

HOW TO

Make Your Own Bushing Tool and Install Bushings

by Cy Felheimer (NJ)

This article is for beginners and half (or less) experts. Most experts have their own way of installing bushings. However, whatever accomplishes the purpose properly is good.

Here you will find plans to make your own bushing tool, with a little

help from a machine shop, at a cost a lot less than the commercial tools.

This article will also tell you how to use the tool to install commercial bushings. You will get enough basic knowledge so that with a little practice you too, will be an expert.

Bushing Tool: Bill of Materials

A	Plywood base	$\frac{1}{2}$ x 12 x 12	or to suit
B	Pipe flange	$\frac{3}{4}$	
C	Short nipple	$\frac{3}{4}$	
D	Tee	$\frac{3}{4}$	2 pcs.
E	Nipple	$\frac{3}{4}$ x 3	2 pcs.
F	Ell	$\frac{3}{4}$ x 90°	2 pcs.
G	Nipple	$\frac{3}{4}$ x 8	
H	Pipe plug, solid	$\frac{3}{4}$	brass or steel
J	Reducer	$\frac{3}{4}$ x $\frac{3}{8}$	brass or steel 2 pcs.
K	Shaft	$\frac{1}{2}$ x 10	brass or steel
L	Bar	$\frac{1}{8}$ x $1\frac{1}{2}$ x 5	brass or steel
M	Handle or ball	to suit	
N	Spring, compression	$\frac{1}{2}$ ins. dia. x 3	
P	Disc, knurled	$\frac{5}{8}$ dia. x $\frac{3}{16}$ thk.	thread for #6-32
R	Clamp base	$\frac{1}{8}$ x $1\frac{1}{2}$ x 10	brass or steel
S	Clamp base	$\frac{1}{2}$ x 1 x $1\frac{3}{4}$	2 pcs.
T	Clamp	$\frac{3}{8}$ x $\frac{3}{4}$ x $1\frac{3}{4}$	2 pcs.
U	Wheel	1 dia.	4 pcs.
W	Anvil	$\frac{3}{4}$ dia.	3 pcs.
Y	Centers	$\frac{5}{32}$ dia. x $1\frac{1}{2}$	3 pcs.

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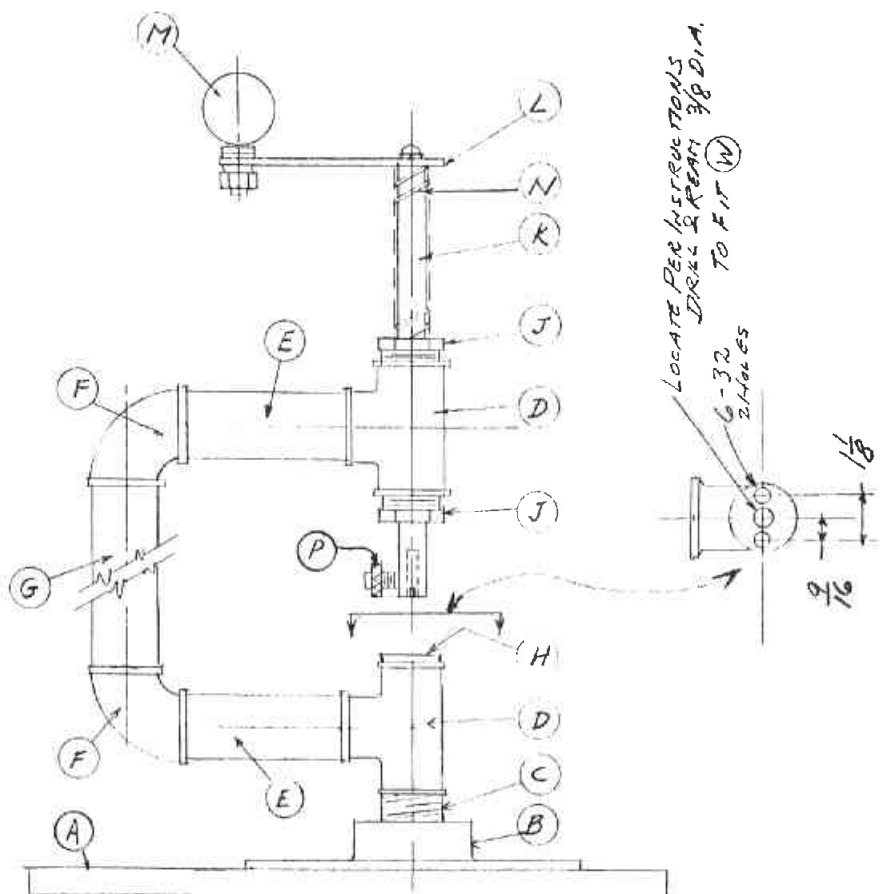


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- Handle

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BRIEF ASSEMBLY INSTRUCTIONS

Make all parts first; vary to suit. True-up flange B bottom surface. Assemble D and H TIGHT then mount on C and B. True-up surface of H flush with D and all true to flange on B. Drill and tap #6-32 two holes in common surface of D and H on $1\frac{1}{2}$ centers and perpendicular to the horizontal leg of the tee D.

Assemble two parts J into the other tee D TIGHT. Drill and ream straight through $\frac{1}{2}$ + or - .005 dia. through the two parts J.

Assemble all parts shown in sketch 1 tightly. Use a square to get shaft vertical, K to H. Put the pointed locating center in the shaft K and tighten P to hold center. Carefully locate the center point on the assem-

bled H in D. Loosen parts enough to drill and ream $\frac{3}{8}$ dia. in center located above. Realign assemble using square with everything TIGHT.

Assemble clamp base R to D and H. Assemble clamp wheels U with $\frac{1}{4}$ -28 flat-head screws and stake screws into wheels. Assemble clamps and balance of assembly.

INSTALLATION OF BUSHINGS

First determine the correct size for the new bushing. To do this, measure the pivot in millimeters and look in the table for KWM bushings which gives the instructions for the bush selection and for the correct drill (reamer).

Rather than buy all the bushings offered, I find the three assortments circled will fit almost all the pivots

KWM BUSHINGS

The numbers prefixed by the letter L (L57) in the chart below indicates the bushing numbers

To select the correct bushing, first measure the pivot and find its measurement in the range of sizes shown in column Z. By reading across you will find the various bushings that will fit this size pivot.

If more than one size bushing is available select the thickness of the bushing you need by referring to the top line of the chart alongside the letter "H" and the correct diameter by referring to the second line after the letter "D".

After choosing the bushing read up the column to line "RN" which indicates the size reamer to be used for the selected bushing...reamers are identified by the Roman Numerals.

Z	H	D	1.0	1.4	1.7	1.9	2.7	3.0	4.0
Pivot Diameter	mm	mm	mm	mm	mm	mm	mm	mm	mm
0.07-0.08	0.1	L 55							
0.10-0.12	0.15	L 56							
0.15-0.17	0.2	L 01							
0.19-0.21	0.25	L 57							
0.23-0.25	0.3	L 02	L 64						
0.27-0.30	0.35	L 58							
0.32-0.35	0.4	L 03	L 08						
0.38-0.40	0.45	L 59							
0.42-0.45	0.5	L 04	L 09						
0.48-0.50	0.55	L 60							
0.51-0.55	0.6	L 05	L 10						
0.57-0.60	0.7	L 06	L 11						
0.65-0.70	0.8	L 07	L 12						
0.75-0.80	0.9	L 61	L 13						
0.85-0.90	1.0	L 62	L 65	L 14					
0.95-1.00	1.1	L 63	L 66	L 15					
1.05-1.10	1.2			L 16					
1.15-1.20	1.3			L 17					
1.25-1.30	1.4			L 18					
1.35-1.40	1.5			L 19					
1.45-1.50	1.6			L 20					
1.55-1.60	1.7			L 67					
1.65-1.70	1.8			L 21					
1.75-1.80	1.9			L 68					
1.85-1.90	2.0			L 22					
1.95-2.00	2.1			L 69					
2.05-2.10	2.2			L 23					
2.15-2.20	2.3			L 70					
2.25-2.30	2.4			L 24					
2.35-2.40	2.5			L 71					
2.45-2.50	2.6			L 25					
2.55-2.60	2.7			L 72					
2.65-2.70	2.8			L 26					
2.75-2.80	2.9				L 73	L 80			
2.85-2.90	3.0				L 27	L 50			
2.95-3.05	3.2				L 28	L 51			
3.10-3.25	3.4				L 74	L 81			
3.30-3.45	3.6				L 29	L 52			
3.55-3.65	3.8				L 75	L 82			
3.75-3.85	4.0				L 76	L 83			
3.90-4.05	4.2				L 30	L 53			
4.15-4.25	4.4				L 77	L 84			
4.35-4.45	4.6				L 31	L 54			
4.55-4.65	4.8				L 78	L 85			
4.75-4.85	5.0								
5.00-5.05	5.2								
5.15-5.25	5.4								
5.35-5.45	5.6								
5.55-5.65	5.8								
5.75-5.85	6.0								
5.95-6.05	6.2								
6.15-6.25	6.4								
6.35-6.45	6.6								
6.55-6.65	6.8								

Z = Pivot Diameter
H = Height
D = Diameter
B = Bore

REFILLS

Refills of individual numbers are available in cellophane packages. Packages L01 to L127 contain 20 bushings. Packages L128 to L137 contain 10 bushings.

All measurements are in millimeters.

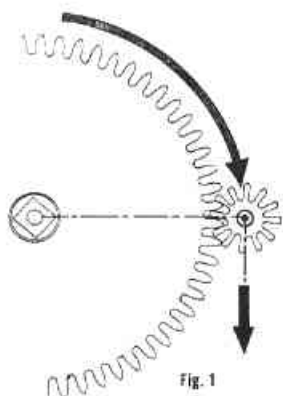


Fig. 1

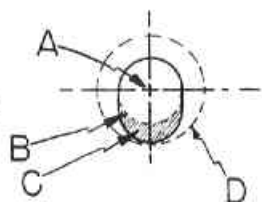


Fig. 2

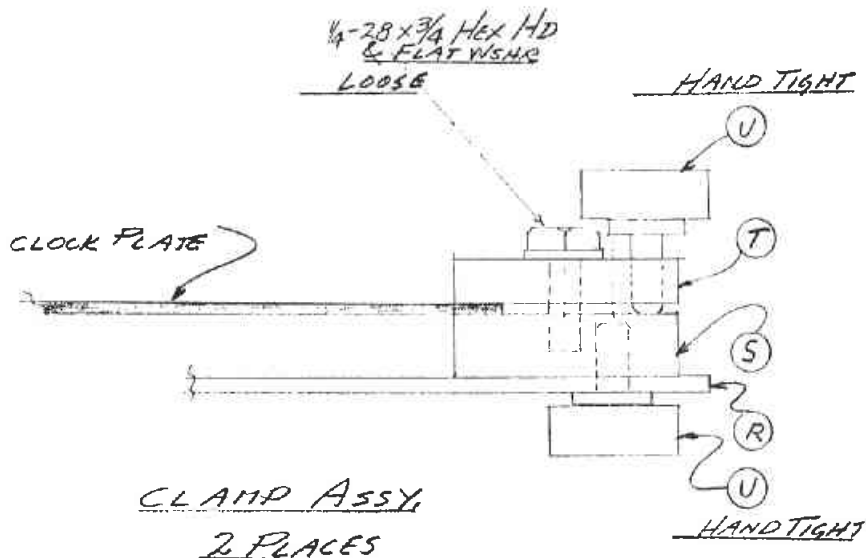
required for clocks. The range of pivots covered by these three assortments is from .3mm to 2.8mm. The part numbers for these are 72-215, 72-216, 72-216A, and will give you 27 different sizes and a total of 300 bushes. All are 1.9 mm high but may be filed off after installation of the bush if desired. The table shows that drill numbers II, III, and IV will drill the proper size holes for these assortments. The chamfering tool will also be needed.

After selecting the proper bushing and drill, there are three things to look at: 1. Finding the true center of the worn pivot hole. 2. Holding the

clock plate firm so that the drilling operation for the new bushing will be at the correct center and at right angles to the plate. 3. Drilling the hole and pressing in the bushing.

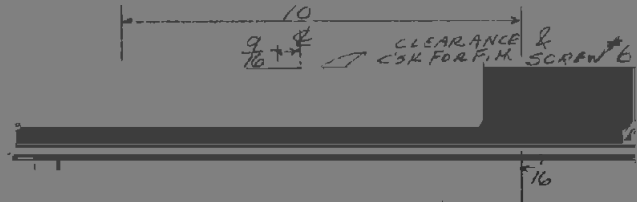
An example for finding the true center is shown in the sketches (Figures 1 and 2). It is a good idea to lightly scribe the true or old center on the plate. This should be done before disassembling the movement.

To drill the hole for the new bush in the correct center, insert anvil W 2 or W 3 in place in the base and put the clock plate in the bushing tool in the approximately correct location.



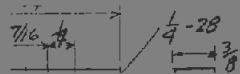
10-32
1/2 DP

SHAFT (K)
1/2 STOCK + POLISH FOR GOOD FIT IN BUSHINGS J



(R) ADJUSTABLE CLAMP BASE 1 REQD BRASS 1/8 x 1 1/2

1 3/4



CLAMP BASE - 2 REQD
1/2 BRASS STOCK

(T) CLAMP - 2 REQD
3/8 BRASS STOCK

Clamp the upper 2 screws but leave the lower 2 slightly loose. The plate should be in the tool with the outside up. Put the pointed locating center, Y 1, in the tool and tighten the disc, P, to hold it in place in the shaft, K. Now locate the scribed or correct center exactly under the point of the center Y 1 and tighten the clamps to hold the plate in place. Remove the centering point and insert the proper drill and tighten it in place.

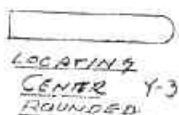
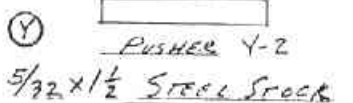
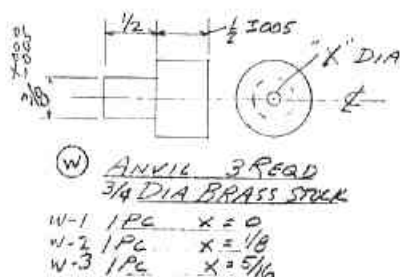
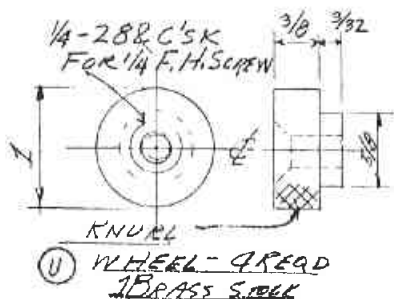
Slowly rotate the shaft and drill by the ball or handle and press down at the same time until the drill enters the plate fully. You now have the correct hole for the selected bush. Remove the drill and insert the chamfering tool and put a slight chamfer on the hole to ease the entering of the bush. To insure that the bush will be flush on the inside of the plate, unclamp the

plate and remove the anvil used. Place the anvil W 1 in the tool and again clamp the plate in place making sure that the inside of the plate is down. Use rounded locating center, Y 3, to locate the plate exactly. Change the center to the pusher, Y 2, and place the bush with the oil cup side up, into the chamfered hole.

Gently bring down the pusher onto the bush and push or tap the bush in place. You will feel the bush come firm against the anvil when it is flush with the inside of the plate.

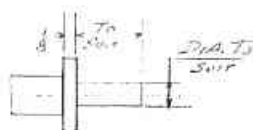
The bush is now firm in place, upright to the plate, and flush to the inside of the plate.

Some plates will be difficult to locate correctly with the outside of the plate up. If so, work from the inside of the plate for inserting the bush. After inserting the bush, make sure



the bush and the plate are flush and smooth on the inside of the plate.

Additional anvils will sometimes be needed, especially where the escape wheel pivot is on a bridge rather than in the plate. Your ingenuity will help you to design these along the line sketched here.



DIMENSIONS NOT SHOWN - SAME AS (W)

REFERENCES

1. NAWCC BULLETIN, August 1972, Vol. XV, No. 5, whole number 159, gives a very detailed discussion on bushings.
2. Clockwise magazine, Winter 1980, p. 40, and Spring 1981, p. 24.
3. Various suppliers' catalogs.
4. Practical Clock Repairing, by de Carle, p. 29.
5. NAWCC BULLETIN, June 1981, Vol. XXIII, No. 3, whole number 212, p. 246, has a detailed article on bushing by hand, and August 1981, p. 366, has an article on using preformed (KWM) bushings. Also see December 1981.

THE PRESIDENT'S MESSAGE *(continued from page 2)*

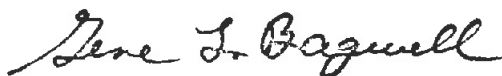
Our Trustees and Council, both present and past, have set the example through their pledges and contributions to date. We now need the serious involvement of the general membership.

I feel compelled to emphasize that this is a hobby organization. NAWCC has never been, and I hope never will become, a commercial organization. Our Constitution clearly states the purposes of NAWCC. The purposes of this Association shall be to stimulate interest in timepieces of all kinds, to foster genuine interest in collecting timepieces, to facilitate the sale or purchase of timepieces by members, to cooperate with individuals and with other organizations in exhibiting timepieces, to collect and preserve horological data and material for posterity, to disseminate full information regarding the mechanism of timepieces and the repair thereof.

This is the second recent notice in the President's Message that the not-for-profit status by the Internal Revenue Service is granted to the Association alone, not to individual members. There is nothing in the non-profit status that excuses any Chapter or individual member from his responsibility to pay taxes on profits, nor is there any protection from the responsibility for paying sales tax where required by the city or state.

Shirley and I are anxiously looking forward to 1984 Regionals and the Indianapolis National Convention in June. During our travels this past year it has been great to see what a good time our members are having at Chapter and Regional meetings. If you are a member who does not participate in Chapter or Regional affairs, you are missing many good times.

Sincerely,



Gene L. Bagwell, President, NAWCC

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