

GET CORRECT TOOL GEOMETRY

with
**VARIABLE
RADIAL
RELIEF**



PC-101* SHARPENING FIXTURE



POINTS

CHAMFERS

SHARPENS

COUNTERBORES

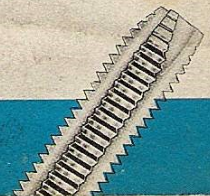
TAPS

COUNTERSINKS

TWIST DRILLS

END MILLS

SPIRAL TAPS



* Pat. Pending

Any shop can eliminate job hold-ups and inspection rejects caused by dull index rate taps and cutters. Now, sharpen all your cutters right in your own plant on your own surface grinder . . . and you needn't go into an expensive, involved machine tool to do it. Get the PC 101.

Versatility Highly versatile. Utilizing standard 5-C collets, it will position to chamfer taps, (both right and left hand) sharpen drills, end mills, counterbores, single point boring tools, countersinks, and many others and with the good sharp cutting edges required on close tolerance work.

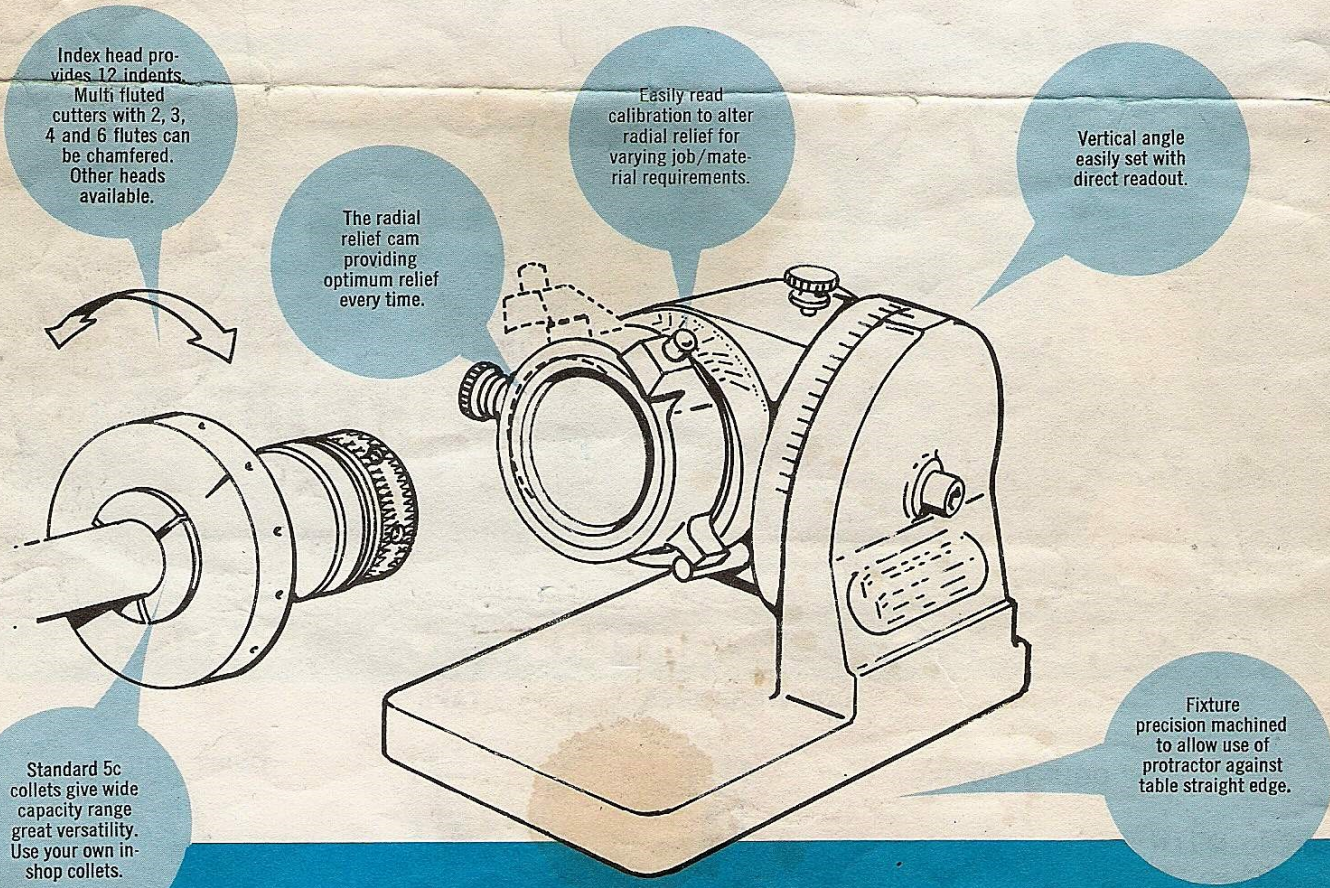
Dividing head Tool geometry remains constant from land to land, because of the fixture's accurate dividing head. Head #1 for 2, 3, 4, 6, 12 fluted tools and head #2 for 5 fluted tools.

Variable radial relief As with all good tools and fixtures, the 101 is basically simple. An eccentric provides the radial relief, and it along with an accurate dividing head insures concentric-

ity and identical tool geometry from land to land. The clearly engraved calibration ring allows the operator to vary the degree of radial relief as job needs vary. The fixture provides .007 of radial relief per each $\frac{1}{16}$ " of grind. For example see Figure 30.

Accurate The 101 is a precision unit and since it is used on a basically precise surface grinder, an exceptionally high degree of accuracy may be expected.

The following pages are the actual operating instructions illustrating each operation. Look them over and you'll see why the PC-101 belongs in your shop. Put it to work for you now!



Manufactured by **THE POLY-CHOKE CO., Inc.**
 BOX 296, HARTFORD, CONNECTICUT 06101
 PHONE: AREA 203 289-2743

TAP CHAMFERING

1. Mount proper wheel. See table.
- 1a. Loosen eccentric spindle lock screw. Fig. 32.
2. Select the proper collet and insert into index bushing. Slot in collet will automatically align with indicator groove on index bushing.
3. Insert tap in collet and align cutting edge of tap with edge of collet slot. Right hand taps align as in Figure 31. Left hand taps align as in Fig. 31a.
- 3a. Set radial relief desired by loosening radial relief lock screw (Fig. 32) and adjusting calibration to proper tool diameter. Be certain right hand taps are set in right hand scale. Left in left hand scale. Tighten lock screw.
Radial relief may be increased or decreased by moving calibration dial laterally toward max. or min. See Fig. 30.
4. Set angle of grind Figure 3.

Note: These settings are suggested for various taps.

Taper	4°- 5° (8-10 threads chamfered)
Plug	9°-12° (3½ to 4½ threads chamfered)
Bottom	25°-35° (1-1½ threads chamfered)

5. Place PC-101 fixture on grinder table butting front or rear of fixture against table straight edge. Center line of tap should be in line with center of grinding spindle. Work will be at right angles to the wheel. Fig. 3.
6. Rotate eccentric spindle to bring tap land to be ground to the topmost position. Fig. 3.
7. Adjust table longitudinally, positioning so spindle of grinder is centered with the tap as shown in Fig. 4. Lock table in this position.
8. Bring grinding wheel down on center of land until contact is made. Fig. 4.
9. Rotate eccentric spindle to *left* until tap land clears wheel. Lower wheel .005 max. Fig. 5.
10. Rotate eccentric spindle slowly to the *right* as shown in Fig. 6. Tap is now being chamfered with optimum radial relief. Continue to rotate until land clears wheel. After wheel has cleared return eccentric spindle to extreme left as shown in Fig. 6.
11. As in Fig. 7 hold eccentric spindle against left stop. With right hand rotate index bushing to the left the proper number of indents to correspond with the number of flutes on the tap. Example: 4 flute tap, index 3 times.
12. The next land is now ready for grinding. Repeat step 10, continuing the procedure until all lands have been ground.
13. Inspect. If more chamfering is necessary, bring wheel down appropriate amount and repeat steps 8 through 12.

To change hook and rake of taps see thinning of drills and end mills.

Fig. 1

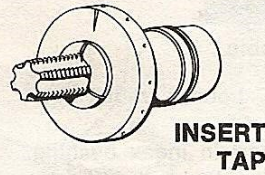


Fig. 2



Fig. 4

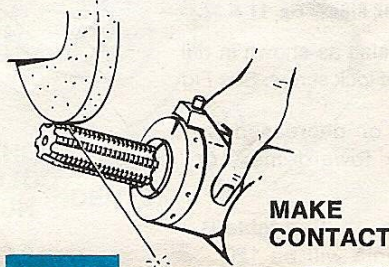


Fig. 5

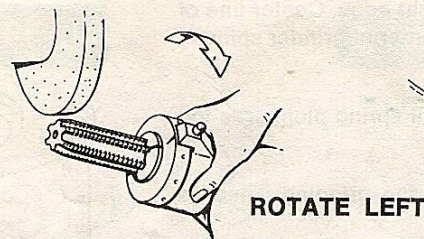


Fig. 6

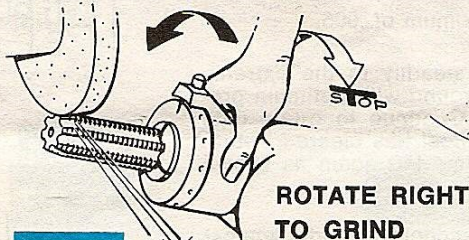
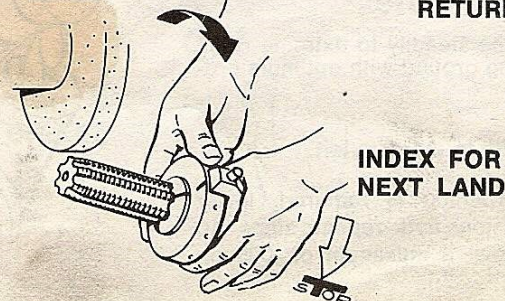


Fig. 7

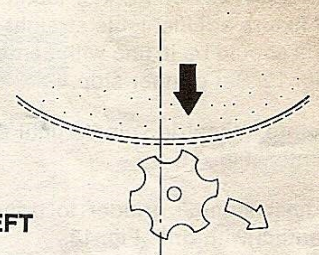
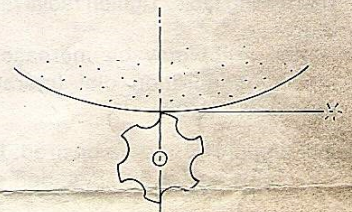
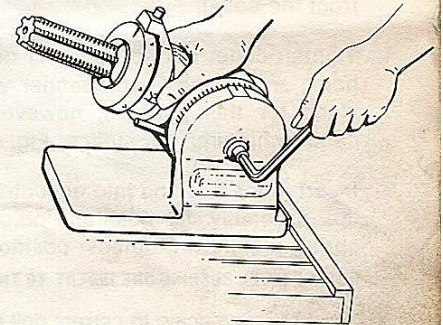


IMPORTANT!

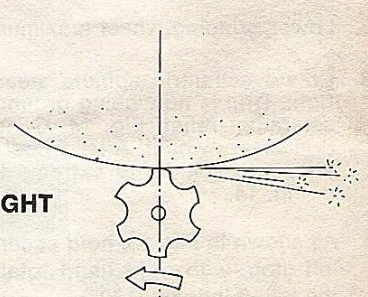
BEFORE SETTING TAP IN COLLET, SEE FIGS. 31 AND 31A FOR CORRECT POSITIONING.

Fig. 3

SET RADIAL RELIEF
SET ANGLE OF GRIND



SET DEPTH OF GRIND



RETURN LEFT TO STOP

DRILLS

1. Mount proper wheel – see table.

1a. Loosen spindle lock screw. Loosen radial lock screw.

2. Select proper collet and insert in index bushing. Slot in collet will automatically align with indicator groove on index bushing. Fig. 8.

3. Position drill in collet, aligning cutting lip of the drill with the indicator groove. Fig. 9. It is recommended that drill tip protrude no more than $\frac{1}{2}$ " from the collet.

4. Tighten collet nut so that drill cannot move when being sharpened. Two spanner wrenches are provided for this purpose, however, in most cases hand tightening will suffice. Fig. 10.

5. Insert index bushing into eccentric spindle rotating the assembly to position indicator groove and spring plunger in topmost position. Fig. 11.

ROTATE INDEX BUSHING ONE INDENT TO THE RIGHT. Fig. 11 & 32.

6. Set calibration scale to correct drill size as shown in drill sharpening table. Tighten radial relief lock screw. See Fig 30A. Radial relief may be increased or decreased by moving calibration dial laterally toward max. or min. See Fig. 30.

7. Set angle of grind as desired. Fig. 11. See table B. **Example:** Set at 60° included angle will be 120° .

8. Place PC 101 on grinder table, butting front or rear of fixture against table straight edge. Center line of drill should be in line with center of grinder spindle. Fig. 12. Set grinder stop.

9. Rotate eccentric spindle until spring plunger is top center. Fig. 11.

10. Adjust surface grinder to bring grinding wheel in contact with drill. Fig. 13.

11. Rotate eccentric spindle to left stop drill point will clear grinding wheel. Fig. 14.

12. Lower grinding wheel maximum of .005.

13. Rotate eccentric spindle steadily to the extreme right. Drill is now being ground with optimum pre-set radial relief. Fig. 14. Continue to rotate until drill clears wheel. After wheel has cleared, return eccentric spindle to extreme left again as shown in Fig. 14.

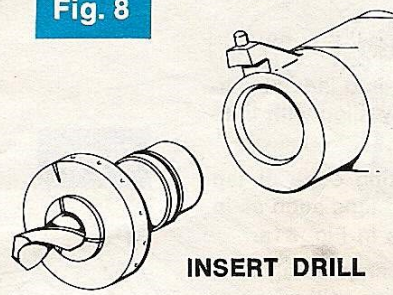
14. As shown in Fig. 15, hold eccentric spindle against left stop, with right hand rotate index bushing to the left, 6 indents (180°).

15. Rotate eccentric spindle steadily to extreme right. Second lip is now being ground with optimum pre-set radial relief.

16. Rotate eccentric spindle to extreme left.

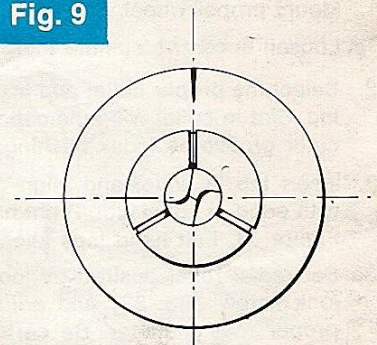
17. Inspect. If more sharpening is required, lower wheel desired dimension and repeat steps 10 through 16. Lower wheel a maximum of .005 on each grind.

Fig. 8



INSERT DRILL

Fig. 9



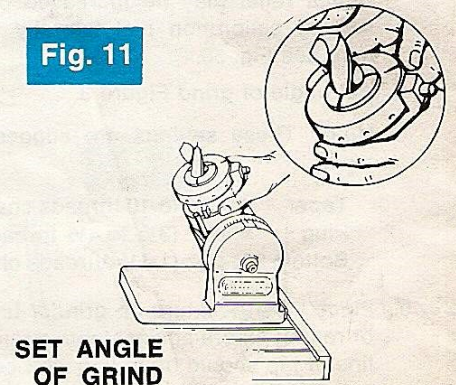
CUTTING LIP ALIGNMENT

Fig. 10



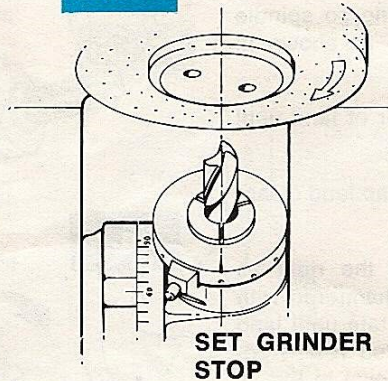
TIGHTEN COLLET NUT

Fig. 11



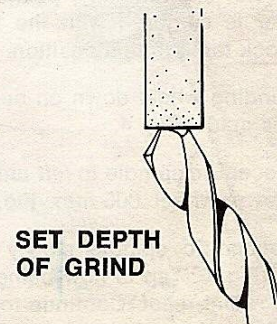
SET ANGLE OF GRIND

Fig. 12



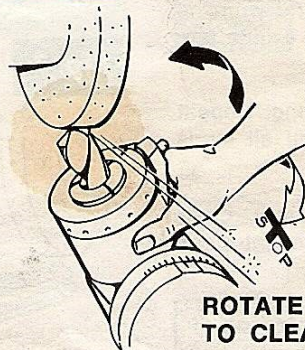
SET GRINDER STOP

Fig. 13



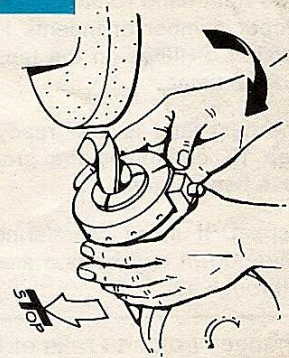
SET DEPTH OF GRIND

Fig. 14



ROTATE LEFT TO CLEAR
ROTATE RIGHT TO GRIND

Fig. 15



INDEX 180°
(6 INDENTS)

DRILLS (cont.)

WEB THINNING

Dress face and side of grinding wheel. Proceed with the following steps with the grinding wheel not turning:

1. Position drill in collet as outlined in steps 1 thru 4 under drill sharpening. Loosen both lock screws.
- 1a. Set calibrated dial to center of scale. Place spring plunger in topmost position. Tighten both lock screws.
2. Insert index bushing into eccentric spindle aligning indicator groove with spring plunger. Place PC-101 on grinder table. Set angle of grind at 45° (other angles may be used). Adjust grinder height and position fixture so that grinder wheel is parallel with the cutting lip of the drill and directly under grinder spindle. Fig. 16. Final adjustment can be made by loosening variable radial relief lock screw. Set lip of tool as necessary. Tighten lock screw.
3. Start grinder wheel.
4. Adjust grinder height to make contact with the highest point of drill web. Fig. 16. Slowly adjust grinder table inward to bring wheel towards cutting lip. Do not contact cutting lip.
5. Move grinder table longitudinally to clear drill from wheel. Fig. 17.
6. Adjust grinder height for .003 grind. Feed table longitudinally through grinding cycle. Return so drill is clear of grinding wheel.
7. Index 6 indents (180°). Grind as in step 6.

Fig. 16

CENTER UNDER SPINDLE LIP PARALLEL TO WHEEL

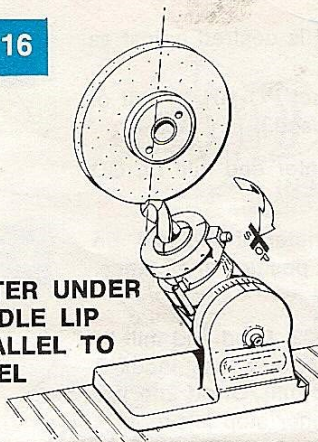


Fig. 17

BRING WORK AWAY AND INDEX

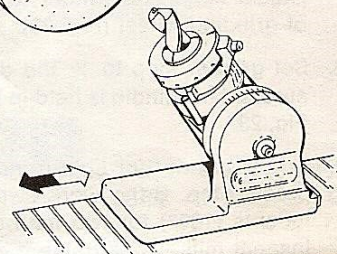


Fig. 18

INDEX 180° (6 INDENTS)

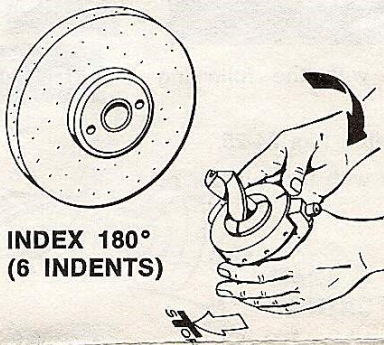


Fig. 19



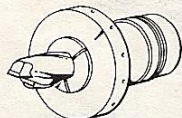
CHAMFERING SPIRAL POINTED TAPS

Use saucer wheel on grinder. Set up PC-101 as under web thinning. Set desired point angle with protractor. Set vertical angle in accordance with existing angle of tap point. Fig. 19.

If necessary to change hook of drill adjust table inward. Index PC-101 between each grind.

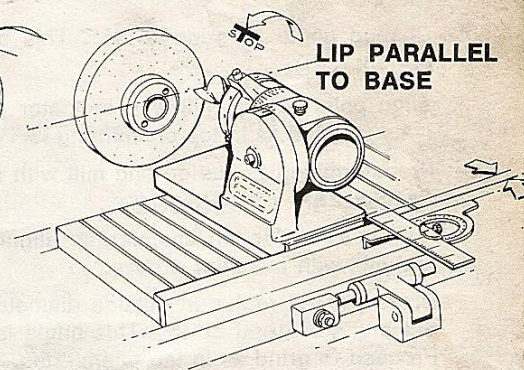
To change hook or rake of taps, dress wheel as per Fig. 19. Use set up above, 1 through 6. Index according to number of flutes. Also see Fig. 32, 32a & 32b.

Fig. 20



INSERT END MILL

Fig. 21



END MILLS

POINTING END MILLS

1. Select proper collet. Place end mill in collet. Tighten collet nut to allow slip fit of cutter. Place index bushing in eccentric spindle. Rotate index bushing to align indicator groove with spring plunger. Fig. 20.
- 1a. Tighten eccentric housing lock screw.
2. Rotate eccentric housing to left stop and tighten both eccentric housing lock nut and radial relief lock screw. With right hand rotate end mill so one flute is parallel to the table. Fig. 21.
3. Remove index bushing and tighten collet nut. Spanner wrenches provided. Fig. 22.
- 3a. Final adjustment can be made by loosening variable radial relief lock screw. Set lip of tool as necessary. Tighten lock screw.
4. Set PC-101 for 6° clearance angle.
5. Dress grinding wheel on side. Place PC-101 on grinder at right angle to grinding wheel. Fig. 21.

Fig. 22

TIGHTEN COLLET

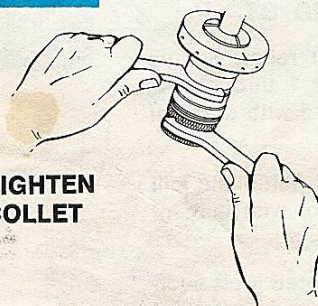
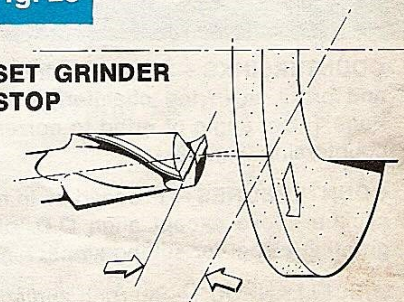


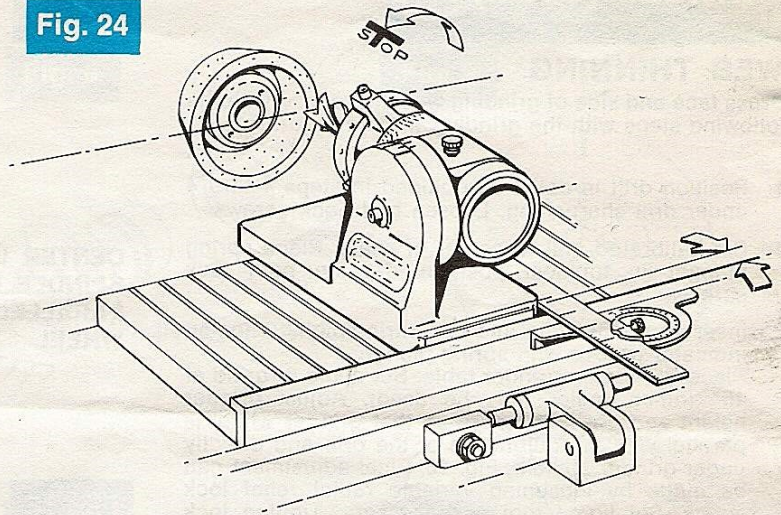
Fig. 23

SET GRINDER STOP



6. If center relief or fishtail effect is desired adjust as follows:
With protractor (see Fig. 21) set PC-101 2° left of center. (Other angles may be used.)
 7. Adjust height of grinder to center end mill on OD of grinding wheel (Fig. 23).
 8. Set grinder stop to 1/2 the diameter of end mill. Be sure index spindle is held in left position at all times. Fig. 23.
 9. Adjust grinder for light grind .002. Feed end mill to preset stop. Bring work away from wheel. Index 6 indents (180°) for two flute end mill. Grind 2nd lip. Inspect mill to determine if grinder stop is properly set. Make necessary adjustments and repeat step 9.
- Recommended surface removal not more than .003.

Fig. 24



MULTI-FLUTED END MILLS

Proceed as in steps 1 thru 9 with the following exceptions:

- A. Use cup wheel 3 1/2-4" in diameter. Fig. 24-25.
- B. Indexing between lips will vary with the number of flutes being ground.

EXAMPLE:

- 4 flute end mill index 3 indents.
- 3 flute end mill index 4 indents.

RADIAL RELIEF ON POINTS

Radial relief on points of end mill. See Fig. 26. Set up as under tap chamfering, with the following exceptions:

1. Change angle of grind to 45°. This angle is important.
2. Align point of end mill with indicator groove. Proceed to grind as in tap chamfering.

Predetermined radius on end mill with radial relief. See Fig. 27.

Set up as under tap chamfering, aligning point of end mill with indicator groove.

Dress wanted radius in outside diameter of wheel. Set angle of grind at 45°. This angle is important. Proceed to grind as in tap chamfering.

Fig. 25

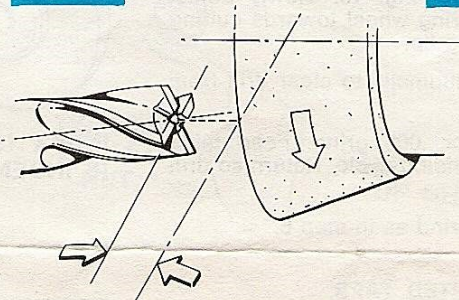


Fig. 26

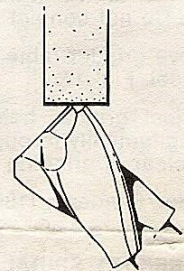


Fig. 27

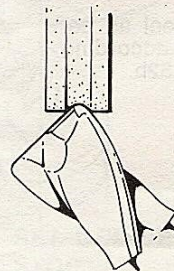
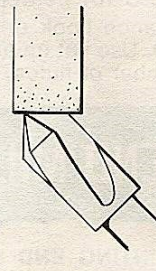


Fig. 28



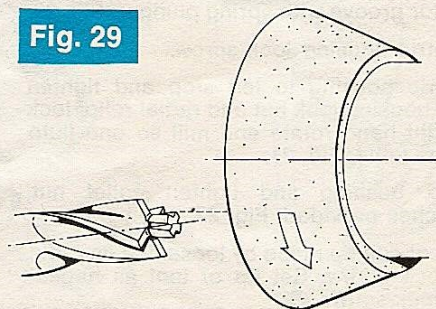
OTHER CUTTERS

COUNTERSINKS — Sharpen with radial relief. Set up and grind as in tap chamfering. Steps 1 through 13, Page 1. Set angle of grind to correspond with angle of countersink. Fig. 28.

COUNTERBORES — Proceed as in multi fluted end mill section above except align O.D. of pilot with O.D. of grinding wheel for setting stops. Fig. 29.

MISCELLANEOUS — Sharpen angled pointed tools such as locating punches, etc., by setting desired angle and rotating index head 360°.

Fig. 29



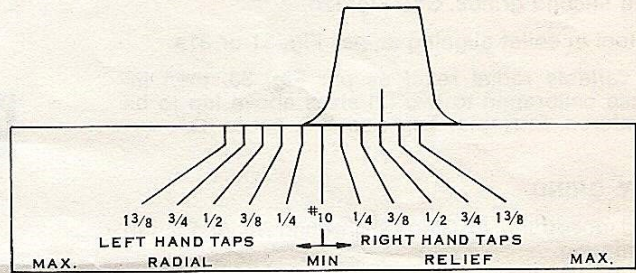
VARIABLE RADIAL RELIEF

Fig. 30

Calibration will produce .007 radial relief for $\frac{1}{16}$ " of grind.

Example: $\frac{1}{2}$ " right hand tap or tool

1. Loosen variable radial relief lock screw.
 2. Set calibration to $\frac{1}{2}$ " in right hand scale.
 3. Tighten radial relief lock screw.
- 50% more radial relief can be had by changing above set up 1 division towards max.
50% less radial relief can be had by changing above set up 1 division toward min.



CALIBRATION SCALE

Fig. 30A

SPECIAL SETTINGS ON CALIBRATION SCALE FOR TWIST DRILLS ONLY

After grinding if angle of web of drill is not to your liking, a very slight change in setting to the left or right (about the width of a calibration mark) will produce an angle to your requirements.

Further note that the drill lip must be aligned in the collet (as in Figure 9 Drill Instr.) exactly the same each time it is set-up. A change in this positioning in the collet will change the calibration and the resulting relief.

DRILL SHARPENING TABLE

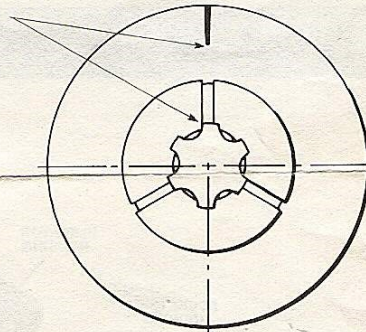
Observe right and left hand settings as indicated on calibration scale. Figure 30 below.

DRILL SIZE	SETTING
#10	Set at $\frac{1}{2}$ "
$\frac{1}{8}$ "	Set between $\frac{1}{2}$ & $\frac{3}{4}$ "
$\frac{1}{4}$ "	Set at $\frac{1}{4}$ "
$\frac{3}{8}$ "	Set at $\frac{3}{8}$ "
$\frac{1}{2}$ "	Set at $\frac{3}{8}$ "
$\frac{5}{8}$ "	Set at $\frac{3}{8}$ "
$\frac{3}{4}$ "	Set just past $\frac{1}{2}$ " (the thickness of one calibration mark)
1"	Same

For drills larger than $\frac{1}{4}$ ", the Hardinge 5-ST collet is recommended. This collet has a greater bearing surface than the standard 5-C and is more precise in positioning thus insuring greater concentricity.

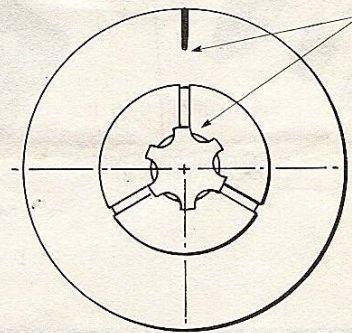
TAP ALIGNMENT

Fig. 31



HEAD ON VIEW
RIGHT HAND TAPS
ALIGN TAP CUTTING
EDGE AS SHOWN

Fig. 31a



HEAD ON VIEW
LEFT HAND TAPS
ALIGN TAP CUTTING
EDGE AS SHOWN

THE POSITIONING OF THE TAP CUTTING EDGE IS HIGHLY IMPORTANT AND CARE MUST BE TAKEN TO ALIGN THE LAND PROPERLY OR IMPROPER RELIEF WILL RESULT.

SPIRAL POINTED TAPS

To chamfer, sharpen or change hook and rake.

Due to width of lands, it is necessary to have both primary and second grinds. See Fig 32b.

1. Set tool in collet aligning as per Fig. 31 or 31a.
2. Set variable radial relief as per Fig. 30, then increase calibration to two (2) sizes above tap to be chamfered. Example: Tap size $\frac{1}{4}$ ", set to $\frac{3}{4}$ ".

PRIMARY GRIND

1. Grind according to Steps 4 through 13 under tap chamfering.

SECONDARY GRIND

1. Rotate index bushing one indent to the right. Fig. 31 and 32.
2. Set grinder for .005-.007 cut. See Steps 8 and 9 tap chamfering.
3. Proceed as shown in Steps 10 through 13 under tap chamfering.

To change hook or rake see web thinning. Fig. 16 thru Fig. 19.

Fig. 32

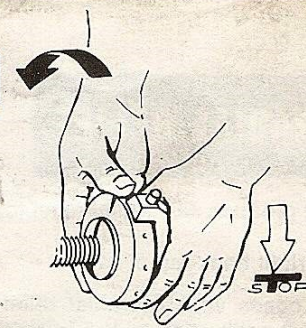


Fig. 32a

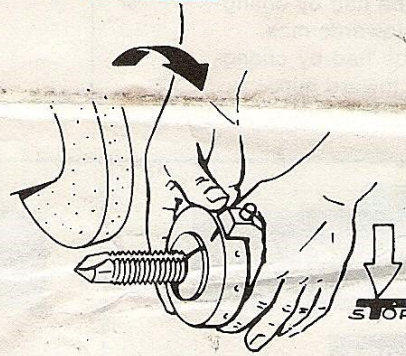


Fig. 32b

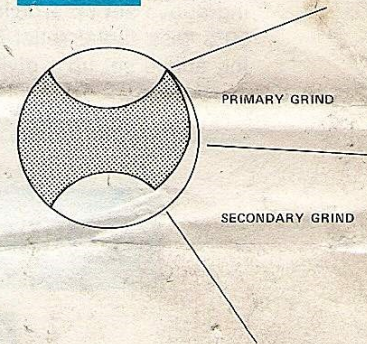


Fig. 33

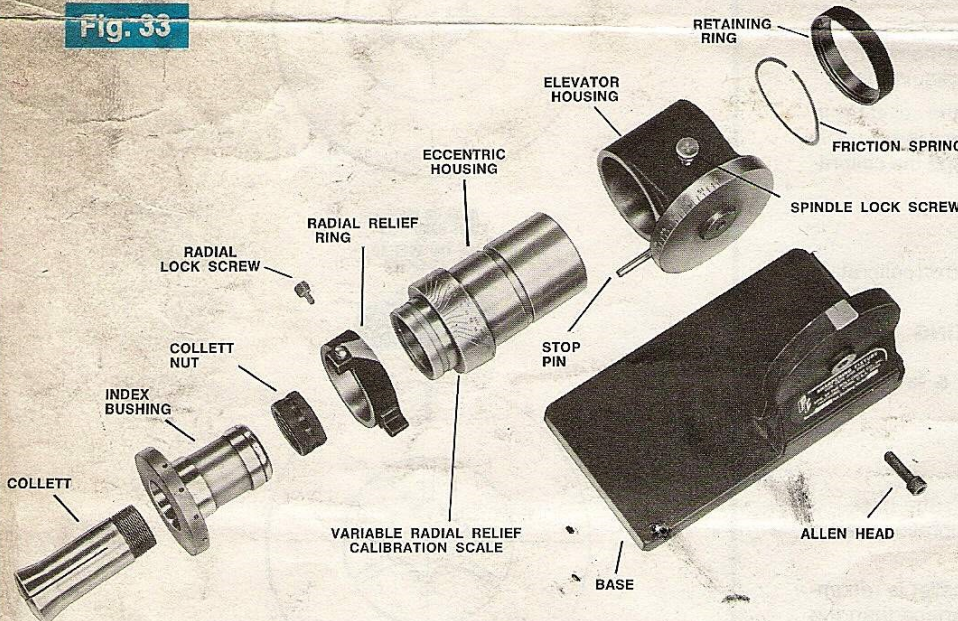


TABLE A
GRINDING WHEEL SELECTION

Tap Type	Grit Size	Diameter Wheel
Plug Taper Bottoming	MA	7" x 1/2"
	60	
Spiral or Fluting	MA	Saucer Type 4" or 6"
	60	

TABLE B
SUGGESTED POINT ANGLES

Material	Point Angle	Lip Clearance
Avg. Work	118°	12°-15°
Alloy Steels	125°	10°-12°
Aluminum/Cast Iron	90°-130°	12°
Copper/Soft Brass	100°-118°	15°
Wood/Rubber/Plastic	60°	12°-15°

Manufactured by THE POLY-CHOKE CO., Inc.

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