

Restoring a Canedy-Otto New No. 16

1. The end result of this restoration will hopefully be both functional and aesthetically pleasing.
2. It is important to keep in mind that this tool is very heavy. Have adequate manpower and think carefully before moving/manipulating the tool.
3. The general approach will be to systematically disassemble the tool, clean and restore all parts and reassemble the tool in reverse order. When possible, parts that can be removed as an assembly, will be kept together until those parts are ready to be cleaned, painted and reassembled. This will minimize the number of loose parts and, hopefully, any confusion.
4. It is important to take pictures and keep careful notes each step of the way. Details may seem 'obvious' at the time of disassembly but difficult to recall later. Do not rely on your memory.



Right side of drill press prior to restoration



Prior to restoration

5. Machine should be secured on workbench in horizontal position.
6. Remove table raising crank n. handle and pinion gear assembly.



Table column, rest and raising mechanism prior to disassembly

7. . Remove foot supporting table rest shaft. The shaft (column), table rest (support), table rest nut and table raising screw with attached pinion (bevel gear) can then be removed as one assembly. Set aside.



Foot supporting table column

8. Remove mandrel (shaft with chuck) assembly. Remove large brass nut which attaches mandrel to feed sleeve and rack. **IMPORTANT!** Brass nut has left hand thread! Turn to left when facing front of drill to loosen. Split washer, which retains nut on feed sleeve, fits in groove of feed sleeve. Ball bearing provides interface for feed sleeve and mandrel. Store nut, split washer and ball bearing in plastic bag for safe keeping. Loosen bolt on lower frame bearing and slide mandrel out through upper bearing, both gears and lower bearing. Bolt on bearing will be retightened appropriately on reinstallation. Gears will become free upon removal of mandrel.

Large gear is on top, small gear on bottom. Hubs (collars) on both gears face down. Both gears have machine keys to fit in groove of mandrel. Temporarily, replace gears on mandrel in original orientation.



Brass nut attaching feed sleeve and mandrel before disassembly



Mandrel gears in place before disassembly



Brass nut loosened from mandrel



Bottom end of feed sleeve with split washer in place



Top end of mandrel with ball bearing



Large brass nut with left hand thread and split washer



Mandrel with original 'safety chuck' holding Jacob's chuck



Lower mandrel bearing and tension bolt



Gears from mandrel shaft removed and in correct orientation



Gear with machine key

9. Feed sleeve and rack can not be removed until feed gear shaft is removed later in disassembly.
10. Remove crank shaft with large bevel gear, flat belt pulley and collar. Crank shaft extends $1 \frac{13}{16}$ " to right of shaft support bracket. Left end of shaft is beveled, right end has flattened recess for handle set screw. Pulley has set screw to outside (left). Pulley collar has bevel to outside (left). Bevel gear has beveled teeth to inside. Loosen all set screws. Resistance to removing shaft from pulley and gear is usually a consequence of raised edges at set screw indentations. File any edges down which may be exposed. Bevel gear is free once shaft is removed. Once gear and pulley are removed all raised or rough areas can be filed easily prior to reinstallation. Temporarily replace pulley, collar and bevel gear on shaft in appropriate orientation.



Crank/pulley shaft with bevel gear in place



Large bevel gear on crank shaft between frame and support bracket



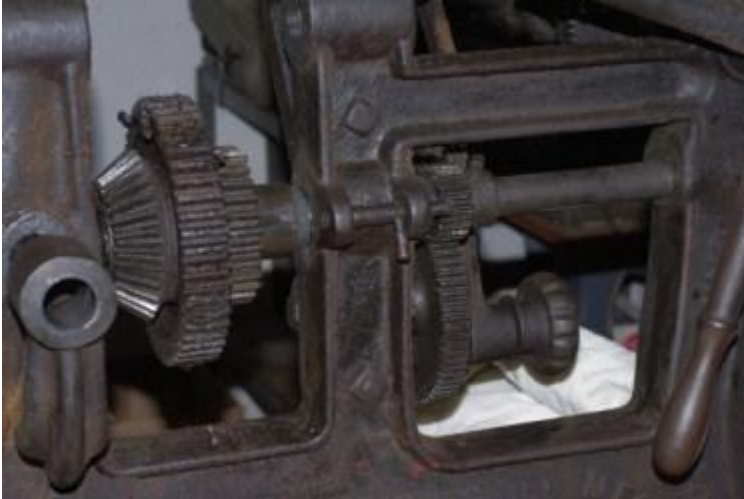
Drive pulley with collar



Crank shaft, pulley and bevel gear after removal

11. Remove fly wheel shaft with bottom bevel gear, large and small flat gears and auto feed gear.
 - a. Loosen set screw on auto feed drive gear. Gear is aligned with gear on auto feed assembly and has collar facing up. Gear can be loosened on fly wheel shaft by gently hitting gear downward with fly wheel shaft seated in frame.
 - b. Release double gear assembly by pushing release pin down and rotating gear to depress brass release lever. Slide double gear downward to expose pin on bevel gear which fixes bevel gear to fly wheel shaft. Machine key on inside of bevel gear aligns rotationally bevel gear with hole for pin on fly wheel shaft but does not align it vertically. Pin should be tapped out from side which appears least deformed. In this case, pin was tapped out from side near large end of brass lever and should be replaced from other side. Deformity of the pin head may require drilling the outer most aspect of the pin to remove deformity and allow pin to be tapped out.
 - c. Double gear assembly has large gear down and small gear up, with release mechanism facing up. Details of release mechanism will be discussed later.

- d. With pin removed and gears loosened, fly wheel shaft can be removed by pulling upward with hand on top of shaft while using rubber hammer to gently strike double gear downward, pushing gear off of shaft. Once double gear is removed, auto feed gear, if tight, can be removed by pulling fly wheel shaft upward sharply, striking collar of auto feed gear against frame, forcing gear downward. Temporarily, reassemble all parts in proper orientation on fly wheel shaft.



Flywheel shaft with, from left to right, lower bevel gear, double gears and feed gear



Double gears, release pin, auto feed gears



Bevel gear with double gear in lower position



Auto feed gear



Pin locking bevel gear to flywheel shaft exposed by sliding double gear down



Outer aspect of pin drilled out to remove deformity and allow removal



Pin partly tapped out from above



Bottom of flywheel shaft with machine key groove for bevel gear



Double gear and bevel gear removed

12. Remove drive shaft support bracket. On this tool cardboard shim was used under mount to align properly with drive shaft.



Drive shaft support

13. Remove double gear release pin and spring. Unscrew knob, depress pin and spring to remove.



Gear release pin

14. Remove auto feed assembly. Remove 2 bolts from top bracket and nuts from bolts on lower bracket. Tap out rear bolt on lower bracket. Assembly will now lift off as one unit. Store all bolts and nuts in proper orientation in assembly. (Note that top bracket receives top of worm gear shaft. Front of bottom bracket receives bottom of worm gear shaft. Worm gear shaft passes through ratcheting assembly. Large knob faces up and loosens to adjust feed rate. Shaft from adjusting gear passes through rear of lower bracket. For bottom bracket, the rear nut is on right – bolt head on left; the front nut is on left with bolt head on right.)



Auto feed assembly, rear on left, front on right



Auto feed assembly, looking from below, rear to left



Worm gear with spiral feed gear, top of drill press to left



Large feed gear with 'eccentric' feed rate adjustment bolt



Worm gear shaft passing through ratchet feed gear



Large feed gear and knob from below



Ratchet gear assembly



Auto feed assembly removed

15. Slide clutch assembly off left side of pinion shaft. Clutch hub has machine key to lock with left end of pinion shaft.



Clutch assembly and spiral feed gear



Clutch assembly and spiral gear removed

16. Remove nut from right side of pinion feed shaft and remove feed handle.

17. Remove sleeve from right side of pinion shaft. Pinion shaft with gear will then slide out right side of frame. On this tool, sleeve had very tight fit in frame and required striking opposite side of pinion shaft to drive sleeve out. Resulting deformity of the left side of pinion shaft then required filing to restore. Oil hole on sleeve faces up when reassembling. Slide pinion shaft out. Temporarily reassemble clutch, sleeve and handle with nut on pinion feed shaft.



Pinion shaft sleeve partly driven out from frame. Groove in shaft is for handle.



Pinion shaft with gear, with sleeve removed from frame

18. Remove feed rack from top of frame.
19. Remove bolts from upper and lower bearings and from table column housing.



Pinion feed shaft, feed shaft sleeve and clutch assembly removed



Frame with all parts removed

20. Remove the frame from the wood mounting board.



Bolts attaching frame to board are recessed on rear of board with nuts in front

This completes the disassembly phase

Reassembly

1. The general approach will be to reassemble the tool in reverse order. At this time, I will prepare what is necessary for mounting the tool on the wall. As the tool is reassembled, it will get progressively heavier and more difficult to manage. I would therefore recommend mounting the frame in its permanent position and then replace part by part in the appropriate order. As a particular part is ready to be reassembled, it will be cleaned and painted as it is needed. Parts that were removed as an intact assembly, will be disassembled, cleaned and painted when ready to be replaced. By keeping loose, disassembled parts to a minimum, confusion and mistakes will hopefully be avoided.
2. I have chosen to mount a 4 x 10 piece of wood to the wall using lead expansion shields and lag bolts. The original 4 x 6 oak mounting board will be attached to this board using 1/2" square head lag screws. In this case the bolts attaching the drill to the mounting board were countersunk from the rear of the oak board with the nuts securing the drill from the front. (Lag screws from the front of the drill would be another common means of attaching the drill to the mounting board.) It should be noted that the mounting holes in the frame of the drill are not symmetric and can not be used to make the drill vertically true. I chose to make the mounting board itself vertically true.
3. The frame should now be cleaned and painted. This drill has much of the original paint still intact including some of the gold lettering. As nice as it would be to have the original paint, the appearance of this drill is far from ideal and I have chosen to repaint it. Because so much of the original paint is present and there is little rust or bare areas, I do will not use a prime coat. I will be using Rustoleum satin black applied with a 1" artist brush. I have found that when done carefully this gives a very nice result. The cast iron is very forgiving and brush marks are very hard to see.



Casting marks on frame



Original gold paint on frame lettering



Original oak mounting board attached to new 4 x 10

4. The frame is now attached to the mounting board. Get an extra pair of hands as it weighs about 100 lbs.



Repainted frame attached to mounting board on wall

5. The planned order in which the drill will be reassembled is:
 - Replace table rest column, table rest, foot and table raising assembly
 - Replace feed sleeve and rack
 - Replace pinion feed shaft with sleeve. Attach clutch assembly and feed handle.
 - Replace auto feed assembly
 - Replace fly wheel shaft with auto feed, double and bevel gears
 - Replace crank shaft support bracket, crank shaft with bevel gear, flat belt pulley and collar.
 - Replace mandrel and double gears and attach to feed sleeve using large brass nut, split washer and ball bearing.
6. First to be replaced will be the table rest, column and table raising assembly. Although not the last parts removed, it will not interfere with replacing other parts and is reasonable to replace it now.



Table rest and table raising parts



Table rest, column, raising screw and nut

7. The column should be placed through the table rest with the lifting nut in proper orientation within the table rest, with the raised threaded part facing up. The lifting screw must be threaded into the lifting nut prior to placing the assembly on the frame. The column should be placed in the opening of the support foot and then the top of the column (notched) inserted into the bottom of the frame, while maneuvering the support foot onto the bolts of the mounting board. Center the column with set screws. Replace pinion gear onto top of lifting screw and frame. Tighten all nuts and bolts.



Table rest, column and lifting assembly replaced



Table raising mechanism

8. Replace feed rack, feed shaft with sleeve, handle and clutch assembly. Machine key for handle has pin facing inward. Sleeve for feed shaft has very tight fit into frame to keep shaft from moving to right. Clutch assembly should be taken apart to clean and paint.



Clutch assembly



Clutch assembly taken apart



Feed shaft, rack and clutch assembly. Handle not shown.

9. Replace feed rack from top of frame. Replace feed shaft with pinion gear from right side of frame. Replace feed shaft sleeve. This has very tight fit and requires force to insert into frame. I slipped a 1 1/4" pipe over end of shaft and hit with rubber hammer. Make sure oil hole is facing up and bevel of sleeve faces forward. Replace handle with machine key (pin facing toward frame) and nut. Reassemble clutch assembly and replace on left side of shaft with machine key articulating with shaft and clutch plate.



Feed rack replaced, viewed from right



As above, view from left

10. Replace auto-feed assembly.

A. Disassembly of auto-feed assembly

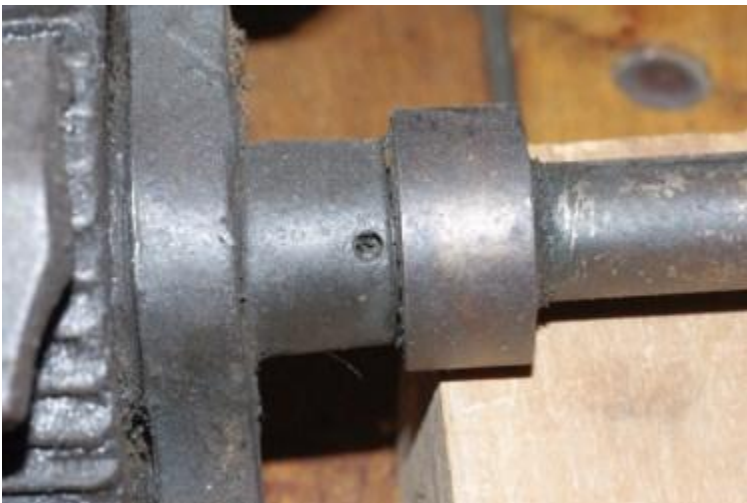
1. Remove top bracket/ arbor feed bearing. Red fiber washer sits between bearing and worm feed gear.
2. Remove cotter pin from rear large feed gear shaft.
3. Remove bottom bracket from worm gear feed shaft and large feed gear shaft. Front shaft contains ratchet mechanism and rear shaft has eccentric gear.
4. Remove bolt attaching long (top) and short (bottom) feed arms.
5. Remove short (bottom) feed arm with attached lower cross feed arm. Red fiber washer is between lower bracket and bottom of lower cross feed arm.
6. Tap out pin from bottom of worm feed gear and remove worm gear from arbor shaft.
7. Remove collar from shaft. Shaft has recessed hole for collar set screw.
8. Remove shaft with attached ratchet feed gear through bottom of upper cross feed arm. Leave gear attached to arbor shaft.
9. Loosen handle for rear eccentric gear and slide bolt head out from slot to remove gear.
10. Unscrew handle to remove from bolt and spacer, and remove from long feed arm. Washer is between handle and spacer. Leave long feed arm with upper cross feed arm intact.



Auto feed assembly intact



Upper bracket/arbor bearing with worm gear and fiber washer



Collar above long feed/ratchet arm



Arbor with long feed arm above gear and short feed arm and bracket below gear



Long and short feed arms attached by bolt at pivot point



Large feed gear with attached arbor in rear of lower bracket



Feed rate adjustable bolt with handle in slot on large feed gear



Auto feed assembly viewed from above right



Auto feed assembly viewed from above left



Auto feed assembly taken apart, in approximately correct orientation, parts numbered to correlate with numbered notes

B. Reassembly

1. Replace handle, spacer and bolt in rear opening of long feed arm
2. Slide head of bolt into slot of eccentric gear and tighten gently.
3. Replace worm feed gear shaft with gear through bottom of upper cross feed arm, which is attached to long feed arm.
4. Replace collar on feed shaft to position above upper cross feed arm.
5. Replace worm gear with pin onto feed shaft.
6. Replace short feed arm onto bottom of feed shaft. Red fiber washer is between bottom of lower cross feed arm and lower bracket.
7. Attach long (upper) feed arm to short (lower) feed arm with bolt. Orientation of the two feed arms is important. The hinged (pinned) joint of the long (upper) feed arm and upper cross feed arm should be 'away' from the frame with the angle formed by the two pieces pointing away from the frame. The short (lower) feed arm/ lower cross feed arm joint is near the frame with the angle formed by the two pieces pointing toward the frame. This should result in the upper feed dog being to the left and the lower feed dog being to the right when looking from the front.
8. Replace bottom bracket.
9. Replace cotter pin into eccentric gear shaft.
10. Replace top bracket onto worm gear feed shaft with red fiber washer between bearing and worm gear.
11. Attach reassembled auto-feed assembly to frame. For lower bracket, rear bolt has head on left, nut on right. Front bolt has head on right and nut to left
12. Replace springs in feed dogs. Both feed dog springs must have sufficient tension for auto-feed mechanism to work.
13. Move all gears, shafts etc. to be certain that orientation of parts is correct and that all parts move easily.



Reassembled auto-feed assembly



Auto-feed assembly replaced on machine

11. Replace fly wheel shaft and its four gears.
12. Remove brass release latch from top of double gear and remove spring. Remove screws that attach smaller to larger gear. Clean and paint parts.
13. Reassemble double gear assembly with spring and brass latch. Place double gear assembly onto bevel gear in the lower position to allow exposure of pin hole. Rest bevel and double gears in appropriate place on frame.
14. Replace fly wheel shaft through top of frame. Pass shaft through small feed gear with set screw toward the top. Do not tighten set screw until shaft is seated in bottom of frame.
15. Continue to lower fly wheel shaft and pass shaft through double gear assembly and bevel gear.
16. Align holes in bevel gear and shaft and replace pin. Try to replace pin in exactly the original orientation. File surface of pin and shaft as needed so that it is flush. Replace trip and spring for gear change latch.
17. Replace trip and spring for gear change latch.



Fly wheel shaft double gear in upper position on bevel gear



Double gear and bevel gear



Brass gear release latch moved to expose spring



Fly wheel shaft and gears before reassembly



Mandrel shaft and gears replaced view from left

18. Replace mandrel with chuck and large and small gears with hubs.
19. Remove safety chuck for cleaning. Loosen knurled top collar to remove Jacobs chuck and adapter. Slide lower smooth chuck collar upward to expose triangular pressure wedge. Remove wedge. Wedge is replaced with pins fitting into notches on mandrel, with pins toward outer aspect of shaft and larger end of wedge facing downward. Lower chuck collar can now slide off bottom of mandrel. When replaced notch in collar for wedge faces downward. Threaded knurled collar screws downward and can be removed.
20. After cleaning reassemble chuck onto mandrel.

21. Place small and large gears with hubs in place on frame. Large gear is higher and small gear is lower. Both hubs face downward.
22. Slide large brass retaining nut onto bottom of feed sleeve shaft and retain with split washer in groove of sleeve. Bevel in washer faces downward.
23. Slide mandrel through bottom of frame, passing through the two gears with hubs.
24. Place ball bearing in top of mandrel shaft and attach mandrel to feed sleeve with large brass nut. Nut has left hand thread. Hand tighten only to avoid stripping nut. Replace lower bearing adjustment bolt and tighten to remove any play of mandrel within gear.



Original 'safety chuck' holding newer Jacob's chuck with adator



Safety chuck with lower collar slid upwards to expose pressure wedge



Pressure wedge removed and sitting in correct orientation



Safety chuck removed (wedge is sitting backwards)



Mandrel shaft and all parts prior to reassembly



Top of mandrel shaft with large brass nut, split washer and ball bearing



Large brass nut held in place by split washer in groove of pinion rack sleeve



Ball bearing in top of mandrel shaft



Mandrel shaft and gears replaced viewed from right



Mandrel shaft replaced viewed from left

25. Replace crank/pulley shaft with support bracket, bevel gear, pulley and collar.
26. Loosely attach crank shaft support bracket. Bolts are to right and bolt with flatter head is placed anteriorly to avoid bolt contacting bevel gear.
27. Slide shaft through bearings. Support shaft bolts should be tightened when bracket is well-aligned. Bolts must be tightened before bevel gear is in place.
28. Replace bevel gear and tighten set screw.
29. Replace pulley. Tighten pulley set screw with bevel gear snugly against frame on right and pulley likewise on left, to remove any right/left play of shaft.
30. Replace collar and tighten set screw.
31. Check that all parts and gears move/turn freely.
32. Replace flywheel, crank handle and table. This machine was missing these parts. They are however almost identical to those on a similar machine that I have, a Canedy-Otto No. 14. I will 'borrow' these parts from that machine for the New No. 16's formal portrait.



Support bracket attached with 'flat' head bolt in front



Shaft and bevel gear replaced



Crank shaft, bevel gear, support bracket and pulley replaced. Viewed from right



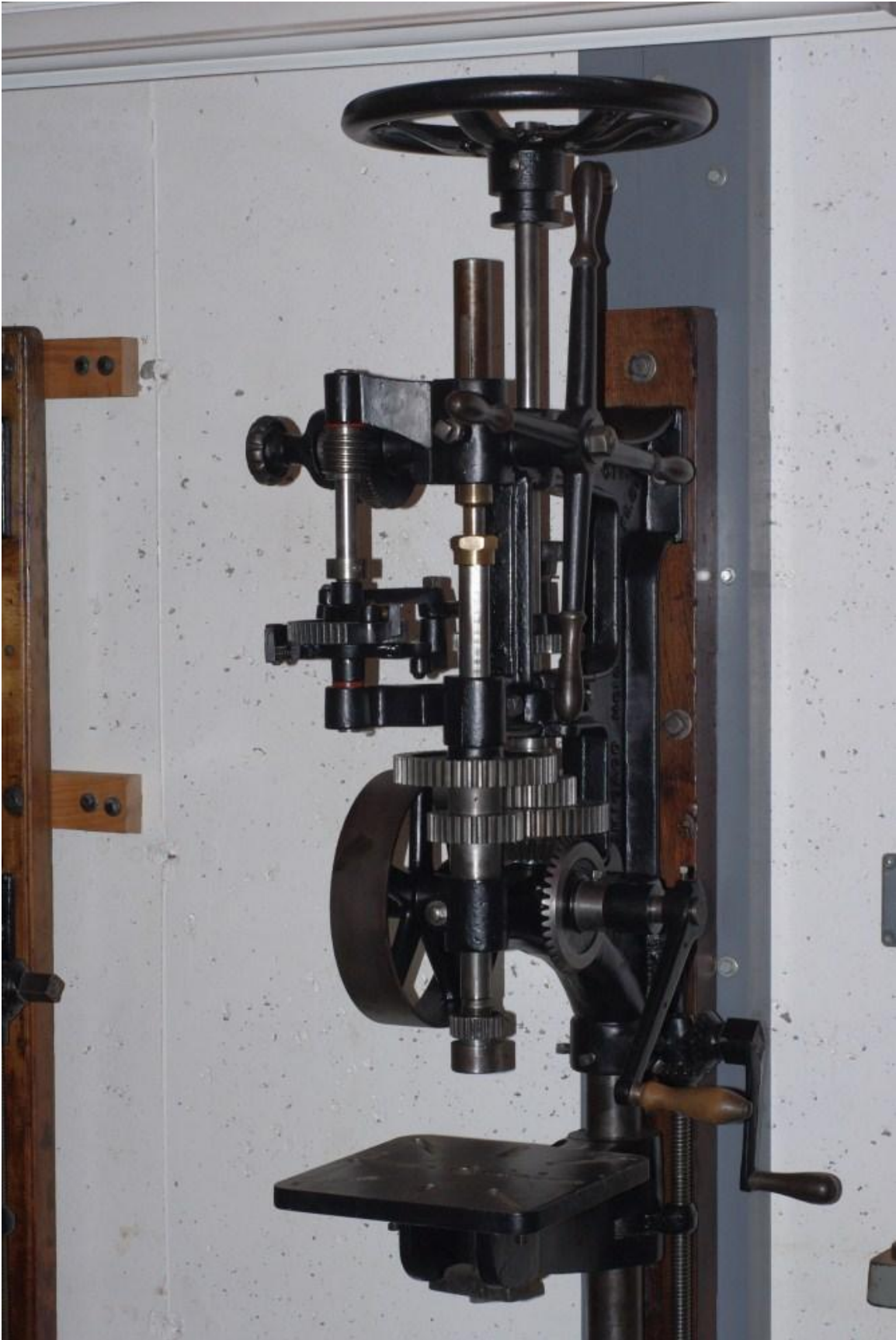
As above, from left



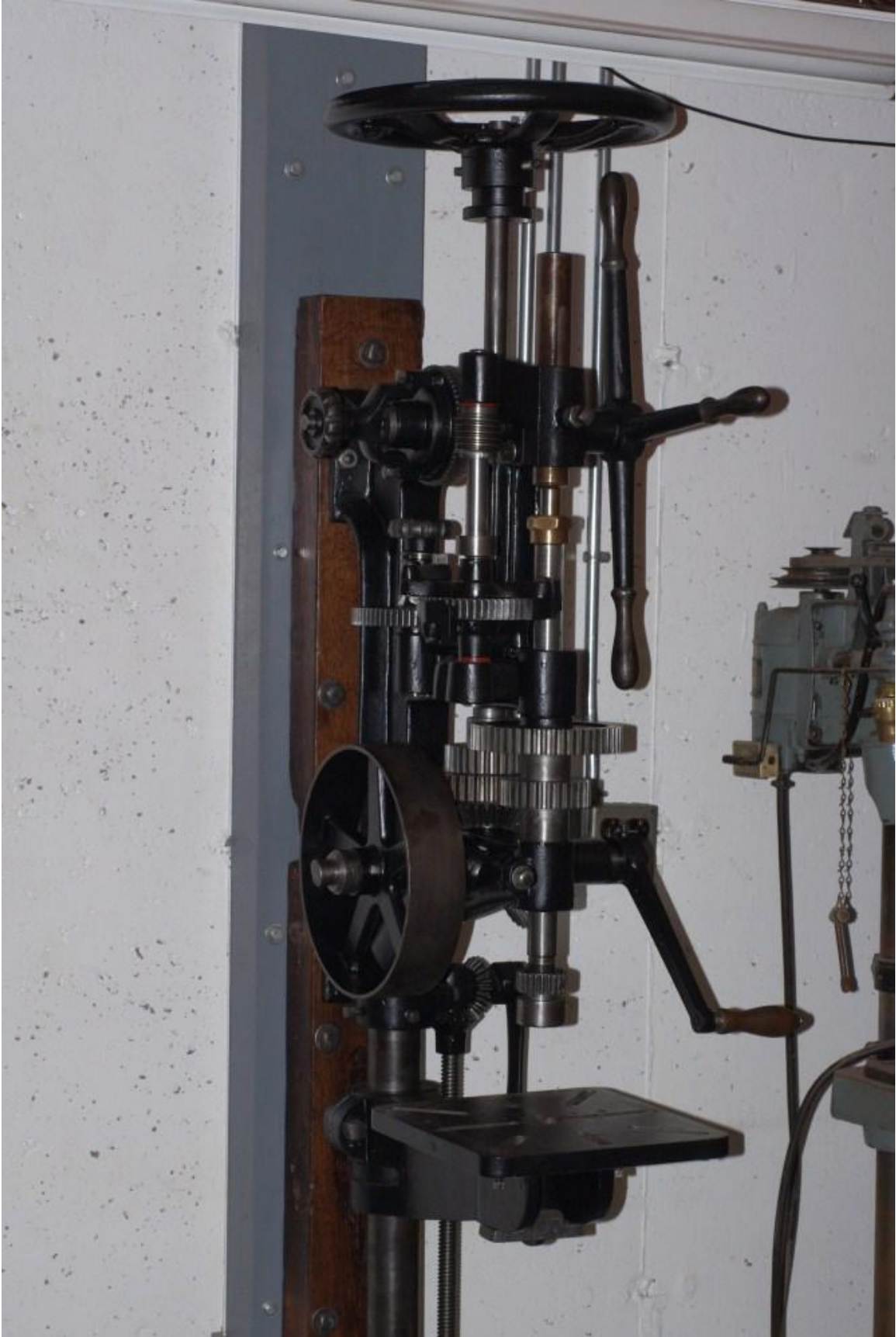
Restoration complete, viewed from right



Restoration complete, viewed from left



With flywheel, table and crank handle, viewed from right



As above, viewed from left

