# Delta 22-101 Planer

## Rebuild

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**Background**

After almost 20 years of using a lunch box planer I decided to add to my OWWM machines and started searching for a Delta 22-101 5” X 13” surface planer. A search of the online auctions brought mixed results and any machines that seemed acceptable or close enough to go look at before bidding were all at premium prices. So I tried my luck by placing an ad on BOYD. While I had some replies the prices seemed a bit high for this bottom feeder. I received a lead from a member who had seen an ad on craigslist for a Delta planer. I contacted the owner via email and started corresponding about the specifics of the planer. After the email exchange and some pictures of the planer a deal was struck. Oh, did I mention the planer was near Philadelphia and I live just west of Pittsburgh.

**Machine Information**

The machine is a 1959 model originally purchased by a school in the Philadelphia area and resold to the previous owner a few years back. Other than a few small issues the machine was in respectable condition considering it is 50+ years old. With the exception of the usual multiple layers of paint, nicks and scratches, there were a couple of the deep scratches in the table and a problem with the clutch disengaging while the machine was running. The owner’s solution to the clutch problem was to tie the handle in the engaged position with some rope. My thought at the time was it wasn’t a deal breaker and a minor adjustment would take care of the problem. It also came with a 5HP single phase motor which the previous owner said he had a local motor shop rewire a couple of years back. Now you know as much of the machines history as I do. So let’s get started. Hopefully the pictures will help.


The planer, motor, base and lifting equipment in my Traverse ready for a trip to its new home.

After a couple of hours of work, we removed the motor, the planer stand and motor mount plus wiring and trying to lessen the planers weight so moving it across the owner's basement, up a couple of steps, across his lawn and up about 6 steps to the driveway we got the planer up and into the back of my Traverse.

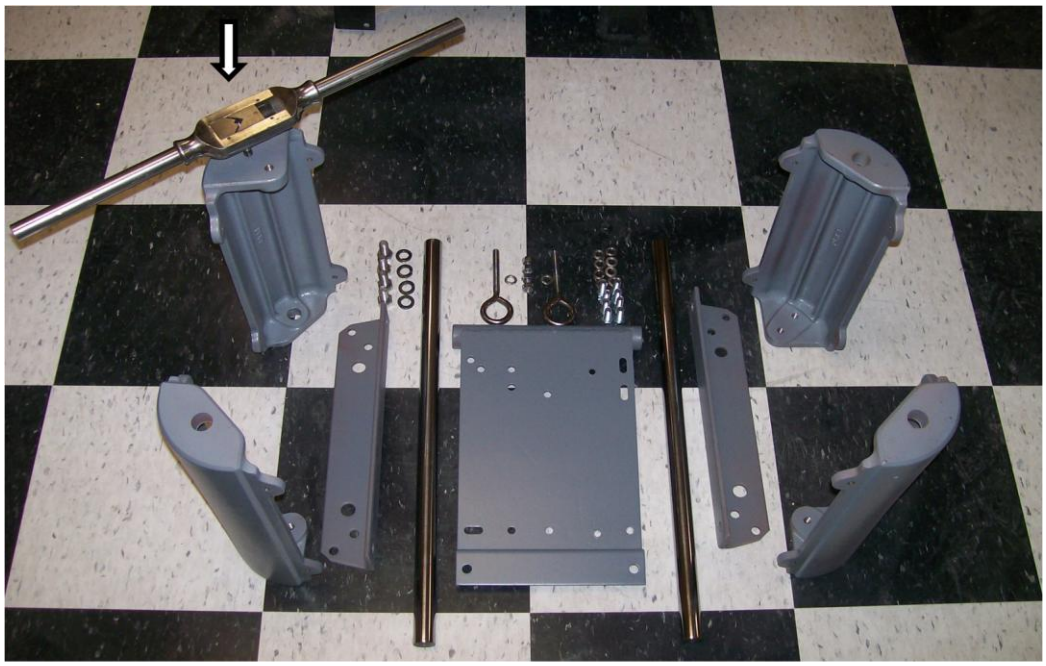
The planer out of my vehicle and on terra firma ,well almost.

The planer unloaded it from vehicle and sitting on a dolly in my garage near Pittsburgh. The next few days were spent taking the planer apart and recording the disassembly with photographs. It is surprising how different parts look after they are cleaned and painted. I also printed off a copy of the planers operators' manual and exploded parts diagram for future reference. The manual is available from the VM site. (http://vintagemachinery.org/pubs/1141/509.pdf) and I call it my sanity checker. More on that later.

Well after taking the machine apart, cleaning, and preparing it for paint, I did an assessment of the parts and pieces looking for those parts that would need replaced and those that would just be cleaned and reused. The table was a major part which I decided to have machined to remove a few deep scratches. The scratches in no way hindered the operation of the planer nor were they proud of the surface so as to not mar the surface of the wood as it is being planed but I didn't like the cosmetics so off to the machine shop for a regrind. I didn't document the cleaning and painting steps because it was fairly mundane stuff and I don't like getting the camera all greasy. The paint was sound and there was no rust so I just sanded the castings and other parts feathering the scratches rather than blasting with some type of media. Media blasting or chemical stripping removes the paint along with any filler material the factory may have used to fill casting flaws and smooth the roughness of the sand casting. Leaving the factory filler saves a good amount of paint finishing time. So after the last of the painting is finished it is time to put it all back together. During the disassembly and cleaning time I also took inventory of missing and broken parts using the sanity checker as my guide. I also checked the

various chains, sprockets, gears, bearings and bushings for excessive wear and decided which ones I will replace and made a note to start looking for suppliers. So begins the journey.

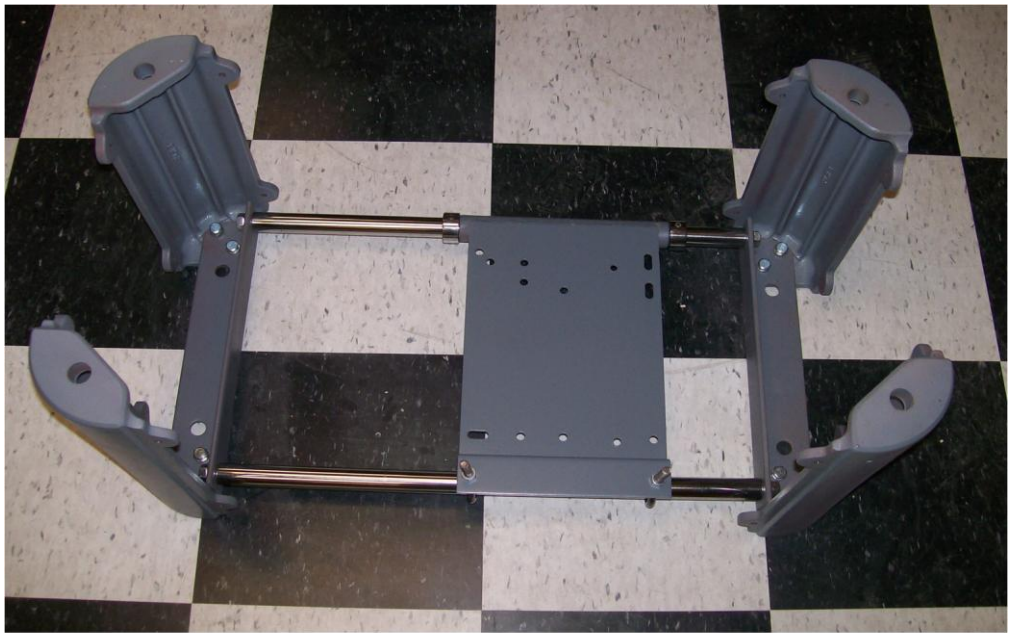
I started the reassembly of the machine, with what I called “laying the foundation”, right where it is going to spend the rest of its (or my) life. I staked out an area in my shop that will allow me to surface boards up 12 feet in length doing so places the planer right in the center length wise in my shop. For those who have limited space or who want to be able to move their planer around their shop I recommend that this is about the best time to get the planer on a mobile base if that is your intention. This planer is heavy and even the stand is heavy and weight adds up very quickly. Just a suggestion.



Machine stand and all the required hardware. Arrow showing tap and handle used to clean out tapped holes. (see text)

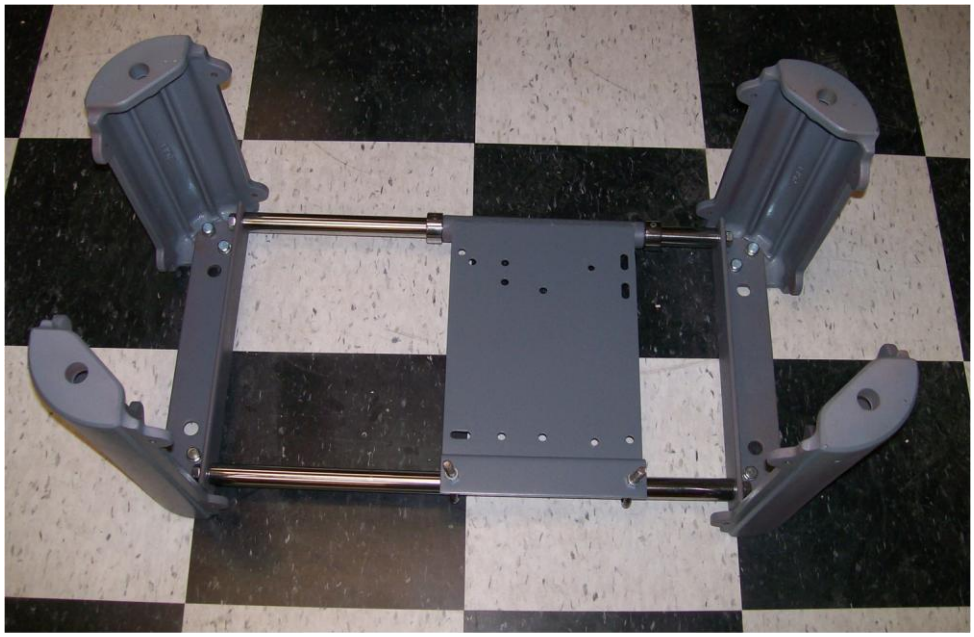
With all the hardware and various pieces that make up the machine stand and motor mount the assembly of the stand begins. While I’m thinking of the motor I decided to install the motor at a later time because I'm undecided about using the existing motor or installing a replacement.

Something I do mainly as an old habit and because it makes starting bolts easier and helps eliminate cross threading is to clean out all the threaded holes before I reassemble almost everything. Running a tap through the holes removes paint, any remaining dirt and chases the thread. It is also much better to find a thread problem now when everything is still in manageable pieces rather than when you are 90% complete with the reassembly and the only way to fix it is to take it all back apart. Another practice I employ is placing a little dab of anti seize lube on the bolt threads. The anti seize helps lubricate the threads and prevents the bolts from seizing making their removal much easier for someone (maybe you) years from now.



Assembled stand ready for machine base

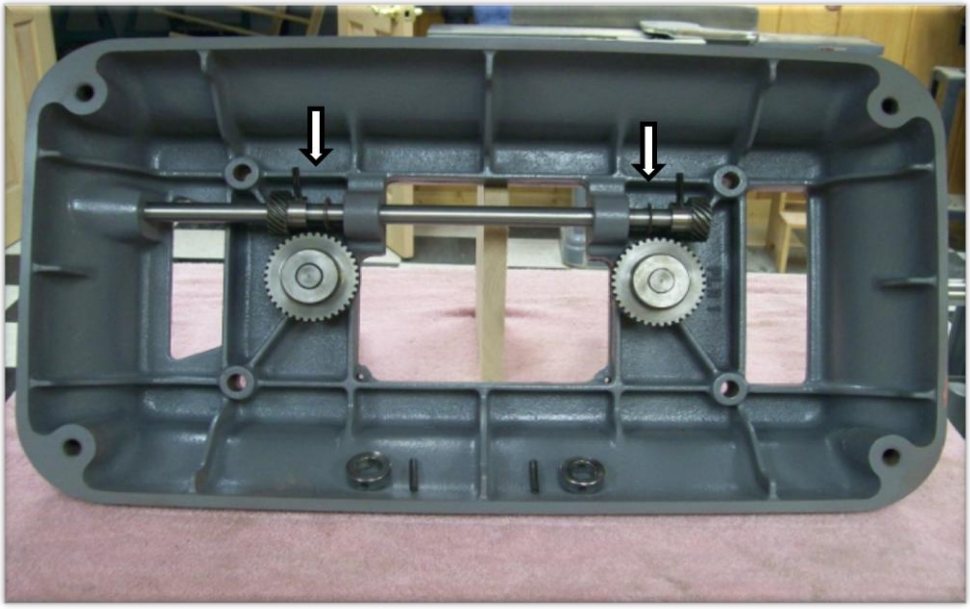
The machine stand completely assembled, at least all the bolts are in the holes and snug enough to hold everything in place but loose enough to allow final alignment. Since the stand is made up of several individual pieces and the machine base, which sits on top of this stand is one piece with holes that need to match up with the pieces of the stand I'll attach the machine base install those bolts get everything aligned and then tighten everything. This saves cross threading bolts because the holes aren't properly aligned and potential cracked or broken cast iron. Trust me cast iron is sometimes like glass but please don't ask me how I know. It was a long time ago and a long story.



Assembled stand ready for machine base

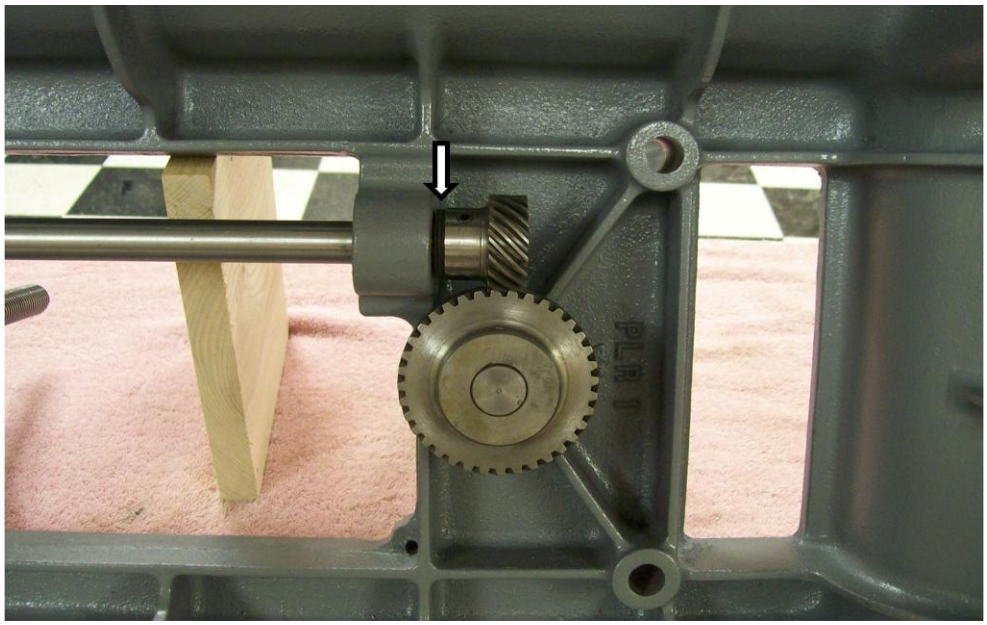
The machine base and its hardware, including the raise/lower shafts, gears, roll pins, and washers which make up the assembly. There are a number of spacer washers which are used to adjust the alignment of the pinion 18 tooth and elevating shaft gears.

Machine base and raise/lower assembly parts. Not shown are the Spacer Washers.

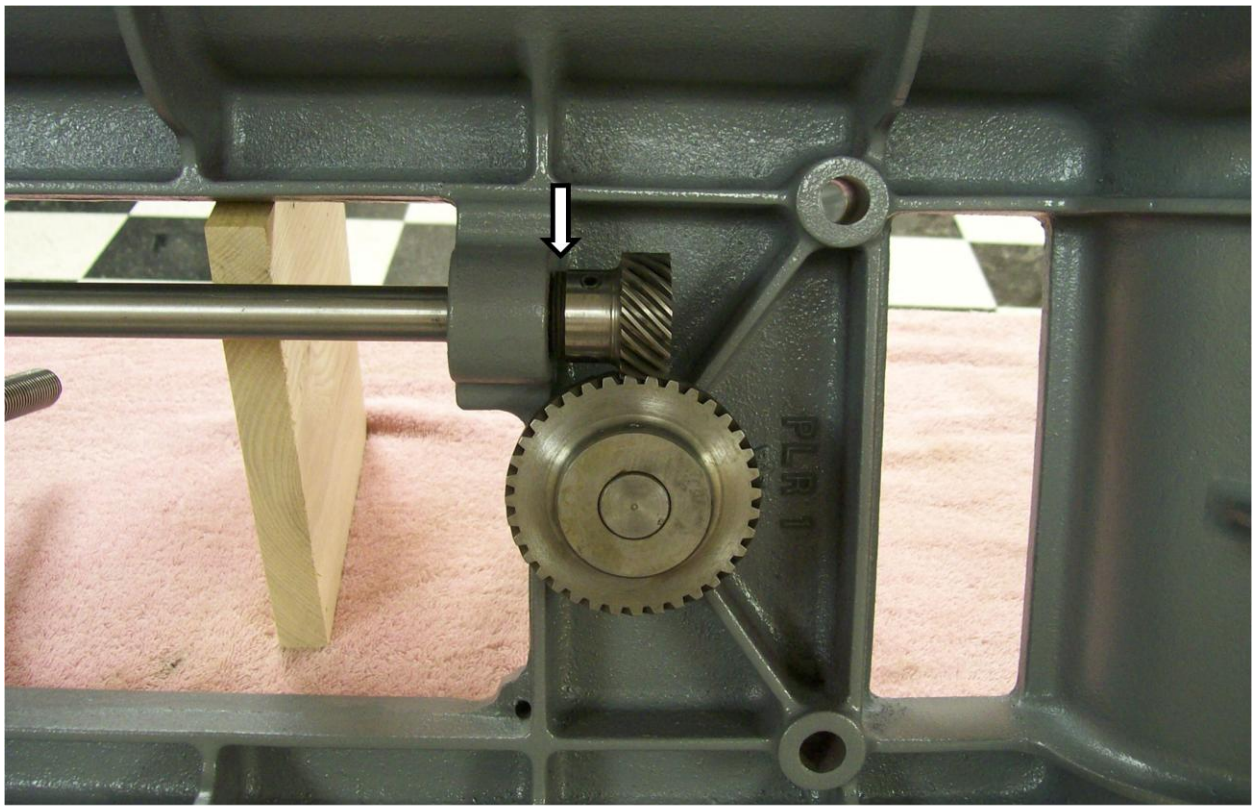


Arrows indicating washer placement. The right side required 3 of the 3/4x 1/6 washers to properly shim the shaft/gear for smooth operation of the raise lower drive gears.

The machine base inverted so the various pieces of the raise lower assembly can be installed. Before the threaded shafts are installed in the base the holes are cleaned and wiped with a slight coating of oil. The shafts received a light coating of a dry lubricant as did the teeth of the gears before they were inserted into the holes. The pinion shaft was installed in the cleaned and lightly oiled holes in the base along with the gears and spacer washers.

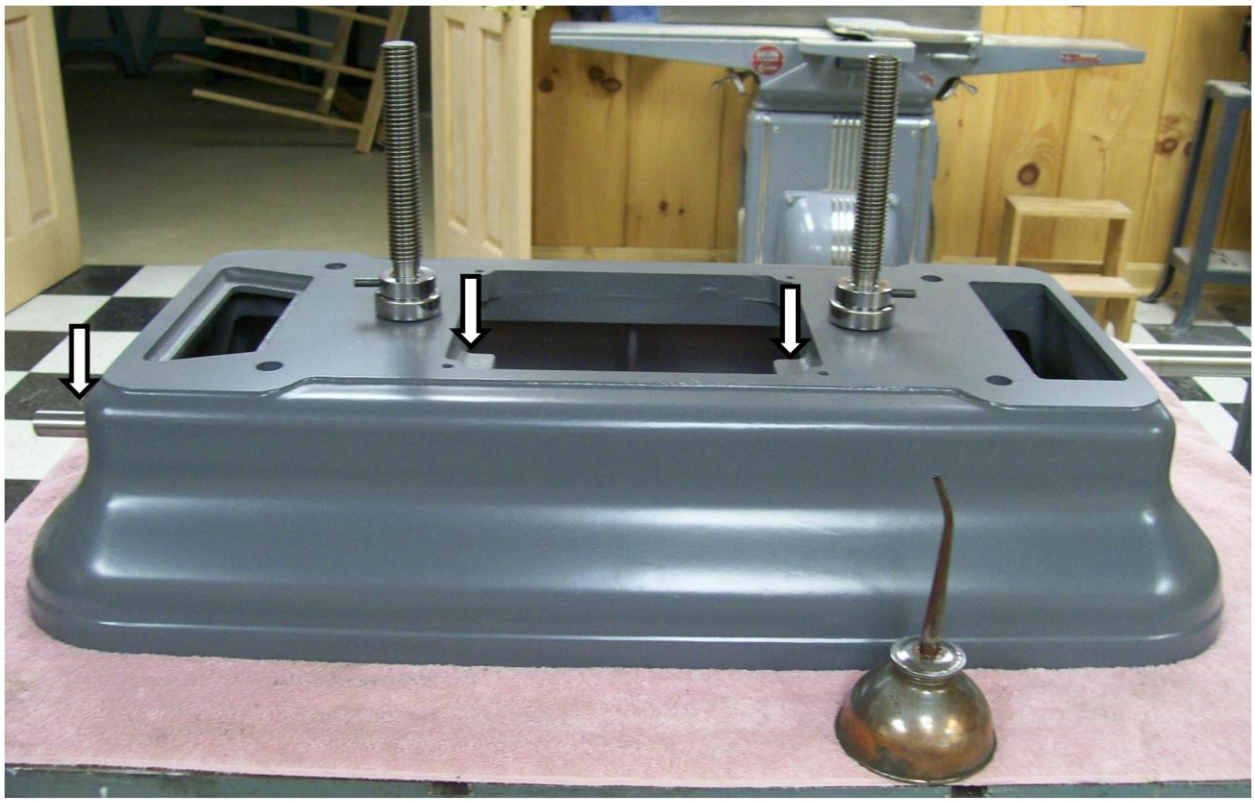


Arrow indicating the necessary thickness of washers required to remove end play – your results may be different..



Arrow indicating the necessary thickness of washers required to remove end play – your results may be different..

The number of washers needed to reduce shaft end play on the right side of the shaft is determined during/after installation. In my case I needed 3 of the 3/4 X 1/16 washers to eliminate the end play. The end play adjustment should be snug but still allow smooth rotation of the pinion drive shaft.

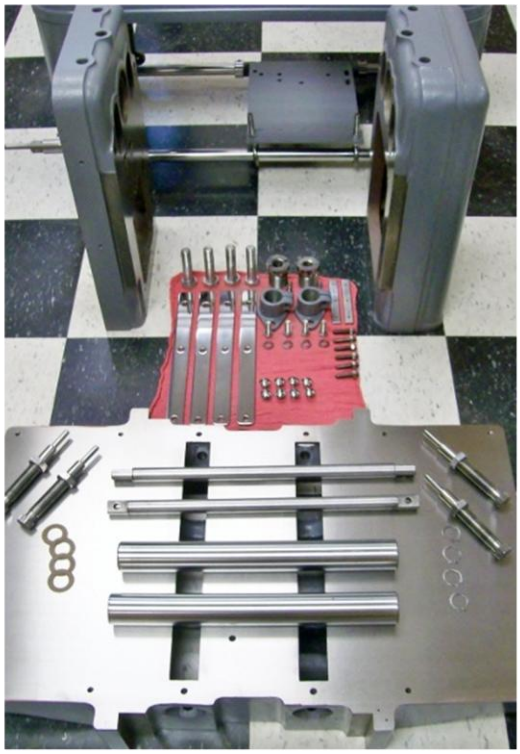


Base with bearings, shaft collars and roll pins installed. Arrows indicate recessed holes in base casting for oiling the raise lower shaft bearings.

The machine base right side up. Arrows indicate holes in the base to oil the pinion drive shaft for the raise lower assembly. I added a few drops in each hole now rather than later because memory being what it is, I had an oil can handy and I knew I would forget about it if I didn't do it right now. At this point the threaded shafts have the thrust bearings in place, mine were Nice 4962's, shaft collars and roll pins are installed and the base is ready to be installed on the stand. Did I mention that even at this stage this machine is heavy.

Assembled machine stand and base.

The Assembled Base and Stand bolted together. After aligning the Stand's legs with the Base, the attaching bolts are fully tightened along with the bolts attaching the motor assembly rails. If you are ready to mount and wire your motor I would do it now. I haven't decided about what I am going to power this machine with as of now and I want to proceed with the assembly so I mount and wire the motor later.



Machine Columns, Table and associated hardware required for assembly.

The Table and Columns are up next in the assembly sequence and this slide shows all the hardware that makes up the assembly, including the Fiber Washers, Snap Rings, Shoulder Bolts, Adjusting Nut Support, Adjusting Nut, Gib Plates and Special Set Screws, Guide Rails and their Truss Head Screws.

I mentioned that I had the table reground to remove a few .020 deep scratches by a local machine shop which cost me $70. A few notes about how the table was reground. The machinist first made a squaring cut on the bottom of the table where the adjusting nut supports attach and referenced off of that to grind the surface. Mechanically the top and bottom of the table are perfectly parallel. Aesthetically I believe it looks better than it did when it left the factory maybe even flatter.

Adjusting nut support and adjusting nut attached to the table elevating screw ready for table

The Adjusting Nut and Adjusting Nut Support assembled and threaded on the Table Elevating Screw. The Adjusting Nut was lightly lubed with some lithium grease which is shown in a later slide. The Table Elevating Screws will receive a lite application of a dry lubricant as needed. A word of caution is probably due here. The Table is on the plus side of 75 – 80 pounds which is my guess and the Adjusting Nut Support is cast iron and while it is pretty substantial any sudden shock such as dropping the table on them could result in breaking one or both of them while trying to place the table on them. As far as I know the Adjusting Nut Supports like most parts for these machines are as they say unobtainable. So it wouldn't be a bad idea to ask for help with setting the table in place. The table is held in place with 4 – 3/8-16 X 1" hex head cap screws and lock washers with a small amount of anti seize applied.

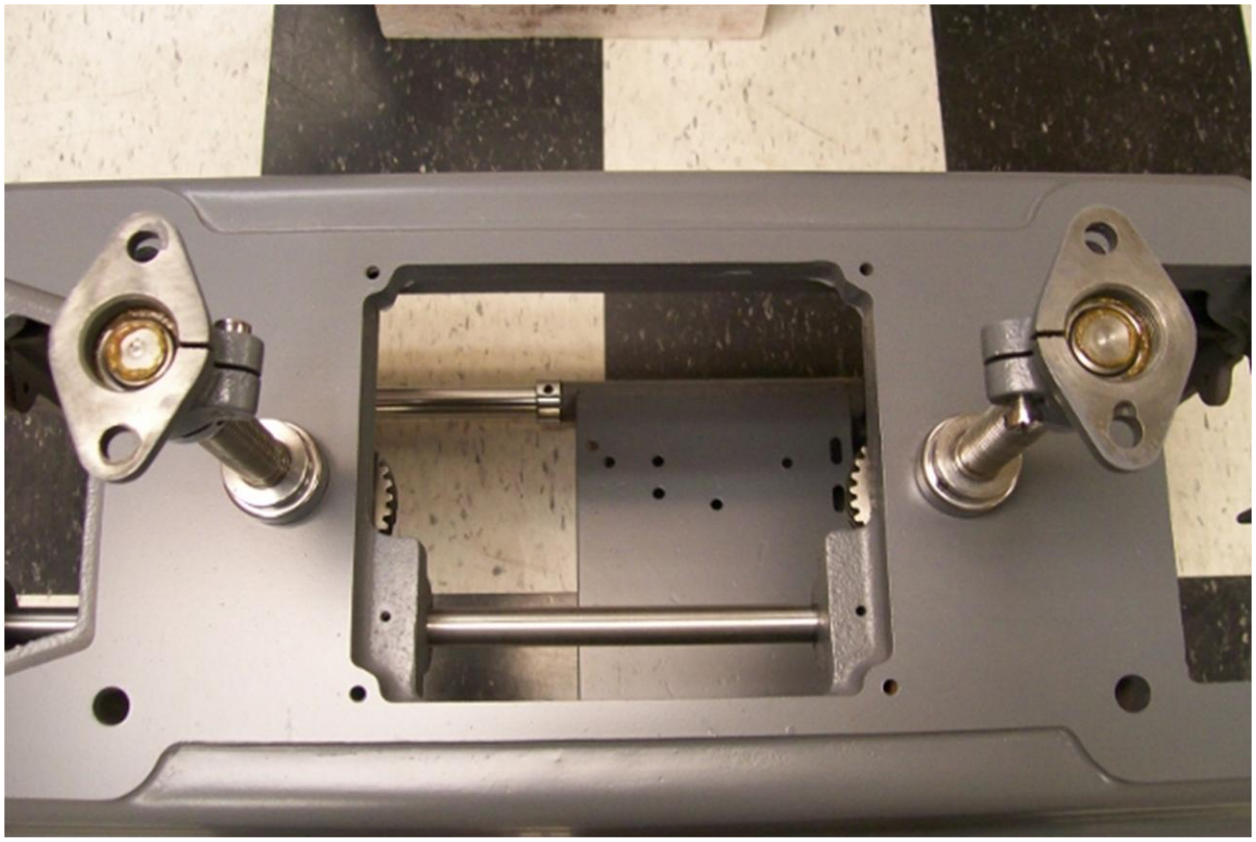
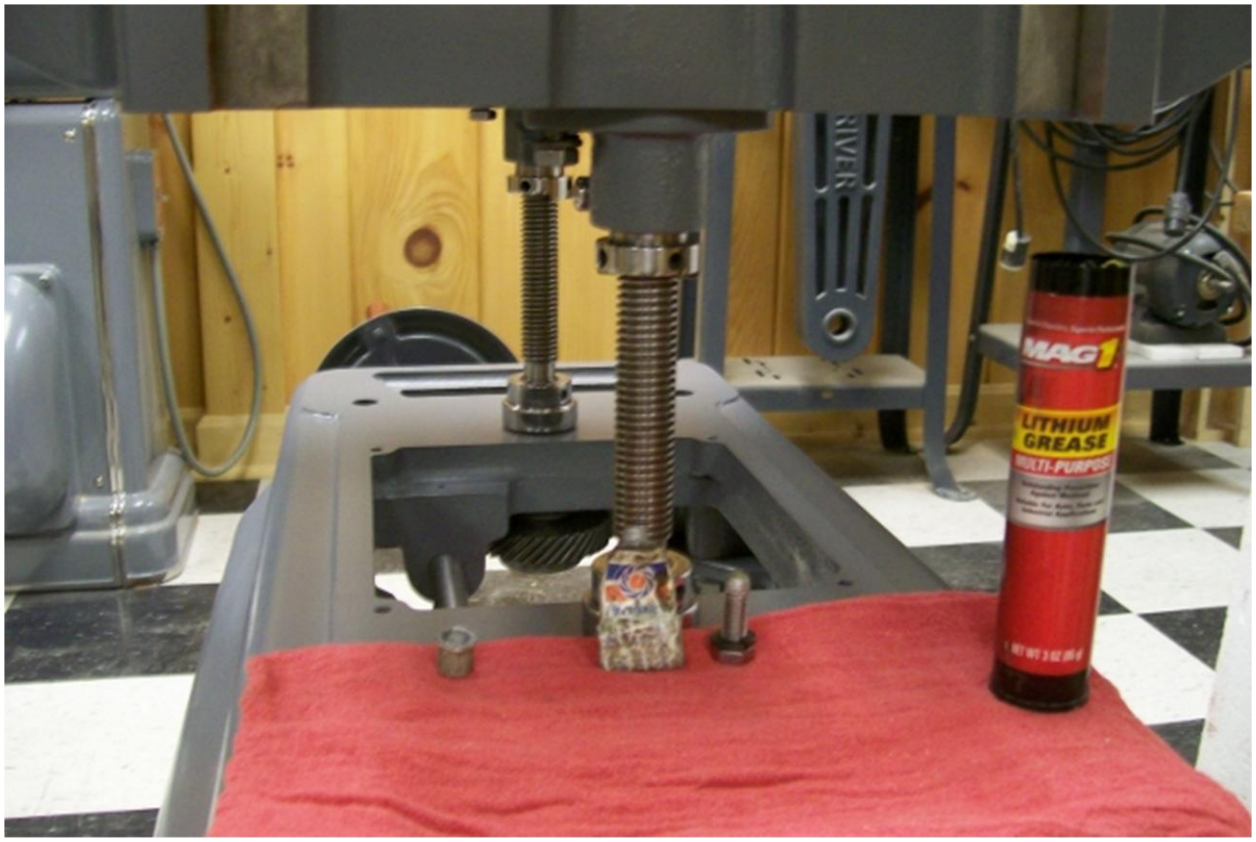


Table Adjusting Nuts lubed and ready to accept the Table

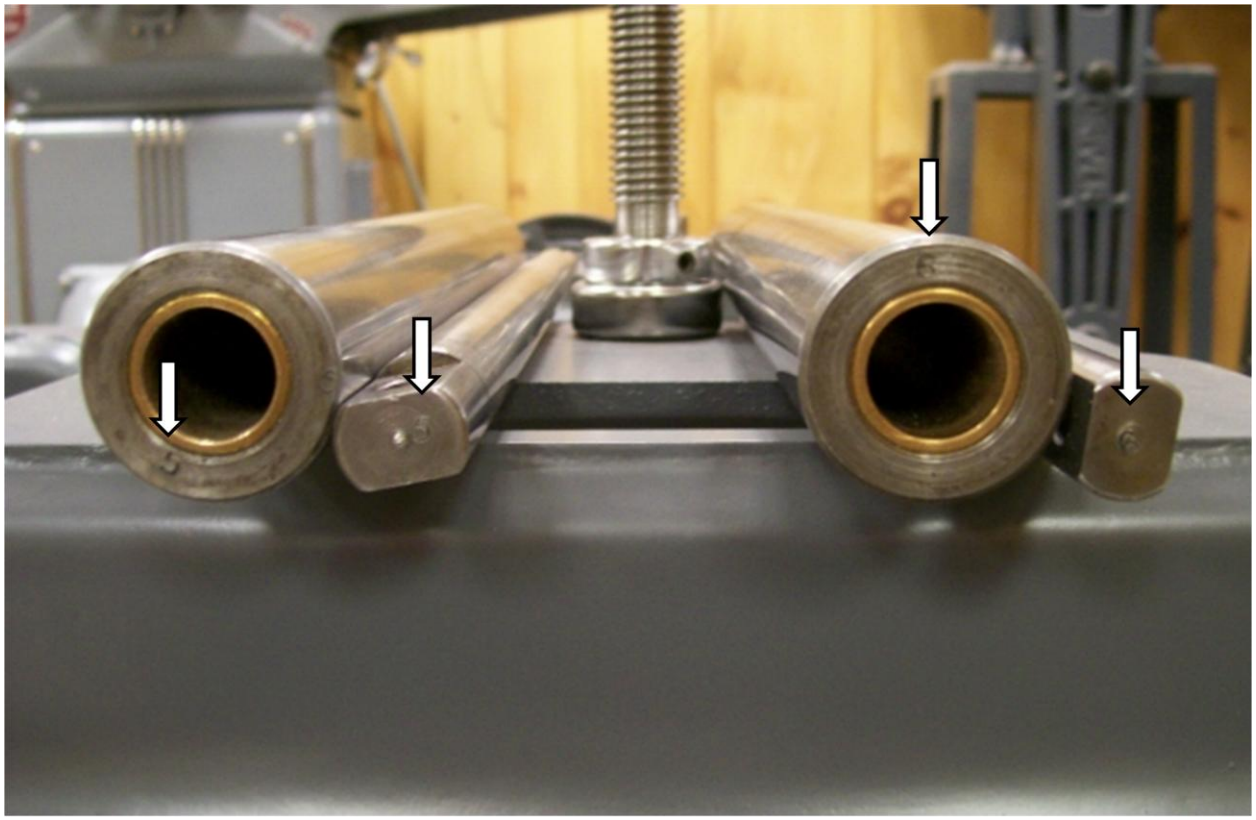
Nothing special here it's just a top view of the Adjusting Nut Support and the lower portions of the machine ready for the table and before the excess lube was removed.




The Table attached to the Adjusting Nut Support and a couple of products I use especially the Anti-Seize.

Here the Table is attached to the Adjusting Nut Supports, well almost there is still the last 3/8-16 cap screw with a small amount of anti seize applied that needs to be attached. I'm sure by now you all may be tired of hearing about anti seize but from someone who has taken a lot of old stuff apart trust me when I say that if a little anti seize had been used when that stuff was initially assembled my work would have been much easier. I had a real appreciation of the use of anti seize when I was the one, years later who had to disassembled something a previous owner or whoever used anti seize when they make repairs. Enough said, no more mention about anti seize.

The Column Supports (no slide) were installed with (4) 5/8-13 Hex Head Cap Screws and (4) Internal Tooth Lock washer along with the (2) Gibs and their (6) 5/16-24 X 1 ½" Special Set Screws and Jam Nuts. Adjustment of the Gibs controls the "play" between the Table and Columns and the "force" needed to raise/lower the table. This adjustment is described in the manual available at the VM site but basically the Special Set Screws are tightened evenly to apply the least amount of pressure against the Gib that it takes to eliminate all play in the table while allowing the table to move up and down smoothly and with minimal effort. After you get the Gibs adjusted properly the Jam Nuts are tightened while securing the Special Set Screws from turning with a screw driver. The procedure is described in the manual I noted on the VM site.



Arrows noting number stamps on Idler Rollers and Shafts

The Idler Rollers and their Shafts ready to be installed in the Table. The arrows note numbers I stamped on the Rollers and their mating Shafts so they could be reassembled with their mating partners. The reason for this is/was the Rollers bronze bearings were very snug and smooth and no wear groves in the bearing or shafts was evident so I decided to not replace the bearings. Thus the stamping allows me to easily match the parts.

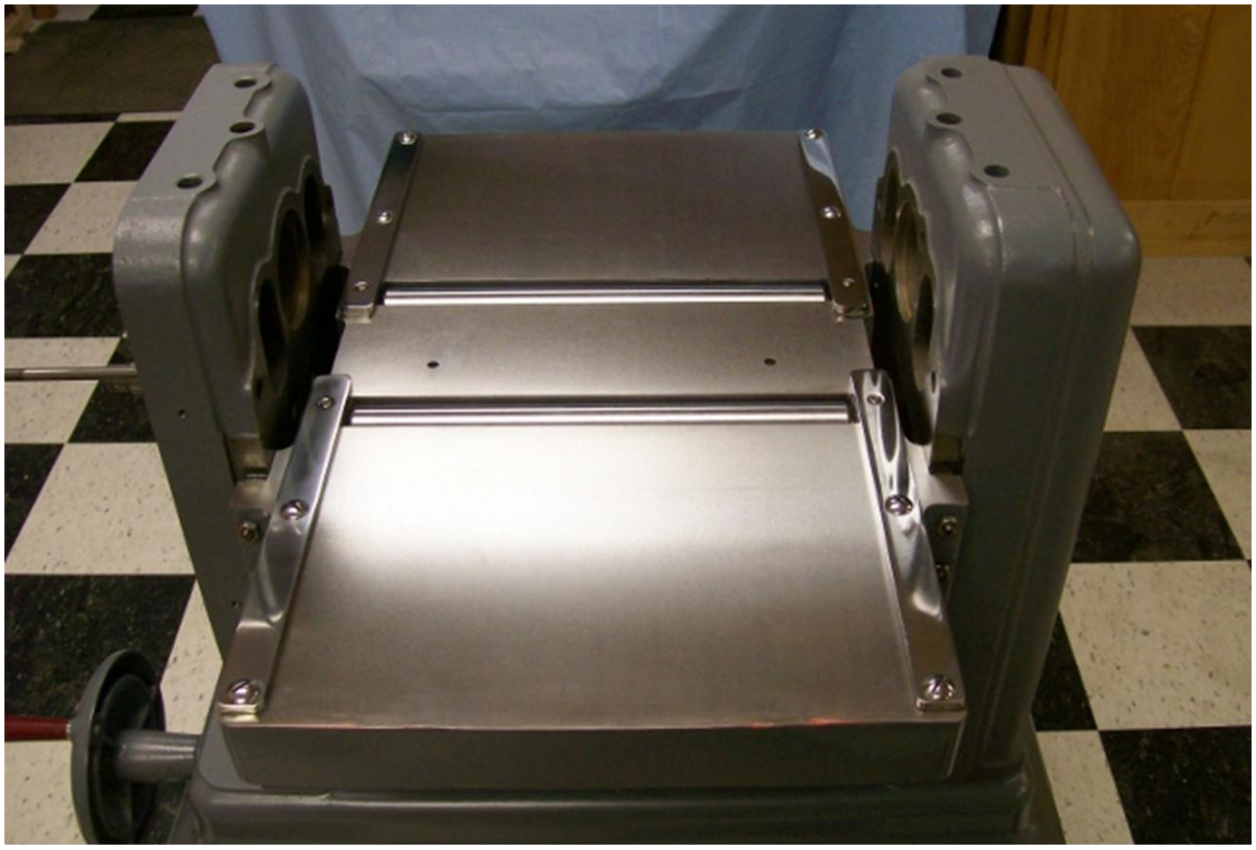
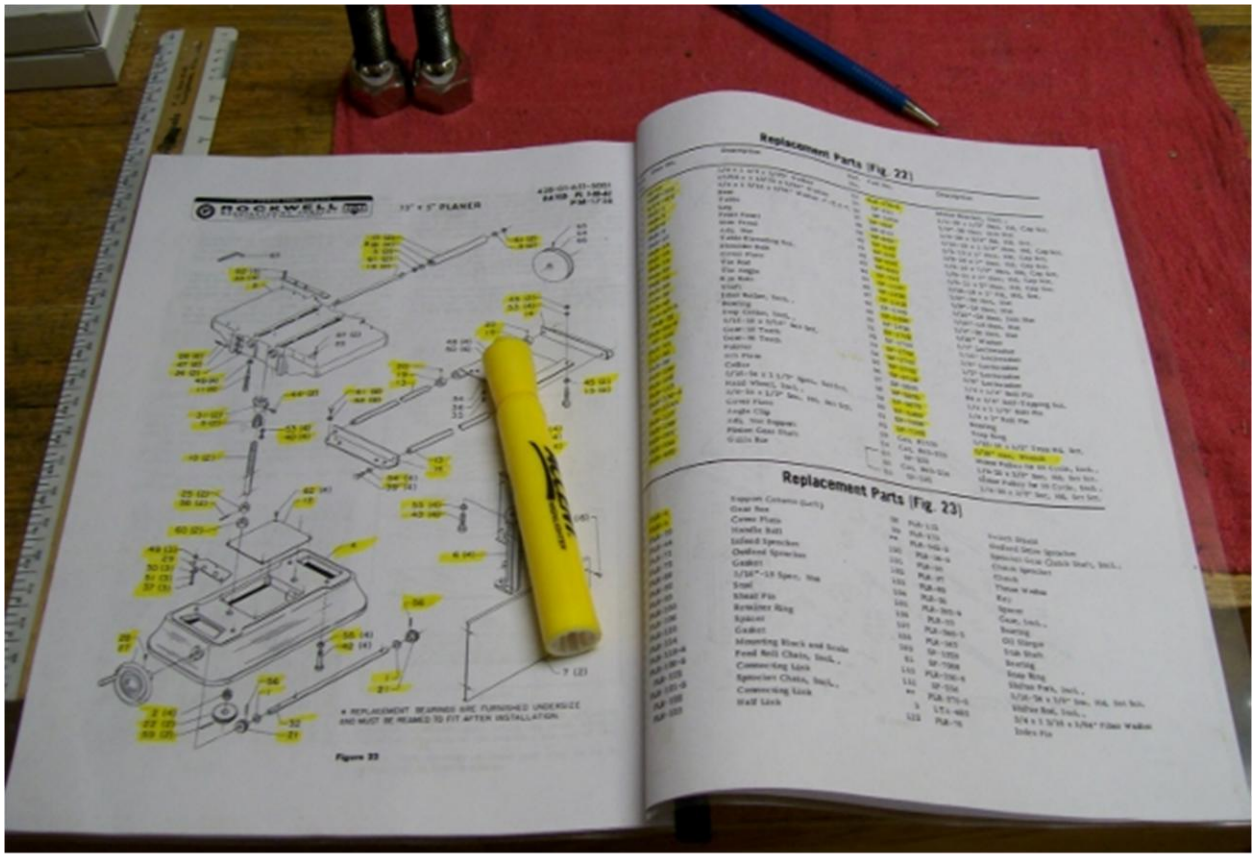


Table assembly with, Idler Rollers, Gib Plates, Adjusting Screws and Guide Rails installed with Support Columns

The completed Table assembly with, Idler Rollers, Gib Plates, Adjusting Screws and Guide Rails installed with Support Columns. The adjustment of the Idler Rollers is detailed in the manual but in the next update I have a slide or two showing the adjustment made using a dial indicator. I wish I had taken a before picture of the table so you all could see the night and day difference.

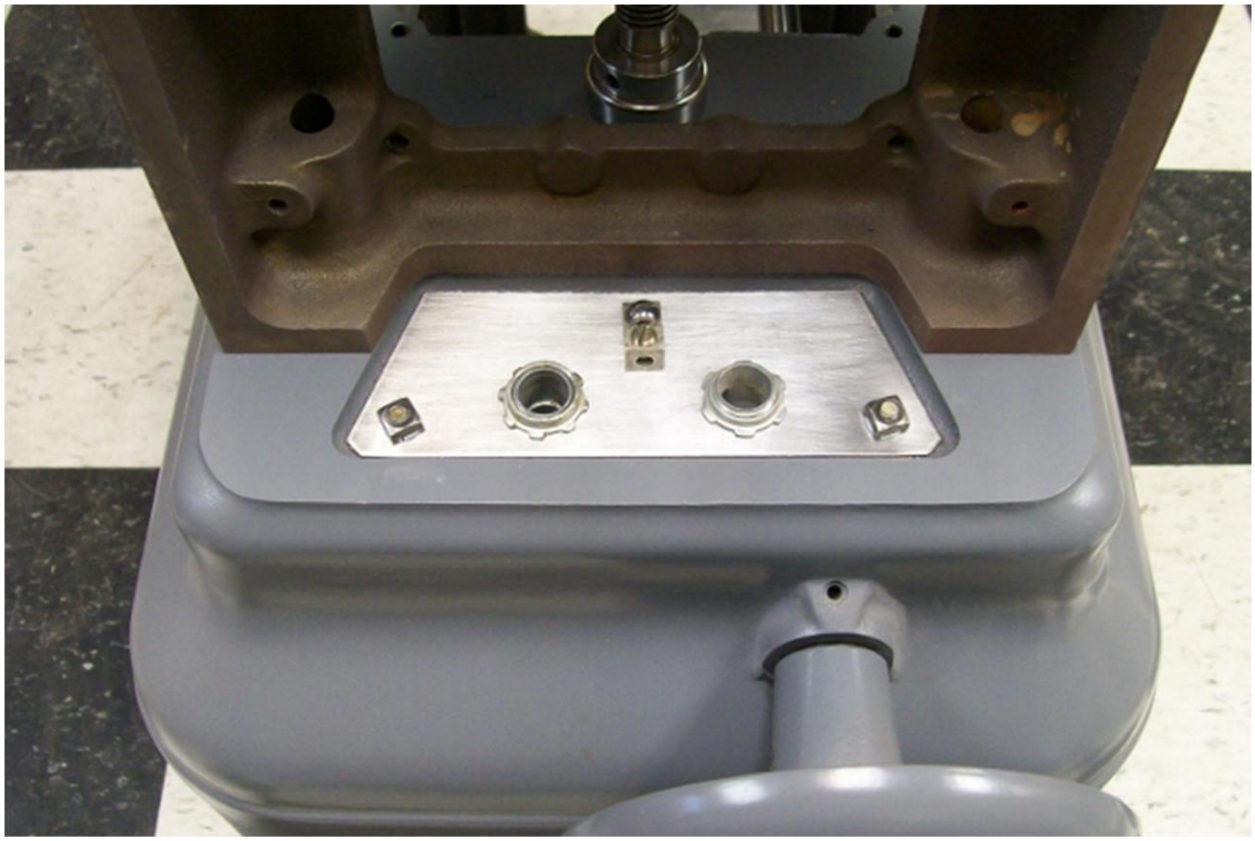
Stand, Base, Table assembly and Support Columns ready for the next phase

Ready for the next phase the Stand, Base, Table assembly and Support Columns. Things will get more and more interesting (complex) as we get more involved with the various sprockets, chains, gears, rollers, cutter head, etc, etc.



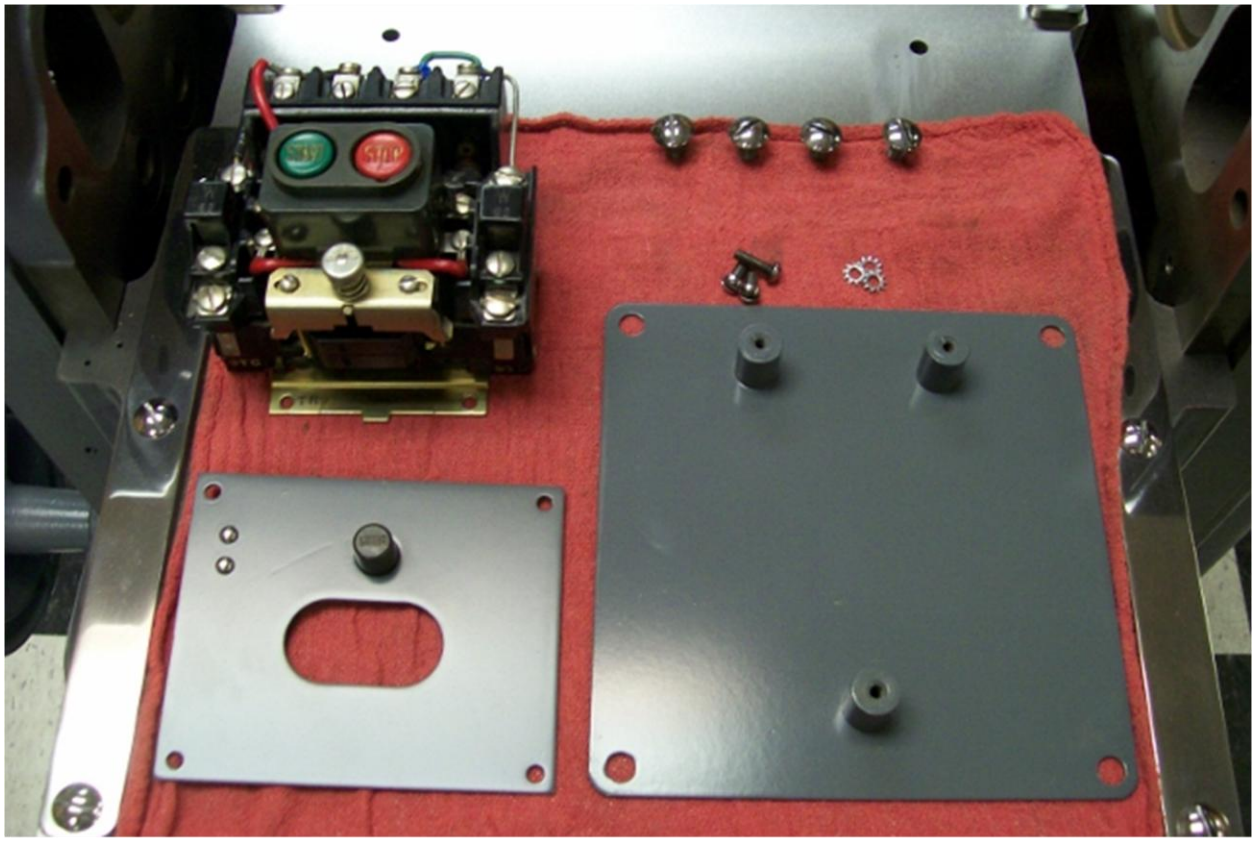

My Sanity Checker

In order to help me account for all the bits and pieces required for this rebuild and as an aid to getting this machine back together as the factory originally did I have what I call my “sanity checker”. It’s nothing more that the parts assembly drawing which details the parts required for the machine and their sequence of installation. I use a highlighter to mark off the parts as they are installed. I also make notes like which nuts and bolts are not tighten because the parts they attach cannot be installed if the bolts are tight. An example would be the Right Support Column. In order install the Out Feed and In Feed Rollers the Column either has to be tilted to allow clearance for the roller installation or removed entirely. Based on how I read the drawing the Rollers and Tie Bars are installed in the Left Column and then the Right Column is installed, sliding the shafts of the Rollers through the Right Column. Then attaching the Column to the Base and then installing the right side hardware for the Rollers and Tie Bars. I elected to tilt the Column to allow me to insert the Roller shafts rather than have the Rollers unsupported on one side during the installation.



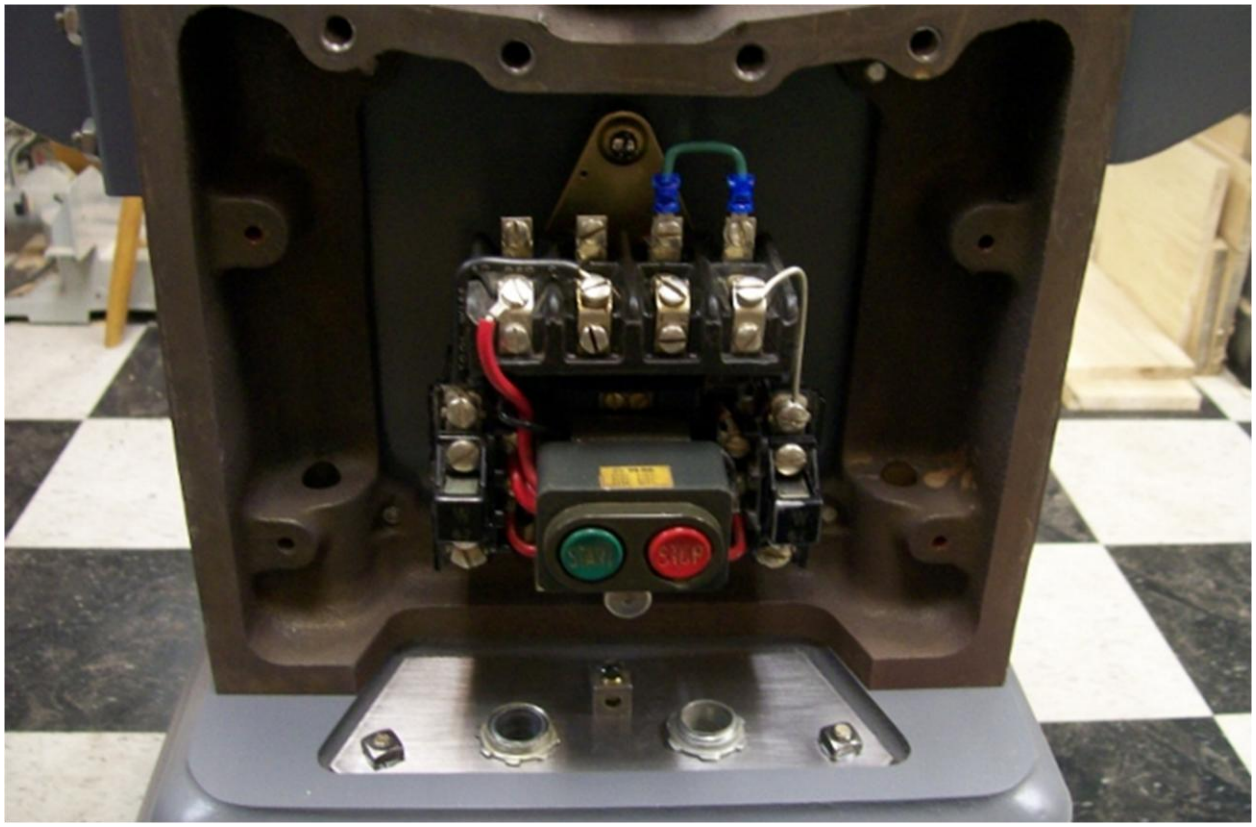
Cover plate and romex connectors installed

This slide just shows the Cover Plate installed with the Ground Lug and the Romex Connectors ready for the electrical wire.



Motor Starter/Switch, Switch  Mounting Plate, Cover plate and mounting hardware

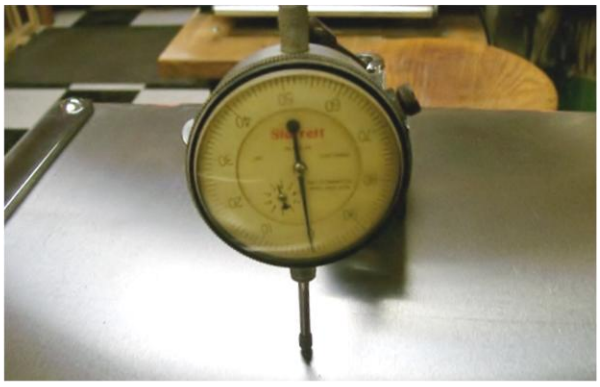
The Motor Starter/Switch, Switch Mounting Plate, Cover plate and mounting hardware before installation. The external lock washers are not shown on the parts assembly drawing and are my addition. Just my little assurance that the Motor Starter/Switch has a good ground to the machine.



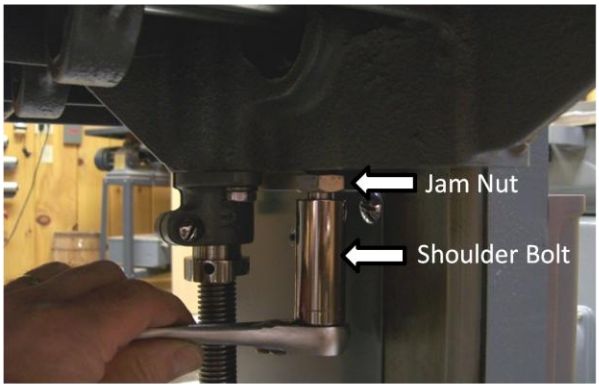

Motor Starter/Switch, Switch  Mounting Plate, Cover plate installed

Motor Starter/Switch, Switch  Mounting Plate, Cover plate installed and waiting for the motor and service wiring which will probably be the last task of this rebuild.

**Idler Roller Installation and Adjustment.**



Setting dial indicator for “0” bed height

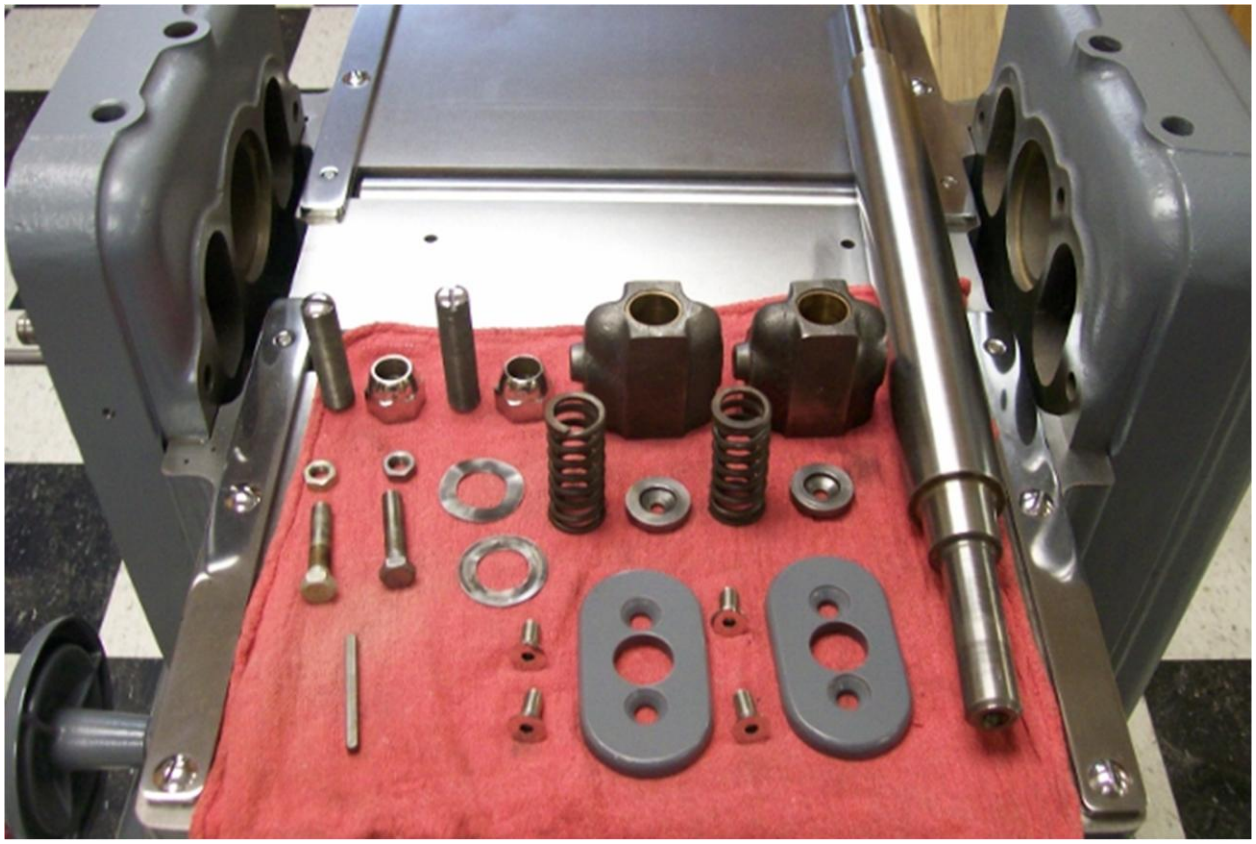



Adjusting Idler Roller height adjustment Shoulder Bolt (inside socket) and Jam nut

Checking Idler Roller height adjustment

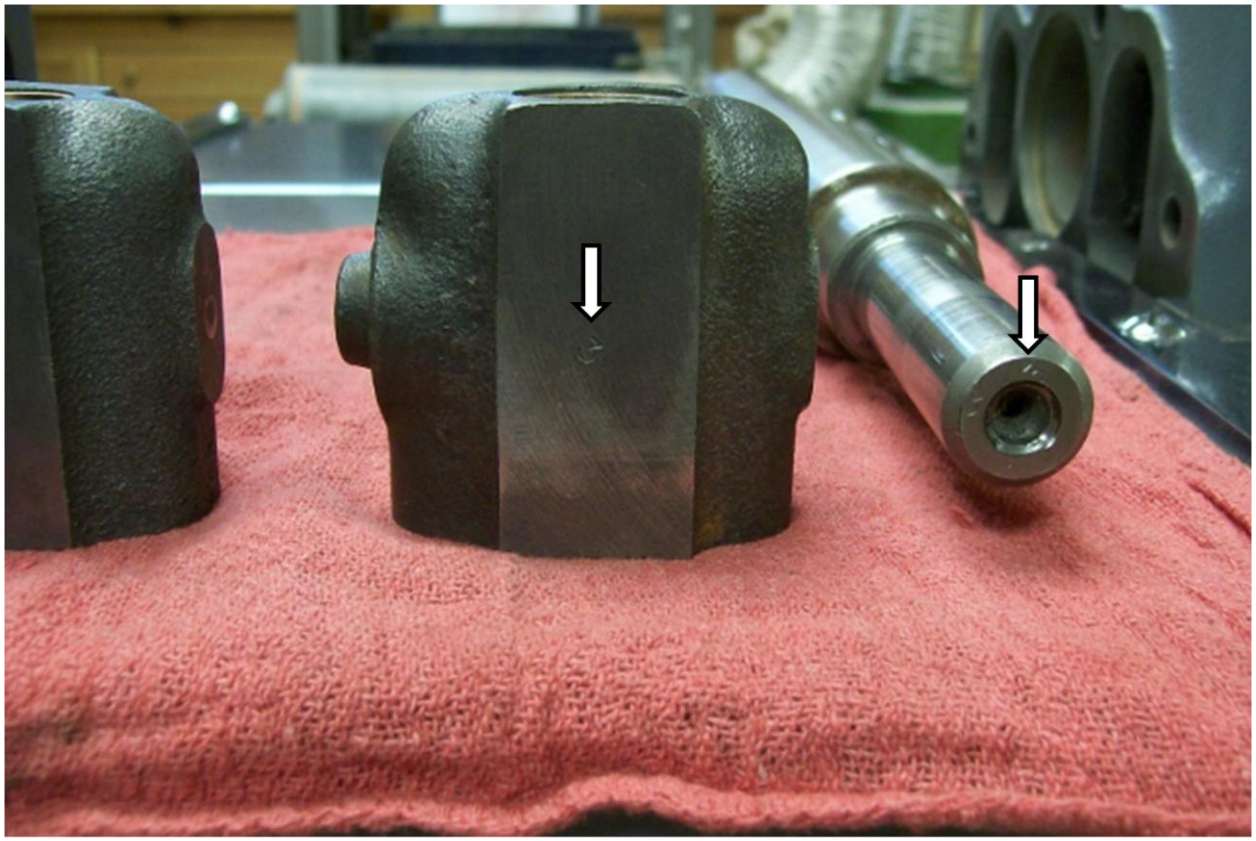
Checking Idler Roller height adjustment across bed

At this point I decided to set the height of the Idler Rollers. I’m sure that I’ll be doing this again before I put wood through the machine but I’ll just call this practice. The first frame (upper left) shows the dial indicator referenced to the planer bed. The planer manual calls for the Rollers to be .005” above the planer’s bed. **Note:** I have found that this .005 dimension works well for smooth boards, however for rough boards .020 may work best. You can best decide what works best for you depending on your stock. The upper right frame shows the adjustment being made to the Shoulder Bolt hidden by the socket Jam Nut that raises and lowers the Roller. After making the adjustment I made readings across the entire width of the Bed/Roller to verify the adjustment. Then the Jam Nut is tightened. I then check the height just to make sure nothing changed when I tighten the Jam Nut.



Outfeed Roller and associated mounting hardware. Not shown are the “O” Rings and Fiber Washers

The Out Feed Roller and it’s associated mounting hardware. The Fiber Washers and “O” Rings aren’t shown in the picture. I just forgot to put them in the picture layout. Another point before the folks with those “detail” eyes pickup on it, I replaced the 5/16-24 X5/8” Flat Head Slotted Screws with the same dimension Flat Head Hex Socket Screws. I had two reasons, (1) the slots on the original screws were really bogered up and couldn’t be restored and (2) I just have bad visions of one of those screws coming loose and falling into the cutter head because even with good slotted screws and a screwdriver of the correct width you really can’t tighten them as well as ones with a hex socket. So I just elected to replace the originals and add a drop of loctite when the new one’s are installed to help prevent any bad things from happening.



Guide Block and Outfeed Roller showing stamping

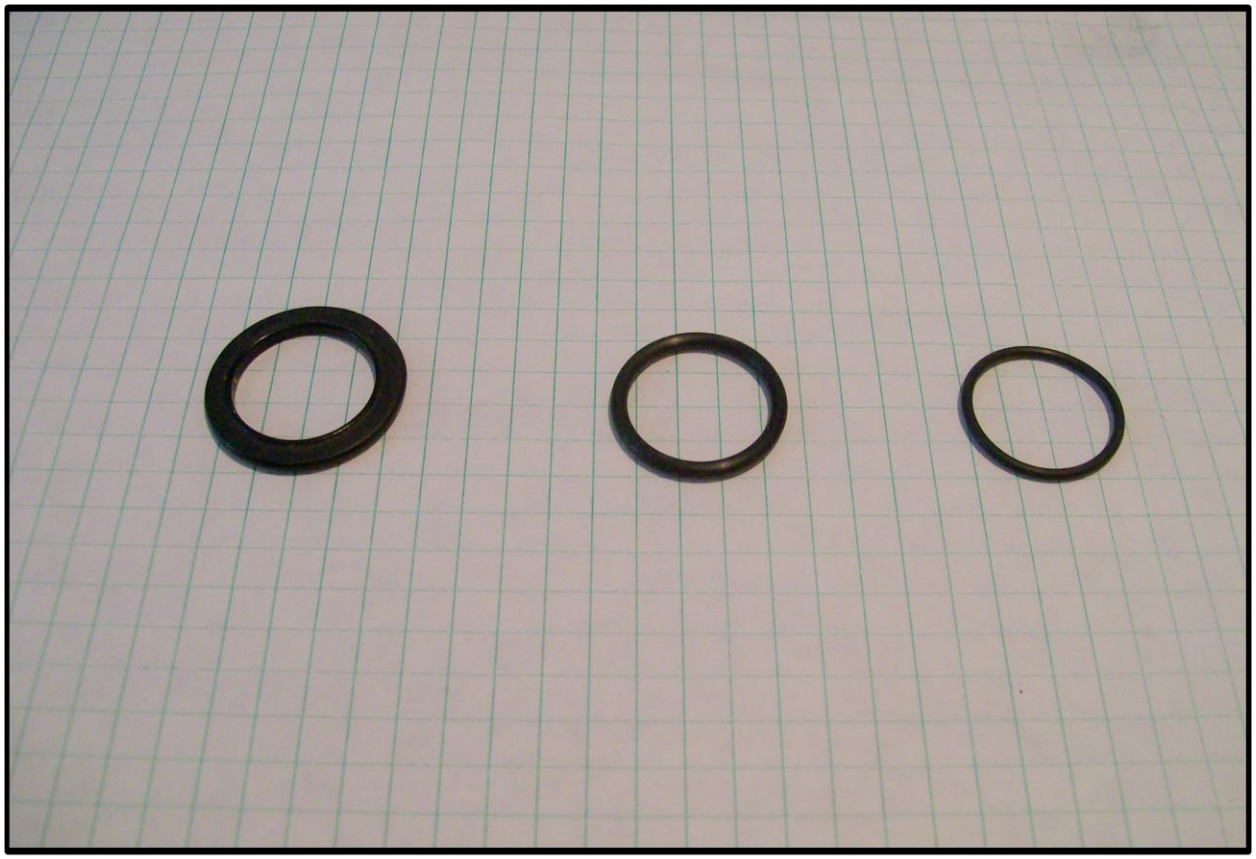
I've mentioned before that the bearings on this machine were/are in very good condition with almost no wear or score marks. So I decided not to replace the bearings on the Rollers. In order to make sure the original Guide Blocks/bearings are reassembled with the original mating Rollers I stamped matching numbers on the ends of the Roller shafts and the Guide Blocks when I disassembled the machine.

**Note:** I've had a couple of inquiries about the 4962 Thrust Bearings used with the Table Elevating Screw. This bearing seems to be "unobtainable". I couldn't locate them through my local supplier and Lynne couldn't find them either. These bearings aren't a high speed bearing like the ones used in the Cutter Head or any high sped rotating shaft. I found replacements that fit the OD of the Table Elevating Screw and the width of the original 4962, which I apologize for not documenting. The width in this case is the application's height, is somewhat critical because it has to fit under the Collar/Roll Pin with the Roll Pin's location being fixed so the bearing cannot be wider than the original. It may be narrower and the gap can be shimmed with washers/spacers. The replacement bearing's OD is not critical. Another option, depending on the condition of your bearings would be to clean them, since they are open, oil them and if they rotate with no noticeable roughness then just reuse them.

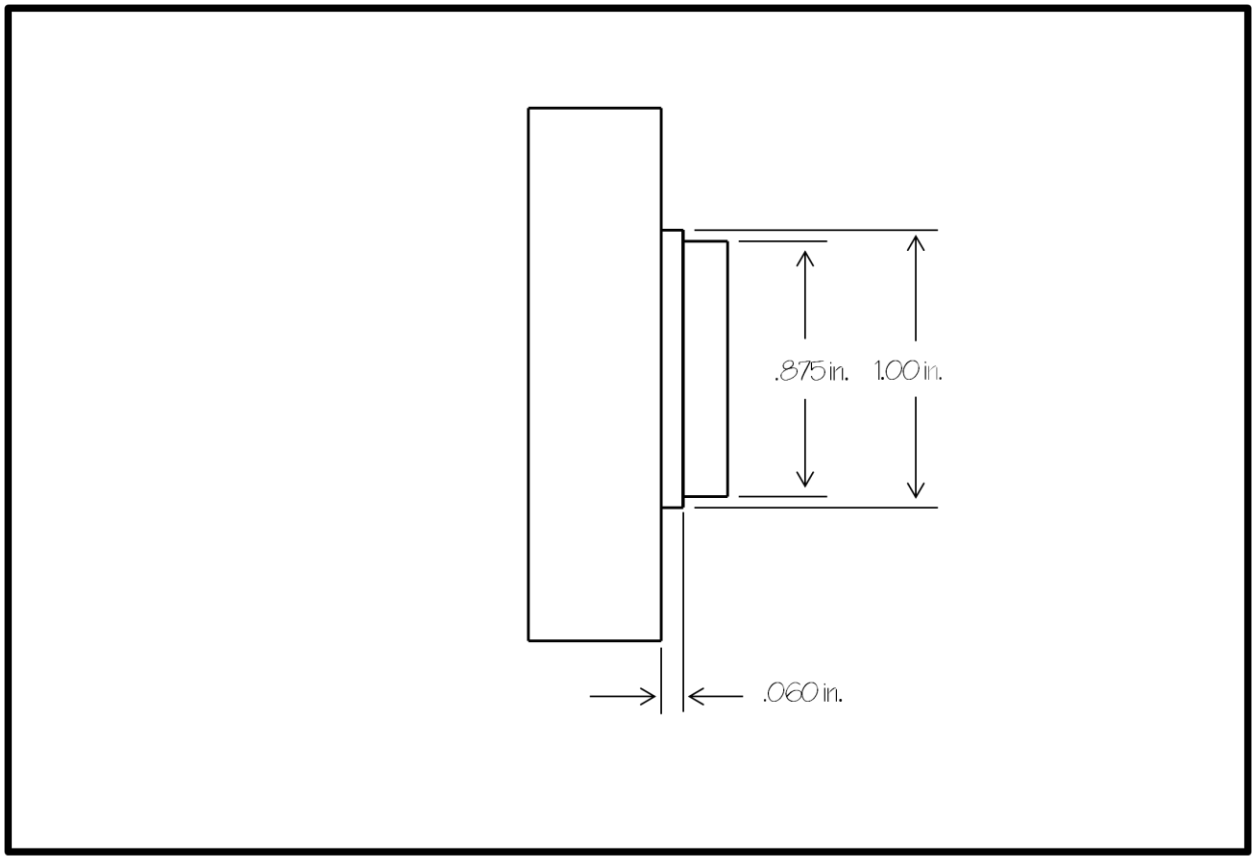
**O Ring Modification**

Before I go on I need to go back and detail the installation of the “O” rings that are located between the guide blocks and the cover plates. I forgot to cover this earlier. The “O” rings provide a seal to help retain the oil from the guide block bearing which receives oil either directly from the gear box or from your oil can on the opposite side. I don’t know how the factory installed these “O” rings but when I disassembled my planer the “O” rings were compressed flat between the guide block and the cover plates. Well they weren’t completely flat but pretty close and hard as a brick. In my mind I couldn’t imagine that is how they were installed at the factory but then again it well may have been. Based on what I saw the “O” rings could seal oil flow from the guide blocks but it would only be a short time before they would wear on the rotating roller shafts. Even if the guide block cover plates were left loose the rotation of the shafts would wear the “O” rings in fairly short order and tightening the guide block covers would only expedite their failure. I also don’t know if the bearings on my planer were ever replaced but I suspect that sometime during its 60+ year history they were. After looking at the guide blocks and how the bearings are installed I decided to recess the bearings into the guide block providing a space for an “O” ring. When assembled the recessed bearing would create a void between the guide block, bearing and the guide block cover that would be approximately 85% of the “O” rings cross section. Allowing the “O” ring to be compressed by 15% and providing a seal to help retain the oil both between the guide block/cover and the roller shaft with hopefully a decent service life. As a side benefit having the “O” ring captured in this groove there should be a significant reduction in the amount of force needed to rotate the rollers. Understanding that some of the force needed to rotate the rollers is dependent upon how tight one makes the guide block cover plates when the “O” rings are installed as they were when I disassembled my machine.

The “O” ring I selected was an AS568-020 with an ID of .864 and a cross section of .070. Time will tell if it is the right selection but I was trying to find a compromise between sealing, pressure on the rollers and wear. As I said time will tell. I made this little jig that allowed me to recess the bearings to the depth I wanted which was .060 while not distorting the bearing ends.



From left the Original Roller O–ring  as removed from planer, a new replacement and the O-ring for my modification



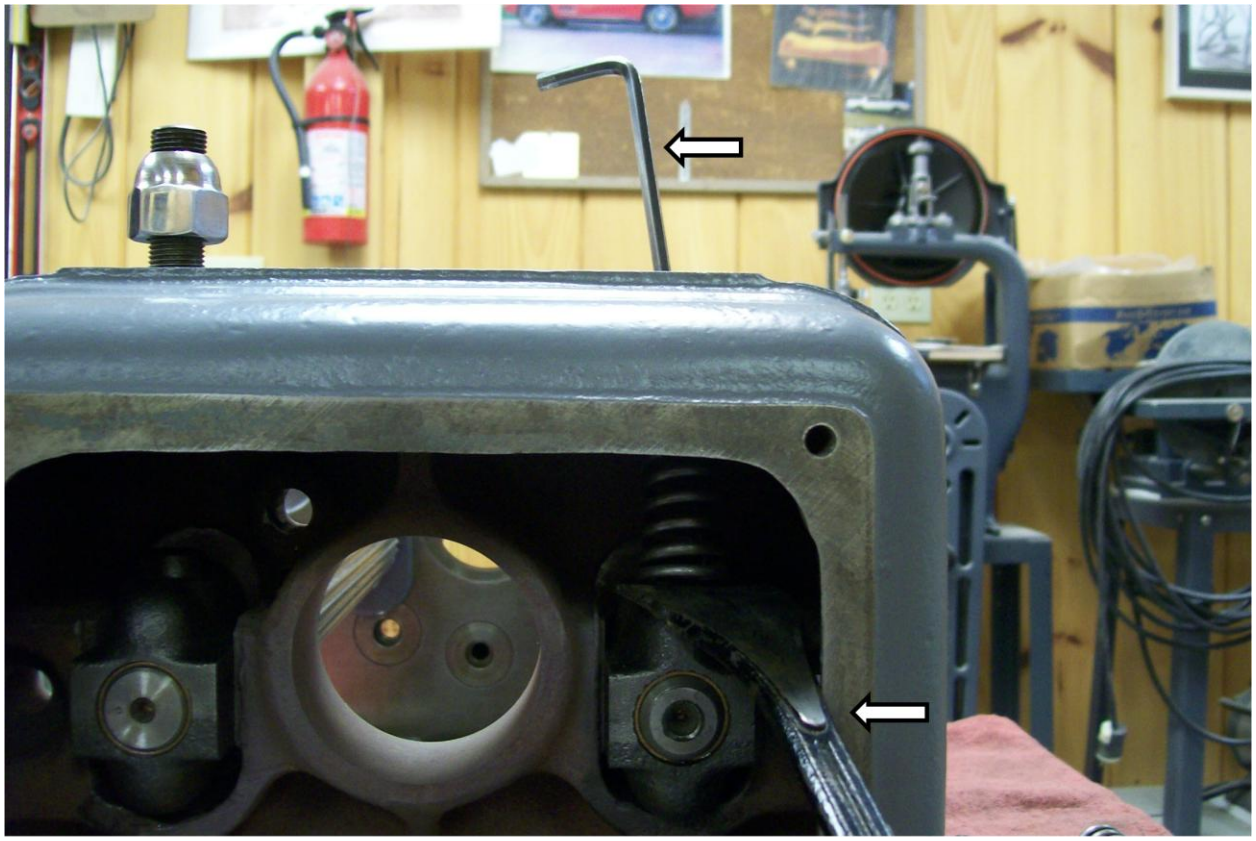

"O" ring recessing jig – not to scale

Guide Block with “O” Rings and Recessing Jig


Guide Block with Bearing recessed for “O” Ring

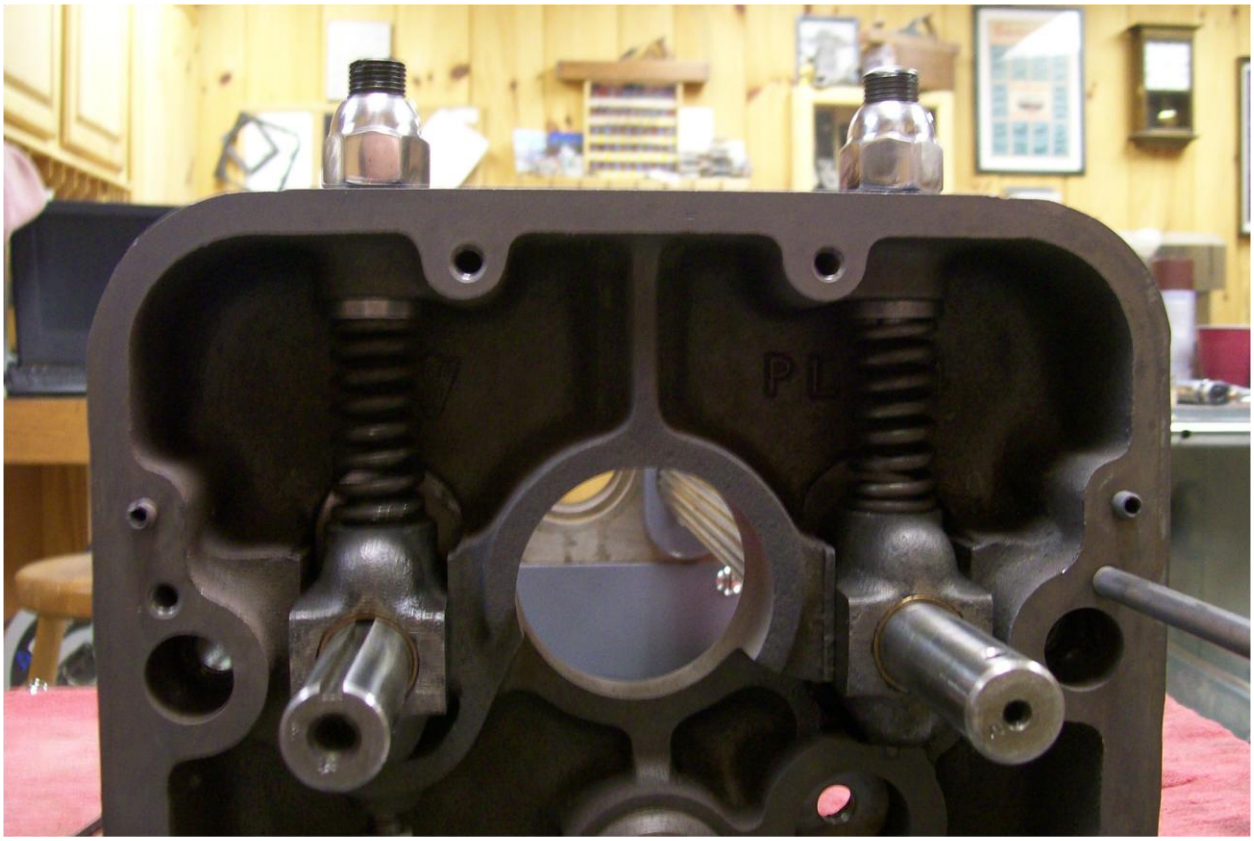
Very simply all I did was place the fixture on top of the Guide Block/Bearing and tap the top of the jig once or twice to recess the bearing. Nothing beautiful but functional, no style points for a one time jig!

Installation of the feed rollers is pretty straight forward. If you remember I mentioned that my interpretations of the parts assembly drawing the guide blocks were inserted into the left support column. Then the rollers with the washers , cover plate and O ring on each roller were inserted into the guide blocks followed by the washers, cover plate, O ring along and the right support column was mounted with the roller shafts inside the openings for the guide blocks and finally the guide blocks are installed on the roller shafts. I didn’t like all that weight cantilevered on one set of bearings so I installed the each roller into both support columns one at a time by tilting the right support column and inserting the roller shaft into its guide block and doing the same for the other roller. It probably wouldn’t harm the bearings to have the rollers hang unsupported for the short amount of time it would take to complete the assembly but “stuff” happens. Usually when stuff happens during assembly of anything I’m working on it isn’t good. This is the easy part of the infeed and outfeed rollers. Just remember to make sure you tighten the 5/8-11 column attaching bolts when you finished installing the rollers.



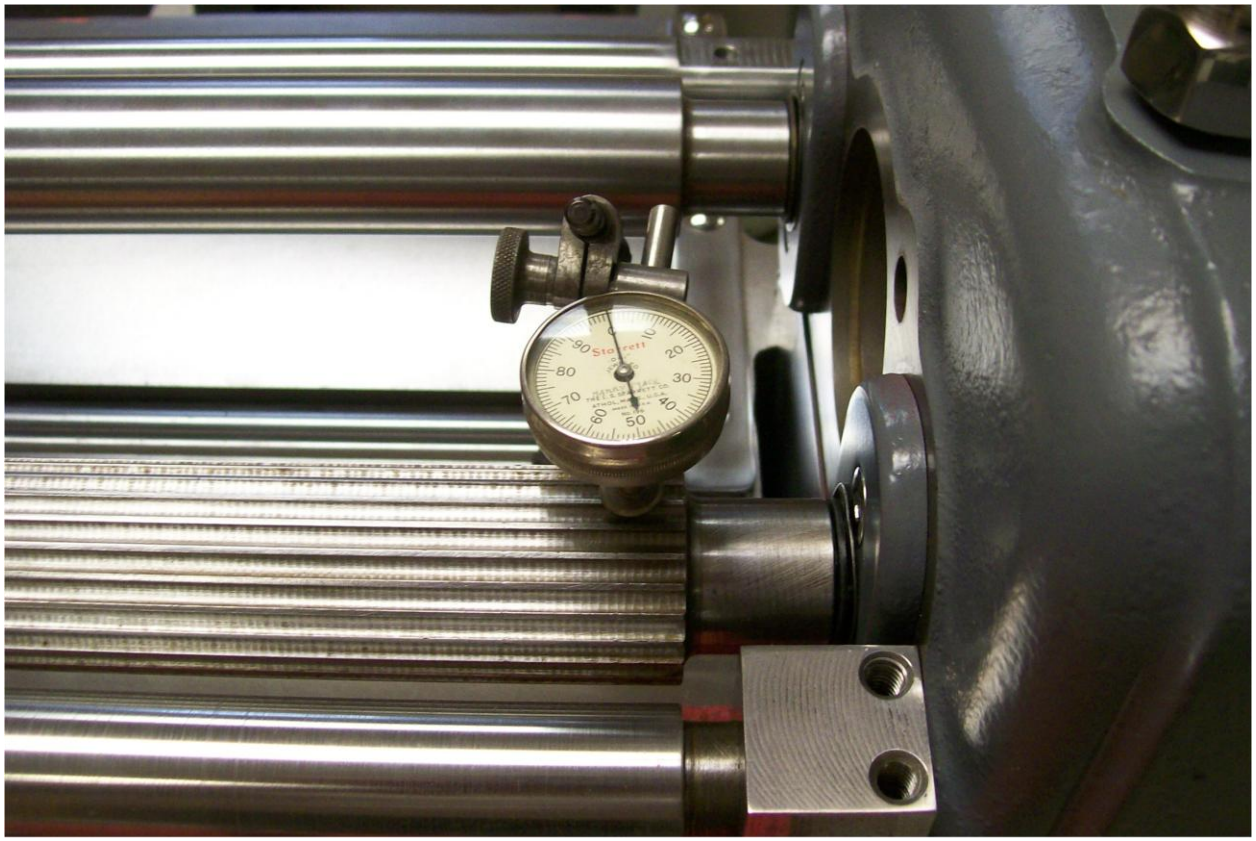
Outfeed Roller Spring installation. Note the allen/hex key wrench and pry bar.

Installing the pressure spring cap and roller spring is a little bit of a challenge especially if want to keep springs from becoming flying projectiles that you spend an hour trying to locate and/or knuckle busters. My approach to this little challenge was to insert an allen/hex key wrench into the opening in the casting used for the pressure spring adjusting screw, down into the pressure spring cap and into the spring to help guide and retain the spring during installation. To compress the spring and assist guiding it up and onto the guide block I used a small flat bladed pry bar. Because of the internal column design some of the springs are easier to install than others.



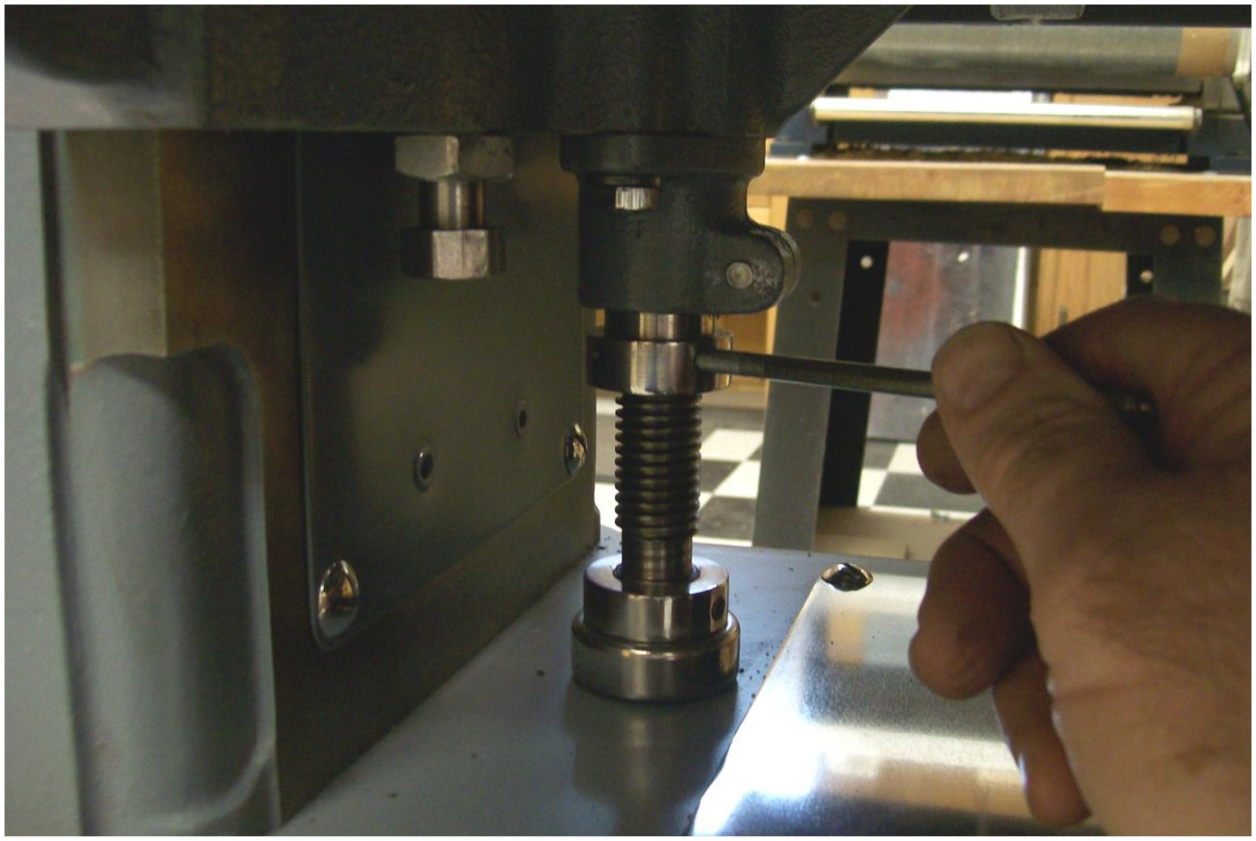
Left Support Column shown with Infeed/Outfeed Rollers,Guide Blocks, Roller Springs, Spring Caps, Spring Adjusting Screws and Lock Nuts installed.

Completed installation of the Infeed/Outfeed Rollers and the Front and Rear Tie Bars.



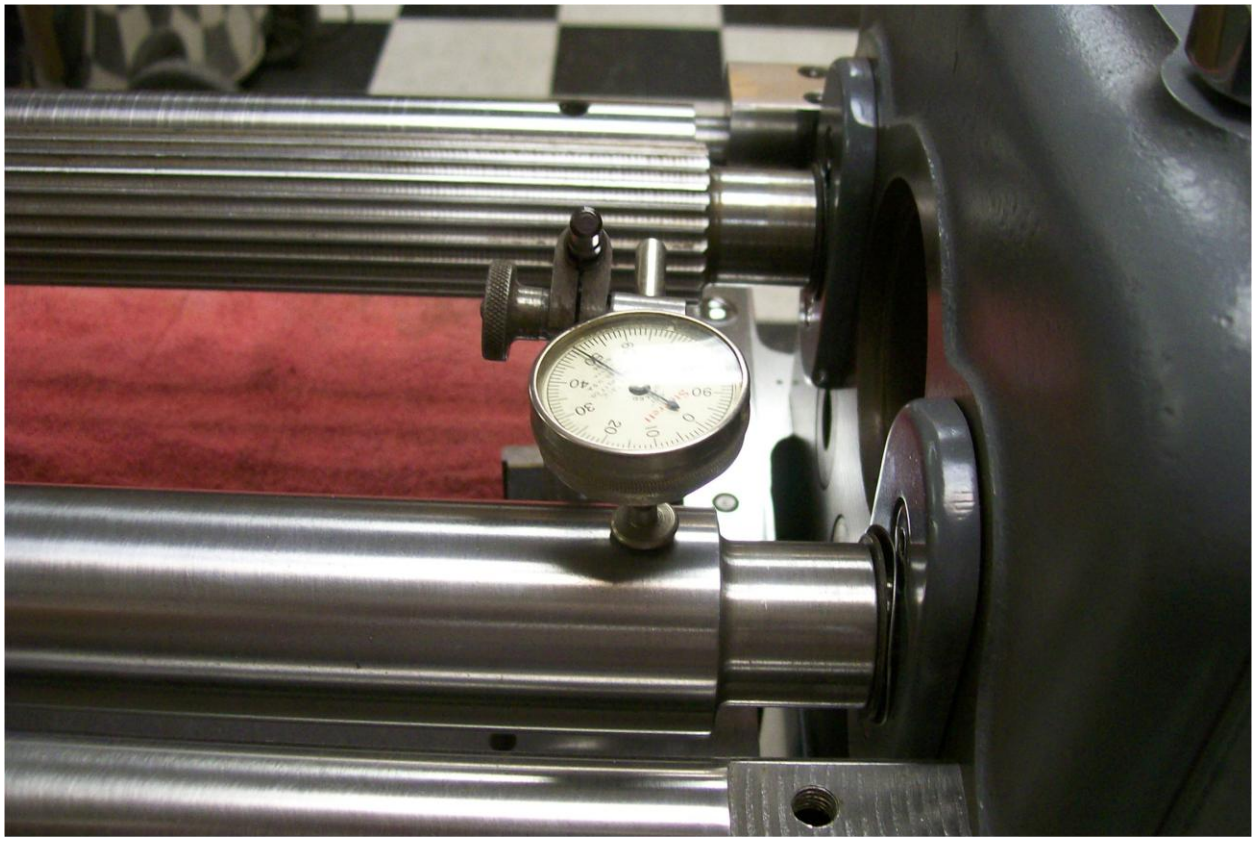
Checking height of Infeed Roller to Planer Table

Here I'm checking and adjusting the infeed roller height using the planer table as a reference. The infeed roller has no up/down adjustment only downward pressure provided by the roller pressure spring.  Read



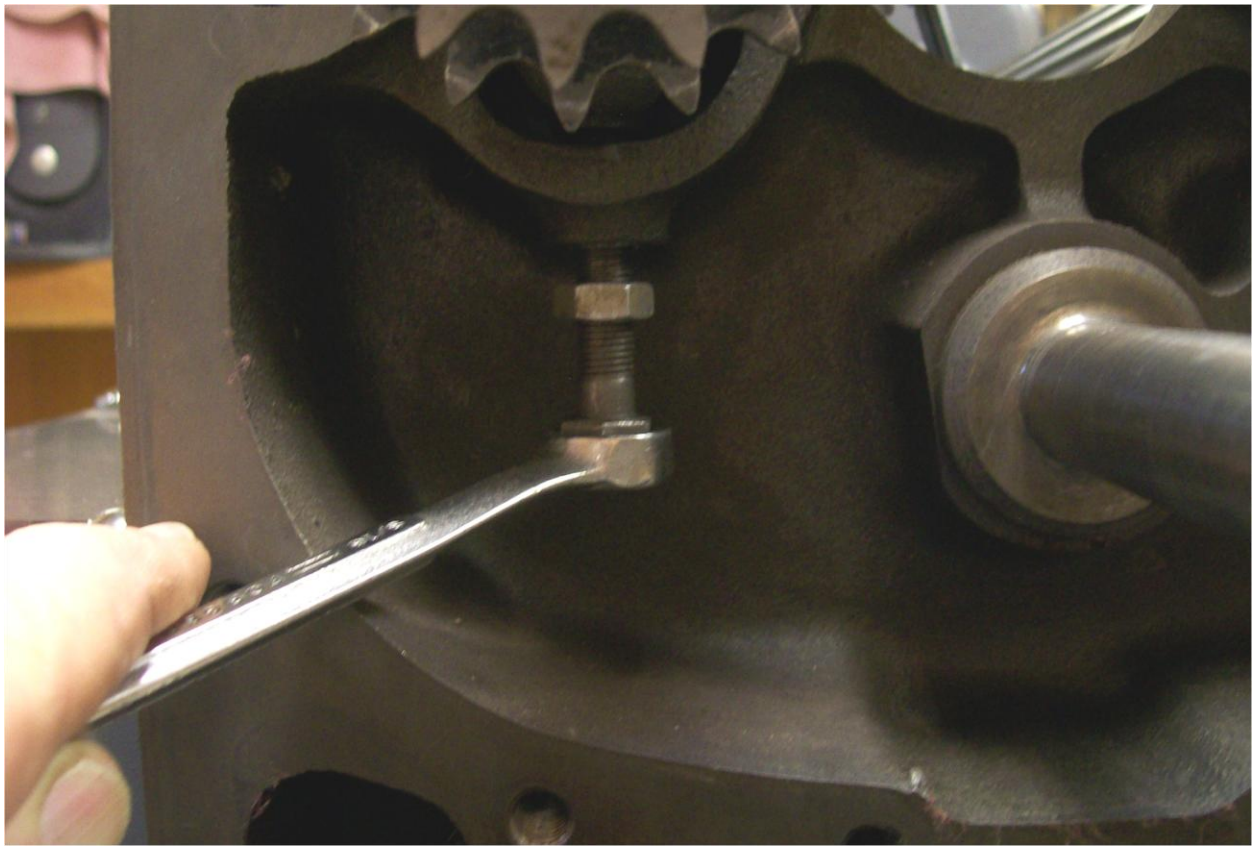
Adjusting the height of Planer Table

Adjusting the table elevating screw which raises or the table in relation to the infeed roller. Both the right and left sides need to be adjusted to be at the same height.



Checking the height of Outfeed Roller

The infeed and outfeed rollers are required to be at the same height for proper operation. So here I am using my dial indicator to verify and adjust the height of the outfeed roller.

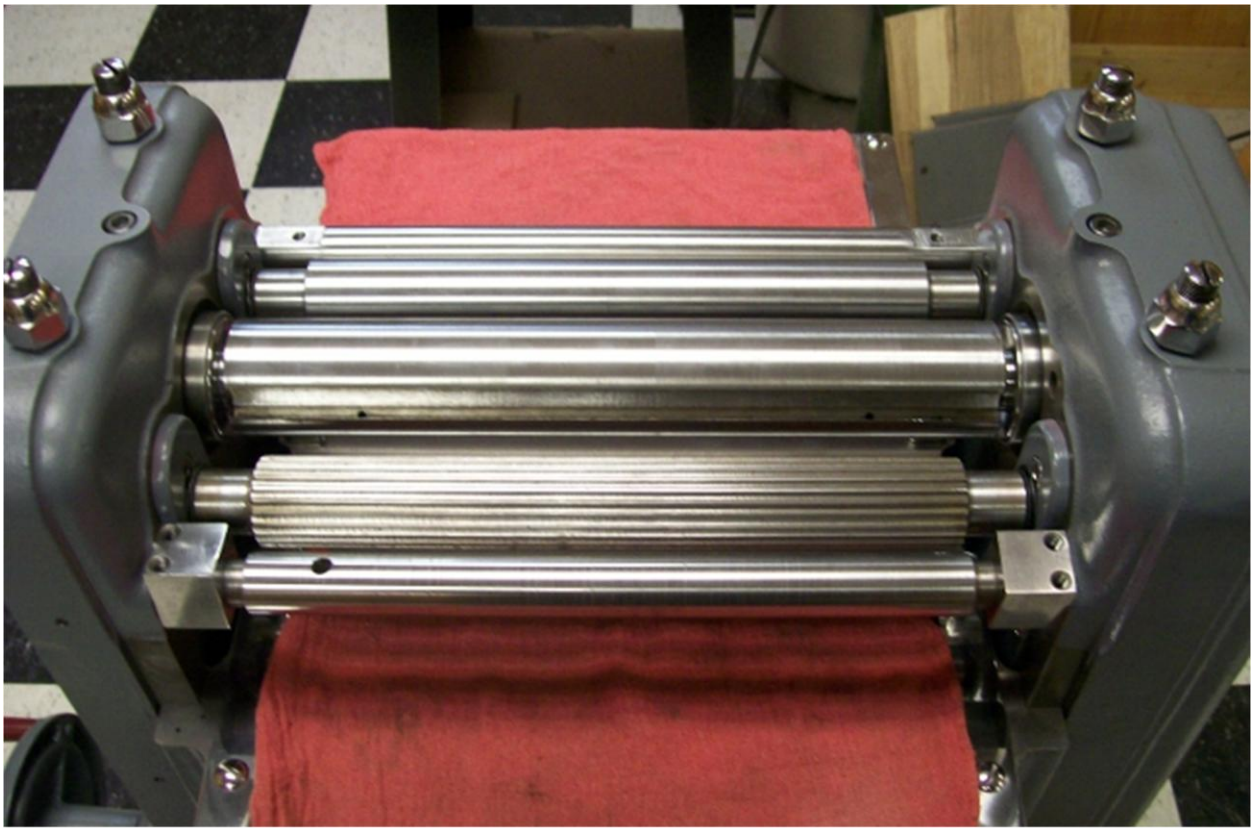


Adjusting the height of Outfeed Roller

To adjust the height of the outfeed roller the 3/8-24 hex head bolt and jam nut are tightened or loosened to raise or lower the guide block which raises or lowers the roller. After adjusting the rollers and verifying it is the same on both left/right side and the infeed roller the jam nut is tightened. A good practice is to verify the adjustment after tightening the jam nut. Sometimes it will affect the adjustment.


Cutter Head and associated parts.

The cutter head and associated parts and pieces ready for installation. Included in the photo is a 5/16 open end wrench with the open end ground to a thickness that allows it to fit in the cutter head slot to loosen/remove the 1/4 -28 hex head set screws which retain the knives. I guess Craftsman won't replace this wrench if I ever break it! Another heads-up is to watch for are the small springs under the blades. Most likely they will be stuck in the cutter head but be careful you don't want to lose them but you can find substitutes if you do.

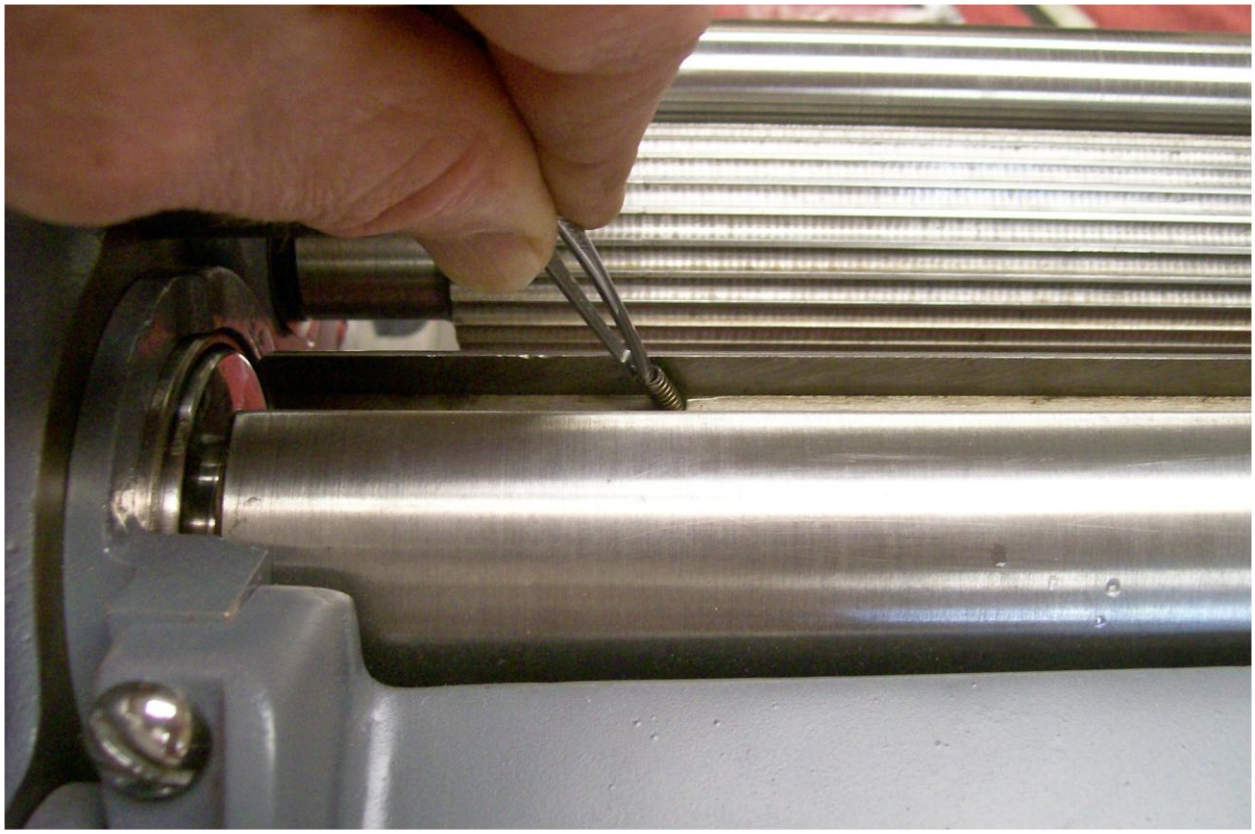


Top end with all rollers, tie bars and cutter head installed, ready for the installation of the knifes. Ah, I forgot the Support Rings for the Pressure Bar.

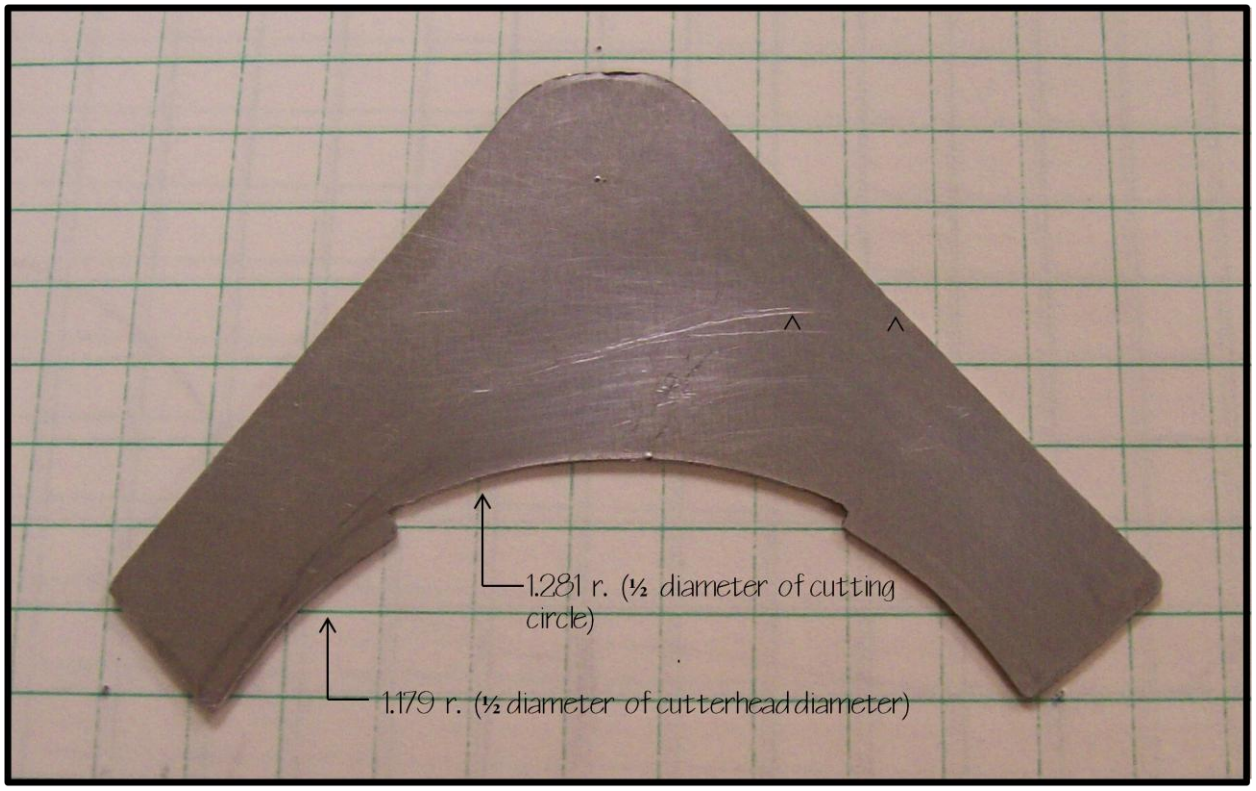
The top end of the planer with all the rollers, tie bars and cutter head installed and leveled with the planer table. During all this verification/adjustment of the rollers, I had this epiphany (I read the Instruction Manual) where it states that the planer table and cutter head must be level across their width. There is no vertical height adjustment for the cutter head so the adjustment is made via the table elevating screw as shown in Slide 26. So after adjusting the table and the cutter head I started to think about how this adjustment negated everything I had done adjusting the height of the infeed and outfeed rollers. Of particular concern was what if the infeed roller needed adjustment since there is no factory provision for adjusting the vertical height of the roller since as the cutter head there is no independent means of adjustment. As it turned out everything aligned. I did determine that if the infeed roller needed to be adjusted there is room under the guide blocks to insert shims if necessary.

Knifves,, Springs, Hex Hd. Screws and Throat Bar

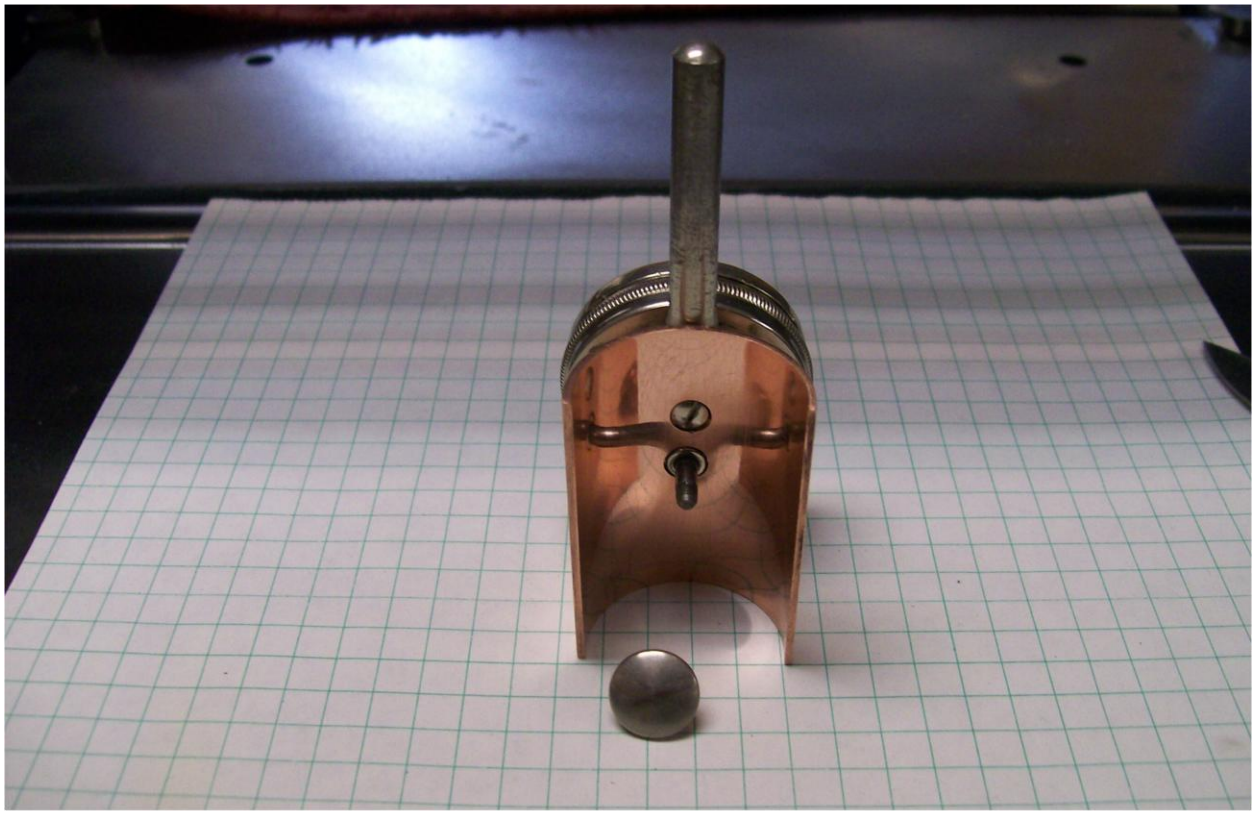
Arrows show springs in the holes awaiting the knife, throat bar with hex hd. screws,



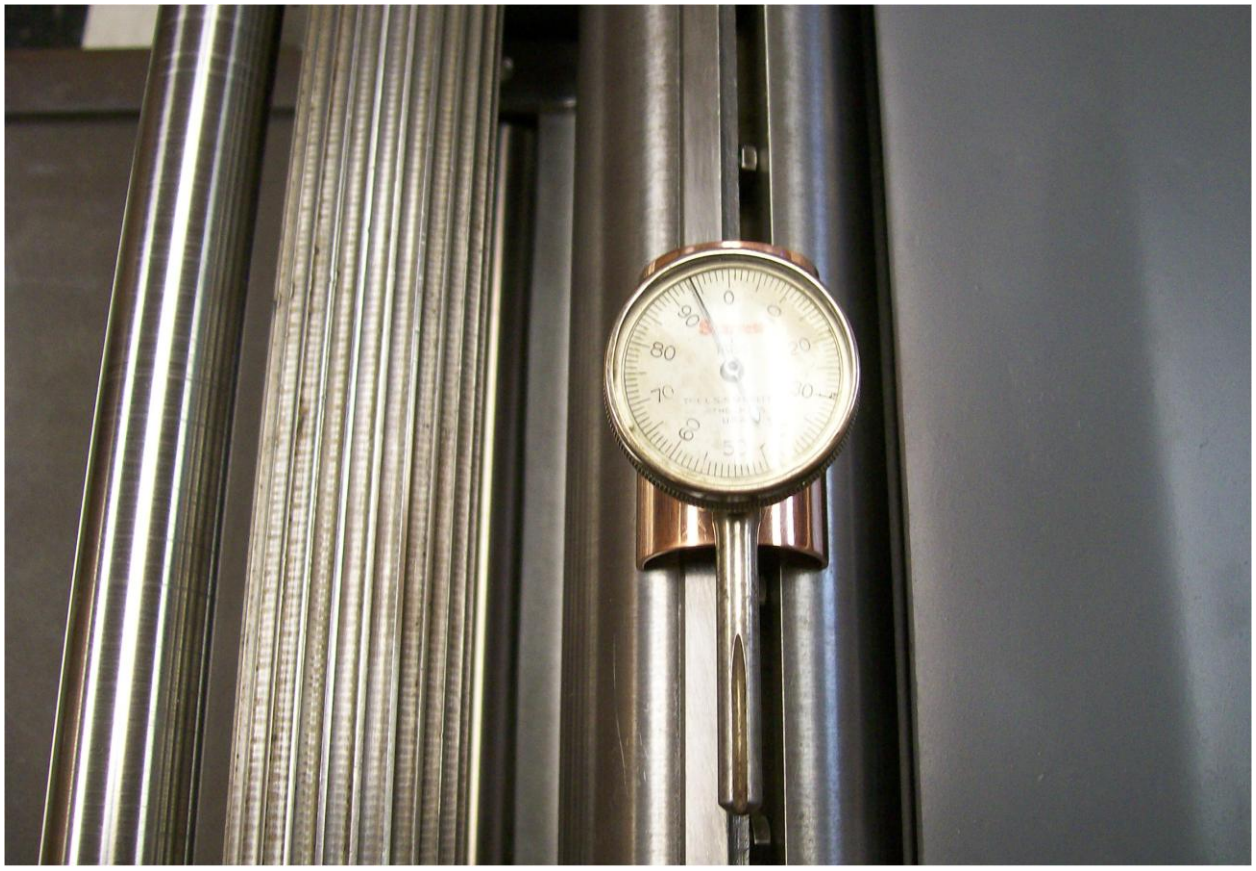
Inserting the small springs that support the knife.


1.281 r. (½ diameter of cutting circle)
1.179 r. (½ diameter of cutterhead diameter)

Knife Gauge

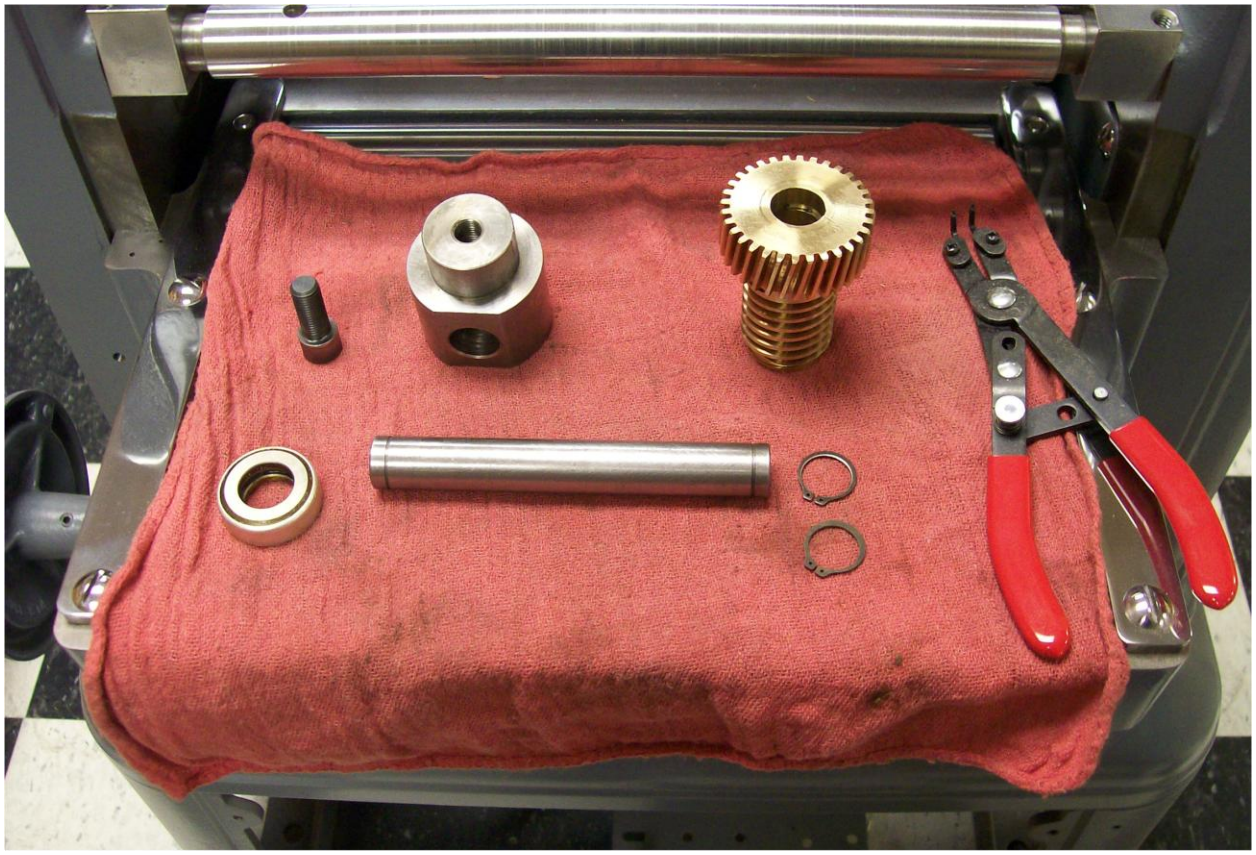


Bottom (inside) of the knife adjusting gauge showing the two holes, one for mounting the indicator and the other for the indicator stem.

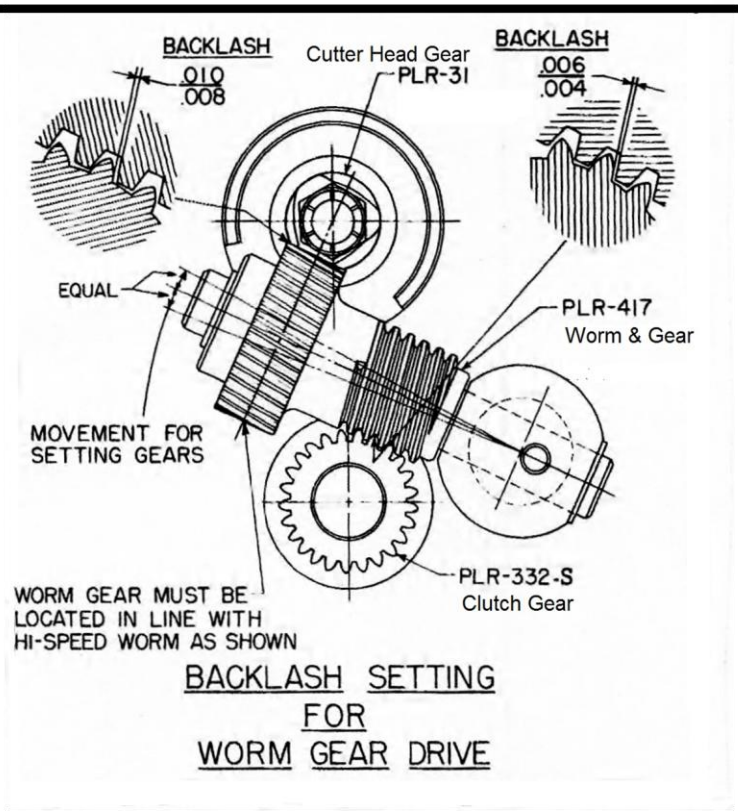


My implementation of the numerous knife setting gauges from the OWWM forums.
See write-up for details.

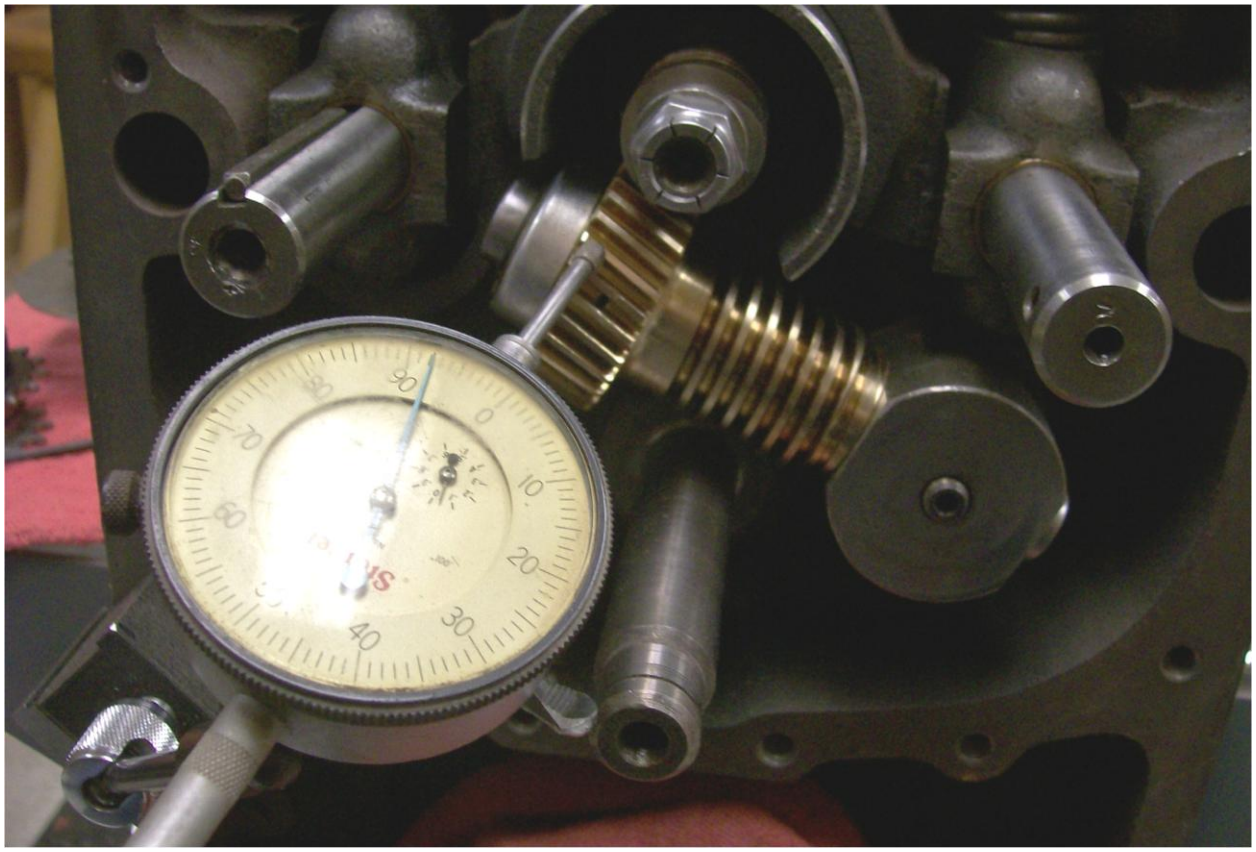
Next up Installation of the infamous Worm Gear



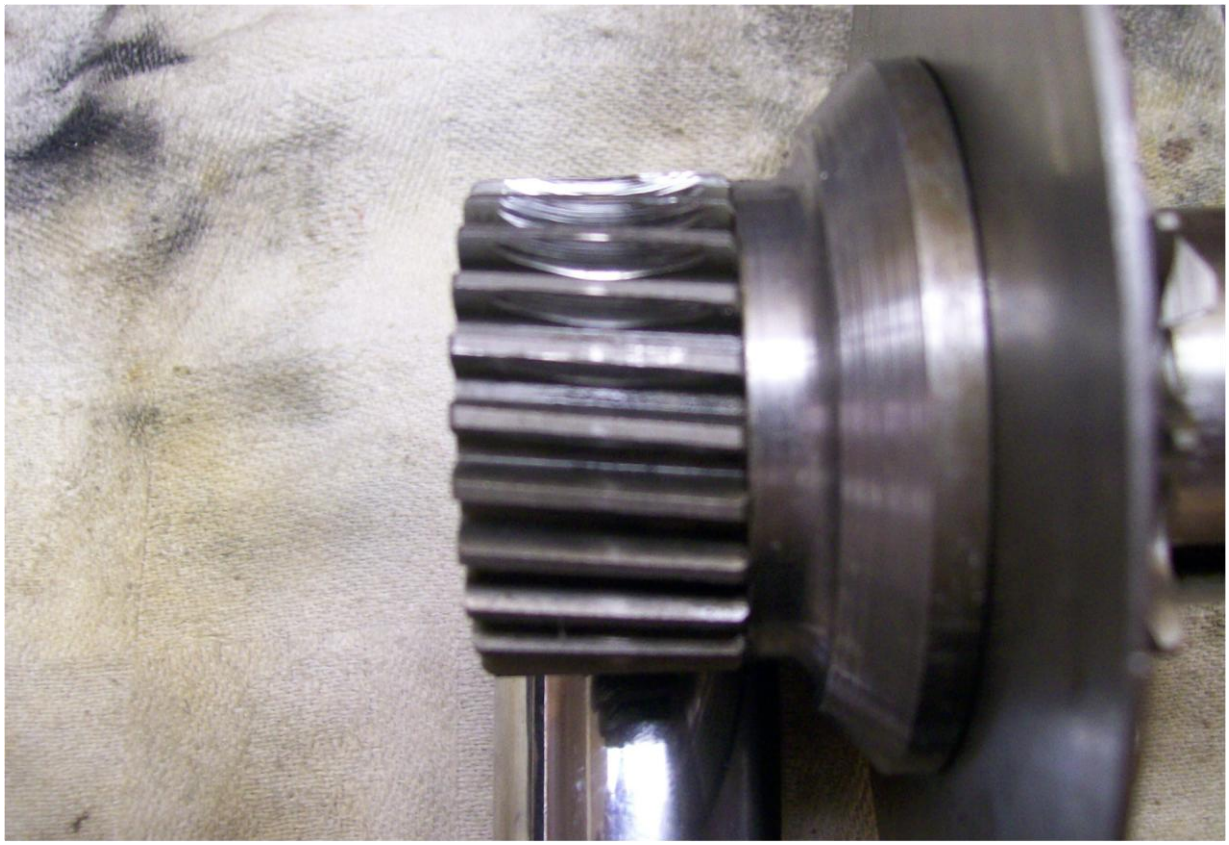
The parts that make up the Worm Gear Assembly, the Gear & Worm, Support Block, Mounting Bolt, Shaft, Snap Rings and Thrust Bearing.



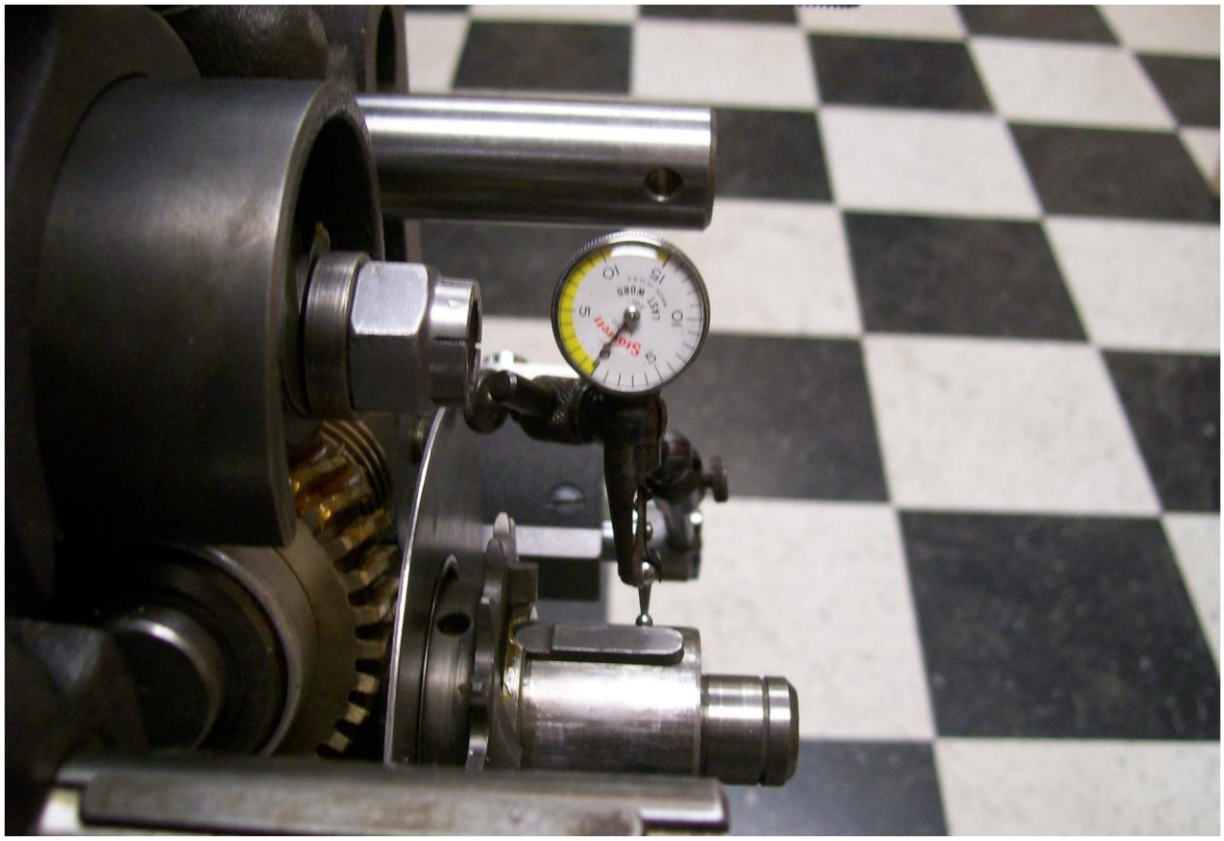

Factory Specifications



Dial indicator setup to measure backlash between Cutter Head and worm gear.



Clutch Gear showing the wear on the driven or thrust side of the teeth



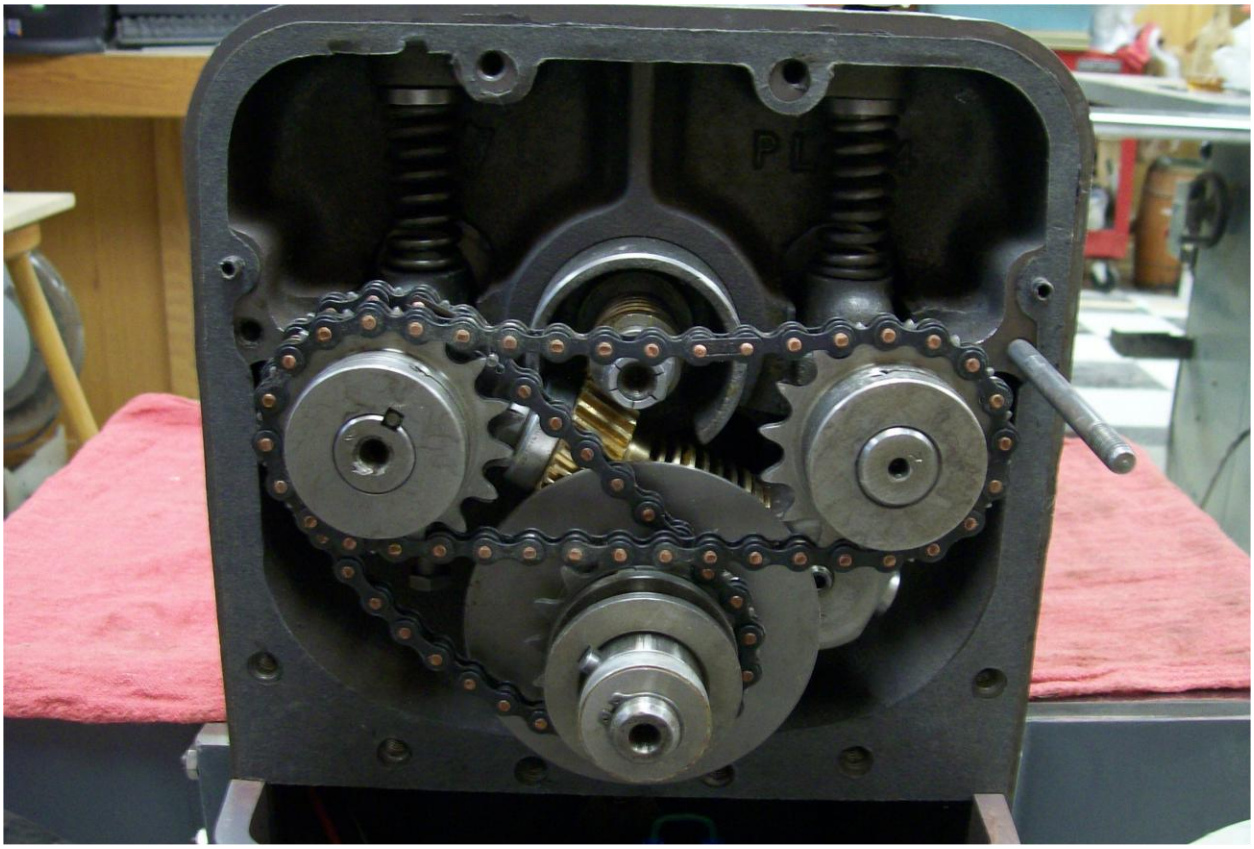
Dial indicator setup to measure backlash between Cutter Head and worm gear.

I was fighting with the worm gear adjustment and couldn't get it even close to the factory settings. I had this concern I would fire up the machine and in no time at all the worm gear would disintegrate. I still have that concern although not as severe as before. While working to get the worm gear adjustment somewhat close to the factory backlash setting, I decided that only brand new clutch, cutterhead and worm gears would allow me to meet the factory backlash specifications. As I noted before, my clutch gear was worn a good bit so I decided to try and locate a "new" one. After a couple of BOYD postings a member offered a replacement clutch gear that is in much better condition than mine. So I now have a brand new worm gear and a very serviceable clutch gear.

**Note:** As a point of information I still believe that the only way the factory backlash settings can be met is with all new gears, period! Any wear of either of the three gears that make up this dive system is going to negatively affect the backlash setting and adjustment is limited. As it stands the backlash on my planer gears is .012 between the cutter head worm and the brass gear/worm and .008 between the brass gear/worm and the clutch gear. Much better than with my old clutch gear but well out of the factory specification. Also I'm not convinced that pinning the brass worm gear is a solution to the wear problem exhibited in other planers I have seen and to some extent the original worm gear in mine. Pinning the gear will only be good for the initial setting. Any wear of the gear(s) will negate the setting and if new or

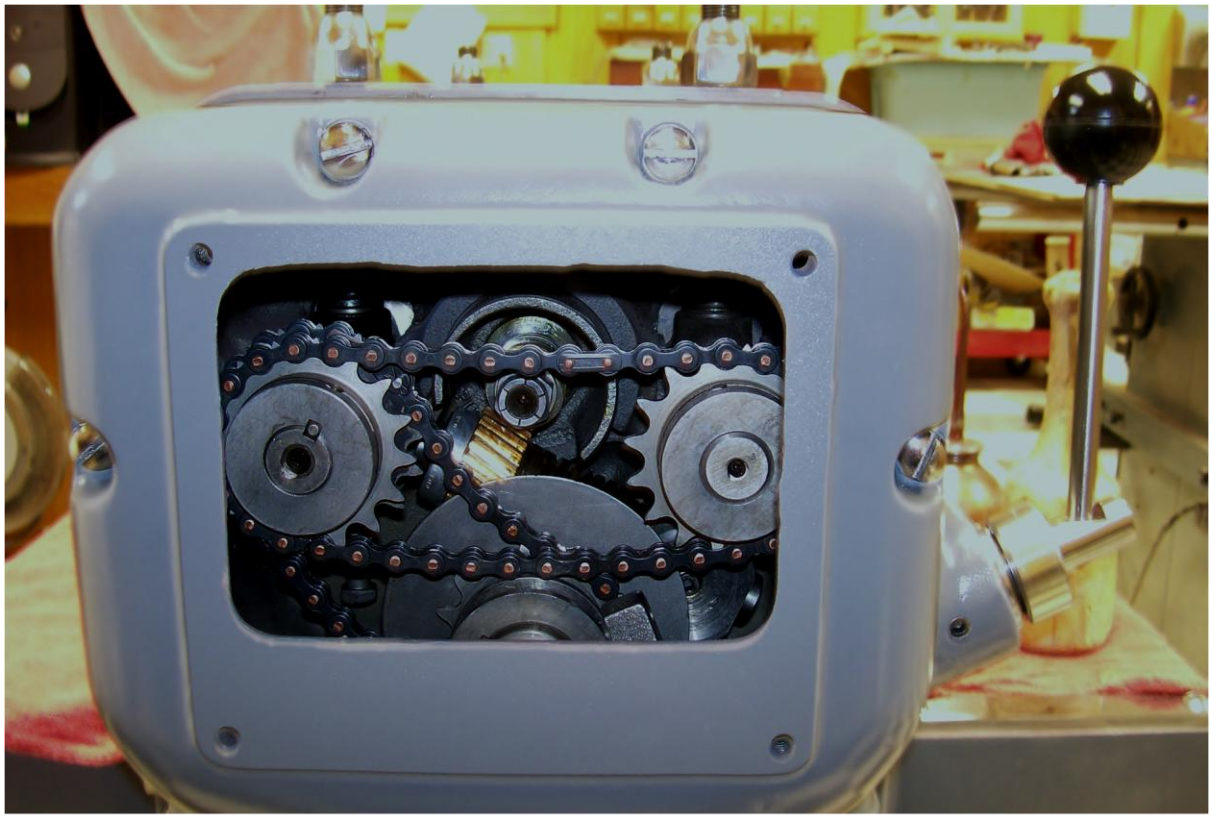
replacement gear(s) are used in the future the pin locating hole will no longer insure a valid setting. Anyway I've elected to not pin the bearing support block. So after all that, it's time to replace the sprockets, chains etc and button up the gear box. The assembly of the gear box other than the gears is pretty straight forward the sprockets and chains can present a little challenge but it is easy enough to figure out in case you didn't note their positions when you took the machine apart. Just to make it easy there are three chain sprockets plus one on the clutch sprocket. Two of the sprockets have 16 teeth and are marked as such. Those are the last to be installed. The other sprocket has 17 teeth and is driven by the clutch sprocket. It is installed first. Pay attention to the orientation of the sprockets on the shafts and to alignment with the clutch sprocket and each other. The parts diagram details which direction the sprockets face on the shafts. The chains on my machine while slightly loose are very serviceable. If you need a replacement I believe you can use a No.35 bicycle chain available at your local bike shop.

Replacement gaskets made using the originals as patterns



Infeed/Outfeed drive sprockets and chains in place ready for cover

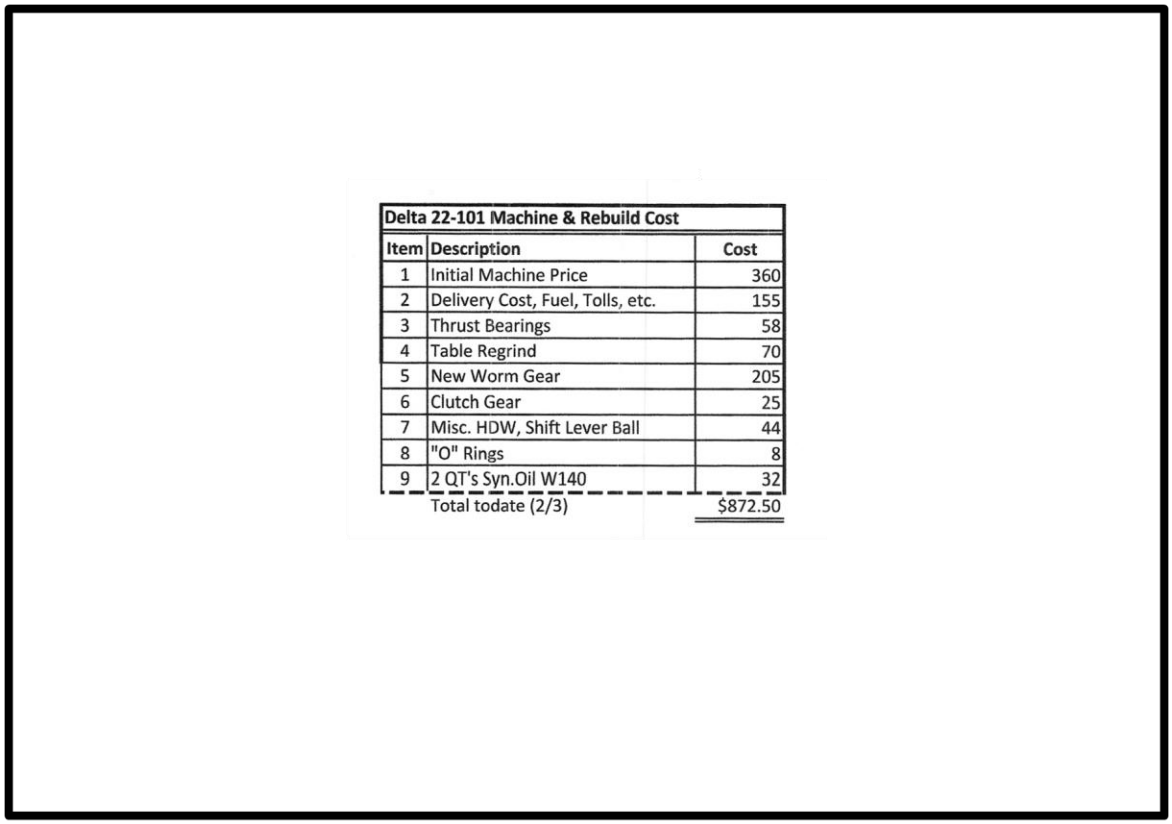
The gears installed and adjusted for backlash. The sprockets, spacers, chains along with a new gasket installed and ready for the cover. One additional point I'd like to make is about the oil slinger, the round metal disk behind the chains is part of the clutch gear assembly. I believe this may be a large contributor to the brass gear failure. (I think and someone else may have made the same comment regarding the oil slinger or at least proposed the lack of lubrication was a contributor to the brass worm gear failing.) The oil slinger does just what its name implies it carries or "slings" oil from the reservoir to the gears and other parts that need lubrication within the gear box. The metal disk is supposed to be .010 away from the brass gear and to maintain that specification the disk is bent into or away from the gear. In this case I think closer is better than further. I found the oil slinger disk on my original clutch gear to be loose and the clutch gear could rotate while the oil slinger disk remained stationary. That is not rotating and slinging oil. Something you all may want to check on your planer.



Gear Box cover mounted and Clutch Shifter installed

Gear box cover installed along with the clutch shifter. There is a fine thread socket head set screw that locates and holds the shifter fork onto the shifter shaft that is installed from the inside. Not difficult but you want to be careful and not drop the screw in the gear box. Takes a little effort to find and remove. Don't ask me how I know. A magnetic extension can be your best friend. While I'm talking about the clutch shifter there are a few pieces that make up this assembly which I didn't photo. Besides the handle and knob, there is the top collar, which is retained with a set screw. Once the top collar is removed there are two locating pins that lock the shifter in place. Under these two locating pins are springs. Mine were stuck in a collapsed position by years and years of saw dust, oil etc. It took a little work but I got the springs out and cleaned the retaining holes. The springs were replaced with new ones with a little more stiffness. The clutch shift moves very smoothly and the new springs add a little more firmness to the locking pins seating in the small indents drilled in the index collar.

A little house keeping or I should say cost accounting to catch up on. Here is my total to date.



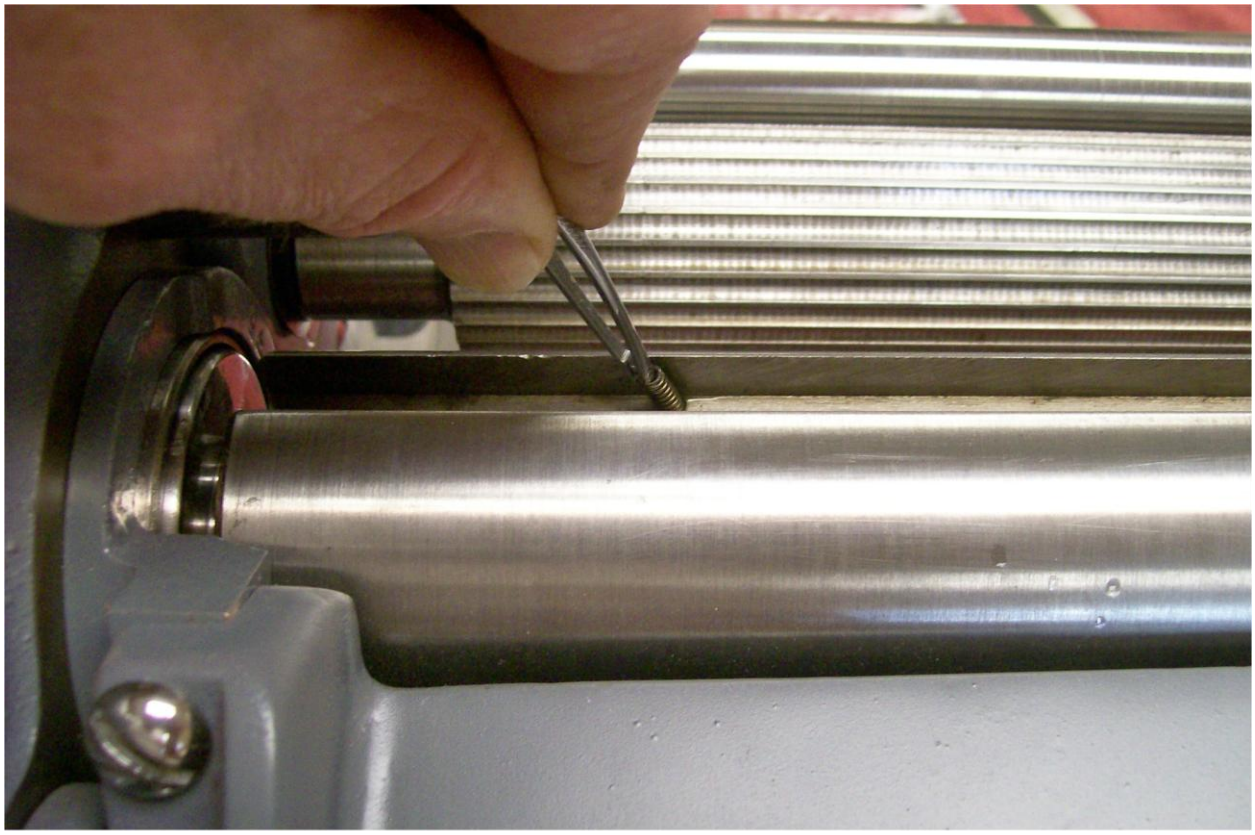
| Delta 22-101 Machine & Rebuild Cost | | |
|---|---|---|
| Item | Description | Cost |
| 1 | Initial Machine Price | 360 |
| 2 | Delivery Cost, Fuel, Tolls, etc. | 155 |
| 3 | Thrust Bearings | 58 |
| 4 | Table Regrind | 70 |
| 5 | New Worm Gear | 205 |
| 6 | Clutch Gear | 25 |
| 7 | Misc. HDW, Shift Lever Ball | 44 |
| 8 | "O" Rings | 8 |
| 9 | 2 QT's Syn.Oil W140 | 32 |
| | Total todate (2/3) | $872.50 |

A current machine and parts cost

There isn't much more that needs to be done, the chip breaker needs installed and adjusted. The motor needs mounted and wired. The drive belt needs installed. The motor compartment panels need installed and final pressure adjustment on the in feed and out feed rollers. The badges need reinstalled. I need to make a badge that mounts on the chip breaker. Like a number of these planers it appears that it left the factory void a badge.

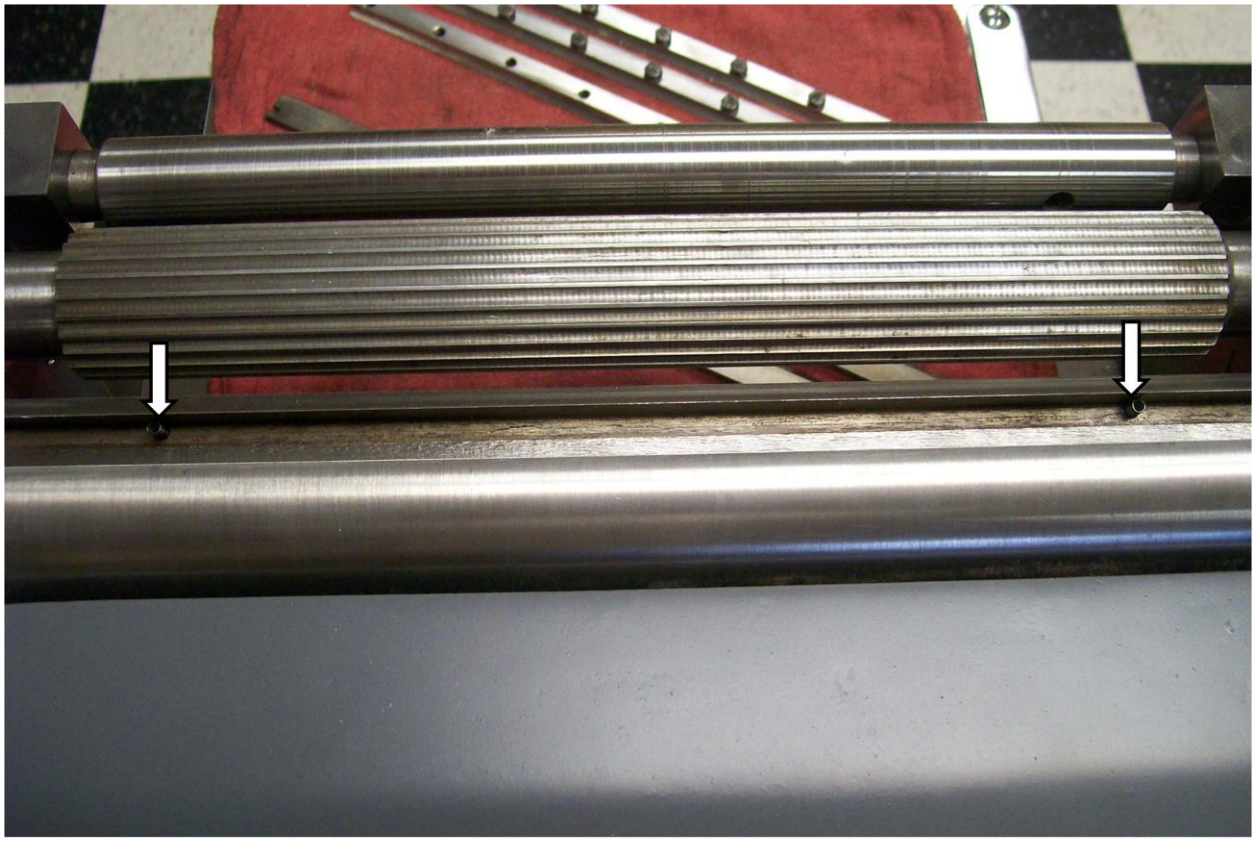
Knifves,, Springs, Hex Hd. Screws and Throat Bar

As I left off I was about to start to mount and set the knives. Here are all the parts needed to complete the cutter head assembly. The support/locating springs (6). Knives (3), the throat bar (3) and the ¼-28 hex head screws (27).



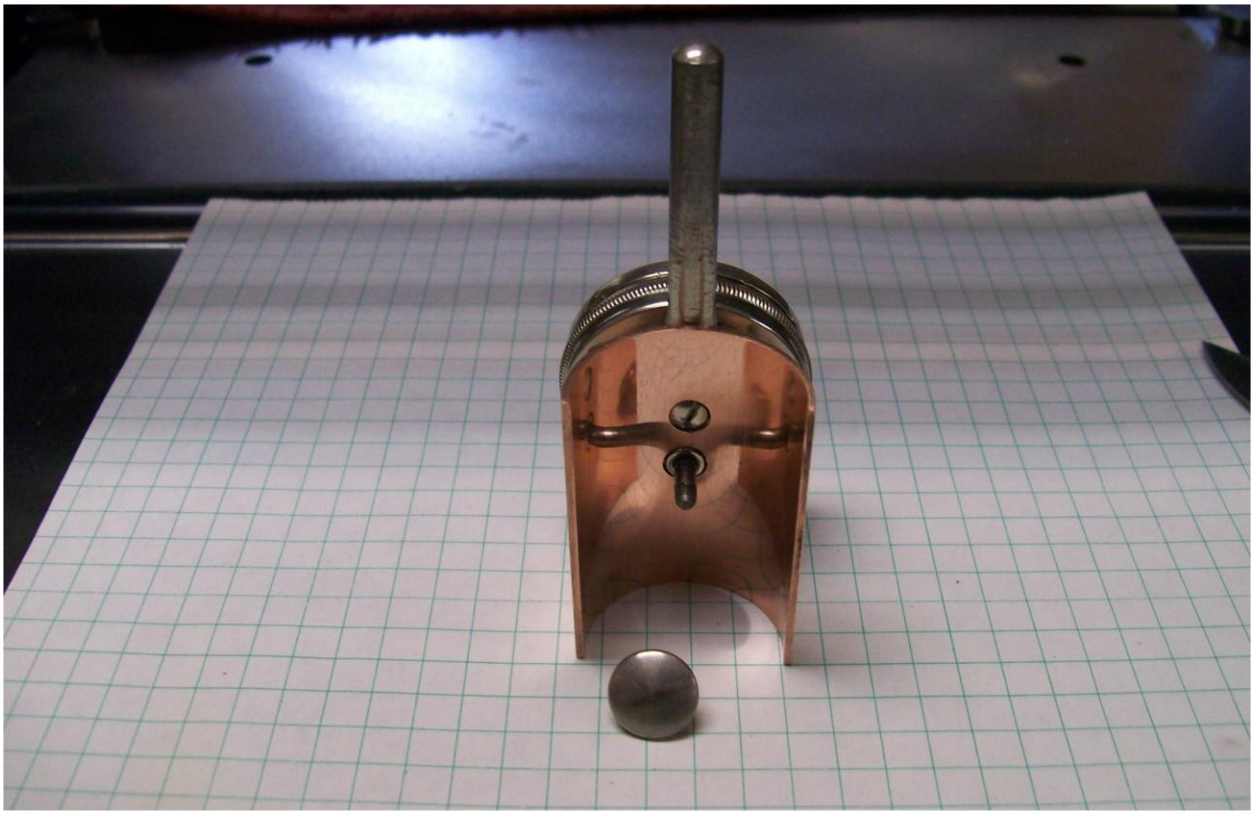
Inserting the small springs that support the knife.

The springs are much too small for my fingers to hold onto and slide them into the holes provided for them in the cutter head. I used a set of tweezers which I usually use to remove splinters and were nearby. A pair of needle nose pliers will also work. Make sure you clean out the holes since it provides a perfect place for sawdust and other debris to accumulate. The idea is to remove any debris from the hole so the spring sits on the bottom of the hole, allowing the spring to be properly preloaded by the knife.



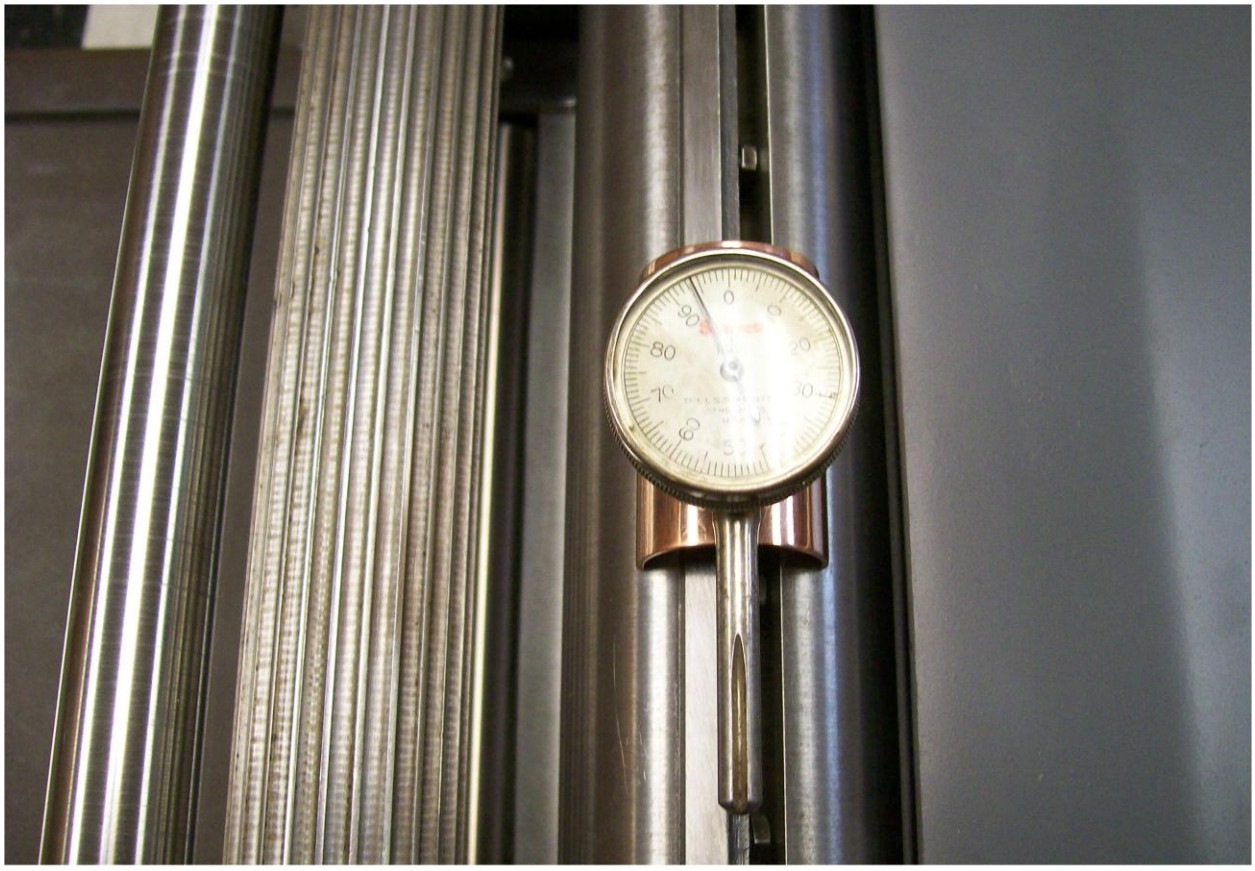
Arrows show springs in the holes awaiting the knife, throat bar with hex hd. screws,

After the springs are set in their retaining holes the blades and throat bar with the ¼-28 hex head screws are placed in the cutter head. My first attempt at setting the blade height was a lesson in futility. I tried using a dial indicator and magnetic base but after several attempts I just surrendered to that approach. Looking through the forums I found several interpretations of a knife adjusting gauge that covered everything from the very simple and functional too the very elaborate. Me I was looking for something simple and functional.



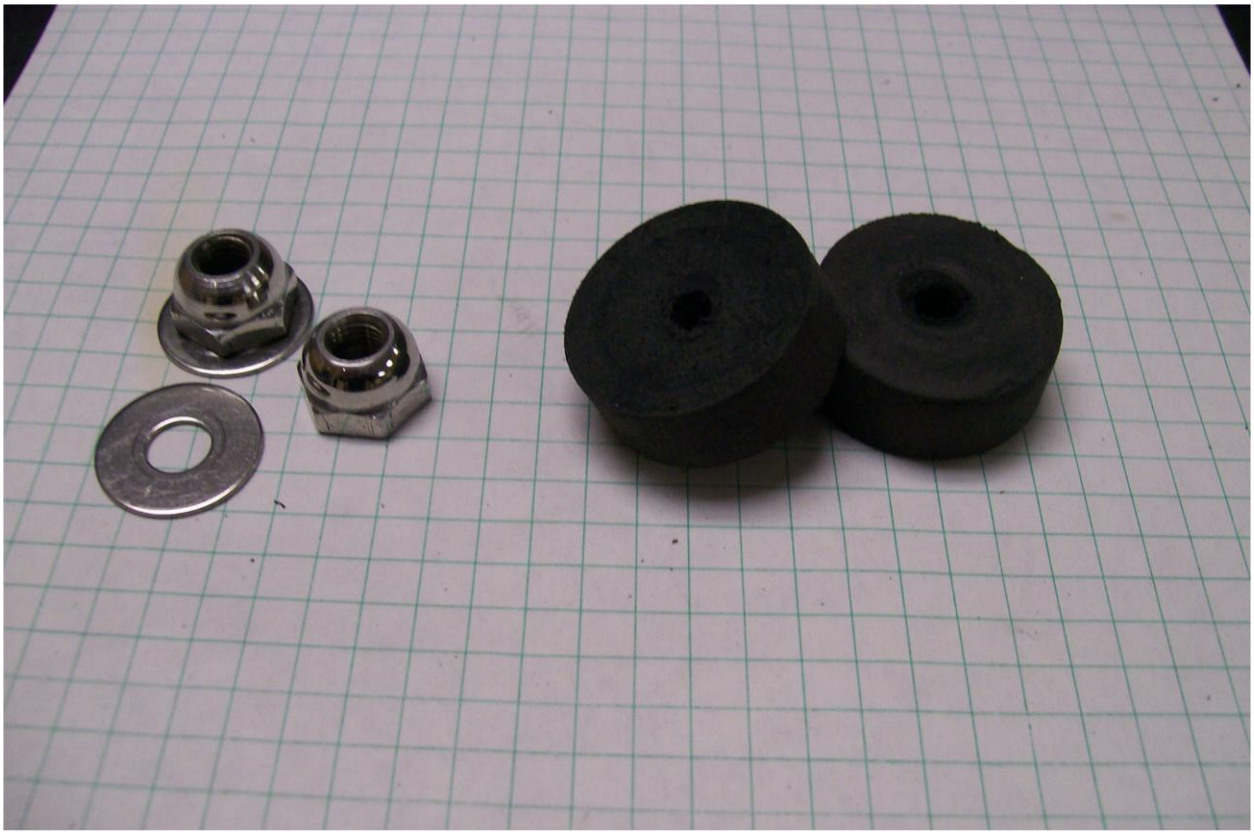
Bottom (inside) of the knife adjusting gauge showing the two holes, one for mounting the indicator and the other for the indicator stem.

This is my interpretation of the knife adjusting gauge. After looking at the various knife setting gauges I found in the OWWM forum I came up with the idea of using a 1 inch copper pipe coupler, which I happened to have in my ever enlarging collection of plumbing fixtures. To make them work with a spare dial indicator and the maximum movement of the indicators stem and span the slot in the cutter head over the knife. I came up with a measurement that was slightly more than the centerline of the coupler, approximately one inch. So I laid out for two cuts and made those with a hand saw. I drilled two holes on the top centerline, one for the indicator stem and the second hole for a machine screw to retain the gauge to pipe coupler. A little clean-up and I now have a functional knife setting gauge

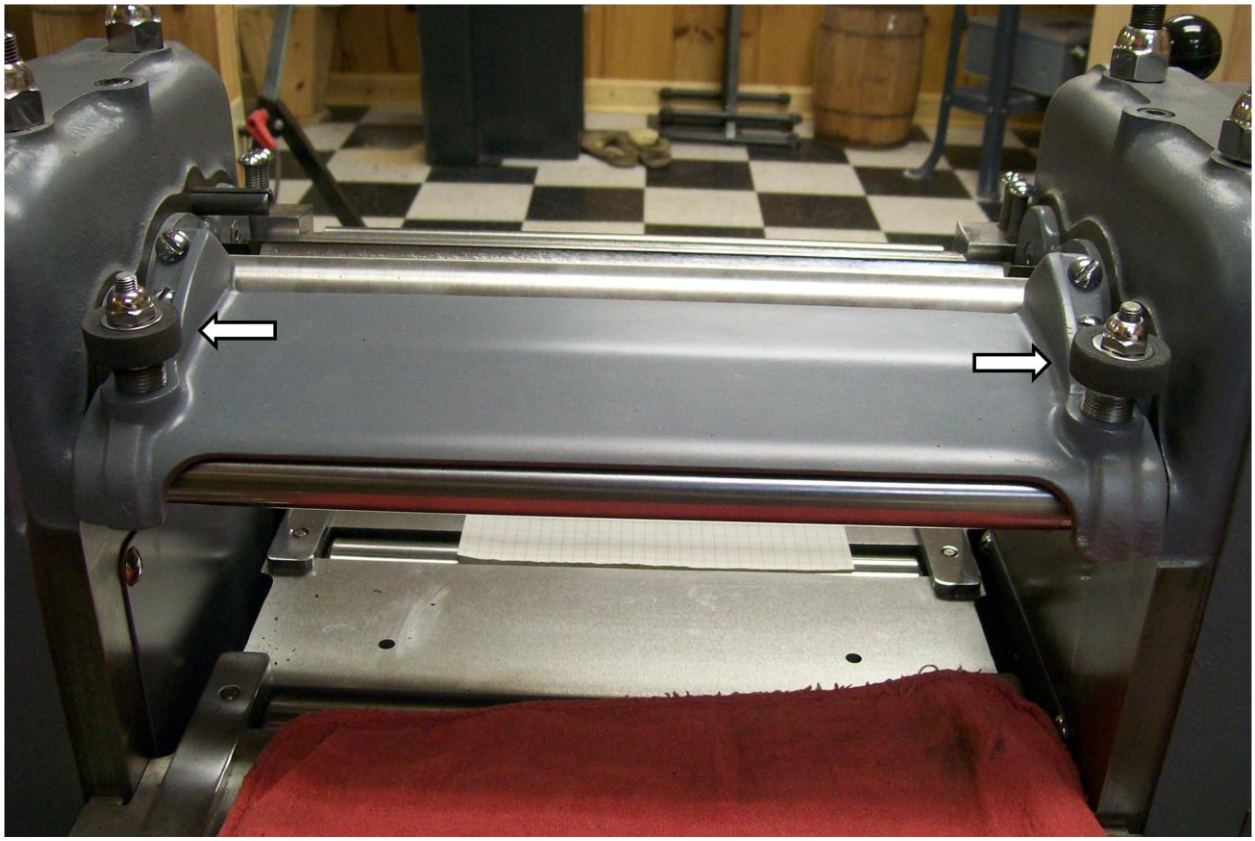


My implementation of the numerous knife setting gauges from the OWWM forums. See write-up for details.

Using the gauge is just a matter of lightly tightening the locking screws on both ends of the knife so that they can be moved with slight pressure. After adjusting the blades so they are all the same height I then tighten the remaining screws which I tighten in three increments. All the screws for the first blade are tightened to the first increment, then the second blade and then the third. Then it is back to the first knife, tightening it to the next increment, then the second and then the third. Back to the first blade and a final tightening, finishing with the second and third knife. The reason I like to sneak up on the final tightening is to try and even out the pressure/tension on the cutter head. I like to check the height of each blade as I tighten them just to make sure they didn't move. I make one more check to verify all the knife retaining screws are tight before I attach the chip breaker. Something about throwing a knife that doesn't appeal to me.



Pressure bar hardware, rubber pads, hex jam nuts and washers



Pressure bar hardware installed


Chip breaker with my shop made badge.

The Delta/Rockwell badge was MIA and from the looks of it the factory never installed one. While the holes for the badge were drilled there is no indication that a drive screw penetrated the hole. Anyway I decided to try my hand at making an etch and fill badge like the factory would have provided. Without going into all the details of how it was made here is the short version. I used one of the decal artworks from the WIKI, modified it, printed the artwork in reverse on PNP Blue paper using a laser printer, and transferred the artwork from the PNP blue paper to a piece of .025 aluminum stock using a hot iron. After removing the paper and checking the transferred image I etched the badge in a mixture of copper sulfate and sodium chloride until I was happy with the depth of the etch. Rinsed and cleaned the badge

Slide 50

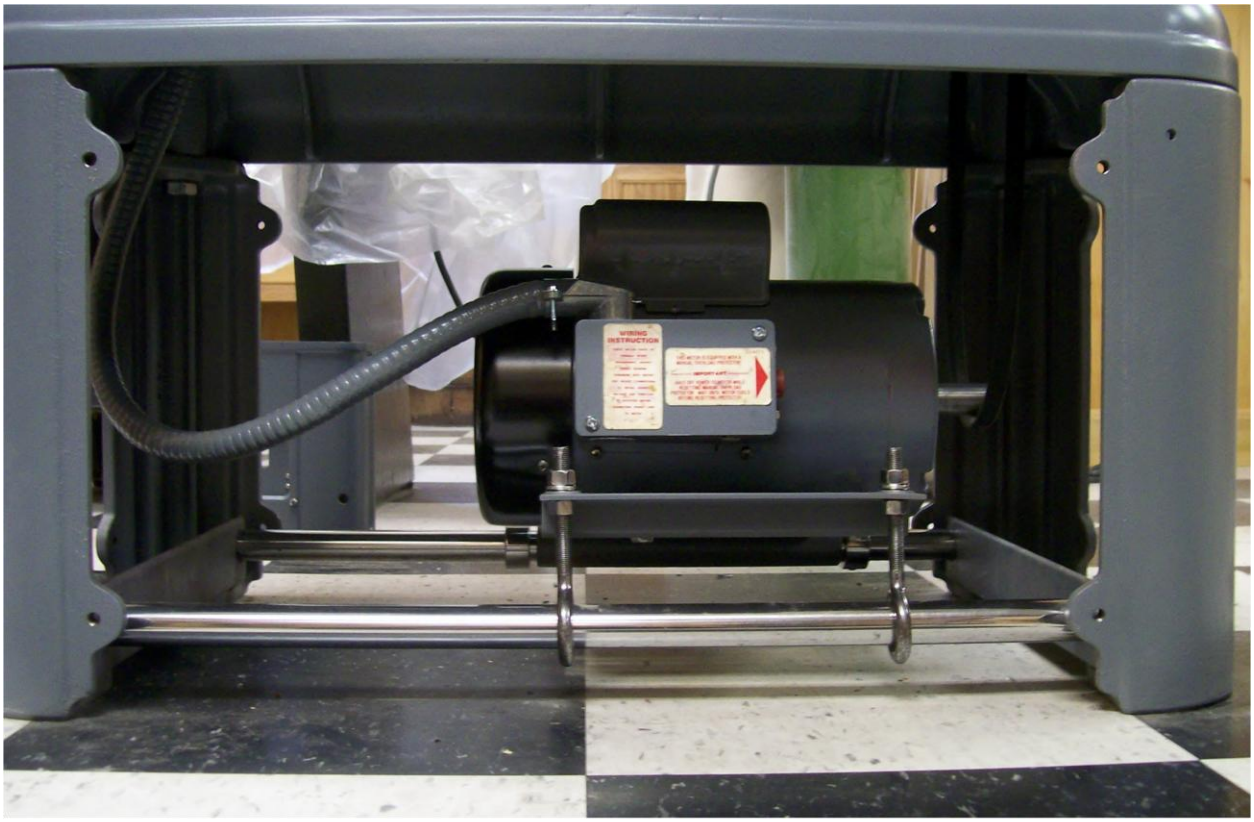
My “sanity checker” (see slide 15) has almost all of the B/M items yellowed out, which means they are installed on the planer. I’m down to just a few items which include the depth of cut indicator, the motor, line cord and the front, rear and side panels. The side and front panels required some body and fender work and are ready for paint. The rear panel was also MIA and I just got my hands on an appropriately sized piece of 16 gauge steel sheet that needs to be trimmed to size, a few holes drilled and a couple of stiffening lips bent on the top and bottom and painted. Then there is the motor. After all this time I have finally decided that I am not going to use the motor that came with the machine. I think 5HP is overkill for this machine so I’m looking for something in-line with the original factory recommendation of 2 or 3 HP.

Replacement Front Panel ready for some final sanding, primer and finish paint.

As I noted the front/rear panel was MIA from the previous owner so I fabricated a replacement from a sheet of 16 gauge steel. The easy part was drilling the four mounting holes. The bending of the stiffening lips on the top and bottom should/would have been easy if I had a brake to bend the sheet but lacking one and having no access to one I used my metal vice and a hammer to bend the sheet. Not as neat and crisp as a bend on a brake but with a little body work with a hammer and file, a coat of primer, a little glazing compound, a couple of coats of primer along with some sanding and two finish color coats the last of the paint/body work is - finished. The new panel looks very factory like, albeit its production took much longer than the factory.


New (to me) 2 HP Single Phase Motor

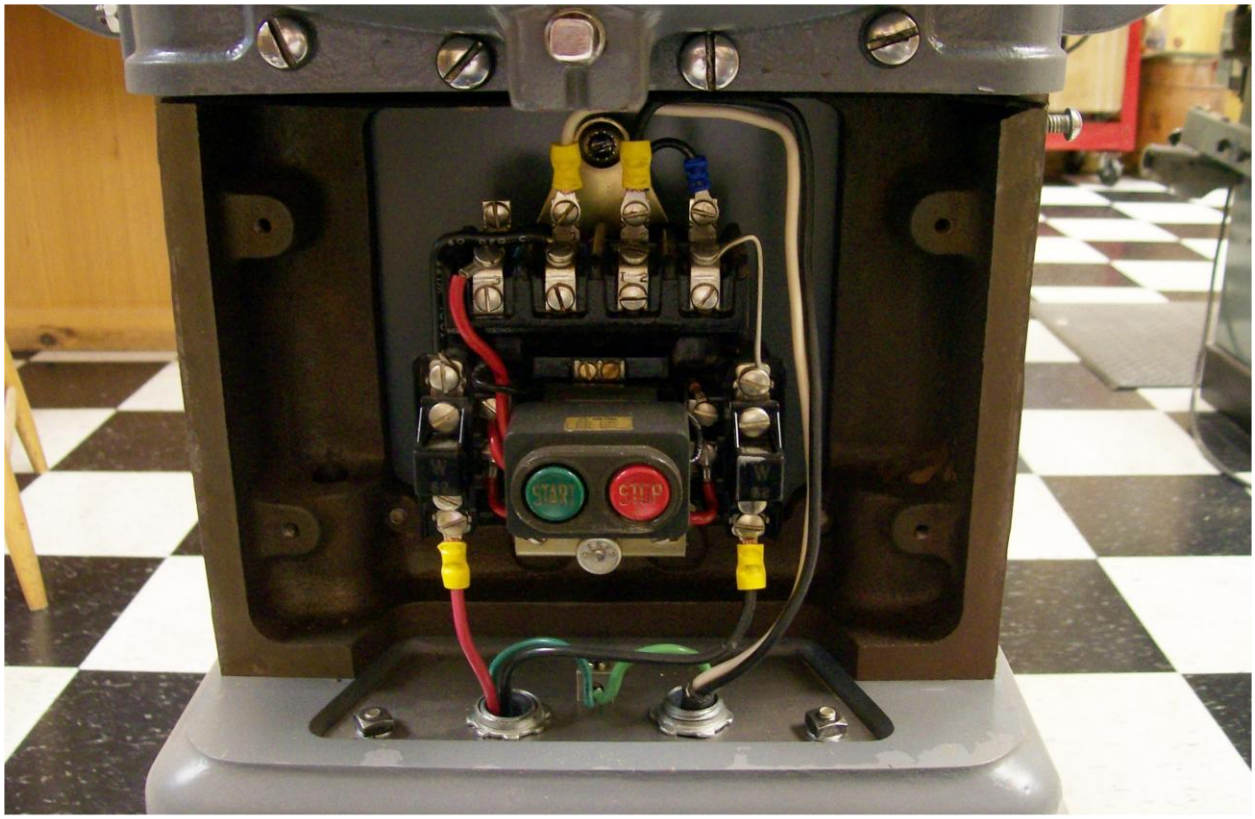
I previously noted the planer as purchased came with a 5HP single phase motor, quite a monster. These planers came with a recommendation from Delta to use a 2HP motor for "school and general industrial use and a 3HP motor for heavy duty" use. I decided the 5HP motor was overkill and potentially could cause damage to the unit if the cutter head or feed rollers jammed. I understand the infeed roller sprocket has a brass shear pin that is suppose to help prevent damage to the planer if something jams but I have seen cases where shear pins didn't shear and other part were damaged. Besides 5HP uses about 3.7 KW and the 2HP uses about 1.5KW so I can save a few bucks on my electric bill. Anyway here is the "new" 2HP Leeson motor ready to install in the planer base.



Motor mounted and wired ready for new pulley

The motor installed in the base, wired to the starter and waiting for the new pulley to be installed. I am getting a little old to be laying on the floor wrestling with a 50 pound motor trying to line up 4 bolt holes at least there isn't dirt and grease involved. The motor pulley that came with the planer when I purchased it was the wrong size for the cutter head pulley which had the OEM pulley. At slightly over 6 inches the motor pulley was barely making 3450 RPM at the cutter head. The cutter head according to the factory data is suppose to make something like 12,600 cuts per minute. To make the factory recommendation with the OEM cutter head pulley a new pulley with a diameter of 7.25" was needed to produce slightly over 12,500 cuts per minute. I don't think I'll miss those extra cuts. So my original plan use the old pulley and just purchase a new bushing to match the new motor shaft went up in smoke. Now I needed both a new pulley and bushing. Off to the surplus house for replacements.

The new pulley also required new belts, another expense I didn't anticipate because the old belts were in great shape and I planned on reusing them. Oh well, it's probably best I put new belts on the planer.




Motor Starter wired and ready for cover.

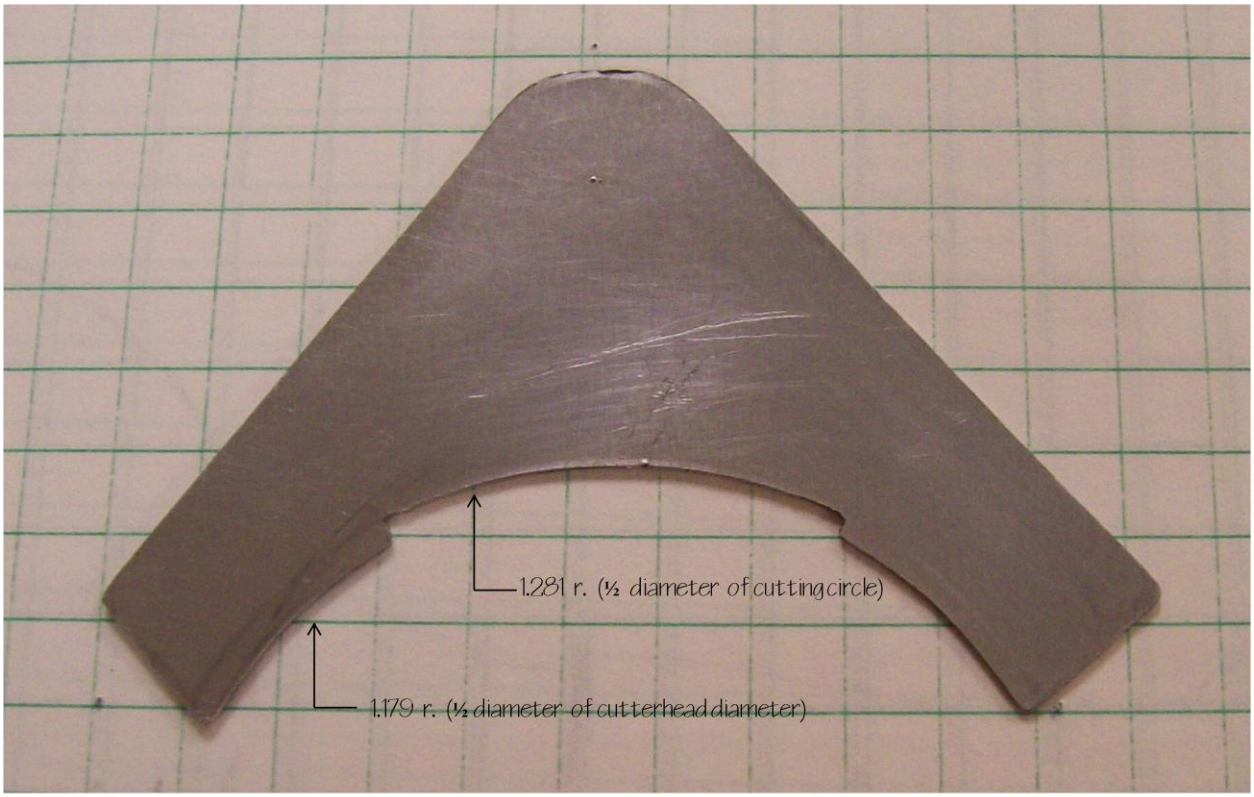
Wiring of the motor starter. Nothing special here just a new 12 gauge line cord from the wall plug to the starter and some 10 gauge from the starter to the motor.

Motor Starter Cover installed.

Motor starter with the cover plate in place.  A helpful word or two about installing the cover for the starter. When you remount the gear box, place the starter cover in its normal position then place the gearbox on top of the starter and attach it to the column. In fact placing a couple of pieces of paper between the top of the starter cover and the bottom of the gear box and then attach the gear box. Remove the cover and paper. This will make removing and reinstalling the starter cover much easier later on.


Front & Rear Views

Here is a slide showing the front and rear of the finished planer awaiting a number of final adjustments. Beginning with setting the blades to the “true cutting arc” which for this machine is 2.562” (9/16). I fab’d a gauge using the 2.9562 to determine a radius to scribe a line on a piece of aluminum sheet stock. Then I measured the diameter of the cutter head which was 2.359” (23/64) and used this number to establish a radius and scribed a line on the aluminum stock using the same reference pivot point. Next I measured the gap in the cutter head where the knife and throat bar are located added a little and used this measurement to cut a notch in the aluminum sheet connecting the two radi. Looks something like this, crude but it works well enough to get you in the ballpark, allowing the use of a dial indicator to get the measurement right on and consistently parallel with the cutterhead. If I get sometime in the future I’ll probably make a more substantial tool. Here is a picture of my fast and dirty gauge.




Knife Gauge

At this point I did a review of Bob Vaughan's article on Getting Peak Planer Performance from the wiki http://wiki.vintagemachinery.org/Getting%20Peak%20Planer%20Performance.ashx and his youtube video http://www.youtube.com/watch?v=uSM7Jrg34a8 (We all looked young in 1994) I highly recommend anyone replacing their planer knives to read and view Bob's work. If anything it shows and Bob explains the major parts of the plainer and how they relate to each other and to the overall operation of the planer. Remember follow you planer manufacturer's specifications regarding final adjustments. After the blade adjustment the only problem I had was getting the Pressure Bar adjusted properly. As it turned out It was pretty simple but then sometimes they turn out to be the most difficult.

Finally doing what it was meant to do.

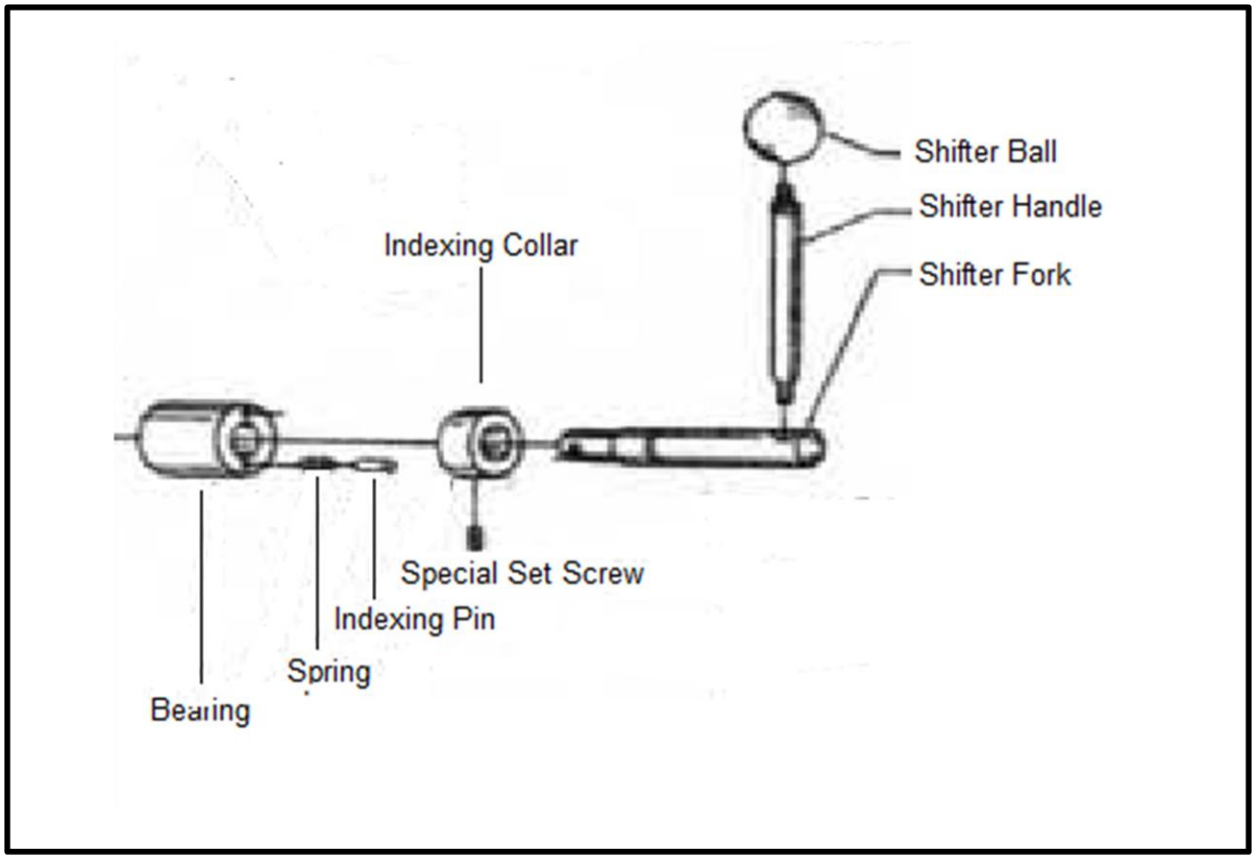
After the final adjustments to the bed rollers, tension adjustment on the infeed and outfeed rollers along with the pressure bar here is the planer doing what it was designed to do – make chips. And if I may add, it seems to do that very well.

| Delta 22-101 Machine & Rebuild Cost | | |
|---|---|---|
| Item | Description | Cost |
| 1 | Initial Machine Price | 360 |
| 2 | Delivery Cost, Fuel, Tolls, etc. | 155 |
| 3 | Thrust Bearings | 58 |
| 4 | Table Regrind | 70 |
| 5 | New Worm Gear | 205 |
| 6 | Clutch Gear | 25 |
| 7 | Misc. HDW, Shift Lever Ball | 44 |
| 8 | "O" Rings | 8 |
| 9 | 2 QT's Syn.Oil W140 | 32 |
| 10 | New Amana Knives | 58 |
| 11 | Pulley & Bushing | 38 |
| 12 | 2HP Motor | 130 |
| 13 | V Belts | 18 |
| 14 | Sheet Metal (front panel) | 25 |
| 15 | 220V AC Plug | 11 |
| 16 | 12 Ga. Line Cord | 20 |
| 17 | Rubber Cushions | 12 |
| 18 | Paint, Miscellaneous | 20 |
| | | |
| | Total | $1,236.34 |

Financial Summary

Financial I added a small excel sheet to keep a running cost of the machine and parts/pieces and outside purchased services. It's something I do for my own information, why ? It's just mundane data that I like to have available if I ever want or need it. Here it can provide a member who is contemplating buying and rebuilding one of these machines an idea of what he/she may expect to spend

Summary this pretty much catches all the cost. Not too bad while some cost were saved by buying over the net via auctions and surplus houses shipping sometimes takes away the advantage but I made a few good deals on some new items like the new Amana knives for $58. About $20 bucks less than the best price I could find from any online or brick and mortar store.




Clutch Shifter and Indexing Collar

Another issue I encountered that I am remiss for not photographing while it was disassembled and I was diagnosing and repairing was the Clutch Shifter. The previous owner noted that the clutch tended to disengage or pop out of gear during operation and said that it did so for all the time he owned it. I didn't pay much attention to it but after running while trying to make my final adjustments the issue appeared. After a lot of adjustments, looking at this simple mechanism and trying to figure out why the shifter would disengage I found what seemed to be the problem. The Index Collar has three holes that engage two spring loaded pins located in the shaft bearing when the clutch is engaged and just one hole when disengaged. No matter how I adjusted the collar I could never get two pins to line up anytime yet alone when the clutch was engaged. I could get one pin engaged when the clutch was engaged but the second pin was close to the hole in the Index Collar but not close enough to allow the 2nd pin to enter. Well not seeing any solution and realizing the Index Collar must have been that way from day one I decided to try my fix. I removed the Index Collar and filled the hole that the second index pin should have engaged with weld from my wire welder. A quick hit on the grinder removed most of the excess weld. A couple of minutes on the lathe leveled the weld to the surface of the Index Collar and I marked the center of the existing holes. Remounting the Index Collar on the machine I engaged the Clutch Shifter with one pin engaged I marked the position of the second pin on the Index Collar, removed the Index Collar and center punched and drilled a 3/16 hole about 1/8" deep. While I was drilling I made not much more than a cleanup cut on the other existing two holes. I mounted the Index Collar, Special Setscrew and Shifter Handle, rotated the handle to engage

the clutch and both indexing pins engaged the Index Collar requiring what I would say is firm but smooth force to disengage the two pins. Since making the correction/modification the clutch has not disengaged on its own. Sorry there are no pictures but here are the parts I have been talking about.

Final Comments

Some final thoughts before I move on to my next project. The machine is very quiet with the motor running and drive train engaged, just the whirling hum of the spinning cutterhead. Even when planning the machine is quiet especially compared to my other machine which we don't talk about here.

The modification I made to the infeed/outfeed Guide Block bearing O-ring seems to be working well. There is no seepage of oil from the gearbox and as I mentioned the rotating resistance difference between the "original" O-rings and my modification was huge which should add to the life of the O-rings, reduce or eliminate oil seepage (a common complaint with these machines) and possibly reduce wear on the drive train and the worm gear.

Speaking of the worm gear, and I hope I won't have to speak or do anything else to it ever, I did not as I noted during the rebuild "pin" the gear. I had developed my own reasons which I used to convince myself not to do it. Time will tell if it was a good or bad decision.

Thanks for following along. Hopefully there is something here that other members can use.

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