DELTA Machine Tools
MILWAUKEE
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PM-1565
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23-B: Tool Grinder Instruction Sheets
U. S. Patent No. 2, 415, 121

# NO. 1296 DRILL GRINDING ATTACHMENT
## Operating and Maintenance Instructions

### INTRODUCTION

The No. 1296 Drill Grinding Attachment is an accessory for sharpening steel drills of any size from 1/8 to 5/8 inch, using the standard tool grinder. It is a time saver in the hands of the expert mechanic, as well as a necessity for the inexperienced operator who could not otherwise expect to sharpen a drill accurately to equal lips.

Simple adjustments are provided to produce the correct lip clearance and angles for quality or production drilling in any material.

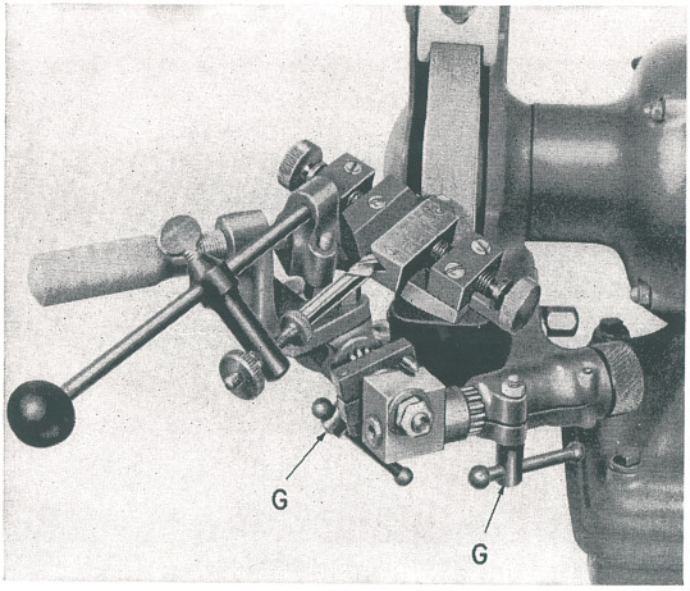


**Fig. 1. Drill Grinding Attachment.**

The attachment is therefore extensively used by tool maintenance departments in production shops, as well as in small establishments where its low price and accuracy make it essential for keeping a lesser number of drills pointed.

Refer to Fig. 13 and Table 1 to identify the parts mentioned in the following description.

### MOUNTING ON TOOL GRINDERS

Controlling dimensions of the Delta 7" Tool Grinder are shown in Fig. 2. These relations between the left wheel and guard are followed so that the drill point meets the grinding wheel at "B" when the attachment is mounted in the tool support groove.

The attachment may be used on other grinders, sometimes by means of a special adapter or holder, if these mounting dimensions can be held. We do not

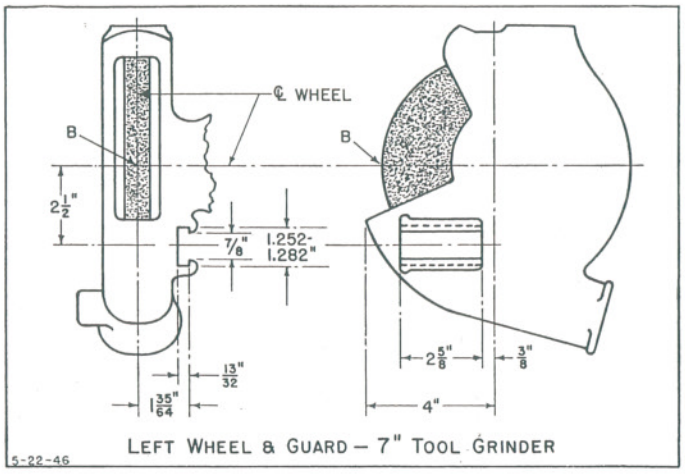


**Fig. 2.**

furnish such adapters, as the customer can have the required holder made, at nominal expense, to fit his machine.

### WHEEL DRESSER HOLDER

Accurate drill grinding cannot be done unless the grinding wheel is true. Dressing the wheel before attempting to sharpen drills is of such importance that

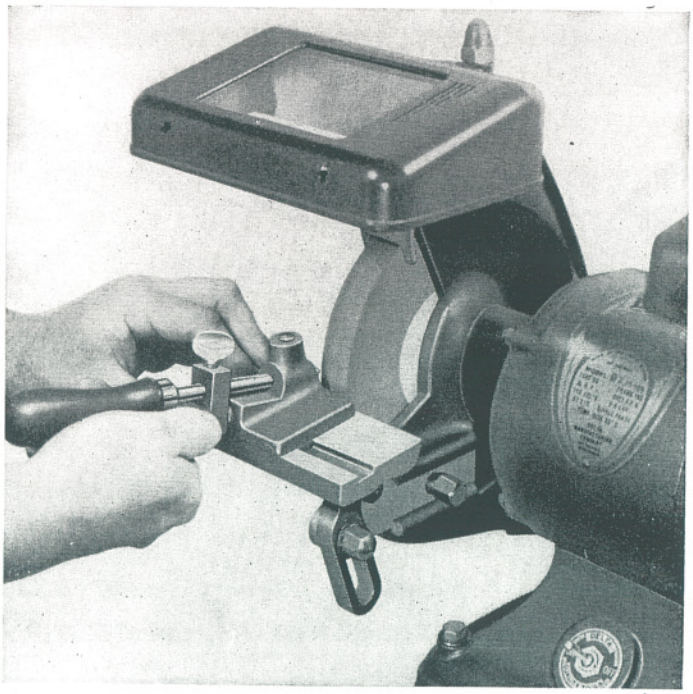

**Fig. 3. Dressing the Wheel.**

we include the Wheel Dresser Holder shown in Fig. 3 with this attachment.

Mount the slide bracket DAG-130 on the tool rest link, in place of the regular tool rest, as shown in the photograph. Adjust it so that the point of the dressing tool will be slightly below the center of the wheel, pointing downward about 5 degrees, and tighten securely.

Insert the diamond wheel dresser, No. 3121 or equivalent, through the push link DAG-128 and the slide DAG-127, bringing the point within 1/16 inch of the wheel. Back out the knurled feed screw DAG-129 until several forward turns are available and tighten the thumb screw SP-1526. The coil spring in the slide casting, acting on the steel ball, maintains pressure on the forward end of the dressing tool to prevent chatter.

When dressing the wheel, pass the tool rapidly across the face, moving the slide by hand. If moved too slowly the dresser will smooth the wheel and reduce its cutting qualities. Approach the wheel cautiously for the first cut, to remove the high spots. Feed only one or two knurl divisions of the screw for each pass across the wheel.

We recommend the No. 3121 Diamond Wheel Dressing Tool shown in Fig. 3. However, the holder will take other dressing tools with shank up to 5/16 inch diameter.

## MOUNTING THE ATTACHMENT

After the wheel has been dressed, remove the tool support holder entirely from the left wheel guard. Insert the arm of the mounting bracket DAG-147-R into the T-slot as shown in Fig. 4. Back out the set screw SP-104 as shown in the photograph, to take up any slack between bracket and slot. When correctly adjusted the screw will drag slightly on the top of the slot to hold the attachment horizontal. Tighten the set screw DAG-132 to clamp the attachment rigidly to the guard.

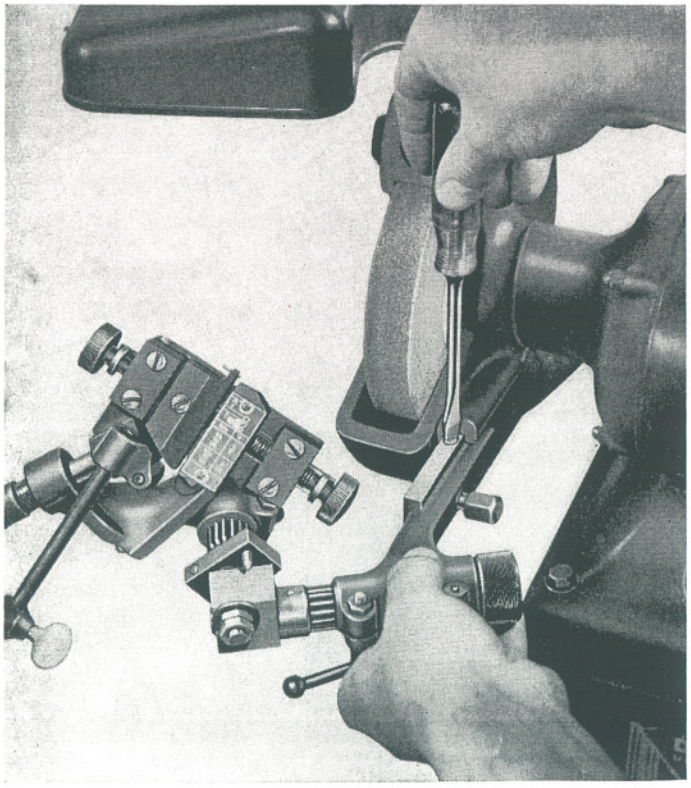

Fig. 4. Adjusting the Mounting Bracket.

It is best to keep the attachment forward to avoid accidental contact on the wheel while setting up. When adjustment to the grinding position is being made, the mounting bracket can be set farther into the guard as required.

## ADJUSTMENT FOR LIP ANGLE

Lip angles of 135, 118 and 82 degrees are most commonly used for drilling in various materials. These angles are marked on the scale DAG-124 which is mounted on the face of the feed screw bracket DAG-101-S. Intermediate angles may be set according to the operator's judgment.

To change the setting, release the hexagon cap screw SP-653, shown at "C" in Fig. 5, swing the feed screw bracket right or left on its support bracket DAG-148-R to the desired scale position "D," and tighten securely.

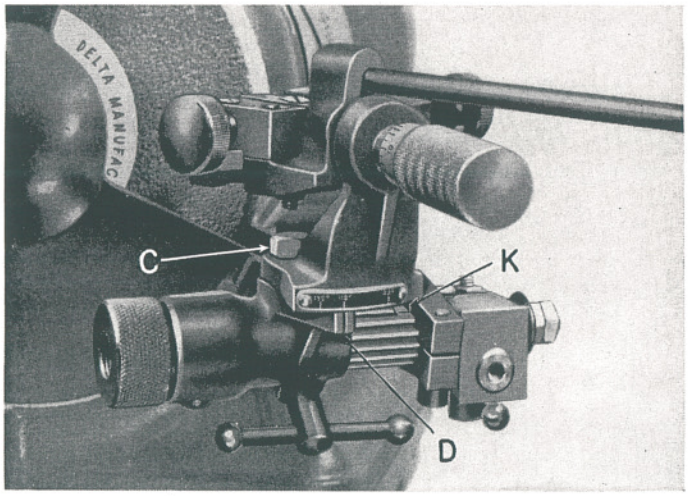


Fig. 5. Lip Angle Scale and Match Marks.

The direction of the drill when presented to the grinding wheel determines the lip angle. Correct relations with respect to the angle scale are built into the attachment. However, the indicated angle will not appear on the drill unless the grinding wheel has been trued and the attachment is properly mounted.

## GRINDING 2-LIP DRILLS FOR 118° POINTS

Ordinary carbon and high speed steel drills have 118 degree points, which means that the angle between each cutting lip and the axis of the drill is 59 degrees. This shape being most commonly used, we give the following directions for clamping and sharpening such a drill. The same procedure, step by step, should be followed for any other drill angle, after setting the angle scale to the required point.

### Setting the Jaws

Adjustment of the drill clamp jaws is provided so that drills of all sizes will be held in the same line for uniform results.

Tilt the jaws away from the grinding wheel by pushing the feed thimble down as shown in Fig. 6. This brings the jaw adjustment scale DAG-126 into view on the inside of the jaw shoe.

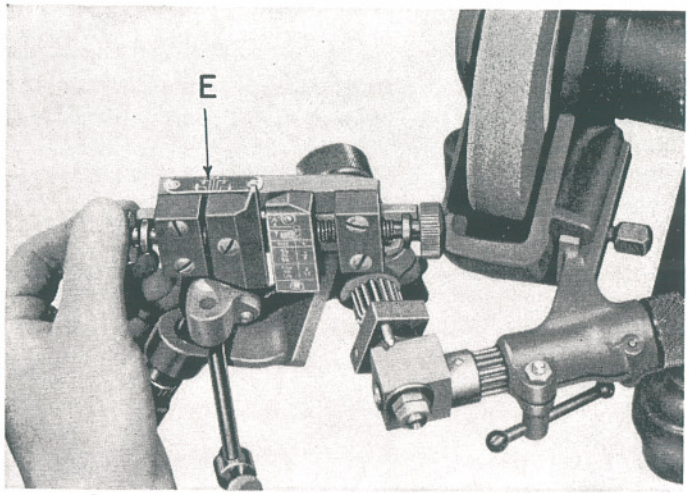


Fig. 6. Setting Jaw for Drill Size.

Set the left edge of the left jaw DAG-106-R even with the graduation equal to the drill diameter, as shown at "E." When making this setting, always turn the knurled screw DAG-109 to the right to avoid slack. For example, when shifting from 1/4 to 1/2 inch drill size, run the jaw to the left beyond the 1/2 inch mark, then bring it back to the right until exactly on the mark.

The jaw scale is divided into 1/8-inch intervals. For intermediate drill sizes, estimate the proper setting between marks.

### Clamping the Drill

The left jaw remains as set for drill size and the drill is clamped entirely by means of the right jaw. Tilt the jaws back to a convenient position as shown in Fig. 7.

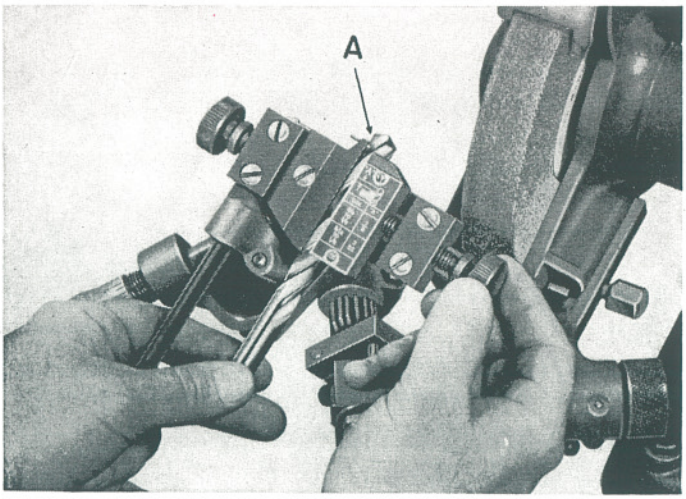


Fig. 7. Clamping the Drill.

Insert the drill in the jaws with one of its flutes engaging the locating pin of the left jaw, and with the cutting lip extending 3/32 to 1/8 inch beyond the jaw as shown by "A" on the instruction plate DAG-149. The required projection varies with diameter of drill.

While holding the drill in the left hand, with the flute surely against the locating pin, turn the knurled screw DAG-108 with the right hand until the jaws are tight.

### Adjustment for Grinding Position

Having clamped the drill, back off the feed screw thimble DAG-114 until about 3/4 inch of thread shows. Take this precaution to prevent accidental contact of the drill point against the wheel.

Swing the jaws toward the wheel by raising the feed thimble, until the pin of the stop block DAG-123-R is in contact with the swivel joint DAG-146-S, as shown at F, Fig. 9. This contact must be maintained while sharpening the drill.

Now release both clamp nuts DAG-150-S, indicated by "G" in Fig. 1, and turn the large knurled adjusting nuts of the brackets DAG-147-R and 148-R cooperatively as shown in Fig. 8 until the drill point is about

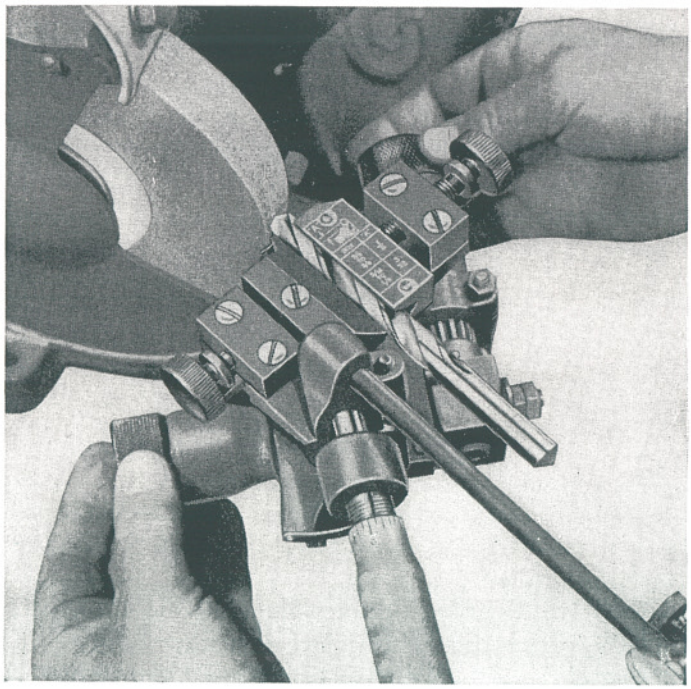

Fig. 8. Adjusting to Grinding Position.

1/16 inch from the face of the wheel. If necessary, shift the mounting bracket arm in the tool support slot inward or outward to accommodate this adjustment. When the drill has thus been lined up so that the lip will meet the face of the wheel, tighten both clamps "G" to hold the position.

### Grinding the Drill

Start the grinder and feed the drill point into the wheel as shown in Fig. 9 by turning the feed screw thimble while rocking the clamp jaws upward and downward by means of the ball handle. Feed one graduation of the thimble for each pass up and down. Use smooth, positive strokes; do not hold the drill in contact with the wheel as the point might be overheated. Continue grinding until enough material has been removed to clean up the lip and heel.

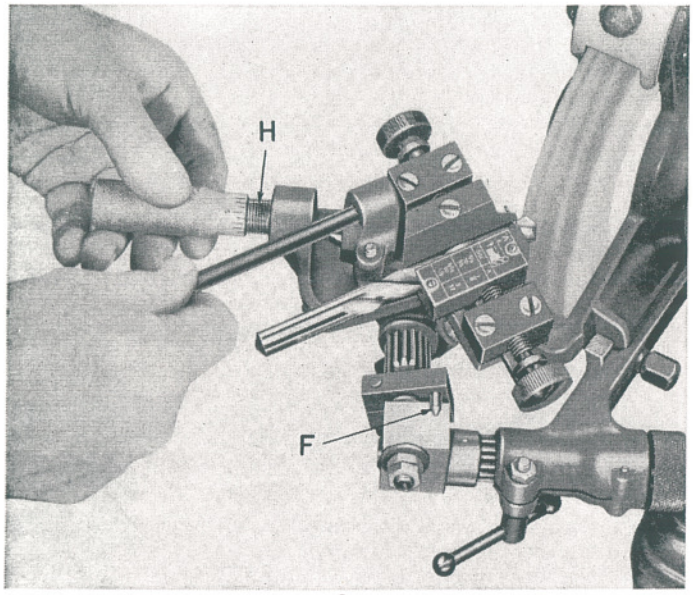


**Fig. 9. Grinding a 2-Lip Drill.**

Note the final thimble position "H" by reading its graduation with respect to the scribed line on top of the feed screw. Turn the thimble back one revolution to exactly the same mark, thus preserving the reading for grinding the other lip equally. The graduations have no meaning other than to control the next grinding operation.

### Use of Stop Gage

To grind the second lip equally with the first, the drill must project the same amount from the jaws. Use the stop gage for this purpose.

Having finished one lip, tilt the jaws away from the wheel and clamp the post DAG-113 in a suitable position on the handle by tightening the thumb screw. Turn the knurled screw DAG-112 until its head is in contact with the end of the drill shank, "I," Fig. 10, and lock it on the post by means of the knurled knob. Hold this setting until the second lip has been ground.

### Grinding Second Lip

Release the drill by backing off the right jaw. Rotate the drill half a turn in the jaws, and locate the second flute against the pin of the left jaw in the same manner as before. Keep the shank of the drill in contact with the stop gage while clamping the drill in the jaws. This procedure brings the second lip into the exact position for duplicating the first lip.

Proceed with grinding the second lip, feeding at the usual rate for one revolution of the thimble to the same final position as before. Swing the jaws away from the wheel and inspect the point of the drill. If the second lip has not been cleaned up, continue grinding the required amount to a new thimble setting, and repeat on the first lip.

### Inspecting the Sharpened Drill

After sharpening, the lips of the drill should be of equal length and angle. The ordinary drill angle gage will be useful in checking the point. Consult the handbooks offered by drill manufacturers for details showing proper drill shapes, as well as for recommendations about drilling various materials.

## GRINDING 82° AND 135° POINTS

Procedure for grinding these special lip angles is the same as described above. After setting to the desired mark on the angle scale "D," Fig. 5, it is generally necessary to locate the jaws with respect to the face of the wheel by means of the two large adjusting nuts, as previously described.

## SPECIAL POINTS

Other lip angles such as 125° may be ground from intermediate positions on the angle scale. The operator will soon become familiar with the action of the Drill Grinding Attachment and can locate additional marks on the scale to give the lip angles which he finds most satisfactory.

## GRINDING 3- AND 4-LIP DRILLS

The operation in grinding 3- and 4-lip drills is the same as for 2-lip drills, except that care must be taken to avoid grinding into the next flute when rocking the jaws.

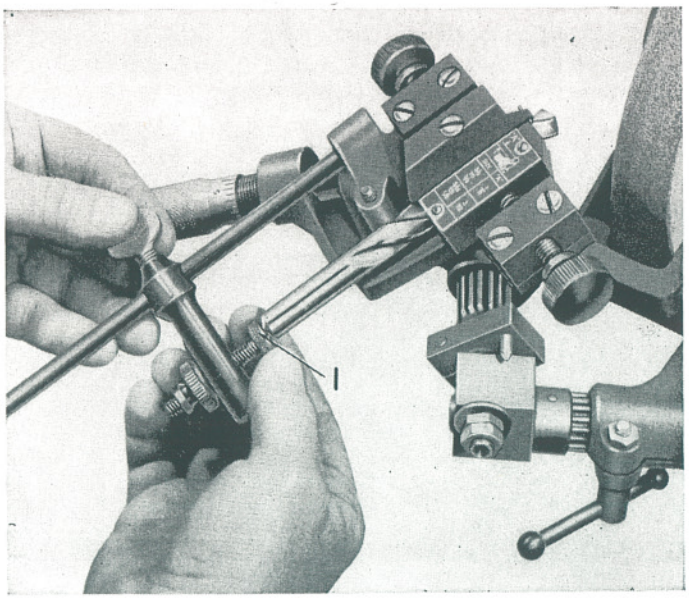


**Fig. 10. Setting the Stop Gage.**

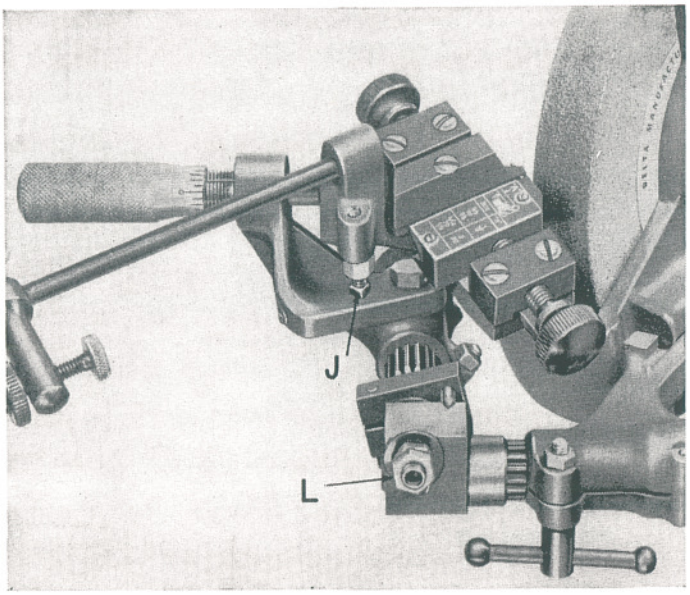


**Fig. 11. Stop Screw and Swivel Shaft Adjustment.**

To limit the swing of the jaws, back out the square head set screw SP-311 in the underside of the jaw shoe casting DAG-103 so that it acts as a stop "J," Fig. 11, against the feed screw bracket. After setting for the proper limit, lock the screw by tightening the hexagon nut SD-18 against the casting.

## ADJUSTMENT FOR HEEL ANGLE

As assembled at the factory, the Drill Grinding Attachment is arranged to produce the 12 to 15 degree heel or clearance angle commonly recommended for 118 degree drills. This is accomplished by the relative position of the drill and feed screw.

Match marks "K," Fig. 5, are stamped on top of the splined swivel shaft DAG-145 and the left face of the stop block DAG-123-R to indicate the position for the 12 degree clearance angle. If the attachment is changed to some other clearance angle, or loses its adjustment, the original setting can be restored by matching these marks. The hexagon socket cap screw SP-750 clamps the stop block on the shaft.

When a heel or clearance angle less than 12 degrees is wanted, release the cap screw, set the stop block forward on the splined shaft, and clamp tightly. This change points the drill downward when meeting the wheel, to grind away less of the heel.

To increase the heel angle, set the stop block with its match mark to the rear of the mark on the splined shaft, thus holding the drill slightly upward to remove more of the heel.

## WHEEL WEAR

Grinding should not be limited to one side of the wheel face; the method described under "Adjustment for Grinding Position" permits using the entire width of the wheel for uniform wear and longer wheel life.

In sharpening 1/8 or 3/16 inch drills it is convenient to work near the left edge of the wheel for maximum jaw clearance. This may be compensated by running the larger drills, which should project farther from the jaws, toward the right edge. Avoid grinding too close to the edges of the wheel, so that the lips will be straight.

When used on the Delta Tool Grinder the attachment will allow for wheel wear down to 5½ inch diameter. As the wheel is dressed down, the mounting bracket is moved farther into the supporting slot. A wheel too small for convenient drill grinding can be used for other work and should be replaced by a new full-sized wheel.

## GRINDING WHEELS

Use of the correct grinding wheel is as important as any other feature in sharpening drills. Grinding is a form of abrasive cutting and should be accomplished by the milling action of the abrasive rather than by excessive pressure. A clean, sharp wheel of proper grit is required.

High speed steel drills are often burned, with consequent loss of temper, when ground on an ordinary wheel. We recommend the No. 1267 wheel, which is a cool, porous vitrified aluminum oxide wheel light blue in color especially adapted for this purpose. It is 7 inches in diameter by 5/8 inch thick, which gives enough face width for the maximum drill size to be sharpened by this attachment.

## WEB THINNING

The web of a drill increases in thickness as it approaches the shank. After repeated sharpening, more power is used in forcing the drill through the work. The web should be thinned to reduce the required end thrust. Correct web thinning is as important as point grinding to secure satisfactory drill performance, especially under production conditions.

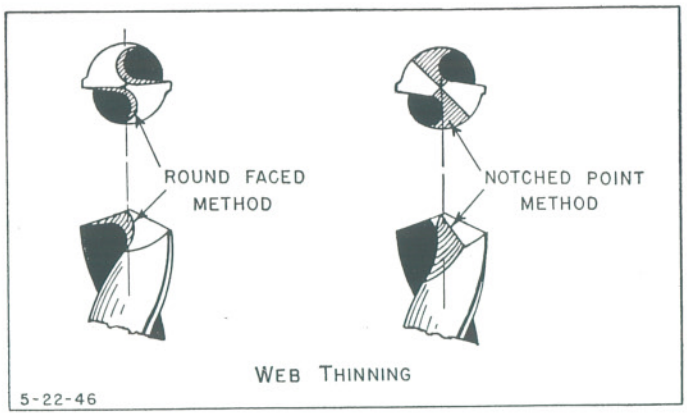


**Fig. 12.**

Two common methods of web thinning are shown in Fig. 12. The round faced method requires the use of a special grinding wheel 1/8 inch thick with rounded edge. The notched point method is generally preferred as it can be done on the regular grinding wheel.

## MECHANICAL ADJUSTMENTS AND MAINTENANCE

In addition to the operating adjustments described above, there are some mechanical adjustments for maintaining rigid assembly and ease of operation.

The splined shafts in the mounting and support brackets replace the keyed shafts formerly used, for more rigid alignment. Any slack which may develop in these parts should be removed by tightening the special fillister screws DAG-151 shown in Fig. 13.

To make this adjustment on either of the splined shafts, take off the clamp nut DAG-150-S, turn the fillister screw to tighten the split casting on the splined shaft until snug, but not enough to prevent movement of the shaft by turning the large knurled adjusting nut. Lock the fillister screw in the required position by tightening its hexagon nut SP-1029. Then run the clamp nut back onto the threaded head of the fillister screw. When these clamp nuts "G," Fig. 1, are tightened, they take up the remaining clearance in the splines to lock the shafts in grinding position.

Adjust the swivel shaft DAG-145 by tightening the hexagon jam nuts SP-1231 shown at "L," Fig. 11, against the swivel joint to a pressure which permits tilting the jaws toward and away from the wheel, but with enough friction to hold the stop pin "F," Fig. 9, against the swivel joint while grinding drills.

Keep the Drill Grinding Attachment clean and lubricate the screw threads and other working parts lightly with fine machine oil for easy operation.

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## MANUFACTURER'S RECOMMENDATIONS

High speed steel drills are fine tools. They are produced in a number of special forms for drilling various materials. The major drill manufacturers have published handbooks which illustrate the best form of point for various operations and explain the causes of drill breakage and other operating difficulties. Consult these references and other technical publications for information which will help you to obtain the best results.

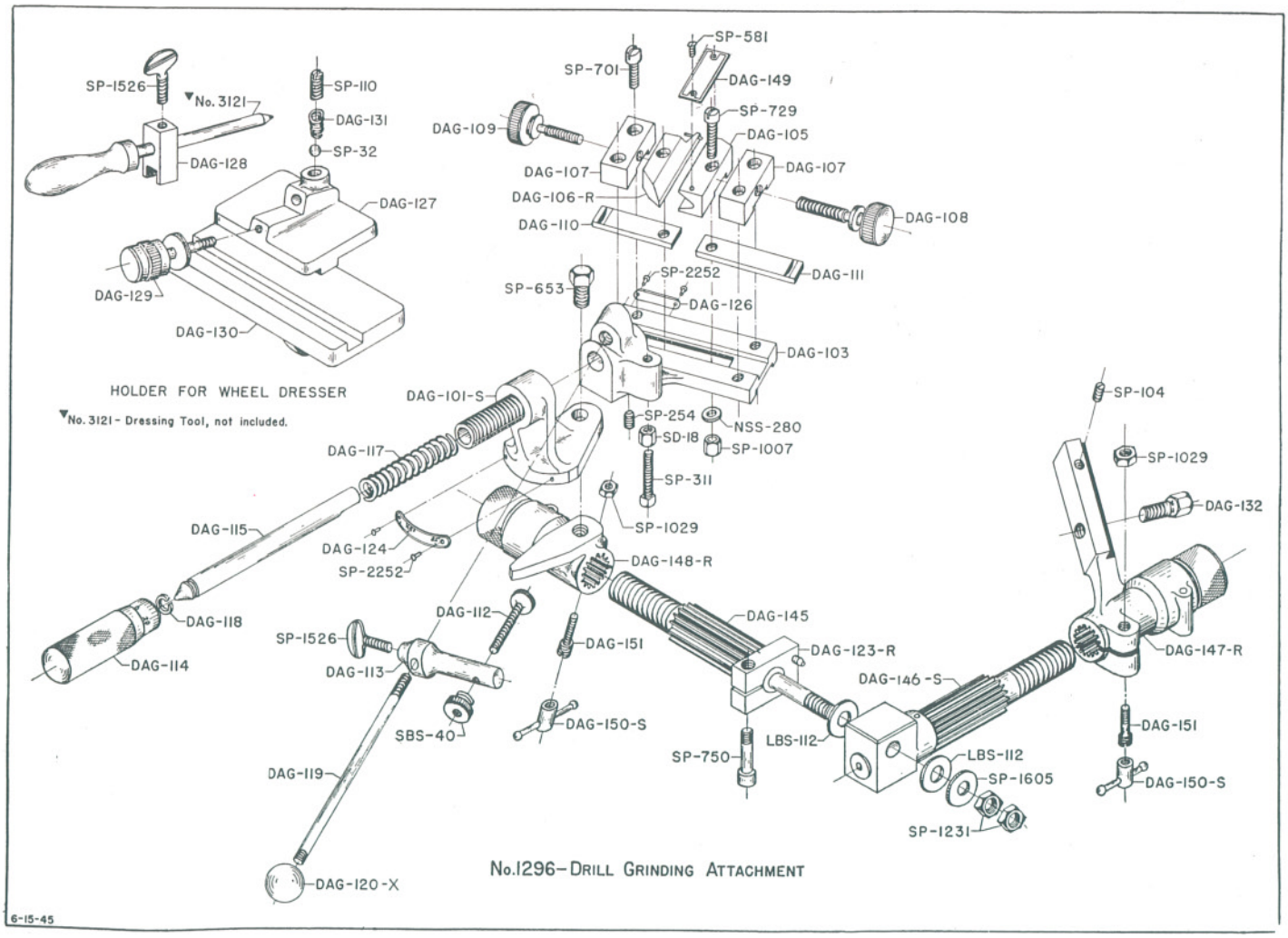


**Fig. 13.**

## Table 1. REPLACEMENT PARTS

IMPORTANT: Give both the Part Number and the Description of each item when ordering from this list.

| Part No. | Description | No. Req. |
|---|---|---|
| | **CLAMP** | |
| DAG-103 | Clamp Jaw Shoe | 1 |
| DAG-105 | Jaw, Right | 1 |
| DAG-106-R | Jaw, Left, with Pin | 1 |
| DAG-107 | End Block | 2 |
| DAG-108 | Knurled Head Screw, 3/8-16 x 1 1/2" | 1 |
| DAG-109 | Knurled Head Screw, 3/8-16 x 1" | 1 |
| DAG-110 | Sliding Key for Jaw, Left, 1 15/16" Long | 1 |
| DAG-111 | Sliding Key for Jaw, Right, 2 7/16" Long | 1 |
| DAG-125 | Pin for DAG-106-R Jaw | 1 |
| DAG-126 | Scale for Jaw Adjustment | 1 |
| DAG-149 | Instruction Plate | 1 |
| NSS-280 | Special 1/4" Steel Washer | 2 |
| SD-18 | Special 1/4"-20 Hexagon Nut | 1 |
| SP-254 | 5/16-24 x 3/8" Hexagon Socket Set Screw | 1 |
| SP-311 | 1/4-20 x 1 1/2" Square Head Set Screw | 1 |
| SP-581 | #3-48 x 1/4" Round Head Machine Screw | 2 |
| SP-701 | 1/4-20 x 3/4" Fillister Head Machine Screw | 4 |
| SP-729 | 1/4-20 x 1 1/4" Fillister Head Machine Screw | 2 |
| SP-1007 | 1/4"-20 Self-Locking Hexagon Nut | 2 |
| SP-2252 | #2 x 3/16" Drive Screw | 2 |
| | **FEED SCREW AND BRACKET** | |
| DAG-101-S | Feed Screw Bracket, with Sleeve & Angle Scale | 1 |
| DAG-114 | Feed Screw Thimble | 1 |
| DAG-115 | Feed Screw Shaft | 1 |
| DAG-117 | Coil Spring, 9/16 x 2 1/2", Flat Ends | 1 |
| DAG-118 | Snap Ring for Feed Screw Shaft | 1 |
| DAG-124 | Angle Scale | 1 |
| SP-653 | 3/8-24 x 5/8" Hexagon Head Cap Screw | 1 |
| SP-2252 | #2 x 3/16" Drive Screw | 2 |
| | **HANDLE AND STOP GAGE** | |
| DAG-112 | Knurled Head Screw, 1/4-20 x 1 11/16" | 1 |
| DAG-113 | Stop Gage Post | 1 |
| DAG-119 | Handle | 1 |
| DAG-120-X | Handle Ball, 7/8" Diam., 5/16"-24 Hole | 1 |
| SBS-40 | Knurled Hand Knob, 1/4"-20 Thread | 1 |
| SP-1526 | 5/16-18 x 9/16" Thumb Screw | 1 |

| Part No. | Description | No. Req. |
|---|---|---|
| | **SWIVEL BRACKET** | |
| DAG-123-R | Stop Block, with Pin, for Swivel Shaft | 1 |
| DAG-145 | Splined Swivel Shaft, with Shoulder | 1 |
| DAG-148-R | Support Bracket, with Knurled Adjusting Nut | 1 |
| DAG-150-S | Clamp Nut, 3/8"-24 Thread, with Ball-End Handle | 1 |
| DAG-151 | Special 1/4-20 x 1" Fillister Screw, Threaded Head | 1 |
| LBS-112 | Special 13/32" Fiber Washer | 2 |
| SP-750 | 5/16-18 x 1" Hexagon Socket Cap Screw | 1 |
| SP-1029 | 1/4"-20 Hexagon Nut | 1 |
| SP-1231 | 3/8"-24 Hexagon Jam Nut | 2 |
| SP-1605 | 3/8" Steel Washer | 1 |
| | **MOUNTING BRACKET** | |
| DAG-132 | Special 3/8-16 x 15/16" Hexagon Head Set Screw | 1 |
| DAG-146-S | Swivel Joint, with Splined Support Shaft | 1 |
| DAG-147-R | Mounting Bracket, with Knurled Adjusting Nut | 1 |
| DAG-150-S | Clamp Nut, 3/8"-24 Thread, with Ball-End Handle | 1 |
| DAG-151 | Special 1/4-20 x 1" Fillister Screw, Threaded Head | 1 |
| NSS-280 | Special 1/4" Washer | 1 |
| SP-104 | 1/4-20 x 1/2" Headless Set Screw | 1 |
| SP-1029 | 1/2"-20 Hexagon Nut | 1 |
| | **WHEEL DRESSER HOLDER** | |
| DAG-127 | Slide | 1 |
| DAG-128 | Push Link | 1 |
| DAG-129 | Knurled Head Screw | 1 |
| DAG-130 | Slide Bracket | 1 |
| DAG-131 | Coil Spring, 5/16 x 3/8", Flat Ends | 1 |
| SP-32 | 5/16" Steel Ball | 1 |
| SP-110 | 3/8-16 x 3/8" Headless Set Screw | 1 |
| SP-1526 | 5/16-18 x 9/16" Thumb Screw | 1 |
| No. 3121 | Diamond Wheel Dresser | 1 |
| | **GRINDING WHEEL** | |
| No. 1267 | 5/8 x 7" Vitrified Aluminum Oxide Wheel, 46 Grit, Grade N, 5/8" Hole | 1 |

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