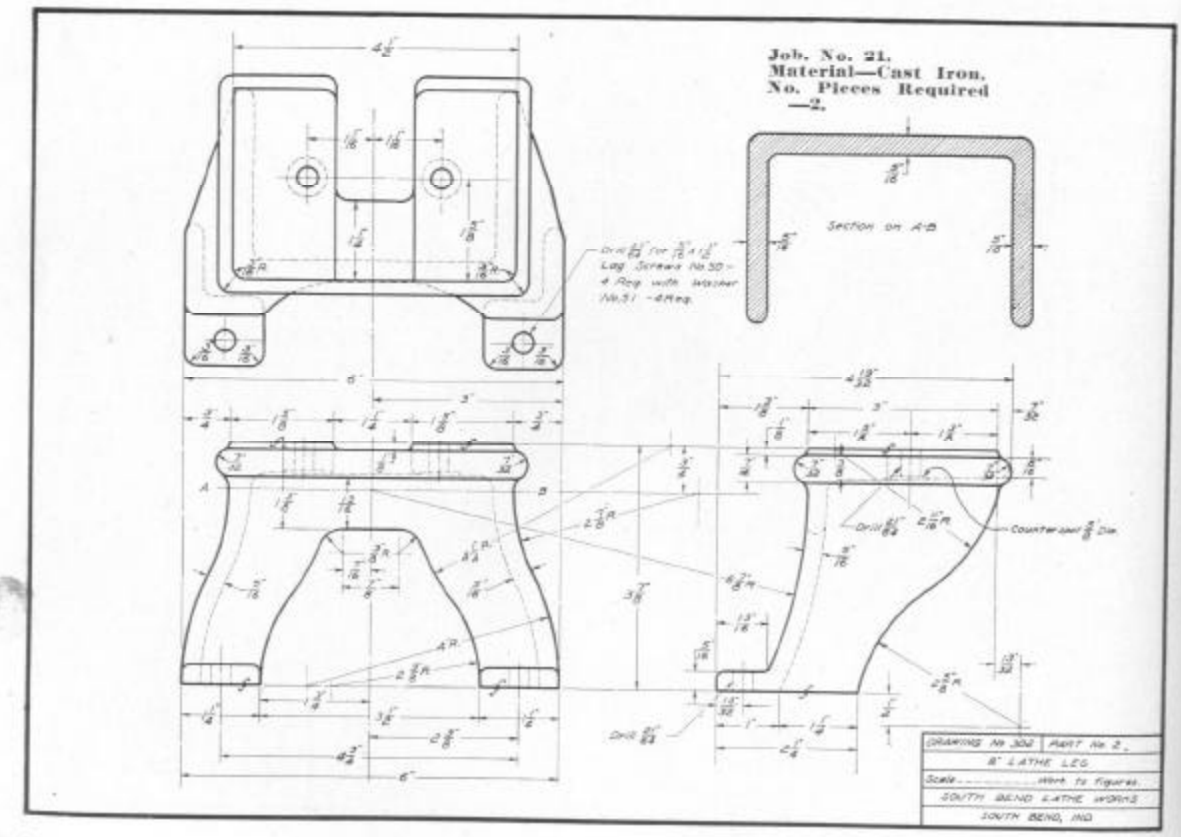
Job No. 19.
Material—Cast Iron.
No. Pieces Required—1.

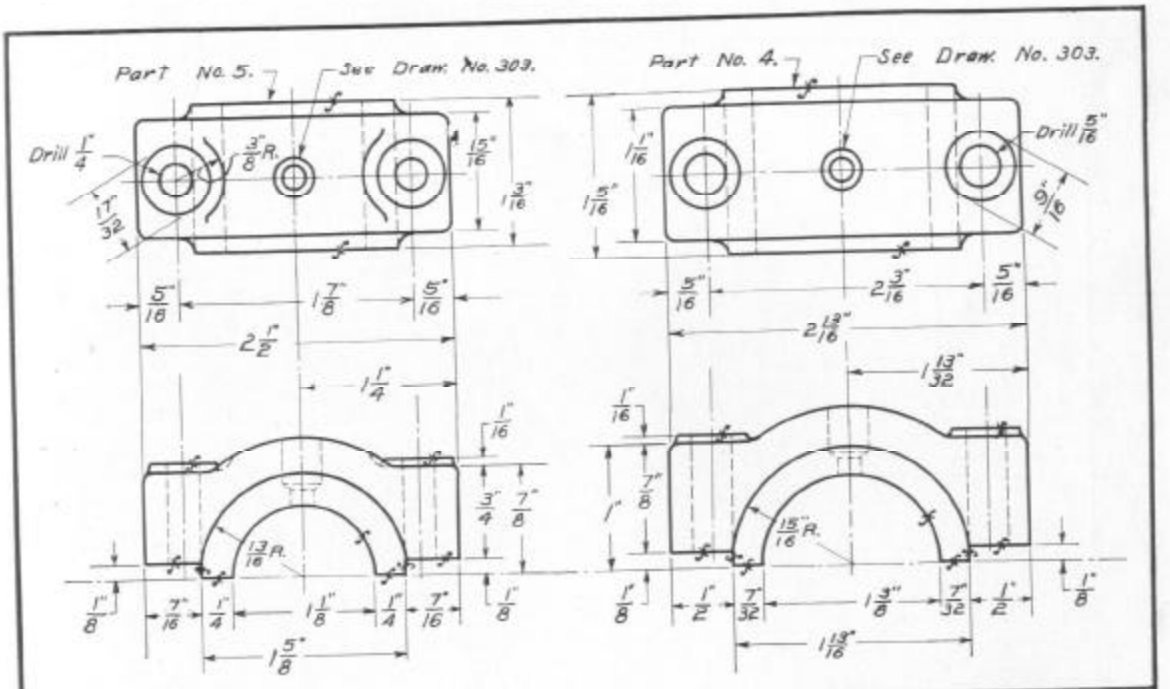
DRAWING No. 312	Part No. 12
8" LATHE - DRIVE PLATE	
Scale	Work to figures
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	



DRAWING No 308	PART No 8
8" LATHE- SPINDLE CONE	
Scale _____ Work to figures	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	

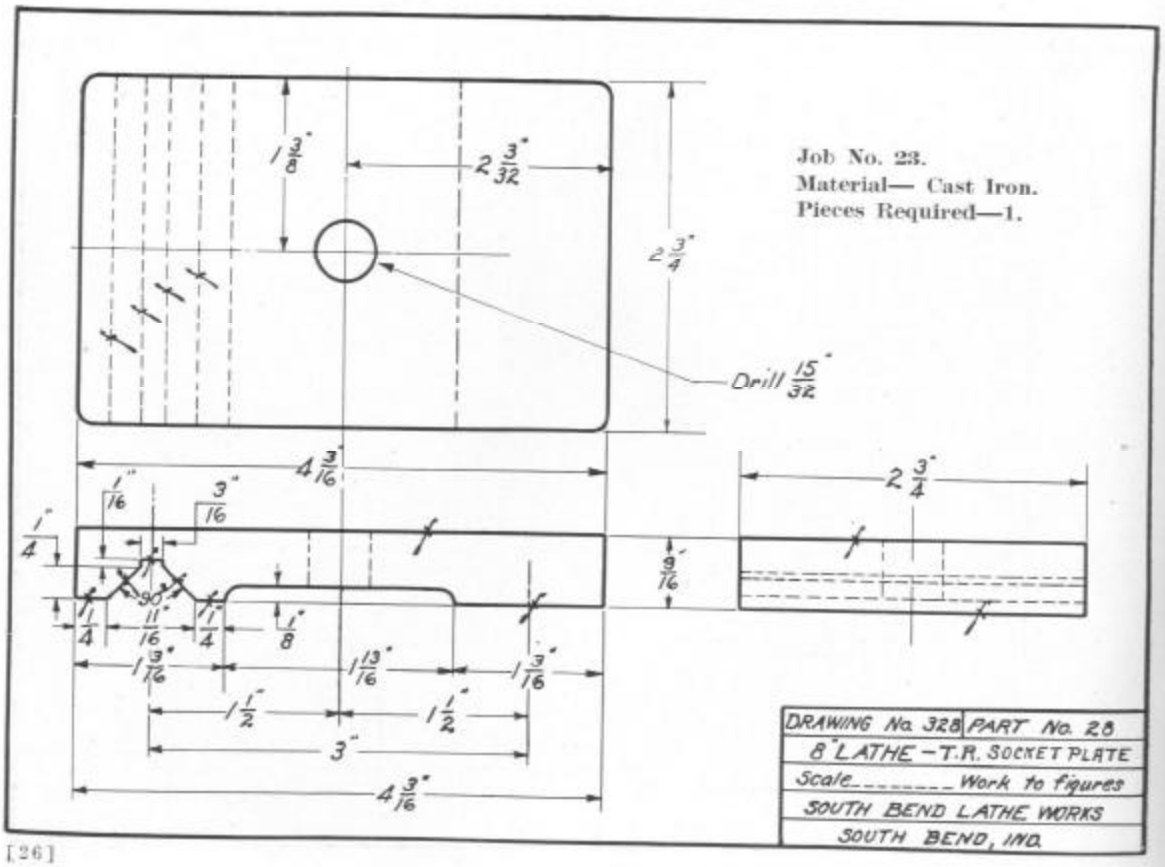
Job No. 20.
Material - Cast Iron.
No. Pieces Required-1.

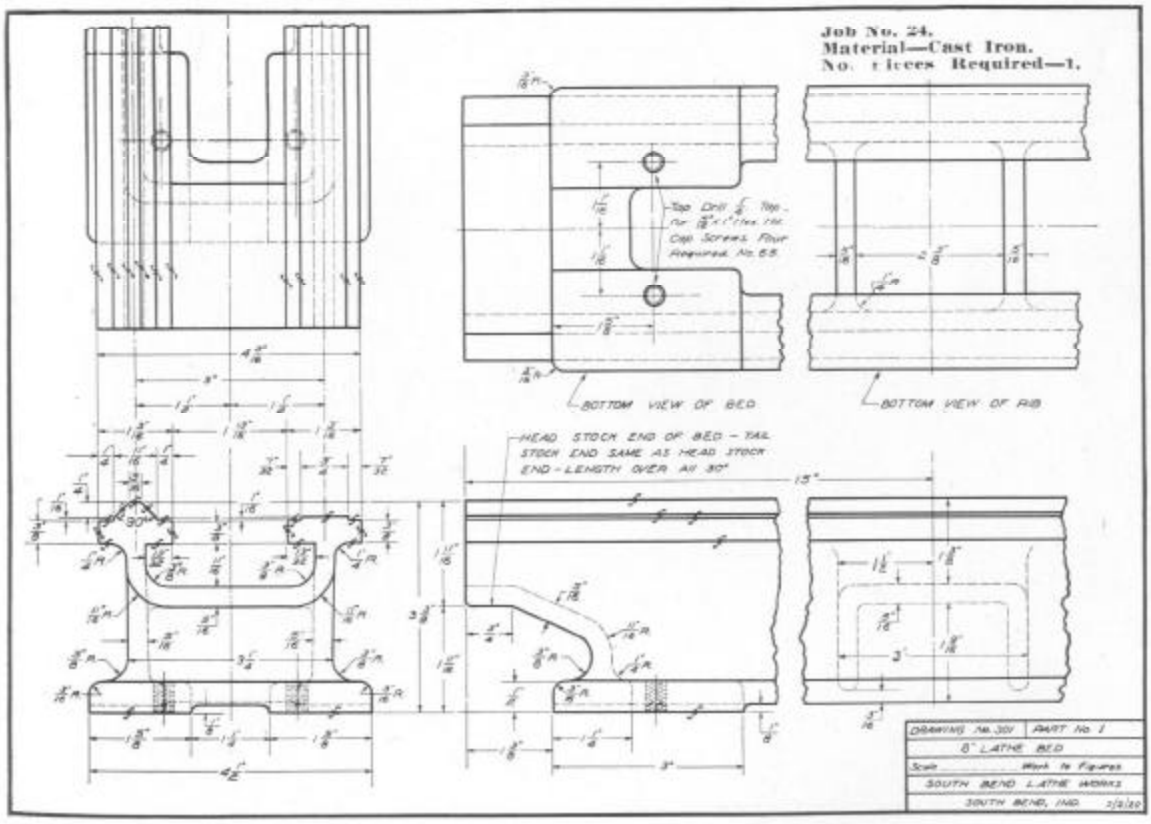

Job. No. 21.
Material—Cast Iron.
No. Pieces Required
—2.
Section on A-B
Drill 13/64 for 1/2" & 1 1/2" Lag Screws No 30 — 4 Req. with Washer No. 31 — 4 Req.
Drill 8 1/64" Dia.
Countersink 3/8" Dia.
DRAWING NO 300 | PART No. 2.
8" LATHE LEG.
Scale..... Work to figures.
SOUTH BEND LATHE WORKS
SOUTH BEND, IND.

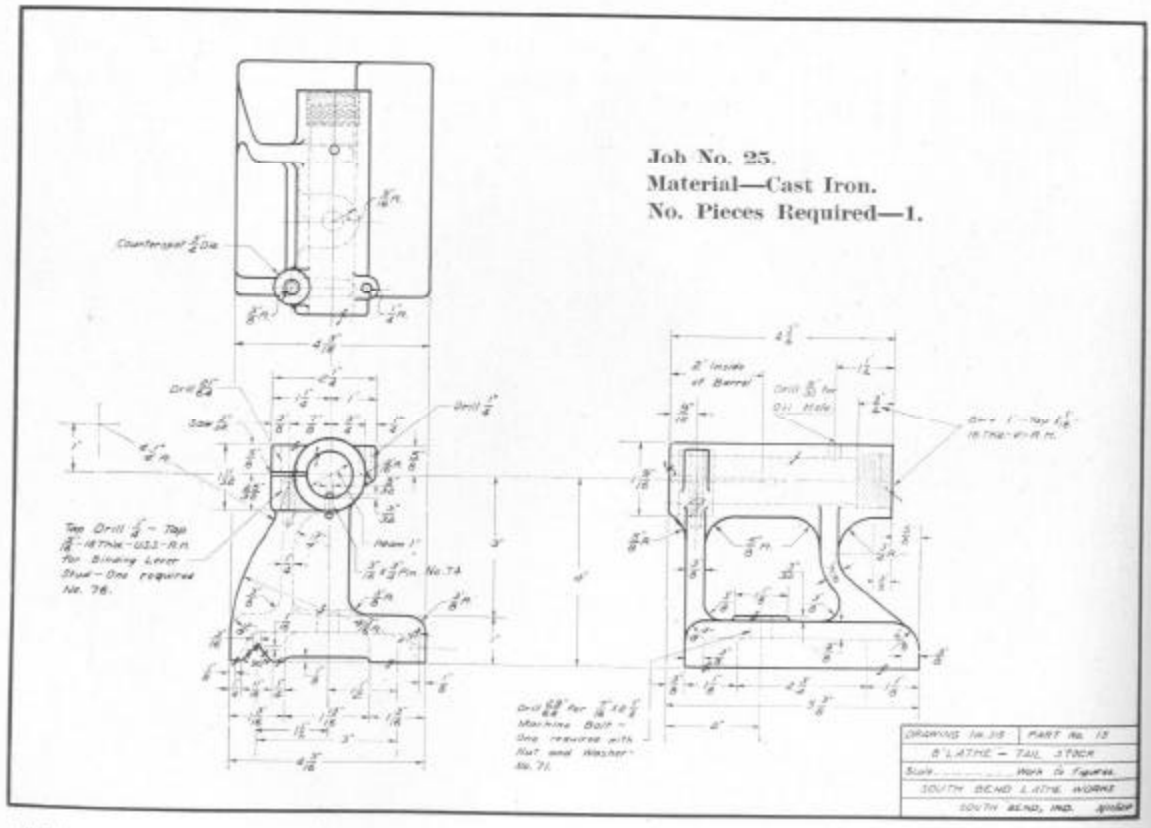


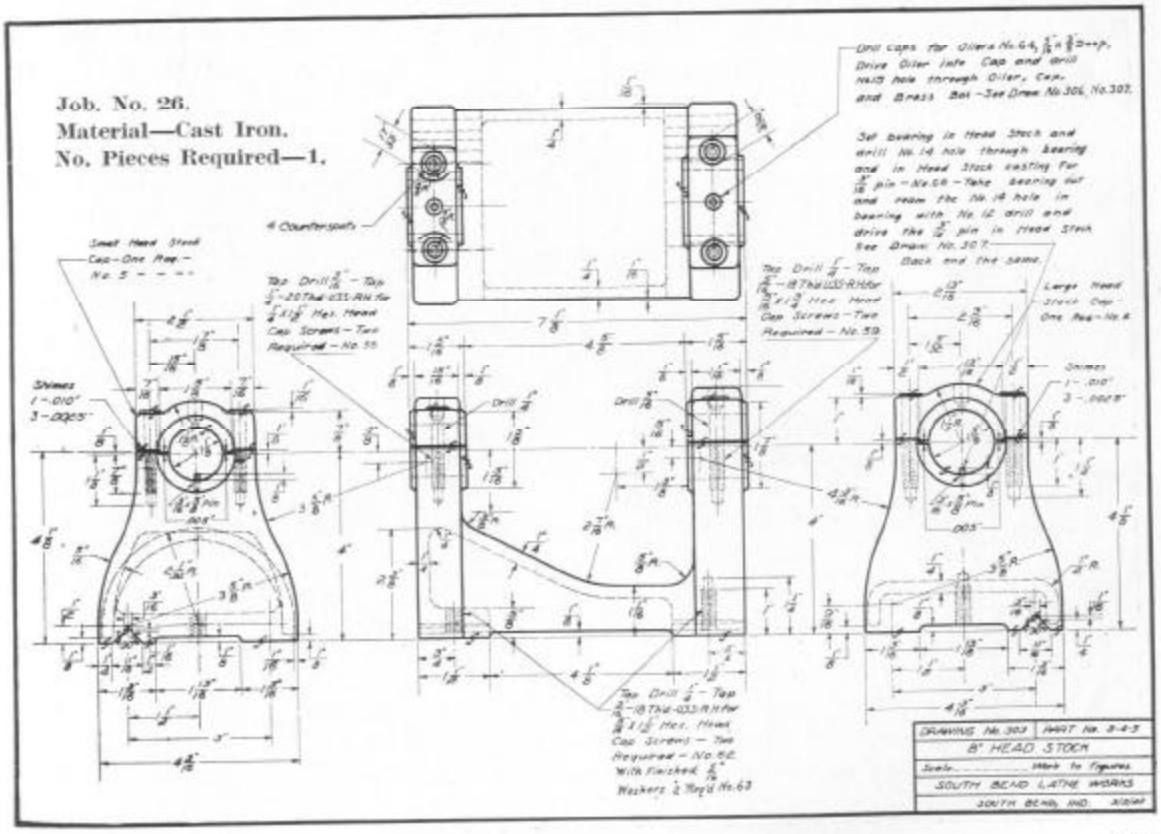
Job No. 22
Material. — Cast Iron.
No. Pieces Req'd. 1 of each.

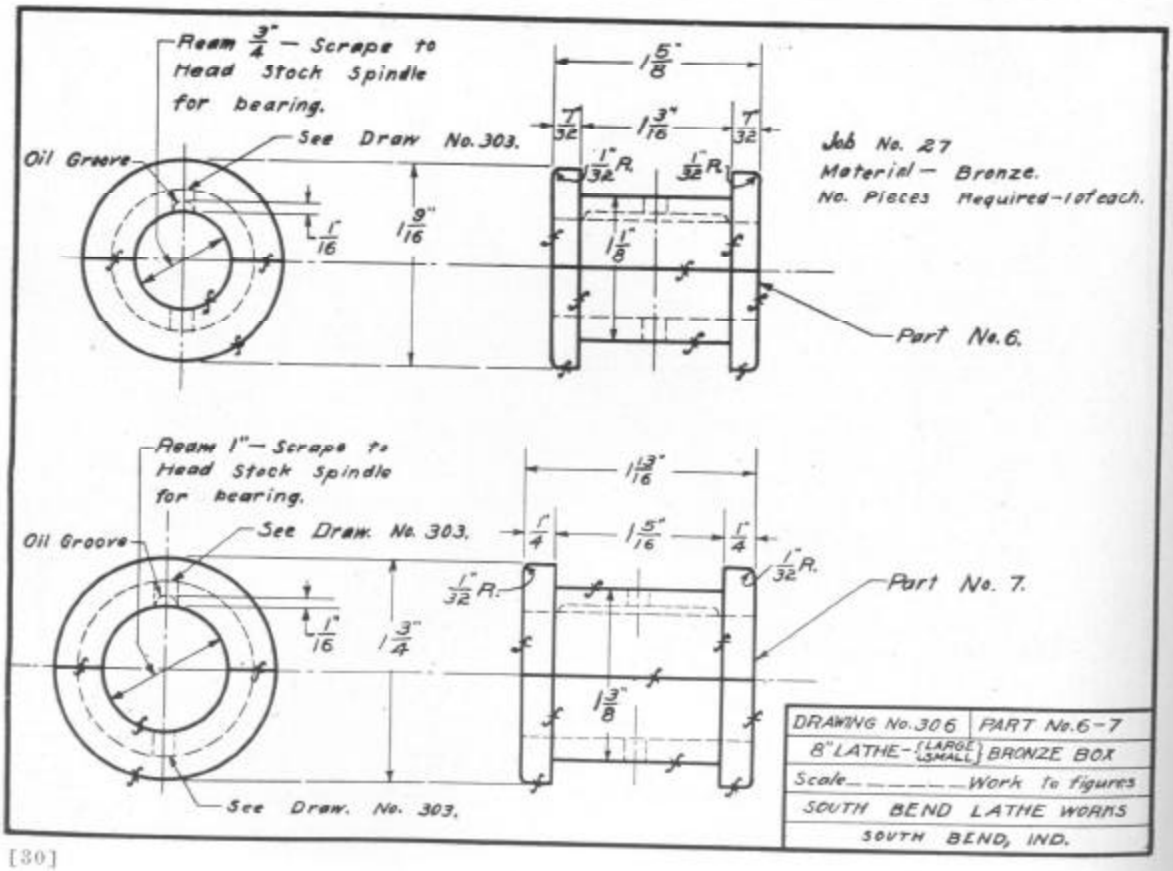
DRAWING No. 304	PART No. 4-5
8" LATHE-HEAD STOCK CAPS	
Scale _____ Work to figures	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	

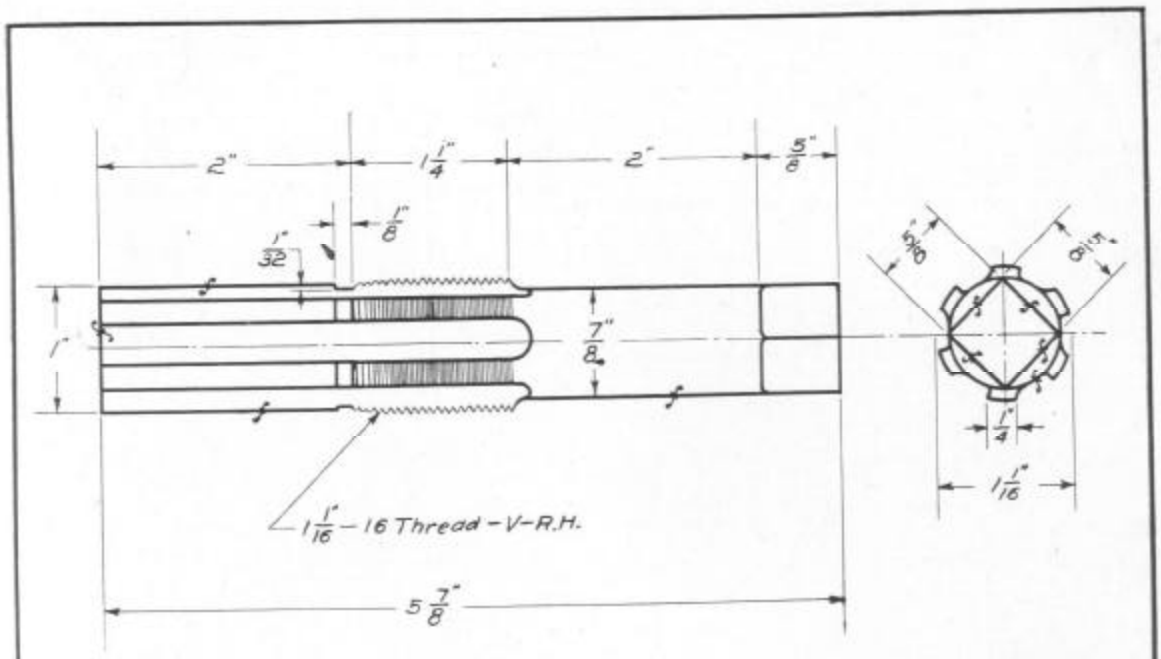

Job No. 23.
Material— Cast Iron.
Pieces Required—1.
1 3/8"
2 3/32"
2 3/4"
Drill 15/32"
4 3/16"
2 3/4"
1/16"
3/16"
1/4"
90°
9/16"
1/4"
11/16"
1/4"
1/8"
1 3/16"
1 13/16"
1 3/16"
1 1/2"
1 1/2"
3"
4 3/16"
DRAWING No. 328 PART No. 28
8" LATHE — T.R. SOCKET PLATE
Scale _____ Work to figures
SOUTH BEND LATHE WORKS
SOUTH BEND, IND.


Job No. 24.
Material—Cast Iron.
No. Pieces Required—1.
Top Drill 5/8 Tap for 1/2" x 1" Flat Hd. Cap Screws. Four Required. No. 65.
BOTTOM VIEW OF BED
BOTTOM VIEW OF RIB
HEAD STOCK END OF BED — TAIL STOCK END SAME AS HEAD STOCK END — LENGTH OVER ALL 30"
15"
30°
3"
4 1/2"
DRAWING No. 30V
PART No. 1
8" LATHE BED
Scale ... Work to Figures
SOUTH BEND LATHE WORKS
SOUTH BEND, IND. 2/2/20


Job No. 25.
Material—Cast Iron.
No. Pieces Required—1.
Countersink 5/32 Dia.
Drill 25/64
Saw 5/32
Drill 1/4
Tap Drill 1/4 — Tap 1/8"-18 Thds.-U.S.S.-R.H. for Binding Lever Stud — One required No. 76.
Ream 1/2 x 3/4 Pin No. 74
Drill 33/64" for 3/8" x 1 3/4 Machine Bolt — One required with Nut and Washer No. 71.
2" Inside of Barrel
Drill 5/32 for Oil Hole
DRAWING No. 25 | PART No. 13
B. LATHE — TAIL STOCK
Scale ..... Half Size Figures.
SOUTH BEND LATHE WORKS
SOUTH BEND, IND.

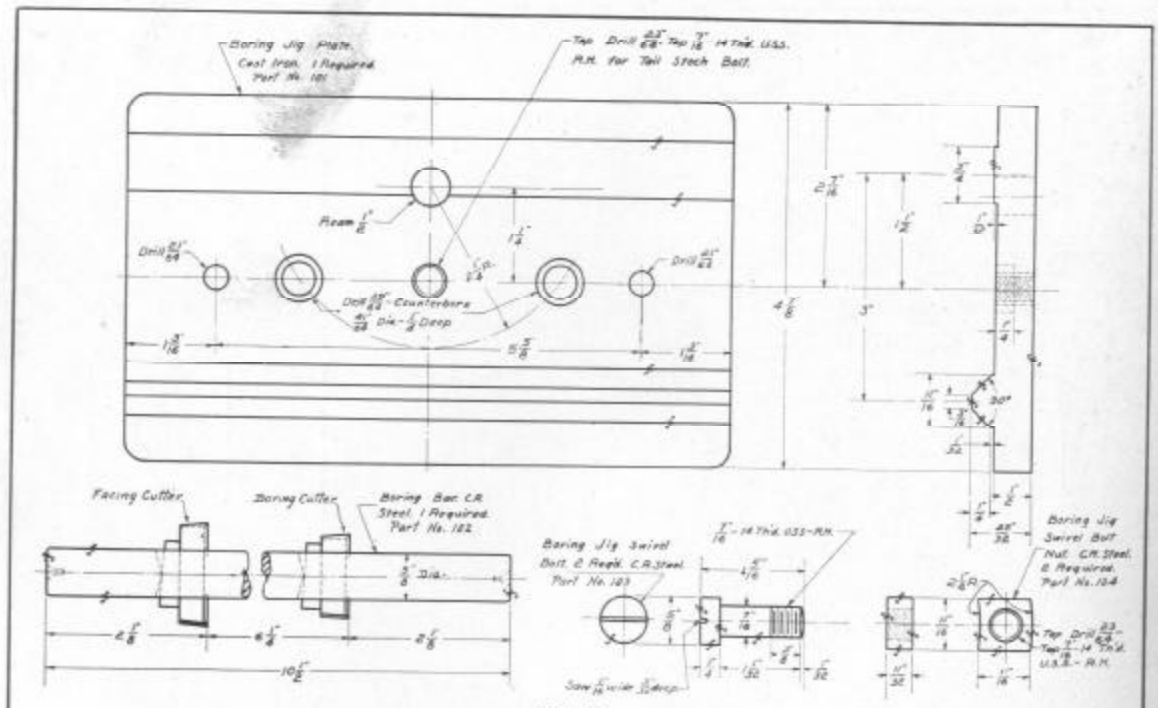

Job. No. 26.
Material—Cast Iron.
No. Pieces Required—1.
Drill caps for Oilers No. 64, 5/16" x 3/8" Deep. Drive Oiler into Cap and drill hole through Oiler, Cap and Brass Bar—See Dwgs. No. 306, No. 307.
Set bearing in Head Stock and drill No. 14 hole through bearing and in Head Stock casting for 5/16" pin—No. 66—Take bearing out and ream the No. 14 hole in bearing with No. 12 drill and drive the 5/16" pin in Head Stock. See Dwgs. No. 307—Back and the same.
4 Countersinks
Small Head Stock Cap—One Req'd—No. 5
Tap Drill 5/16" Tap 5/16"-20 Thd. U.S.S. R.H. for 5/16" x 1 1/2" Hex. Head Cap Screws—Two Required—No. 55
Tap Drill 5/16" Tap 5/16"-18 Thd. U.S.S. R.H. for 5/16" x 1 1/2" Hex. Head Cap Screws—Two Required—No. 59
Large Head Stock Cap—One Req'd—No. 4
Shims 1—.010" 3—.002"
Drill 1/4
Drill 13/64
Tap Drill 5/16" Tap 5/16"-18 Thd. U.S.S. R.H. for 5/16" x 1 1/2" Hex. Head Cap Screws—Two Required—No. 62. With Finished 5/16" Washers & Req'd No. 63
DRAWING No. 303 | PART No. 3-4-5
8" HEAD STOCK
Scale..... Work to Figures.
SOUTH BEND LATHE WORKS
SOUTH BEND, IND. X1944


Ream 3/4" — Scrape to Head Stock Spindle for bearing.
See Draw No. 303.
Oil Groove
1 5/8"
7/32
1 3/16"
7/32
1/32" R.
1/32" R.
1 1/8"
r/16
1 9/16"
Job No. 27
Material — Bronze.
No. Pieces Required — 1 of each.
Part No. 6.
Ream 1" — Scrape to Head Stock Spindle for bearing.
See Draw. No. 303.
Oil Groove
1 13/16"
r/4
1 5/16"
r/4
1/32" R.
1/32" R.
Part No. 7.
r/16
1 3/4"
1 3/8"
See Draw. No. 303.
DRAWING No. 306 | PART No. 6-7
8" LATHE — {LARGE / SMALL} BRONZE BOX
Scale _____ Work to figures
SOUTH BEND LATHE WORKS
SOUTH BEND, IND.



Job No. 28
Material – Tool Steel.
No. Pieces Required – 1.

DRAWING No. 379	PART No. 79
8" LATHE – TAIL STOCK TAP	
Scale_____ Work to figures	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	

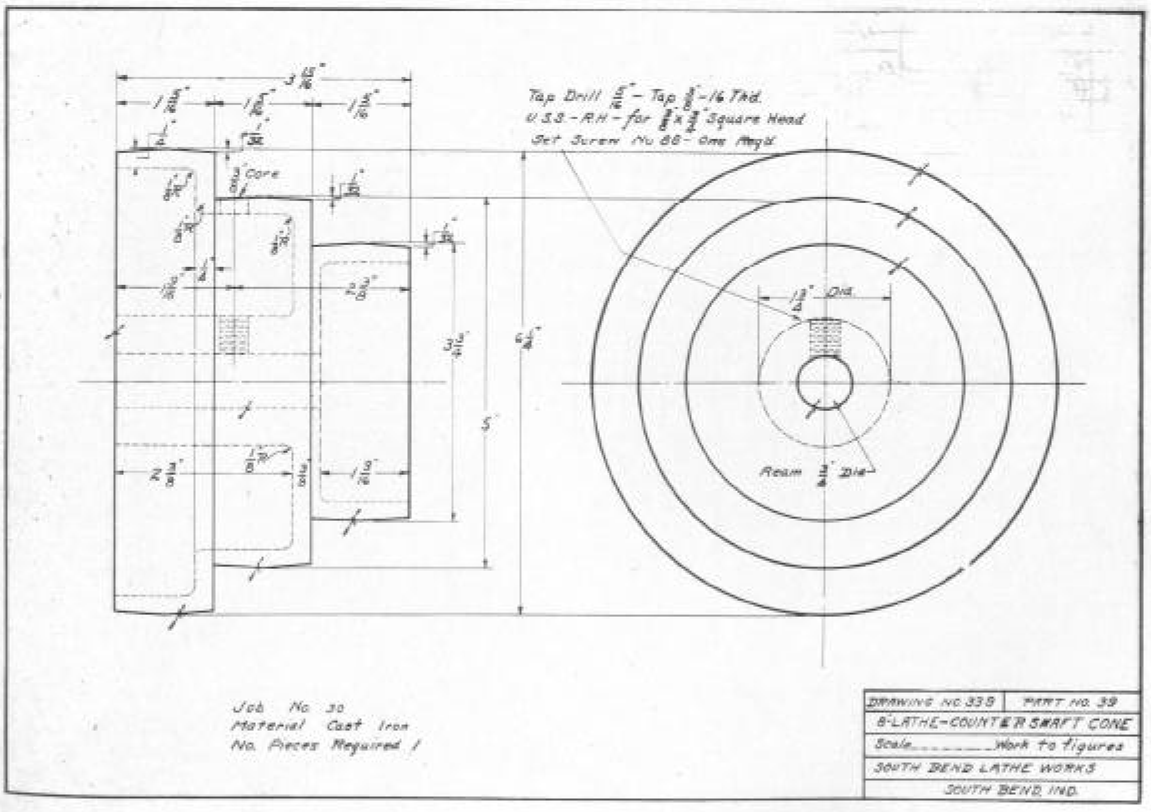


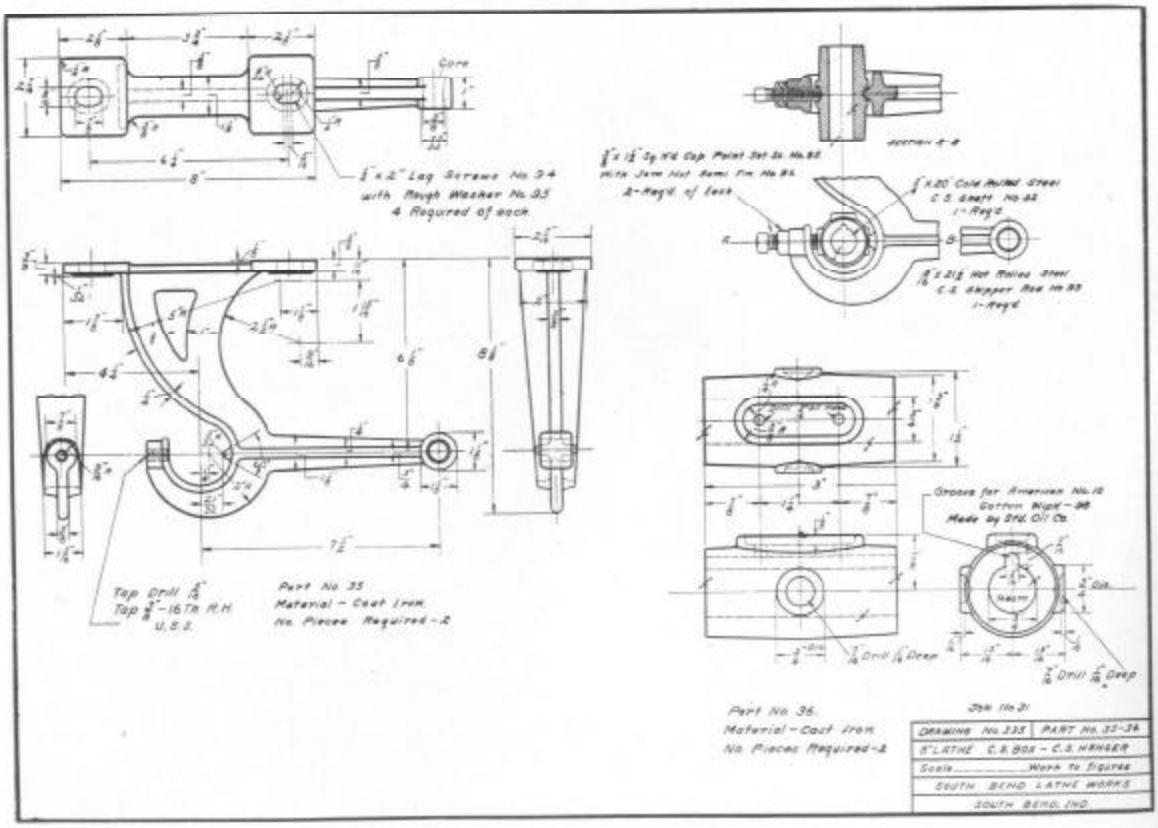
Job No. 29

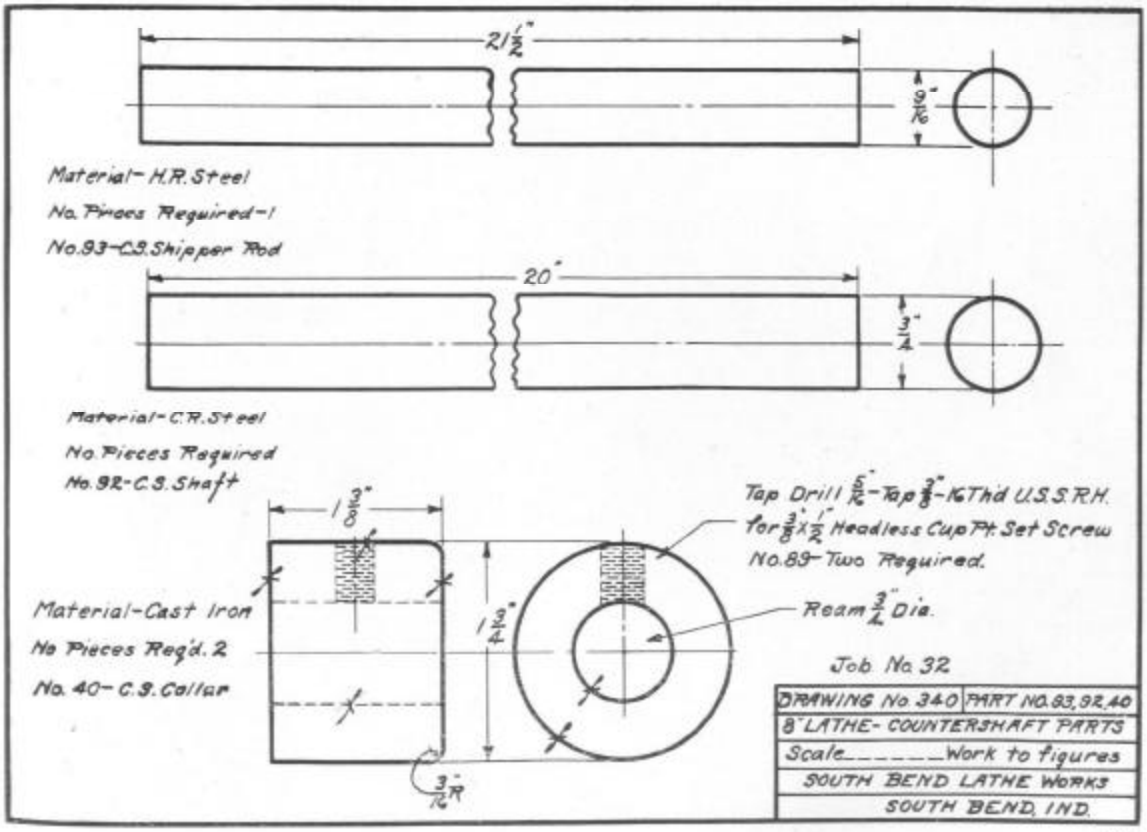
NOTE

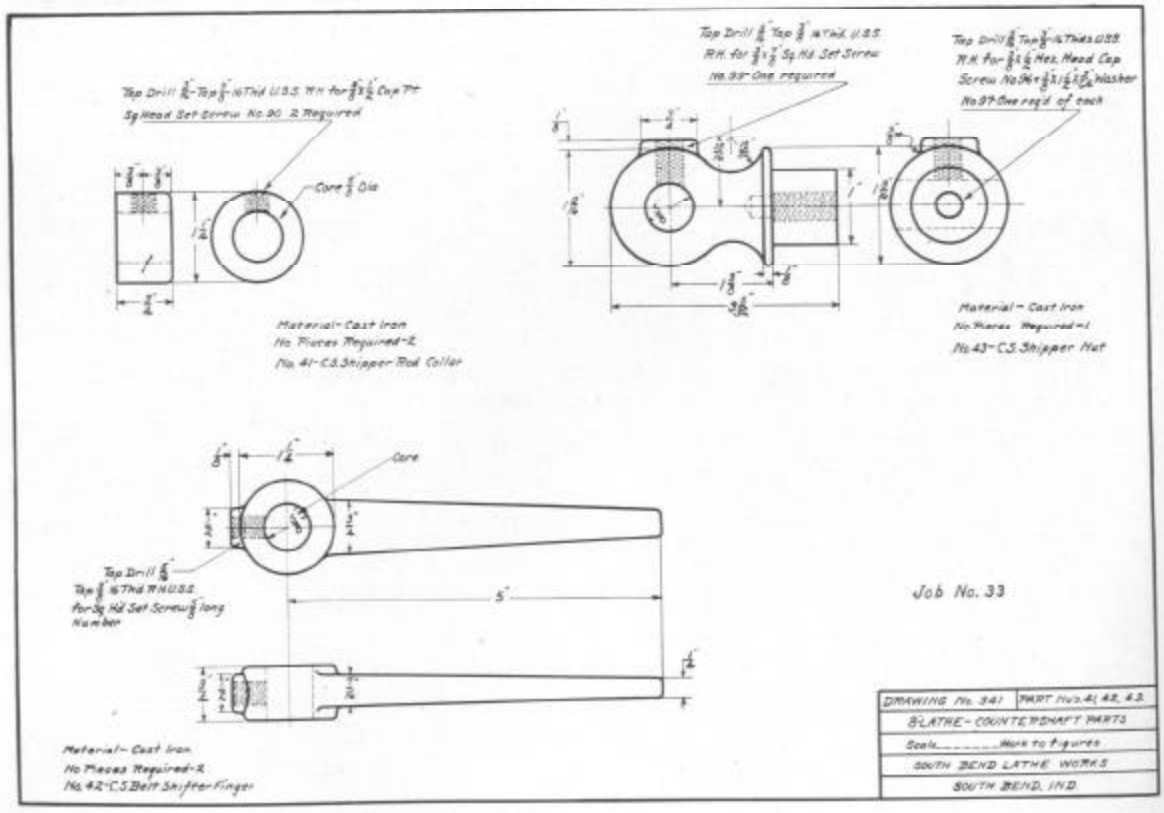
This Jig is to be used for boring 8" Head Stock and Tail Stock castings on a 13" South Bend Lathe.

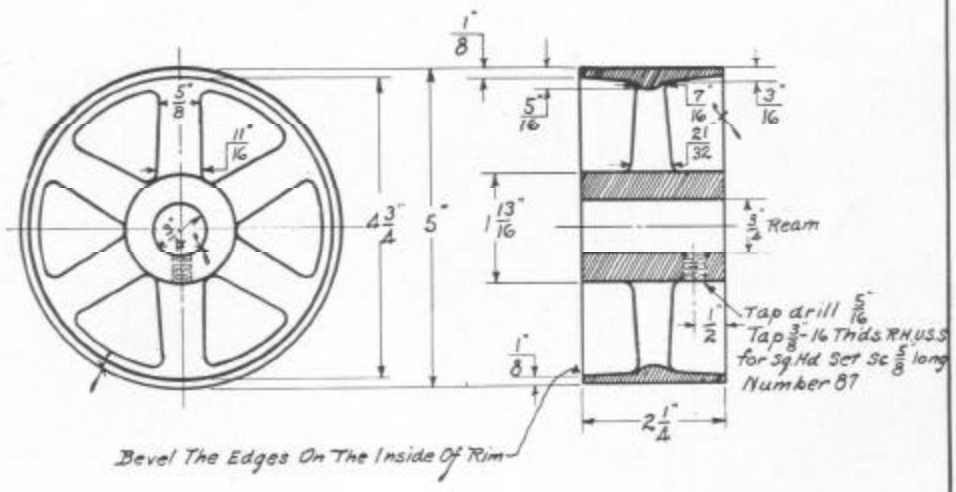
DRAWING No. 401	PART No. 101 to 104
8" LATHE-BORING JIG	
Scale ..... Work to Figures.	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	


Tap Drill 5/16" - Tap 3/8"-16 Thd.
U.S.S.-R.H.- for 3/8" x 3/4" Square Head
Set Screw No. 88 - One Req'd.
3/8" Core
5"
6 1/4"
Ream 3/4" Dia.
Job No. 30
Material Cast Iron
No. Pieces Required 1
DRAWING NO. 339
PART NO. 39
8"-LATHE-COUNTER SHAFT CONE
Scale Work to figures
SOUTH BEND LATHE WORKS
SOUTH BEND, IND.


Core
Section A-B
Groove for American No. 12 Cotton Weight - 3/8
Made by Dixie Oil Co.
Part No. 35
Material - Cast Iron
No. Pieces Required - 2
Part No. 36.
Material - Cast Iron
No. Pieces Required - 2
Job No. 21
DRAWING No. 335 | PART No. 33-34
6" LATHE C.S. BOX - C.S. HANGER
Scale ..... Work to figures
SOUTH BEND LATHE WORKS
SOUTH BEND, IND.

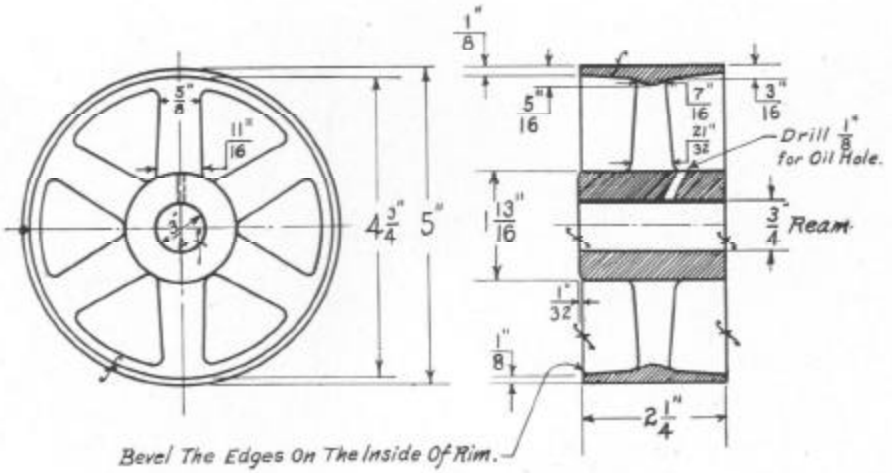

21 1/2"
9/16"
Material- H.R. Steel
No. Pieces Required-1
No. 93- C.S. Shipper Rod
20"
3/4"
Material- C.R. Steel
No. Pieces Required
No. 92- C.S. Shaft
1 3/8"
Material- Cast Iron
No Pieces Req'd. 2
No. 40- C.S. Collar
1 3/4"
3/16" R
Tap Drill 5/16"- Tap 3/8"- 16 Thd U.S.S.R.H.
for 3/8" x 1/2" Headless Cup Pt. Set Screw
No. 89- Two Required.
Ream 3/4" Dia.
Job No. 32
DRAWING No. 340 | PART NO. 93, 92, 40
8" LATHE- COUNTERSHAFT PARTS
Scale_____Work to figures
SOUTH BEND LATHE WORKS
SOUTH BEND, IND.


Tap Drill 5/16" Tap 3/8"-16 Thd U.S.S. RH for 3/8" x 1" Sq Hd Set Screw No. 39 One required
Tap Drill 5/16" Tap 3/8"-16 Thds U.S.S. RH for 3/8" x 1 1/2" Hex. Head Cap Screw No. 96 & 3/8" x 1 1/2" x 1/16" Washer No. 97 One req'd of each
Tap Drill 5/16" Tap 3/8"-16 Thd U.S.S. RH for 3/8" x 1/2" Cup Pt Sq Head Set Screw No. 90. 2 Required
Core 1/2" Dia
Material - Cast Iron
No. Pieces Required - 2
No. 41 - C.S. Shipper Rod Collar
Material - Cast Iron
No. Pieces Required - 1
No. 43 - C.S. Shipper Nut
Core
Tap Drill 5/16" Tap 3/8"-16 Thd R.H. U.S.S. for Sq. Hd Set Screw 1/2" long Number
5"
Material - Cast Iron
No. Pieces Required - 2
No. 42 - C.S. Belt Shifter Fingers
Job No. 33
DRAWING No. 341
PART No's. 41, 42, 43.
SLATHE - COUNTERSHAFT PARTS
Scale ..... Mark to Figures
SOUTH BEND LATHE WORKS
SOUTH BEND, IND.



DRAWING No. 338	PART No. 38
8" LATHE - C.S. TIGHT PULLEY	
Scale_____Work to figures	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	

Job No. 34
Material - Cast Iron
No Pieces Required - 1



Job No. 35
Material-Cast Iron
No. Pieces Required.-1-

DRAWING No. 337	PART NO 37
8" LATHE-LOOSE PULLEY	
Scale_____Work to Figures	
SOUTH BEND LATHE WORKS	
SOUTH BEND, IND.	

Instructions for Machining the 8-inch Bench Lathe

MACHINING THE THRUST COLLAR

Job No. 1. Page 6. Part No. 57. Drawing No. 357.

Attach a 3-Jaw Universal Chuck to the Lathe spindle. Chuck the disc; center and drill a 5/8" hole. Bore the hole 47/64" in diameter, finish with a 3/4" Standard Reamer. Press the collar on a 3/4" Mandrel and machine to the dimensions shown on the drawing. Cut the Keyway in a shaper and case harden. For instructions on case hardening see book "How to Run a Lathe."

MACHINING TAKE UP NUT

Job No. 2. Page 6. Part No. 9. Drawing No. 309.

Chuck the casting in a 3-Jaw Chuck on the Lathe and bore 11/16" hole. Gear the lathe to cut 16 threads; cut a R. H. V thread. We will use this nut later as a gauge, to cut the thread on the spindle. Using a nut arbor, turn and face the Take Up Nut to the dimensions given on the drawing. Drill a 7/16" hole and tap with a 1/4"x20 U.S.S. R.H. Tap.

MACHINING THE 3" AND 6" TOOL RESTS

Job No. 3. Page 7. Drawing No. 325. Part Nos. 25 and 26.

Locate the centers, drill and countersink the center holes. Drive the tool rest between centers with stud in the face plate. Machine the tool rest to the dimensions given in the drawing. The outside diameter is shown as .623" as it fits in the Tool Rest socket which is drilled and reamed .625".

MACHINING THE BINDING LEVER STUD

Job No. 4. Page 8. Part No. 76. Drawing No. 376.

The Binding Lever Stud is a 5/16 x 18 U.S.S. R.H. thread. The material for this piece is long enough to make two studs. Locate the centers; drill and countersink the center holes. With a cutting off tool divide the material in the middle to a depth of 1/8" below the bottom of the thread. Face the end, and finish turn .006" under 5/16". Cut the thread slightly longer than

the 1⅜" at which the stud finishes. Use a Standard $\frac{3}{16}$" Nut for testing this stud so as to be sure the thread is cut the proper depth. For thread cutting, see pages 32 to 39 in booklet "How to Run a Lathe." Cut the threaded portion off $\frac{1}{16}$ of an inch longer than 1⅜". Chuck the stud; face and round both ends, as shown in drawing.

MACHINING THE TAIL STOCK HAND WHEEL

Job No. 5. Page 9. Part No. 17. Drawing No. 317.

Chuck the hand wheel casting with the hub outside, making sure that the outside diameter and the hub run true. Drill the hole in the hub 27/64" and ream with a Machine Reamer, keeping the hole about .002" under standard. Press the Hand Wheel on a $\frac{7}{16}$" Standard Mandrel and face the Hub. It is important that the length of the hub be $\frac{5}{16}$" as indicated on drawing. About the best method of turning the outside diameter is to take a round-nose tool, and start at the center of the rim and feed to the left slowly by hand at the same time feeding the cross feed by hand in order to get the desired radius. Do the other half of the rim in the same manner. Follow the same method for finishing as was used for roughing, being careful to get a smooth finish. Finish by filing with a mill file, and polishing with emery cloth and oil. The hole should now be reamed with a Hand Reamer, taking care that the Reamer is started straight.

MACHINING THE TAIL STOCK NUT

Job No. 6. Page 10. Part No. 16. Drawing No. 316.

Chuck the hexagon end of the casting in a 3-Jaw Chuck, taking care that the casting runs true. Drill, ream and bore at one chucking. The important overall dimensions on this tail stock nut is the distance 1-5/32". Hand ream the ½" Hole with a Standard Reamer. Press the casting on a Standard ½" Arbor, and machine to the dimensions given on drawing. Cutting the $1\frac{1}{16}$" x 16-V thread should be deferred until after the tailstock has been tapped.

MACHINING THE HANDLE FOR HAND WHEEL

Job No. 7. Page 11 Part No. 70. Drawing No. 370.

The material for this piece is long enough to make two handles. Locate centers; drill and countersink the center holes. With a cutting off

tool divide the material in the middle to a depth of about ⅛". Face the ends and turn both ends to the dimensions shown on the drawing. A templet should be made from cardboard to get these measurements. A very satisfactory job can be turned out by using the hand feed and finishing with a file and emery cloth.

MACHINING THE BINDING LEVER

Job No. 8. Page 11. Part No. 18. Drawing No. 318.

Locate the centers as near as possible with a center punch. Place the binding lever between centers on the lathe and revolve by hand. If the piece is not centered accurately enough, change the center punch marks in the proper direction. Drill and countersink the center holes and machine the handle. A great many of the dimensions given on the drawing are for the pattern maker, and are not needed for the machining. This job can be done in the same manner as Job No. 7. A very good looking job can be obtained by the use of the hand feed, then filing and polishing. Drill the hole ¼" to the proper depth, face the end with a counterbore and tap carefully.

MACHINING THE SHIMS AND WRENCH

Job No. 9. Page 12. Drawing No. 320
Part Nos. 52 and 53, 20.

There are eight shims required for each headstock bearing. Two shims .010" and six shims .0025". This material is furnished in strips. Cut the shims out with a pair of shears to the dimensions shown in the drawing.

There is no machine work to be performed on the tailstock wrench. It may be necessary to file the end to fit the tailstock and tool rest nuts.

MACHINING THE HEADSTOCK, TAILSTOCK, AND TOOL REST CLAMPS

Job No. 10. Page 13. Part No. 19. Drawing No. 319.

Hold the castings in the shaper vise and machine to dimension on drawings. Drill a 15/32" hole in the Tail Stock and Tool Rest Clamps, and a 11/32" hole in the Head Stock Clamps.

MACHINING THE TOOL REST SOCKET

Job No. 11. Page 14. Part No. 27. Drawing No. 327.

Hold the casting in shaper vise, taking care to have it as level as possible, and machine the

bottom surface. Remove the casting from the vise and test it on a surface plate, to be sure that it is straight. Clamp the casting to the planer or shaper table and machine the top surface. Drill and ream a 5/8" hole using a 39/64" Drill, followed by a 5/8" Machine Reamer. Finish the hole with a 5/8" Standard Hand Reamer. Drill the 7/16" hole and tap with a 3/8" 16-thread U. S. S. R. H. Tap.

MACHINING THE TAIL STOCK SPINDLE

Job No. 12. Page 15. Part No. 73. Drawing No. 373

Chuck the spindle in the lathe, face and center. Drill a 13/32" hole 4-1/32" deep, and follow with a 7/16" Drill through the remainder of the material. Countersink both ends and machine on centers. Take care to face the ends of the spindle to the proper dimensions. Turn the outside diameter to the 1" diameter shown on the drawing.

We are now ready to bore the No. 1 Morse Taper. Set the Spindle up in the lathe, as shown on page 51. Use the taper attachment to bore the taper hole. Set the taper attachment to what you think is about the proper angle and take a few light chips. It will be necessary to use a No. 1 Morse Taper Reamer to finish this hole when bored to the proper dimensions, therefore, use the reamer as a gauge. Micrometer the reamer and mark the place on the reamer with chalk where the reading is .475". Be sure to get the proper adjustment on the taper attachment, before boring the hole too large. When you know that you have the proper taper, bore the hole so that the reamer will fit in by hand to within 1/8" of the length necessary to ream the largest point .475". Ream the hole by hand to the proper depth. In the shaper cut the 5/32" Keyway 3/32" deep. This keyway could also be cut in a milling machine. The Oil groove may be cut in the shaper. Tap with a 3/8" x 16 thread U. S. S. Left-hand Tap. This hole must be tapped straight. Do not tap this hole until after jobs Nos. 13, 14, and 15 are finished.

The Tail Stock Spindle can be tapped by using the Tail Stock Nut as a bushing, and tapping the Spindle through this bushing having both the Tail Stock Nut and Spindle assembled in the Tail Stock. This way of tapping the Spindle would insure a straight hole.

MACHINING THE 60 DEGREE CENTERS

Job No. 13. Page 16. Part No. 60. Drawing No. 360.

Drawing No. 360 shows the 60 degree centers. There are two of these centers required, therefore, make them in pairs, from one piece of Tool Steel. The Morse Taper on each end.

Drill and countersink the center holes in the piece of tool steel. The Morse taper for this job can be turned by off-setting the tail stock, see page 42, in booklet "How to Run a Lathe." Turn this taper, so that it will enter in the tail stock spindle 2¼". Use the tail stock spindle as a gauge. Be sure the taper is correct before proceeding too far. When the two ends have been turned to the proper taper, use a cutting-off tool and cut the piece of tool steel in two in the middle. Finish the 60 degree part of the center in the tail stock or head stock spindle. Set the spindle up in the lathe using the steady rest, as shown on page 51, being careful that it runs perfectly true. Place the center to be machined in the tail stock spindle. Set the Compound Rest at 60 degrees as shown on page 23, "How to Run a Lathe," and machine the centers 60 degrees, using a center gauge to test the angle. See page 22, "How to Run a Lathe."

MACHINING CUP AND SPUR CENTERS

Jobs 14 and 15. Page 17-18. Drawing 378-367. Parts No. 78 and 67.

Machine the No. 1 Morse taper Shanks on Jobs Nos. 14 and 15 the same as on Job. No. 13. Do not, however, cut this piece of steel exactly in the middle as in Job No. 13, because the Spur Center finishes greater in length than the Cup Center.

Place Cup Center in tailstock spindle, as in previous job, and machine the end to dimensions given on the drawing. This can be done by setting the compound rest at 60 degrees.

Place Spur Center in Tailstock Spindle and machine the ⅜" recess. Drill the No. 13 hole. Holding the Spur Center in the Dividing Head on the Milling Machine cut the four flutes with an end mill. If there is no milling machine, file the flutes. File the 45 degree angle on the face of the flutes.

MACHINING THE TAILSTOCK SCREW

Job No. 16. Page 19. Part No. 75. Drawing No. 375.

Locate the centers, drill and countersink the center holes. Face the ends so as to have the length over-all exactly right. Rough turn, leav-

ing 1/32" stock on all diameters, and shoulders. With a cutting-off tool cut the shoulders. Finish turn the screw all over, turning the two diameters that are to be threaded about .006" under size. Cut the 5/16" Right Hand thread to fit a 5/16" Standard Hexagon Nut. Cut the 3/8" Left Hand thread to fit the thread in the tailsock spindle. Put the screw in the tailstock hand wheel and drill the No. 31 hole, so that a 1/8 x 1/4 pin will prevent the hand wheel from turning on the tailstock screw.

MACHINING THE HEAD STOCK SPINDLE

Job No. 17. Page 20. Part No. 54. Drawing No. 354.

Center both ends, face and rough turn the diameter for a distance of 3" on each end. Chuck one end and run the other end in the steady rest. Drill a 3/8" hole through the entire length of the spindle. Countersink each end and turn the spindle on centers to the dimensions given on the drawing. Cut the 3/4—16 V. R. H. thread on the small end of the spindle. Use the take up nut made in Job No. 2 as a gauge. The 1 1/8" x 10 U. S. S. Right Hand thread on the large end of the spindle should be a perfect thread. Cut this thread carefully. When the last few cuts have been reached, use plenty of oil and take very light cuts. As there is no recess in which to end this thread, drill a .100" hole about 3/8" deep. To bore the Morse Taper, follow the same procedure as in Job, No. 12.

MACHINING THE FACE PLATE

Job No. 18. Page 21. Part No. 11. Drawing No. 311.

Chuck the casting, by the flange, hub side out, and rough turn and face the hub and back side of the plate. Bore 1-1/64" hole in casting. Recess the hub 1-5/32" diameter so it will finish 1/4" deep. Cut the 1 1/8" x 10 U. S. S. Right-hand Thread. Great pains should be taken with this thread and the finishing cuts should be very light keeping the threading tool sharp. This face plate should fit on the spindle nose so that it can be screwed on by hand. It should also fit so that when the first three threads have taken hold there is no shake between the face plate and spindle. Use the spindle as a gauge. Using a Nut Arbor, turn and face to dimensions shown on the drawing. Drill and countersink the three 1/4" holes in the flange of the plate. This face plate can be filed and polished after the lathe is assembled and ready to run.

MACHINE THE DRIVE PLATE

Job No. 19. Page 22. Part No. 12. Drawing No. 312.

Job No. 19 is similar to Job No. 18 as far as the general procedure is concerned.

MACHINING THE SPINDLE CONE

Job No. 20. Page 23. Part No. 8. Drawing No. 308.

Hold the small step in the chuck, make sure that the outside diameter of the large step and also the hub run true. Bore the hole 29/32". Use a standard machine reamer, be sure to get the reamer started true in the hole, ream the hole $\frac{15}{16}$". Press the spindle cone on an Arbor and rough turn and face all over; leave enough stock to finish the casting the proper dimensions. Hand ream the spindle cone so that the hole is exactly $\frac{15}{16}$" in diameter and straight its entire length. Press on an Arbor and finish machine all over to the proper dimensions. Off set the tail stock, and crown the three cone steps. Drill $\frac{5}{16}$" hole and tap $\frac{3}{8}$ x 16 threads in the small step $2\frac{1}{32}$" from the end. Spindle Cone should be filed and polished in order to make a first-class job.

MACHINING THE 8" LATHE LEG

Job No. 21. Page 24. Part No. 2. Drawing No. 302.

Clamp the casting to the Planer Platen or the shaper table and plane the top of the leg. Plane the bottom of the leg. Drill the two holes for the cap screws which fasten the legs to the bed. Drill the holes through the foot of legs.

MACHINING THE HEADSTOCK CAPS

Job No. 22. Page 25. Drawing No. 304-305.

Clamp the casting in the shaper vise and plane the bottom to the dimensions given on the drawing. Drill cap screw holes, and counter bore surface for cap screw heads.

MACHINING THE TOOL REST SOCKET PLATE

Job No. 23. Page 26. Part No. 28. Drawing No. 328.

Plane the top surface of the casting smooth. Plane the two bottom surfaces, the flat way and 90 degree V. For planing the V, first use a cutting off tool and cut the recess to the proper depth. The V can be cut setting the planer head at a 45 degree angle, also set over the clapper box and planing first one side with a cutting off tool, then reversing the head to the 45 degree angle the other way, and planing the other side of the V. Then finish by cutting first one side of the V. and then the other until the V measures $\frac{1}{16}$" on top. Use the plate as a gauge when planing the bed. Drill the 15/32" hole for the clamp bolt.

MACHINING THE BED

Job No. 24. Page 27. Part No. 1. Drawing No. 301.

Arrange to rough plane the bottom of the bed. It may be necessary to shim some corners before clamping the bed to the planer platen. This may be necessary on account of the casting being twisted somewhat in the moulding. The bed should rest solid on the planer platen before the planer clamps are tightened. Plane the bottom. Now clamp the bottom of the bed to the planer platen. If the first operation was carried through properly the bed will rest solid on the planer platen without any shimming being necessary. It is important that the bed rests perfectly solid on the platen. Rough the four sides, the top, and the undercut where the head and tailstock clamps fit, leaving $\frac{1}{32}$" stock on all these surfaces for finish planing. For undercutting, see page 50.

Turn the casting over on the planer platen and finish plane the bottom. Use ¼" strip of cold rolled steel under the flat way, so that the bed will set level on the planer platen. Use broad nose tool for finishing the bottom and take several chips, the last chip scraping very little metal off. Clamp bed on platen bottom side down and finish plane the sides and top of the bed. The correct procedure here is to finish the two outside edges first, being careful to get this dimension $4\frac{3}{16}$". Use a side tool and feed the head down about $\frac{1}{32}$" to the stroke. Finish the two inside edges in the same manner. With a broad nose tool finish the top surface of the V. This dimension when the V is finished planed will be $\frac{3}{16}$". Therefore, plane it so that it will measure now about ¼". Plane the flat way. After finishing the top of the V drop your tool .250". Start at the outside corner taking a small cut and feed the tool across the surface of the flat way. When the tool has traveled all the way across the flat surface feed it back, letting it scrape whatever metal it will. Using a tool as shown on Page 50, undercut the bed for the clamps.

Caution: Be sure and raise the tool at the end of the cutting stroke. See hinge idea for raising this tool, on page 50.

We are now ready to cut the V. Set the planer head over 45° angle, also set clapper box on an angle. Using a square nosed tool, cut both sides of the V way until the top measures exactly $\frac{3}{16}$". Now try the tool rest plate on the bed as a gauge. If there is any "rock" in the plate it can readily be detected. Determine which of your

three surfaces (the two sides of the V or the flat way) needs to be further machined and take a light chip on that surface, then try your plate again. When the plate rests solid on the bed, put red lead on the plate and rub the plate back and forth on the bed to see what kind of a bearing you have on these three surfaces. If this shows a good bearing all over, loosen your clamps and try the plate on the bed again. It should still show no "rock." Drill and tap the bed for the legs, using the legs as a drill jig, spot the bed; remove the legs and drill the holes in the bed.

MACHINING THE TAILSTOCK

Job No. 25. Page 28. Part No. 15. Drawing No. 315.

Place a wood plug in the spindle hole with a piece of tin attached to it. Locate a center point at the center of spindle hole. Mark a line from the center to the middle of the base. Arrange to plane the bottom of the tailsock. Clamp the tailstock casting to the planer platen, having the line from the center of the spindle hole to the center of the base square, with the platen. Plane the bottom of the tailstock. Be sure to get the 4" height dimension correct. Test tailstock on the bed and if it does not test perfectly flat with the bed scrape the bottom where it indicates the high spots. We will bore this tail stock in the lathe. For boring use the jig shown in drawing, on page 52 and follow instructions on page 53. Run the first boring bar fitted with a fly cutter through cored hole, boring the spindle within $\frac{1}{32}$" of finished dimension. Follow this with another cutter leaving about .006" to take out with the reamer. Then ream to size. Use the tap shown in Job No. 28, tap the $1\frac{1}{16}$" hole. Cut the 3/32" slot in the Milling machine. Drill and tap the hole for binding lever. Drill the hole for the $\frac{3}{16}$" x $\frac{3}{4}$" pin and drive the pin into place. Drill the oil hole and the hole for the machine bolt.

MACHINING THE HEAD STOCK

Job No. 26. Page 29. Part No. 3. Drawing No. 303.

Arrange to plane the headstock. Be careful to get the dimensions from the center of the spindle to the bottom of the headstock correct, leaving about $\frac{1}{8}$" stock for finishing the top of the casting. Note that the center line of spindle is $\frac{1}{8}$" below the top of the casting. Draw center lines from the center of the spindle hole to the center of the base, the same as in Job No. 25, and clamp the casting on the planer platen so that these lines are square with the planer platen, and plane the bottom of headstock, following the same procedure as in Job. No. 25. Plane the top of the headstock to fit the head-

stock caps. This should be a snug fit. Drill and tap the four holes for the cap screws in the headstock. Put the shims between the caps and with capscrews screw caps to the headstock. Bore this headstock in the lathe, following the same procedure as in Job No. 25. The boring bar used, however, will have two cutters spaced $5\frac{13}{16}$" apart, so as to bore both bearings at the same time. Face the four sides of the bearings, using side cutters or a fly cutter in the boring bar. (See instructions for boring page 53).

MACHINING THE BRONZE BOXES

Job No. 27. Page 30. Part No. 7. Drawing No. 307.

Plane each half of the large bronze castings so they fit together. These should be planed so that the 1" hole will bore out an equal amount from each half. Chuck the two castings together; bore and ream 1". Place the two castings on a 1" Standard Arbor, clamp them together and face the two ends to the proper dimensions. It will be necessary in order to turn the boxes to make a special arbor for holding them. Page No. 50 shows a good Arbor for this purpose. A nut holds the two halves solid while the sharp V rings will hold the bore true with the Arbor. Turn the bronze boxes to the dimensions shown on drawing. Drill the No. 12 holes and cut the oil groove with a chisel. The boxes are now ready to be assembled in the headstock, as described in Job No. 26.

Machine the smaller bronze boxes following the same instructions as above.

MACHINING THE TAILSTOCK TAP

Job No. 28. Page 31. Part No. 79. Drawing No. 379.

In Job No. 25 it is necessary to have a $1\frac{1}{16}$" x 16 Thread Right-hand Tap. Therefore, make this tap before cutting thread on Job No. 25.

Center the tool steel to be used for this tap. Turn to the proper dimension. Cut the thread. Mill the slots as shown in the drawing. Use a saw file and back off each thread on the tap. Back off each side of the thread and also outside diameter for clearance. Harden and temper the tap.

MACHINING THE JIG FOR BORING HEAD AND TAIL STOCK

Drawing No. 401 shows the details for the jig to which the head stock and tail stock are clamped while being bored on a 15" South Bend Lathe. The boring operation on this jig is shown on page No. 52.

Machine the cast iron plate in the shaper or planer in the same manner that the top of the lathe bed was planed. Drill, tap and counter bore the hole as shown on the drawing. The boring bar shown can be used for both the head stock and tail stock jobs. For the tail stock jobs it will be necessary to put a cutter in the center of the bar, in order to bore all the way

through the tail stock casting. For details of instructions on how to make a boring bar, see page No. 47, in booklet "How to Run a Lathe."

Machine the swivel bolts and nuts for the jig to the dimensions shown on the drawing.

MACHINING THE COUNTERSHAFT PARTS

There are no special instructions necessary on the different operations for machining the countershaft parts. The machine work embraces operations that have all been covered in the building of an 8" lathe. In fact, Jobs Nos. 31, 32 and 33 require but very little machine work. The drawings, however, are of interest to the pattern maker.

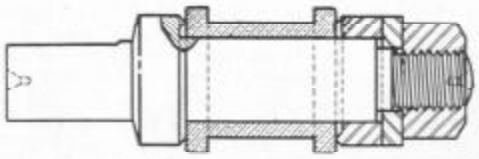
ASSEMBLING THE LATHE

The lathe should be assembled by units. The different units are the head stock, tail stock, tool rest, bed, and countershaft.

In assembling the tail stock put the tail stock nut, hand wheel and $\frac{3}{16}$" nut on the tail stock screw. Be sure the length of the shoulders on the screw correspond with the length of the nut and hand wheel. Drill the hand wheel and screw for the $\frac{1}{8}$" and $\frac{1}{4}$" pin at the same time. Assemble the binding lever stud before putting it on the tail stock. Screw the lever on the stud as tightly as possible, then screw on the tail stock. We have already given instructions on the way to tap the tail stock spindle.

For assembling the head stock scrape the bore in the head stock so the brass boxes fit snugly, but do not bind. Put in the $\frac{3}{16} \times \frac{5}{8}$" pins, following directions given in drawing No. 303. Place the spindle in the lower half of the bronze bearings and using blue lead scrape the bronze boxes so they show a good bearing. Fasten the caps; place the spindle in the bearings and turn by hand, and scrape the top half of the bronze boxes, using blue lead in the same manner. Put the spindle cone thrust collar and take up nut in place and the head stock unit is complete. The spindle should have the thrust on the thrust collar.

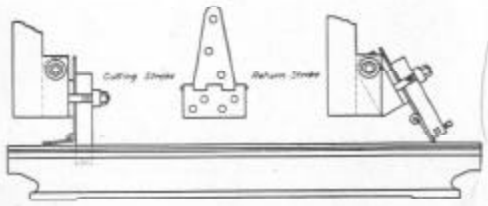
Fasten the legs to the bed, scraping the bed to fit the leg if necessary. Arrange to "set" the Head Stock. The Head Stock must rest solid on the flat way of the bed, and the axis of spindle must be parallel to both V way and the top of the bed. Test the Head Stock for these requirements by using a steel bar turned taper at one end to fit the spindle, and the other end turned straight for a distance of six inches. Place this test bar in the Head Stock and use a dial indicator fastened to the Tool Rest Plate. Adjust the indicator so it reads zero at outer end of the steel bar, then move the tool rest plate 6 inches nearer the Head Stock and see if the indicator reads the same. Revolve the spindle slowly while the indicator is at each end and see that the dial remains at zero. See "Testing Alignment of Lathe Spindle" illustrated in book "How to Run a Lathe." The tests outlined above will show where to scrape the Head Stock to correct the alignment with the bed.



ARBOR FOR HOLDING BOTH HALVES OF BRONZE BOXES

The above illustration shows an Arbor that is adapted for holding securely both halves of the bronze boxes, while being machined. The Arbor consists of three pieces. The Arpor proper has a ring machined on it with a sharp "V". The collar also has a like ring machined with a sharp "V". The two halves of the bronze boxes are placed on this Arbor and the nut fastened. This causes the sharp "V" to bite into the bronze boxes on each end and holds them firmly while the machining operation is completed.

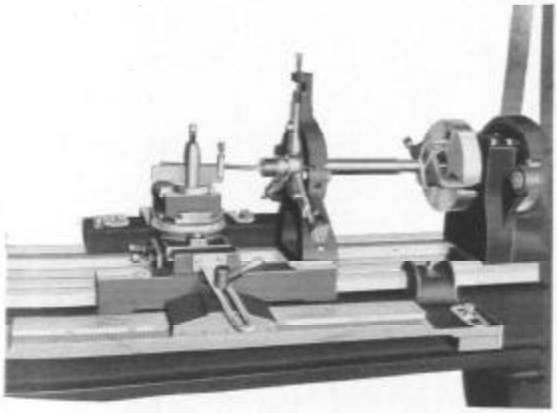
This little book is written in the interest of Industrial Education.



HINGE RAISING DEVICE FOR CUTTING TOOL

The above drawing shows an under cutting tool in the Planer for an under cutting operation on the lathe bed. An ordinary hinge is fastened just behind the tool in the clapper box so that when the bed has passed beyond the tool, after the cutting stroke, the planer reverses, the hinge part drops below the tool and causes the tool to ride on top of the bed on the return stroke. This is an automatic method of raising the tool holder at the end of each stroke and also does away with any chances of accident.

The undercutting tool shown in the above drawing is simply a 1½" x 2" x 8" piece of soft steel with a hole drilled and filed to accommodate a piece of $\frac{5}{16}$" square steel. This steel is ground in the proper manner for doing the cutting and is held by a set screw. The cutter can be extended from either side so that this holder can be used to machine jobs on the right or left side.



BORING MORSE TAPER IN SPINDLE

The above illustration shows a Morse Taper being bored in a finished spindle in the lathe. Boring the taper hole is the last operation on a spindle.

Fasten the dog to the rear end of the spindle and tie it with a belt lacing to the face plate of lathe. While the face plate is on the spindle nose only two or three threads, then when tied securely screw the face plate home and that tends to tighten the job firmly. Put the steady rest on the lathe and bring the tail stock up so that the center enters the other end of spindle. Make a sheet brass ferrule to fit the spindle bearing where the steady rest holds. This is to prevent the jaws of the steady rest from cutting the bearing while spindle is revolving. With the tail center lining up spindle, adjust the jaws of the steady rest so that they fit snugly on the brass ferrule, clamp the jaws. Remove the tail stock and see if the spindle revolves freely. The steady rest jaws should be tight enough so as to hold firmly but still allow the spindle to revolve. Keep plenty of oil between the brass ferrule and the spindle bearing. The spindle is now ready to bore.

Set the taper attachment at about the right angle to bore the size Morse Taper required. Take a few light chips with the boring tool, then use a Morse Standard Taper Reamer to test the angle of the taper. If the Taper attachment is not set at the correct angle, this will show which way to adjust it. When the proper taper is obtained, bore the hole until the reamer will enter by hand within ⅛ of an inch of the desired diameter which has already been obtained by measuring with the micrometer.

Now feed the reamer by hand with a wrench, and use plenty of oil, and taking care that the chips do not clog in the reamer flutes. It is well to take the reamer out several times and clean the chips off. Do not revolve the spindle while reaming this hole by hand.

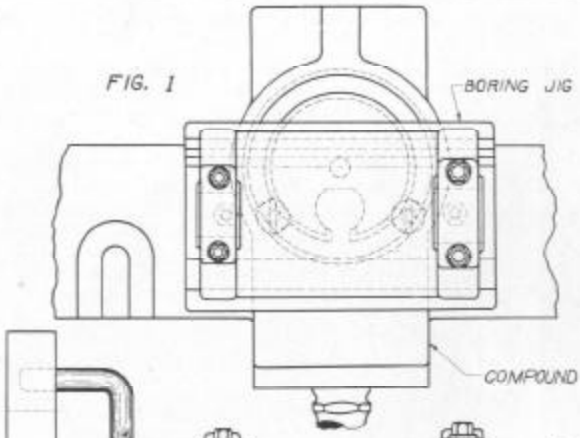


FIG. 1
BORING JIG
COMPOUND REST BASE

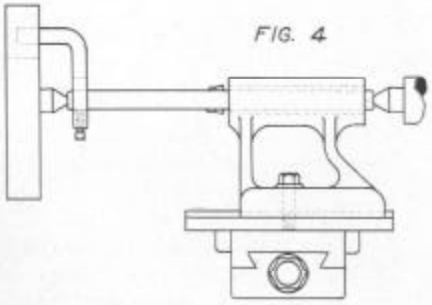


FIG. 4

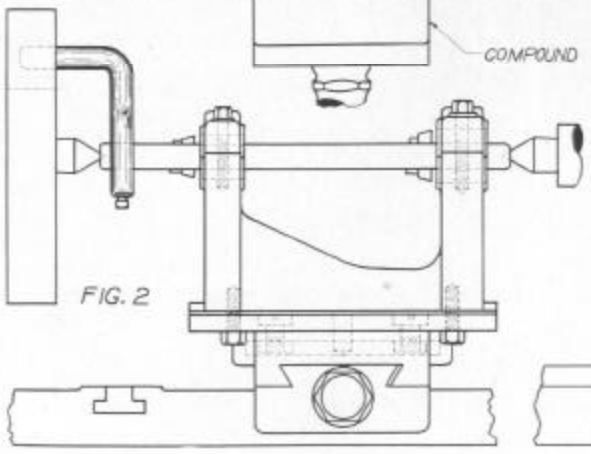


FIG. 2

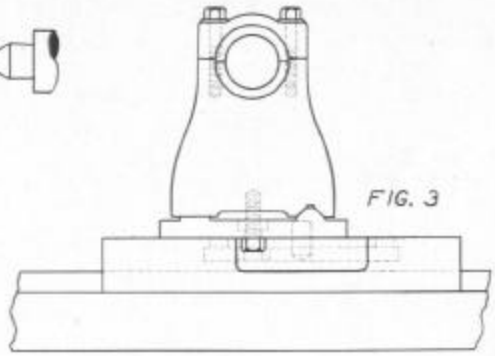


FIG. 3

Jig for Boring the Headstock and Tailstock

The drawings on page 52 illustrate the application of the jig for boring headstock and tailstock.

Fig. 1, shows plan view of the jig which is fastened to the compound rest base and the headstock is attached to jig.

Fig. 2, shows front elevation of the jig in position with the headstock attached to jig and and the boring bar on lathe centers.

Fig. 3, shows end view of the jig with headstock attached. This view is from the tailstock end of lathe.

Fig. 4, shows the tailstock attached to jig and in position for boring with the boring bar through the tailstock spindle hole and resting on centers.

The jig on the four operations on page 52 is shown attached to a 15" South Bend Lathe. In attaching this jig to the compound rest base it is necessary that the "V" on the jig be absolutely parallel with the saddle "V" of the lathe on which you do the job. Clamp the jig to the compound rest base and test to see that it is parallel. A good way to make a test would be to put a shaft on centers and attach an indicator to this shaft and let the indicator rest on one side of the "V" of the jig and run the carriage back and forth along the bed and test the various points.

When jig is true fasten securely and clamp the headstock to the jig by means of two cap screws. The headstock must rest solid on the jig. Place your boring bar in position and take roughing cut through both bearings and face both ends of each bearing. Then measure for center distance from bottom to center of bearing and be sure that you are proceeding properly. Then before attempting to finish bore, fasten the gib screws on the compound rest bottom to which the the jig is attached. This is important because we do not want to change the position of this jig in any way until both the headstock and the tailstock are bored and they both must be bored while the jig is in one position because if the tailstock is bored with the jig in a different position than it was when the headstock was bored, they will not line up with each other when placed on the bed of the lathe. This operation is very important.

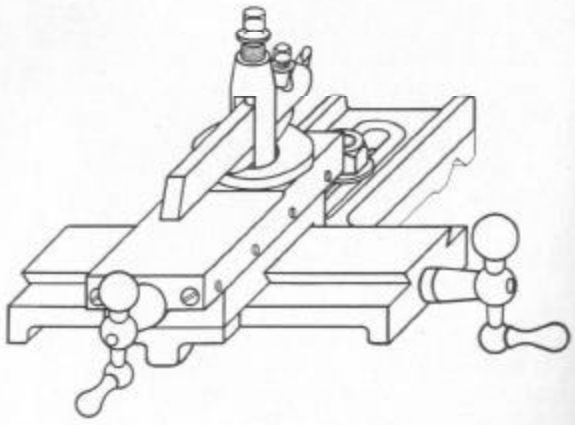
A Slide Rest for the 8-inch Bench Lathe

The herewith drawing illustrates a Slide Rest for the 8" Bench Lathe. The base of the Slide Rest fastens to the Tool Rest Base Plate and is slotted so that it can be adjusted to take care of work within the range of the lathe. The lower Slide has a travel of about 7 inches, and the top Slide that carries the Tool Post, has a cross travel of about 2 inches.

The detailed drawings of the Slide Rest are not included in this book but if any school wishes to make this Slide Rest in addition to the lathe, we can furnish Blue Print of detailed drawings.

A Slide Rest is a practical attachment for a Bench Lathe in the work shop because it equips the lathe for doing a great deal of work where small accurate machining is required.

Young man, learn the machinist's trade, learn mechanical drawing. If you master both subjects you will be a trained man and your future will be limited only by your ability.



Solid Rest.

Castings and Supplies for 8-inch Bench Lathe

For accommodation of schools who wish to build this 8" Bench Lathe, and who are not in a position to make patterns or to secure the necessary castings, steel, etc., we shall be pleased to supply all the parts and material in the rough.

For prices of Rough Castings and all material, finished parts, etc., for the 8" Bench Lathe, write for special circular which groups all the parts and shows the price of same. This circular also contains the prices of Blue Prints.

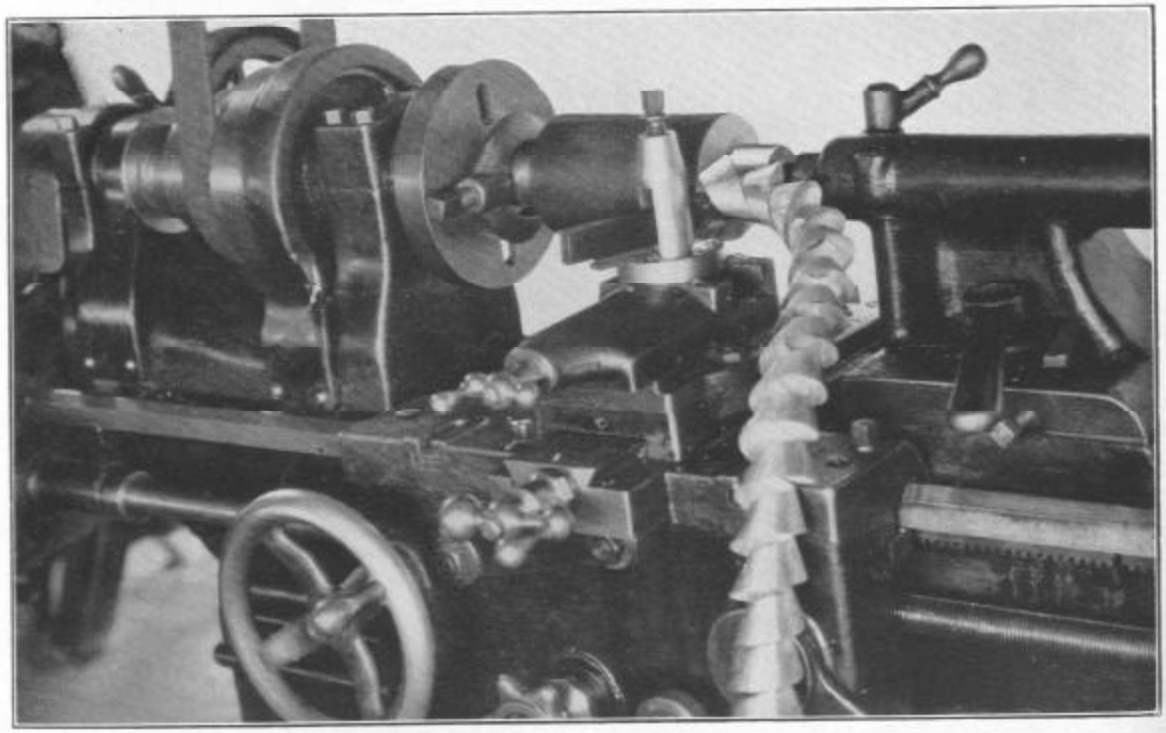
The drawings on pages 27, 28, and 29, of this book are reduced so that it is rather difficult to work from them to advantage so we suggest that you send for Blue Prints of these drawings, as they are larger and the figures can be seen more plainly. These Blue Prints will be mailed, price 10c each, postpaid.

In planning the instructions for building this lathe we arranged the work so that it could be done in the small shop, where the equipment was limited. If there is a milling machine in the shop a number of these jobs can be done to advantage on it. If a school wishes to build this lathe but have no planer equipment, we will furnish the bed fully planed at a slight addition of cost.

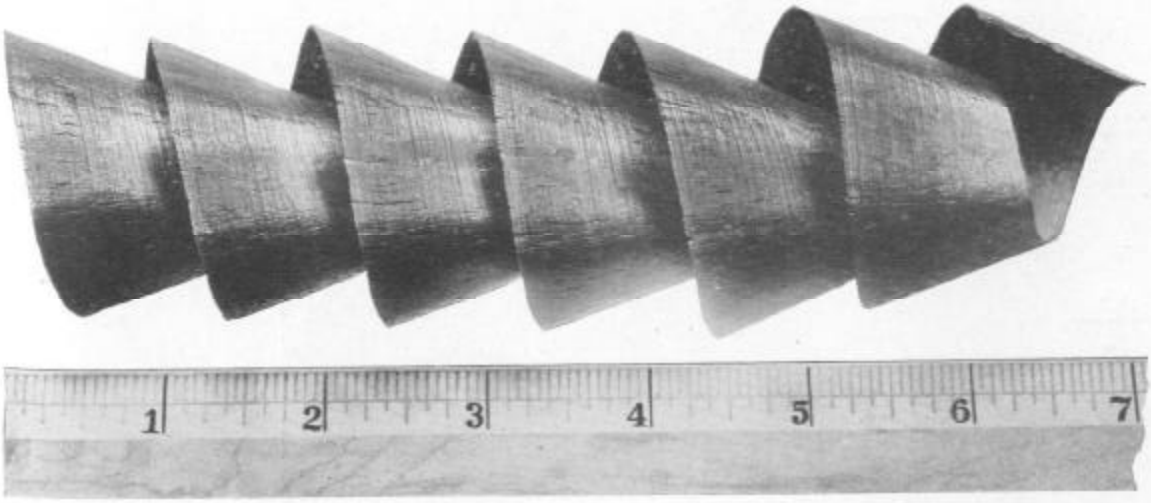
We claim no patent on this Lathe. Anyone who wishes to make the machine in part or whole, has our permission. We shall be glad to supply them with text books.

The work may be divided into four departments as follows:

1. DRAWING ROOM. The students may make a complete set of drawings, using this text book as a guide.
2. PATTERN ROOM. A complete set of working patterns can be made from the above drawings.
3. FOUNDRY AND CORE ROOM. A complete set of cores and castings can be made up if the school has the necessary equipment.
4. MACHINE SHOP. This text book illustrates and describes in detail, the machining of the lathe.

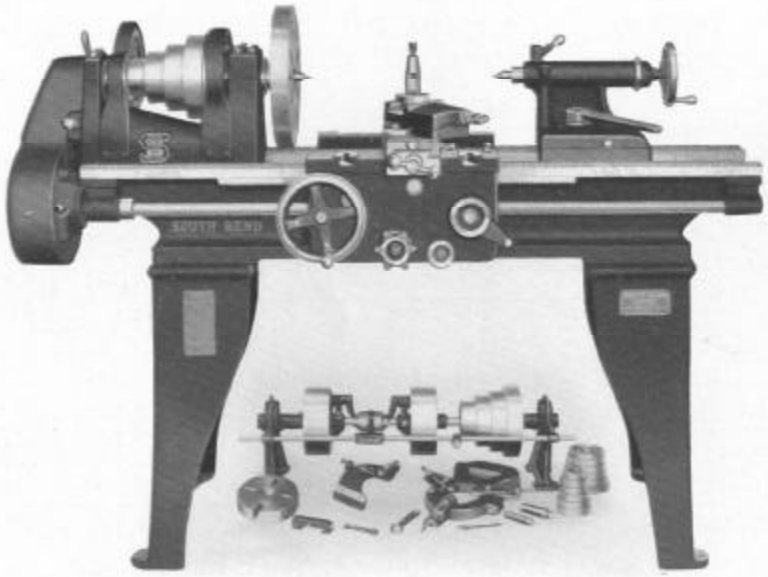


Reducing a Steel Shaft from 4" to 2⅛" in one chip on a 16" No. 40 South Bend Lathe.
See size of chip on opposite page.



Photograph of a Steel Chip.

The above cut represents a photograph of the steel chip which is being produced on the lathe shown on the opposite page. This chip is under the actual size, as may be seen by comparing with a measuring rule, on account of the page being too small to show it full size. But it demonstrates the power of the South Bend Lathe.



Regular Equipment as Illustrated Under Lathe, is Included in Price.

No. 37-C—15-INCH x 6-FOOT SOUTH BEND LATHE

The Practical Size for the School Shop

Price: f. o. b. South Bend, Indiana **$505.00**

No. 37-C—15-INCH x 6-FOOT SOUTH BEND LATHE

Fitted with Automatic Longitudinal Feed, Automatic Cross Feed and Compound Rest

The No. 37-C Lathe we reccomend as the most practical size for the school shop

Bed is rigid, cross ribbed by heavy box braces cast in at short intervals its entire length; has three V's and one flat way for guiding the head stock, tail stock, and carriage. The rack attached is of steel, cut from the solid bar.

Head Stock is equipped with **improved reverse.** Spindle cone has four steps for 1¾-inch belt. Spindle is of special carbon steel accurately ground; has 1⅛-inch hole its entire length. Centers are No. 3 Morse taper. Bearings are of heavy **phosphor bronze** with ample oiling facilities and are adjustable for wear.

Tail Stock is off-set to allow compound rest to swivel parallel to bed and is provided with set-over for turning taper. Tail stock center is self-ejecting.

Carriage is strong, with wide deep bridge; has T slots for clamping work for **milling** and **boring.** Both automatic cross feed and automatic longitudinal feed are operated from the front of apron and but one feed at a time can be engaged. Both feeds are driven by a splined screw and worm so that the thread of the lead screw **is used for thread cutting only.**

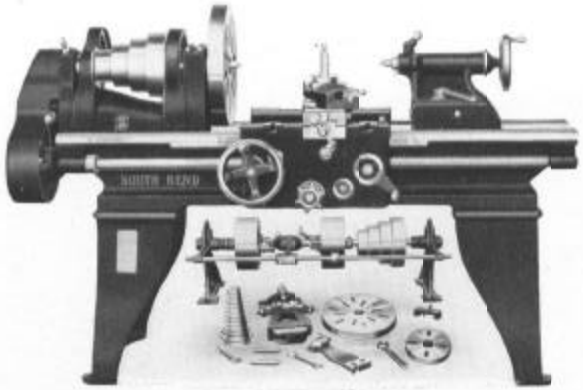
Thread Cutting. The lathe is indexed to cut standard threads from 4 to 40, right or left, including 11½ pipe thread.

Graduation. The compound rest is **graduated in degrees.** The cross feed screw has micrometer graduated collar reading in **one-thousandths** of an inch.

Equipment as shown in cut is included in the price and consists of large and small face plates, compound rest, two steel centers, center rest, follower rest, change gears, adjustable stop for screw cutting, a set of feed gears, gear guards, necessary wrenches and double friction countershaft.

Weight of Lathe, crated for shipment, 1425 lbs.

Price: 1 No. 37-C, 15" x 6' South Bend Lathe, f. o. b. South Bend, Indiana, $505.00.



No. 40—16-INCH SOUTH BEND LATHE

For Manufacturing and the General Machine Shop

We illustrate above the 16-inch South Bend Lathe. This lathe is a heavy, powerful tool, designed to give service for general all-around work. We recommend it for manufacturing and for general machine shop.

Carriage has T slots for clamping work for milling and boring. Both automatic cross feed and automatic longitudinal feed are operated from front of apron and but one feed at a time can be engaged. Both feeds are driven by a splined screw and worm so that the thread of the lead screw is used for screw cutting only.

Thread Cutting. Lathe is indexed to cut standard threads from 4 to 40, right or left, including 11½ pipe thread.

Graduation. The compound rest is graduated in degrees. The cross feed screw has graduated mircrometer collar reading in one-thousandths of an inch.

Equipment, as shown in cut, is included in the price and consists of large and small face plates, compound rest, two steel centers, center rest, follower rest, change gears, gear guards, necessary wrenches and double friction countershaft.

CATALOG. Free interesting catalog, describing the entire line of South Bend Lathes, showing prices of all lathes and attachments. **Catalog mailed free to any address.**

SOUTH BEND LATHES ARE BUILT IN THE FOLLOWING SIZES

No. 34—13-inch South Bend Lathe

No. of Lathe	Swing Over Bed	Length of Bed	Distance Between Centers	Hole Through Spindle	Approx. Weight on Skids Crated	Price F. O. B. South Bend
34-A	13 ¼ in.	4 ft.	18 in.	¾ in.	950	$385.00
34-B	13 ¼ in.	5 ft.	30 in.	¾ in.	1000	400.00
34-C	13 ¼ in.	6 ft.	42 in.	¾ in.	1050	415.00
34-D	13 ¼ in.	7 ft.	54 in.	¾ in.	1100	430.00
34-E	13 ¼ in.	8 ft.	66 in.	¾ in.	1150	450.00

No. 37—15-inch South Bend Lathe

37-B	15 ¼ in.	5 ft.	27 in.	1⅛ in.	1350	$483.00
37-C	15 ¼ in.	6 ft.	39 in.	1⅛ in.	1425	505.00
37-D	15 ¼ in.	7 ft.	51 in.	1⅛ in.	1500	524.00
37-E	15 ¼ in.	8 ft.	63 in.	1⅛ in.	1650	545.00
37-G	15 ¼ in.	10 ft.	87 in.	1⅛ in.	1900	587.00

No. 40—16-inch South Bend Lathe

40-C	16 ¼ in.	6 ft.	36 in.	1⅛ in.	1700	$550.00
40-D	16 ¼ in.	7 ft.	48 in.	1⅛ in.	1750	570.00
40-E	16 ¼ in.	8 ft.	60 in.	1⅛ in.	1825	590.00
40-G	16 ¼ in.	10 ft.	84 in.	1⅛ in.	2025	630.00
40-H	16 ¼ in.	12 ft.	108 in.	1⅛ in.	2250	690.00

No. 45—18-inch South Bend Lathe

45-C	18 ¼ in.	6 ft.	31 in.	1⅜ in.	2250	$735.00
45-D	18 ¼ in.	7 ft.	43 in.	1⅜ in.	2325	750.00
45-E	18 ¼ in.	8 ft.	55 in.	1⅜ in.	2450	785.00
45-G	18 ¼ in.	10 ft.	79 in.	1⅜ in.	2550	835.00
45-H	18 ¼ in.	12 ft.	103 in.	1⅜ in.	2750	910.00

No. 47—21-inch South Bend Lathe

47-D	21 ¼ in.	7 ft.	39 in.	1½ in.	2875	$900.00
47-E	21 ¼ in.	8 ft.	51 in.	1½ in.	3085	930.00
47-G	21 ¼ in.	10 ft.	75 in.	1½ in.	3325	990.00
47-H	21 ¼ in.	12 ft.	99 in.	1½ in.	3750	1085.00
47-K	21 ¼ in.	14 ft.	123 in.	1½ in.	4025	1160.00

No. 54—24-inch South Bend Lathe

54-E	24 ¼ in.	8 ft.	46 in.	1¾ in.	3975	$1250.00
54-G	24 ¼ in.	10 ft.	70 in.	1¾ in.	4475	1330.00
54-H	24 ¼ in.	12 ft.	94 in.	1¾ in.	4725	1425.00
54-K	24 ¼ in.	14 ft.	118 in.	1¾ in.	5150	1505.00
54-M	24 ¼ in.	16 ft.	142 in.	1¾ in.	5385	1585.00

Machine Shop Equipment for Vocational and Industrial Schools, is a 64 page book issued in the interest of Vocational and Industrial training in the school.

This book contains useful information as to the proper equipment to install in Vocational and Industrial Schools. There are five Standard Machine Shop Equipments listed in this book, indicating the style and size of the equipment most practical. The size of the equipment is governed by the number of boys that are to be taken care of.

"The above half-tone shows a reduced page from the "Machine Shop Equipment" booklet.

NEW "MACHINE SHOP EQUIPMENT FOR VOCATIONAL AND INDUSTRIAL SCHOOLS" JUST OFF THE PRESS.

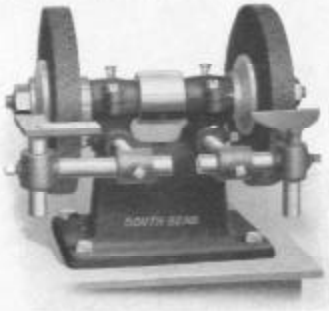
This book contains 41 photographs showing the interior views of some of the practical school machine shops in this country. Postal will bring a free copy. Give your street and number to insure delivery.

FIRST YEAR LATHE WORK

How to Make an 8-inch Grinder

First Year Lathe Work, is a text book for the school Machine Shop. It contains instructions for building an 8" tool room emery grinder. This is an excellent project for vocational and industrial schools, because at least one of these grinders can be used to good advantage in every school shop.

First Year Lathe Work contains detail drawings of the grinder. Accompanying each drawing are complete instructions as to how to proceed with the machine work.



8-inch Bench Tool Room Emery Grinder.

The above illustration shows an 8" tool room emery grinder built by students who used First Year Lathe Work as their text. This machine complete is fitted with a column, pan and water pot, also with a countershaft. All these parts are described and illustrated in First Year Lathe Work.

FIRST YEAR LATHE WORK

Price, 10 Cents

First Year Lathe Work, postpaid on receipt of 10 cents, coin or stamps accepted. Copy of this book sent free to any educator.

Copy of this book free to any educator.

A copy of this valuable little 80-page book will be sent, postpaid, to any address on receipt of 10c. Coin or stamps of any country accepted.

"HOW TO RUN A LATHE"

A Partial List of Contents

Layout for a small machine shop.
Speed and diameter of line shaft.
Horse power required to drive a lathe.
Rules for figuring size of pulleys.
How to find the pitch of a screw.
Milling and keyseating in the lathe.
How to case-harden a piece of mild steel.
How to harden and temper a lathe tool.
Rule for gearing any lathe for thread cutting.
How to fit a lathe chuck to a lathe.
Cutting speeds for different metals.
How to make a boring bar for the lathe.
Cutting a key-way in the lathe.
Application and use of lathe tools.
Boring in the lathe.
Turning taper in the lathe.
How to reseat a valve in the lathe.
Grinding in the lathe.
Making and fitting of piston rings.
Making of ball race and cone.
Hardening, tempering and annealing steel.
Case hardening, etc., etc.

HOW TO RUN A LATHE

This booklet is used as a text-book for apprentices in the large industrial plants and for students taking machine-shop work in Vocational and Industrial Schools.

A FEW USERS OF SOUTH BEND LATHES

Ford Motor Co.	Detroit, Mich.	Remington Arms U. M. C. Co.	Hoboken, N. J.
Marlin Arms Corp.	New Haven, Conn.	New York Ship Building Co.	Several Places
Victor Talking Machine Co.	Camden, N. J.	National Lamp Works	Cleveland, Ohio
Union Pacific Railroad	Omaha, Neb.	International Harvester Co.	Detroit, Mich.
Westinghouse Elec. Mfg. Co.	Pittsburgh, Pa.	Peters Cartridge Co.	Kings Mills, Ohio
Colts Patent Fire Arms Mfg. Co.	Hartford, Conn.	American Can Co.	New York, N. Y.
Eastman Kodak Co.	Columbus, Ohio	General Electric Co.	Several Places
Singer Sewing Machine Co.	Several Places	United States Government	Several Places
Packard Motor Car Co.	Several Places	Standard Oil Co.	Several Places
Wagner Electric Co.	St. Louis, Mo.	Cambria Steel Co.	Johnstown, Pa.
Air Reduction Co.	Several Places	American Can Co.	New York, N. Y.
Emergency Fleet Corp.	Several Places	Chicago Flexible Shaft Co.	Chicago, Ill.
Haynes Motor Car Co.	Kokomo, Ind.	Timkin Roller Bearing Co.	Canton, O.
National Biscuit Co.	Chicago, Ill.	United States Government	Several Places
Liggett & Myers Tobacco Co.	Several Places	Burroughs Adding Machine Co.	Detroit, Mich.
Libby, McNeal & Libby	Chicago, Ill.	Briscoe Motor Corp.	Detroit, Mich.
Union Metallic Cartridge Co.	Weehawken, N. J.	Diamond Match Co.	Oswego, N. Y.
Allis-Chalmers Mfg. Co.	Milwaukee, Wis.	E. I. Dupont de Nemours Co.	Several Places
U. S. Military Academy	West Point, N. Y.	Edison Lamp Work	Harrison, N. J.
Pennsylvania Railroad	Pittsburgh, Pa.	U. S. Navy	Several Battleships and Destroyers
Thos. A. Edison	Orange, N. J.	Studebaker Auto Co.	Detroit, Mich.

OVER 25000 SOUTH BEND LATHES ARE IN SERVICE
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