Rebuilding a South Bend

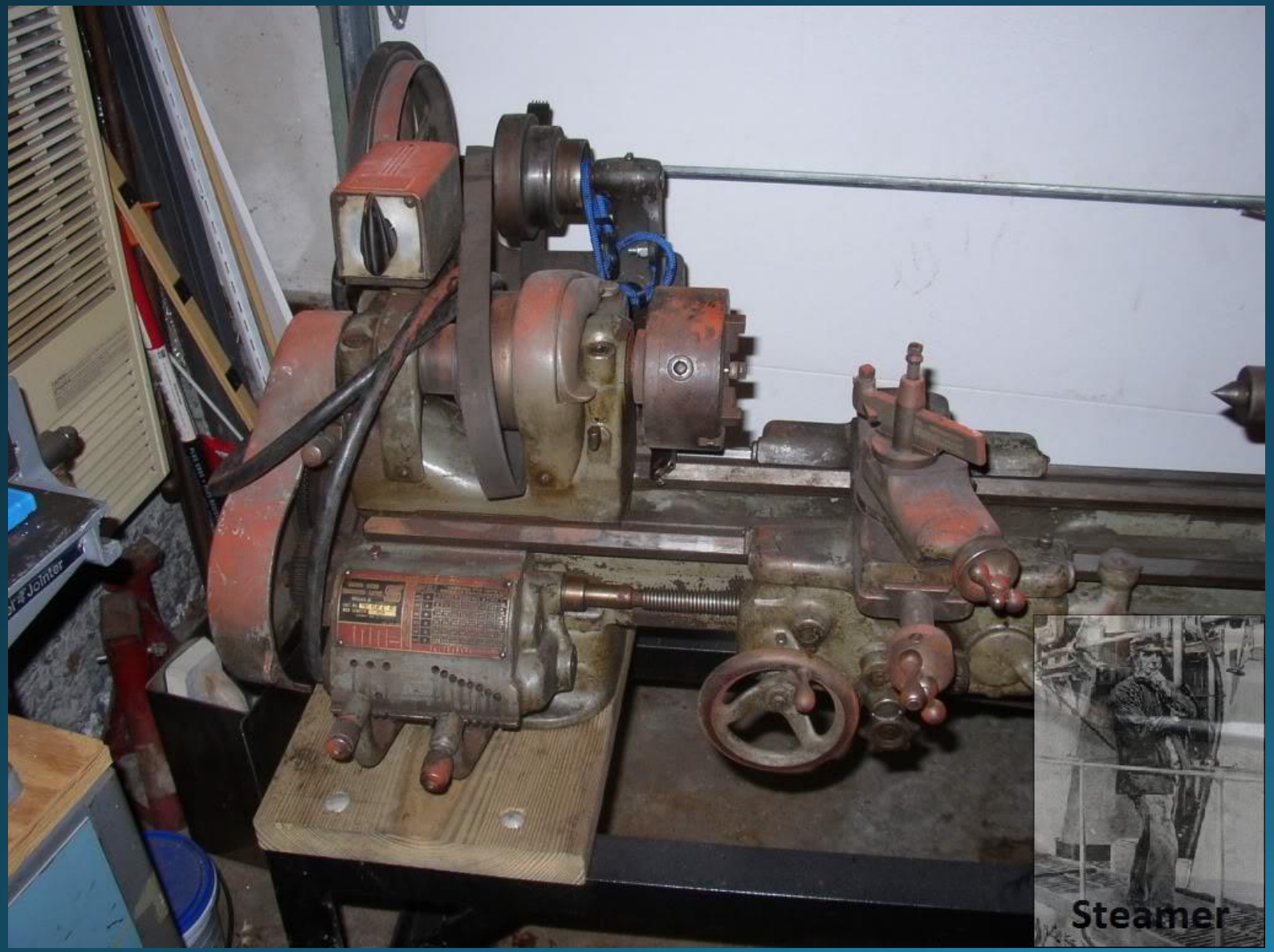
My last lathe…

-

Well, this is the saga of my 9" Southbend model A long bed.

It started about 5 years ago when a family member said he had this lathe and wanted to know if I would be interested in it?
Well....I had 4 lathes at the time...not all in running condition....so adding another one to the mix seemed dubious at best....however, the price was right...."come and get it out of my shop"....so...I figuired I'd at least fake interest and check it out.
Here's how I found her

How I got it.....



1951 SB 9 x 4 ½ Model A

Originally sold to a tool and die shop
In Leominster.

It then spent 30 years in a auto repair shop cutting commutators on
Truck generators

...pretty grungy.....

How I got it.....

Stuff!.

The Plan

- Looked pretty good….I was wrong!
- Bed had a lot of wear….like .006 belly
- Tailstock was low .018”
- Tailstock quill was worn .004”
- Saddle had wear and abuse on it
- Worn shafts and bearings in many places
- But….was a long bed, and had some options..and I wanted a lathe this size…..
- …….Fish or cut bait time……I went for it!

FIRST THING

stevewb on Ebay

Great kit of parts and instructions

Accurate

Good quality

Worth the money and then some!

I bought two kits…for spares….

Counter shaft bearings

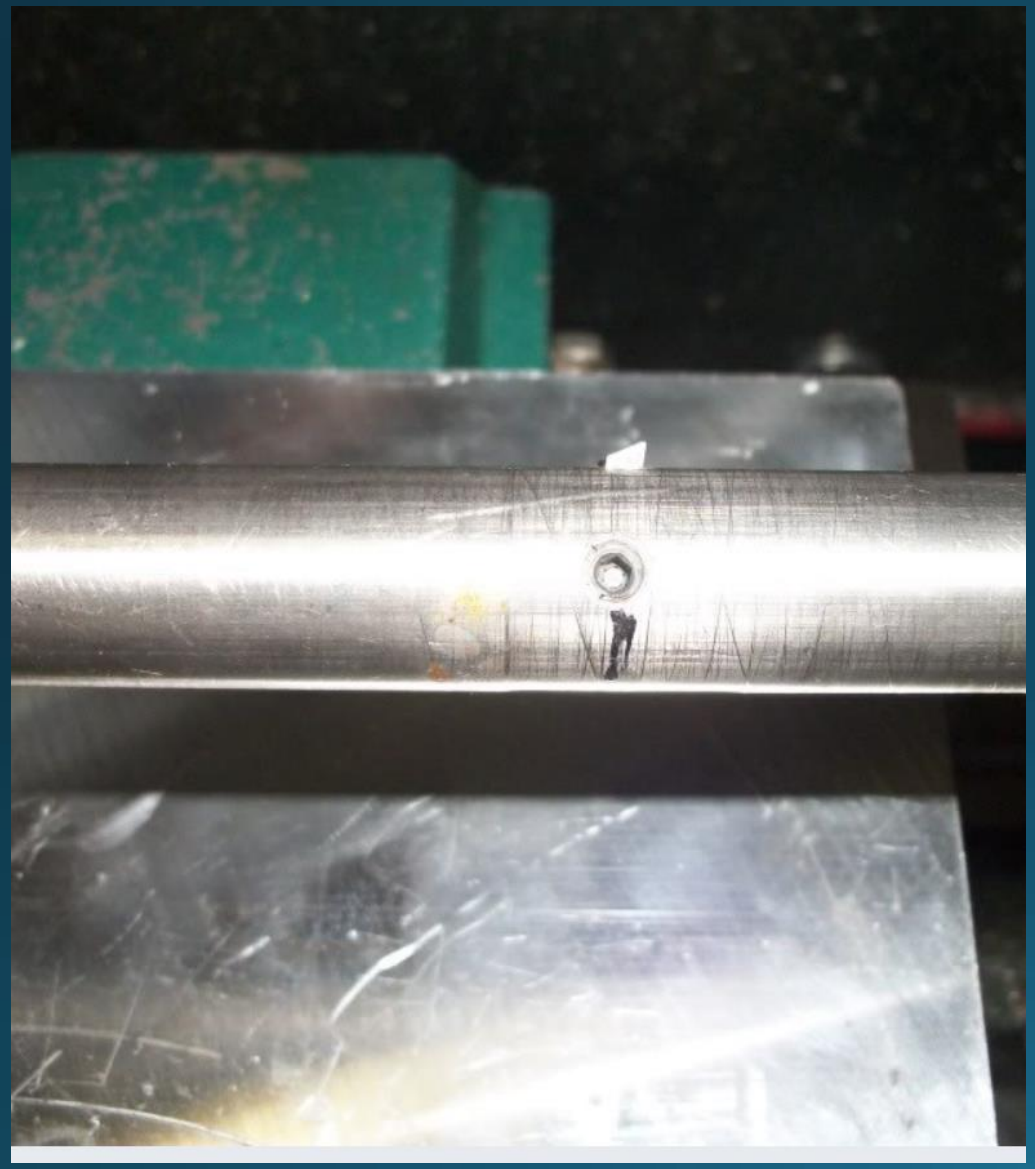
Some lathes were bronze bushings
Some lathes were cast iron….

Mine was cast iron and had 0.062 wear on the bore and shaft

I turned a new shaft, and bored the housing for Sintered Bronze bushings and new oilers

Bored with a between centers boring bar on my Boring table in the Logan

Counter shaft bearings



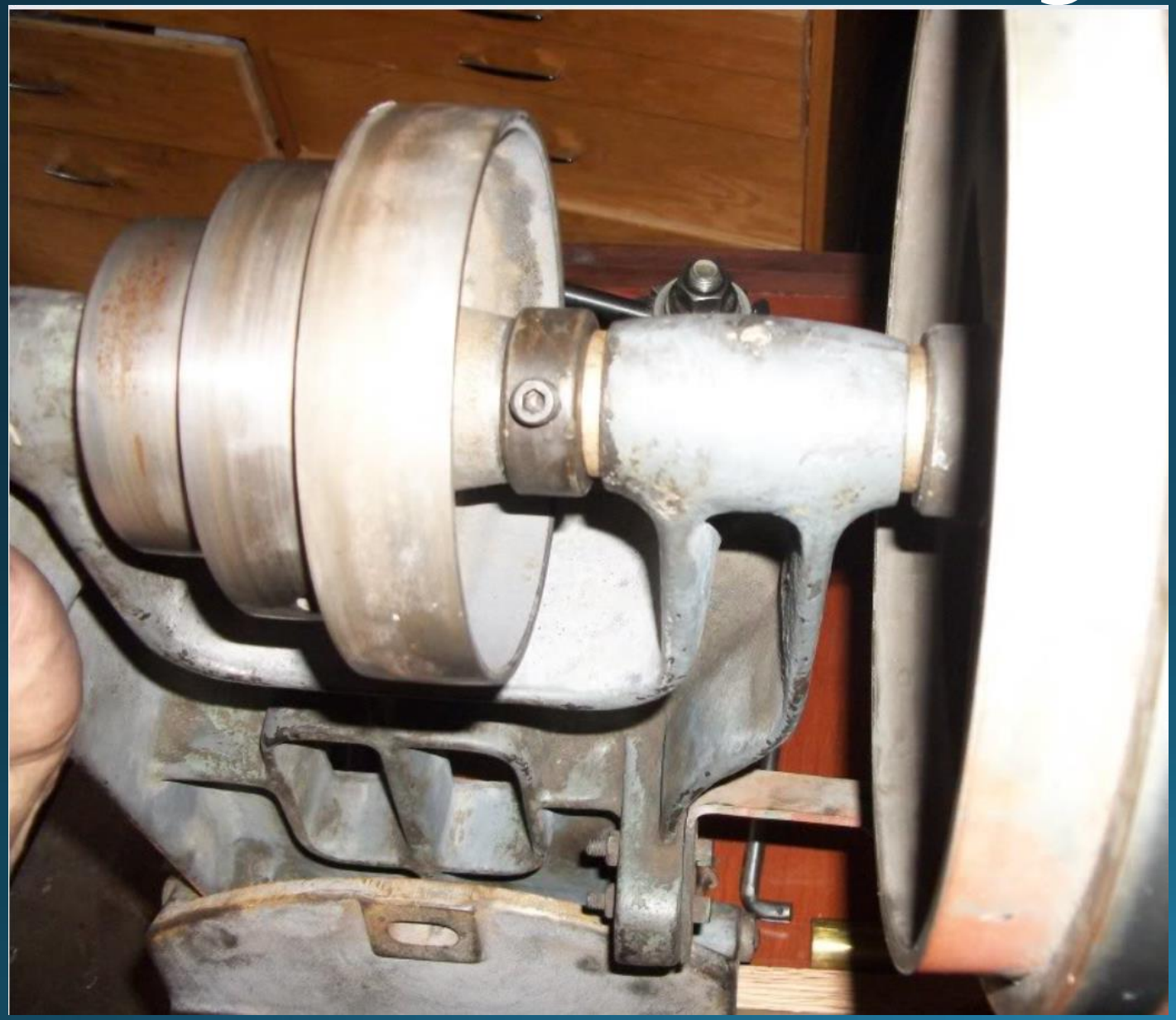
Between centers boring bar and boring table on the Logan

Counter shaft bearings

Counter shaft bearings

Boring complete.

Counter shaft bearings



Complete!

The Bed

- Didn't have a master straight edge 50 inches long
- Didn't have a surface plate that could handle a 50 inch straight edge
- What do do!!!!?

- Get it ground, and use the bed as the master, and then scrape everything to it.

The Bed

Forest City Grinding.

Dave Johnson Proprieter.

Approximately $500 plus shipping

WE'll get back to this…..lots to do while at the Grinder!

Headstock and bearings

Headstock and bearings

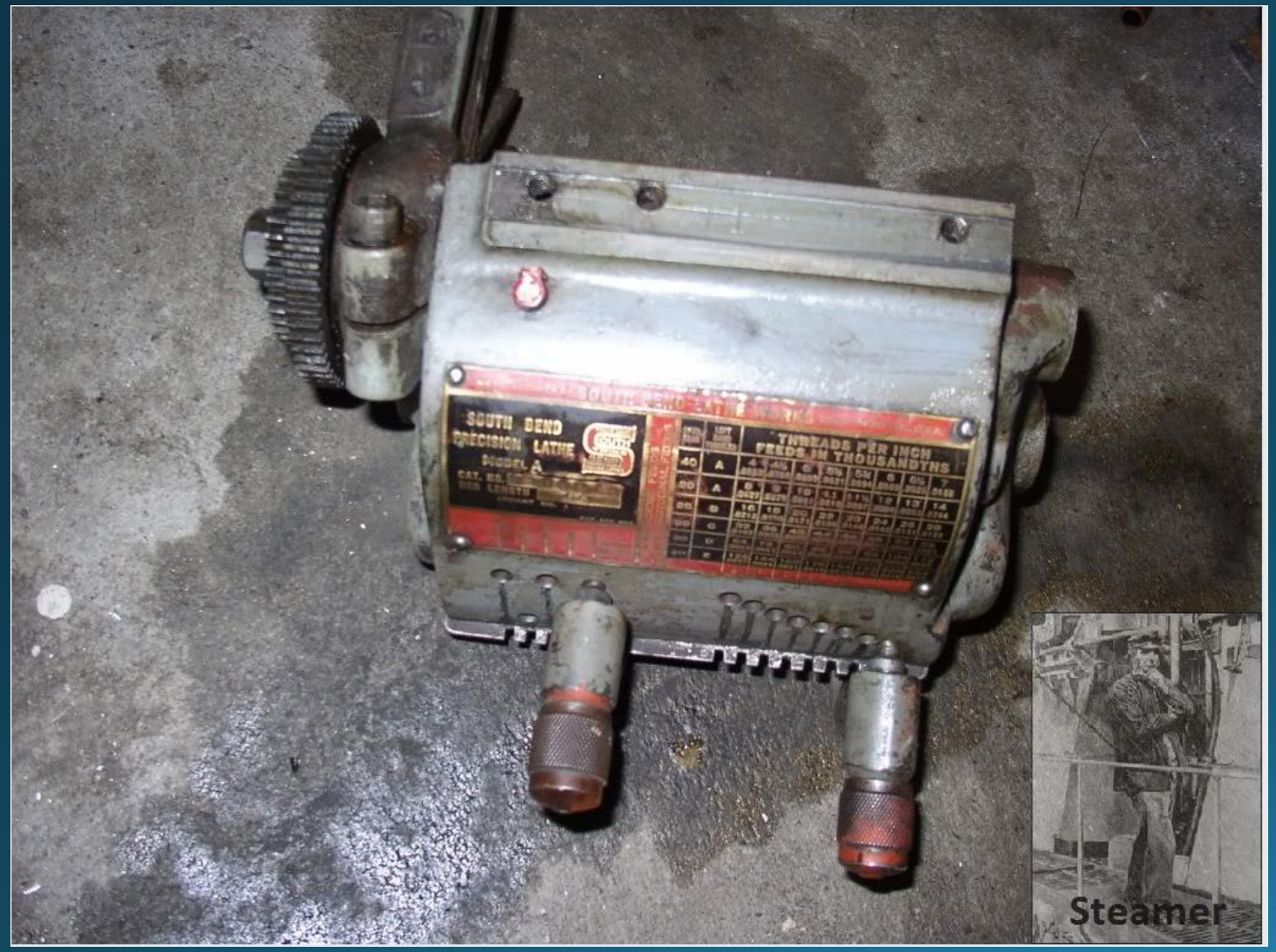
The only part of the lathe
That didn't need anything
It was as far as I could measure
and discern…Like brand new

I did replace the fiber thrust washer
At the back of the late with a needle
Roller bearing. Worth the money
And It was a drop in replacement.

Disassembly instructions in book
Are accurate…follow them!…

Headstock and bearings

Change gear box

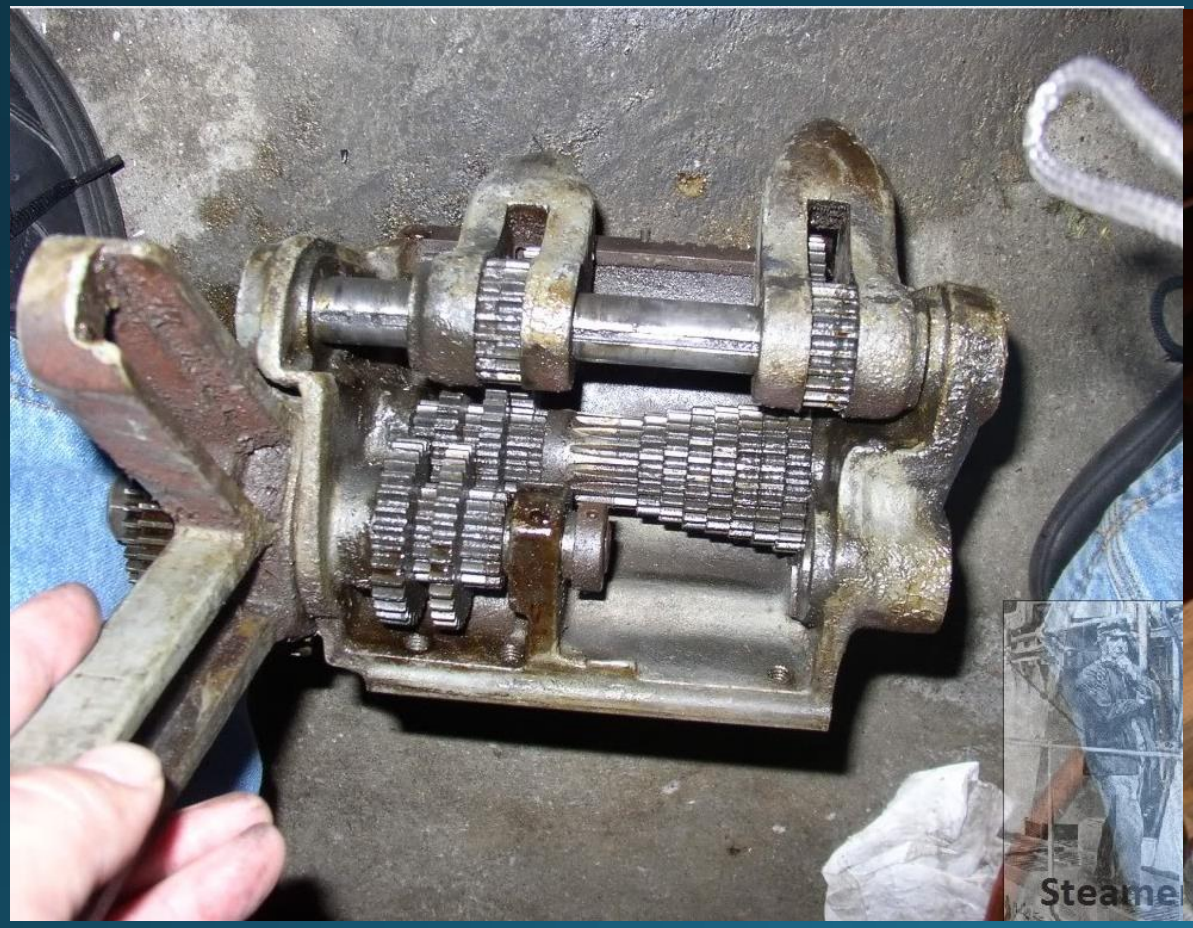


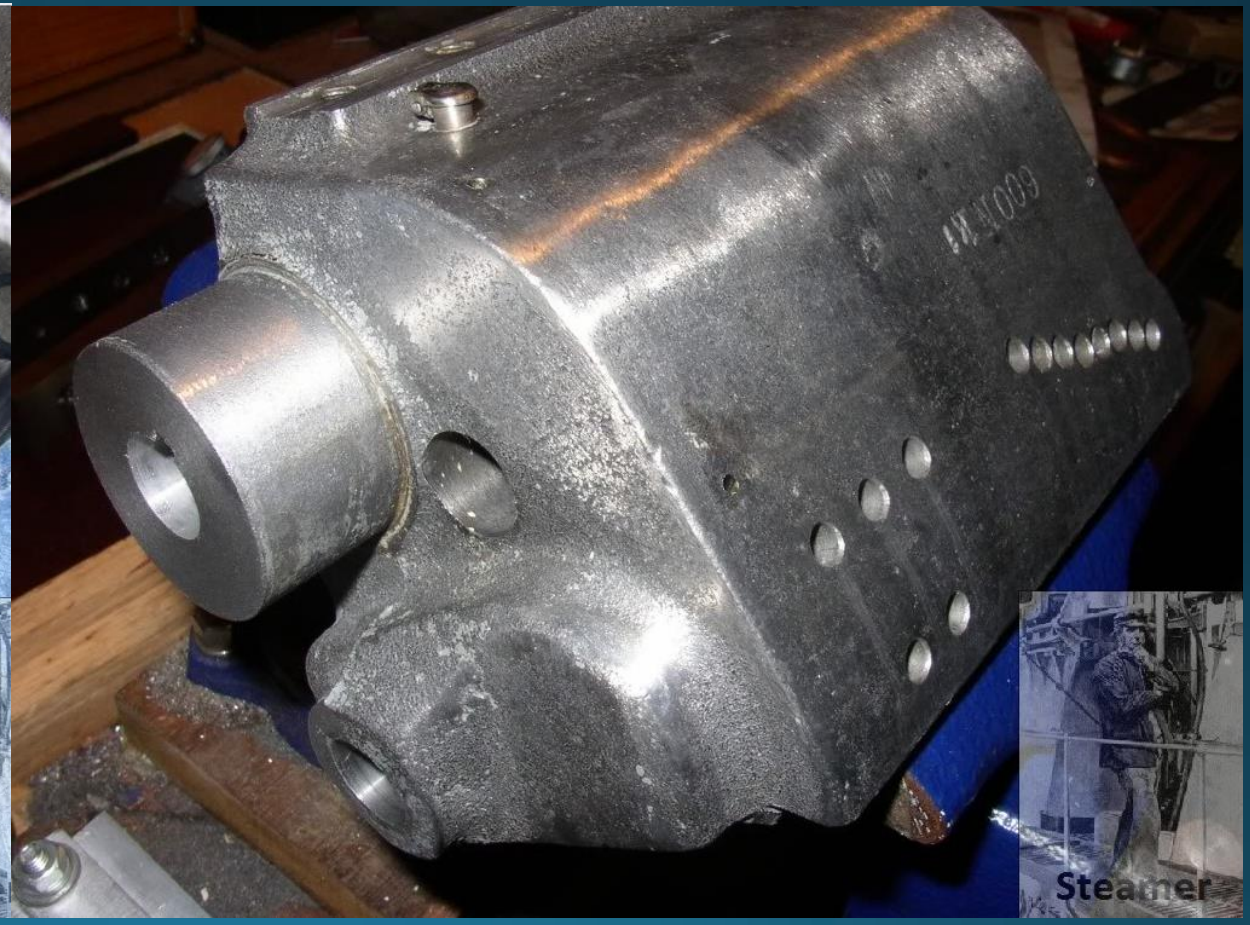
Looked pretty good
It had Worn shafts..one of them bad
Gears were good though
Nothing broken!

So I stripped it down

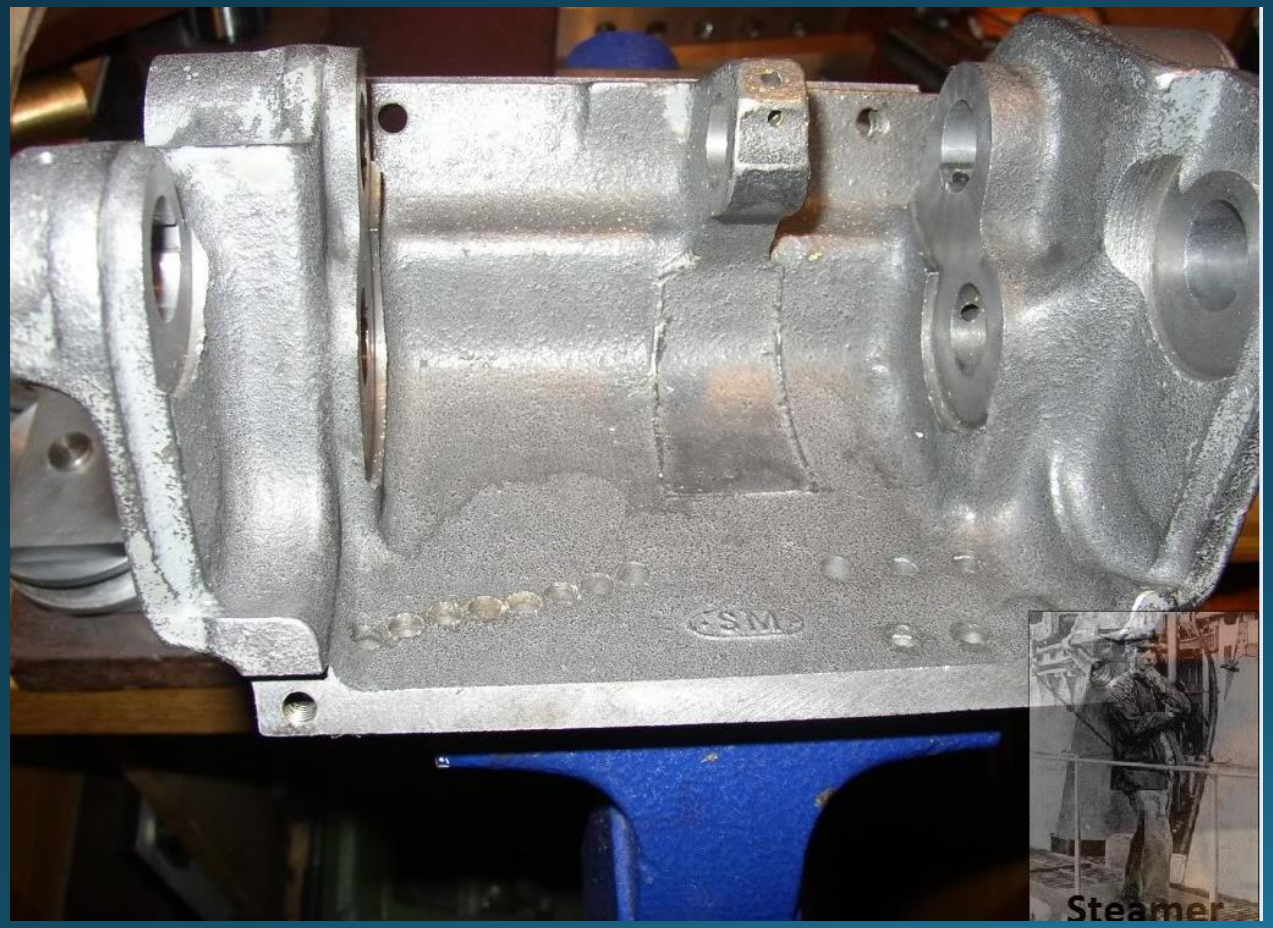
Change gear box

Simple green and hot water soak and it all comes off



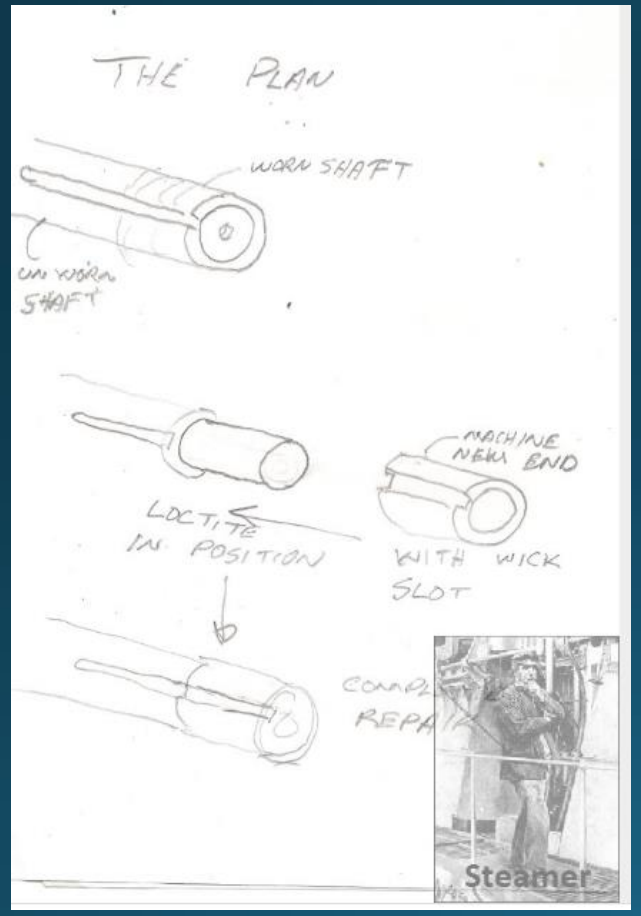


Change gear box



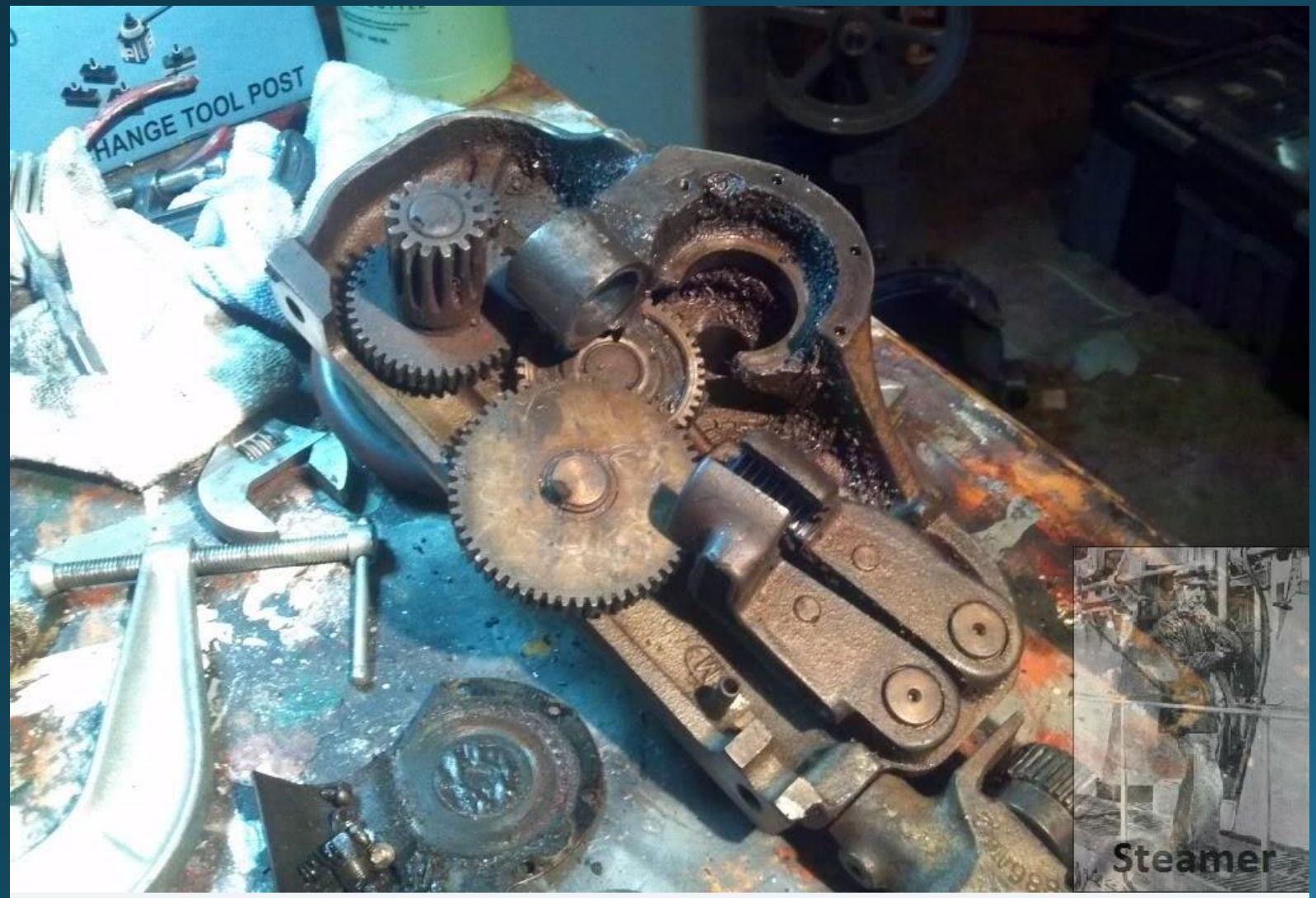
Simple green and hot water soak and it all comes off

Change gear box



Change gear box

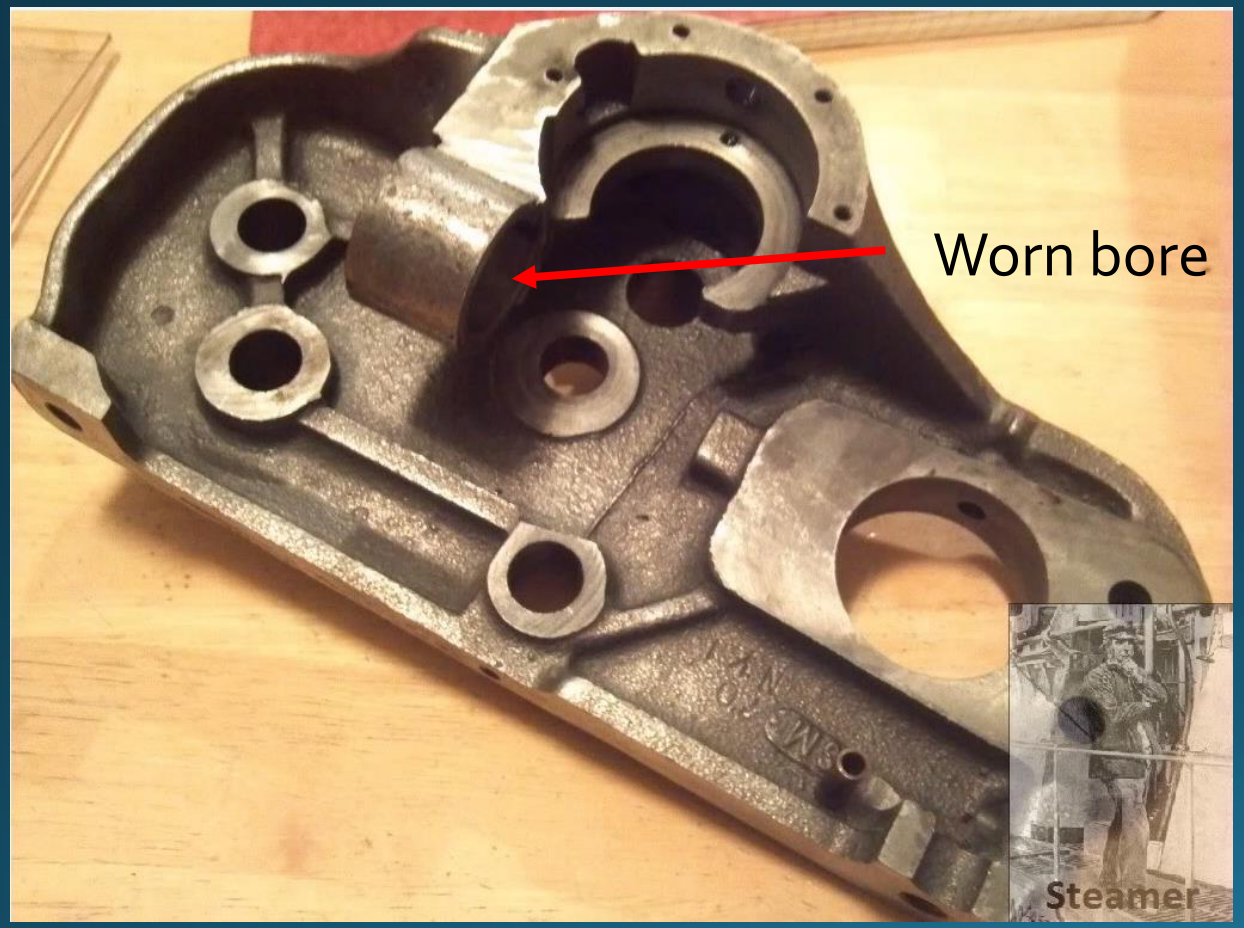
Apron



More worn parts
Worm gear housing had .06
Half nuts were half gone
Replaced bearings
Had to come up with some
Creative solutions for the
Worn housing though

Apron

Apron



This was going to require some Creative solutions!....all one piece.. Hard to get to.....what was the actual Center of the bore because it was No longer round...hard to tell!

Apron

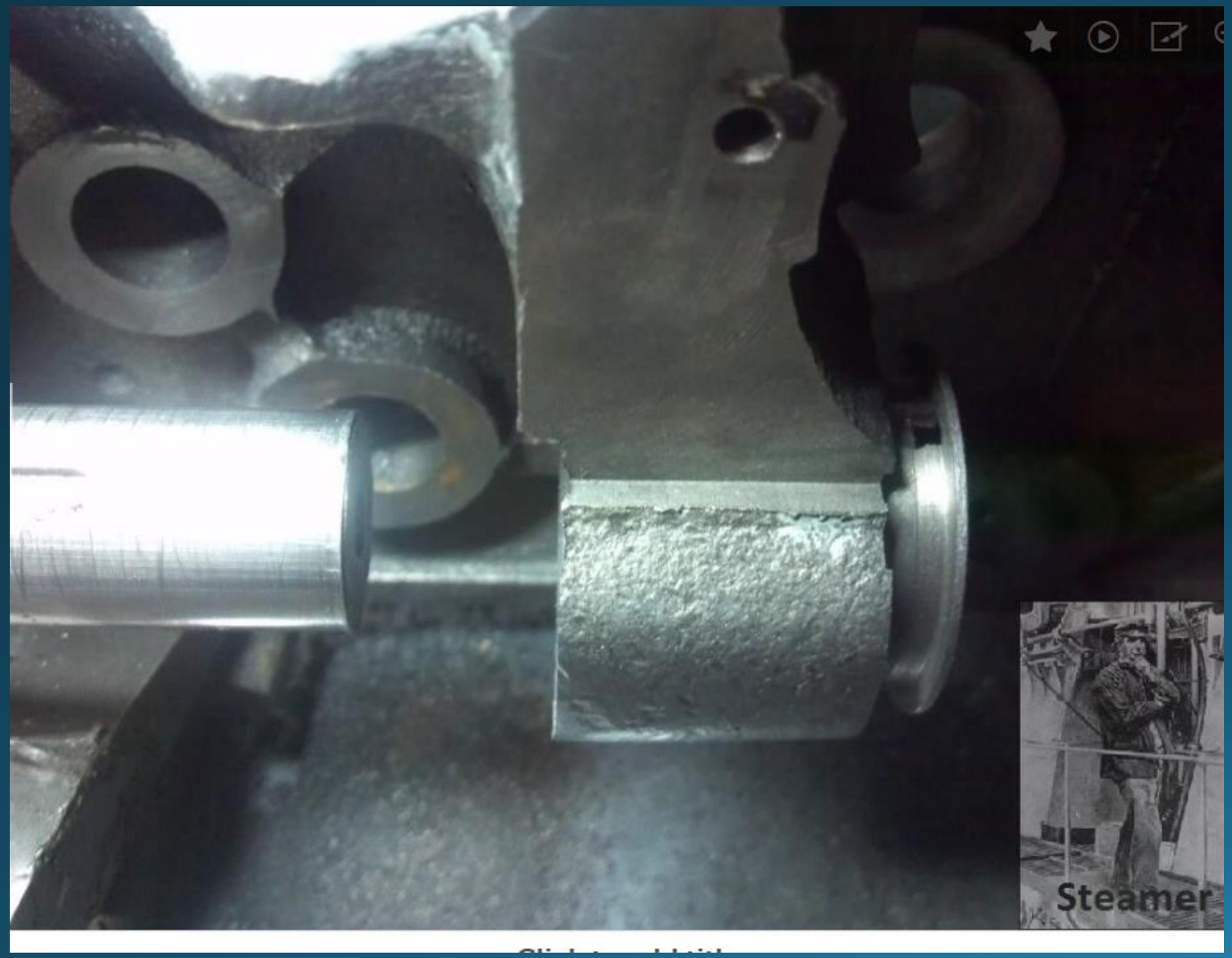
I machined a bushing to a close fit with the Worm gear, and a nominal fit with the new Hole I was going to bore. You will notice the Slot on the OD. This bushing was then loctited Into the new housing bore, and then bored to size. When to size, the slot was open. Then a standard wick could be fitted in place.

Apron

Set up on the boring table
Put the lead screw between
Centers through the apron
Adjusted the height and lateral
Position such that when the half
Nuts closed, there was no
Movement of the lead screw up
And down and side to side.

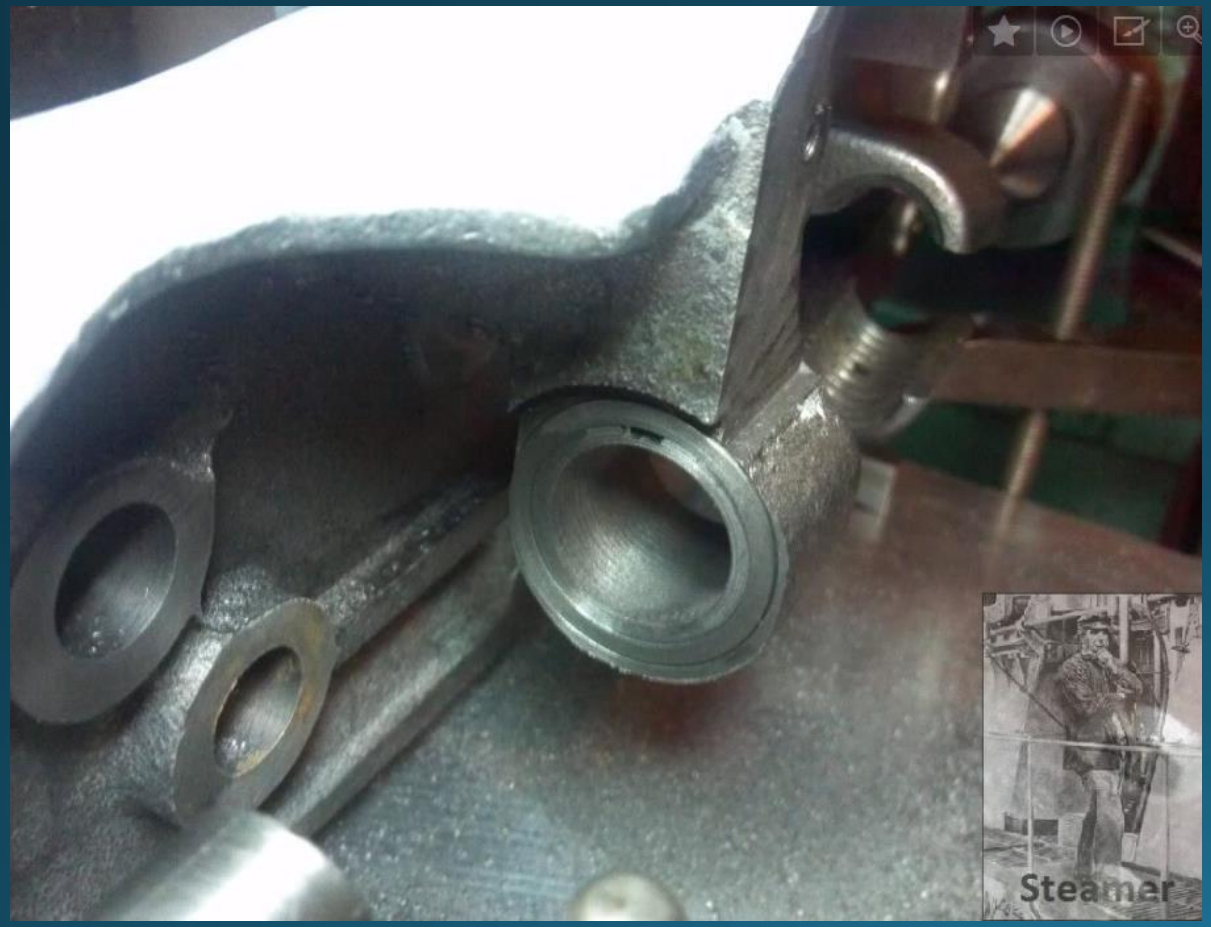
.....

Apron



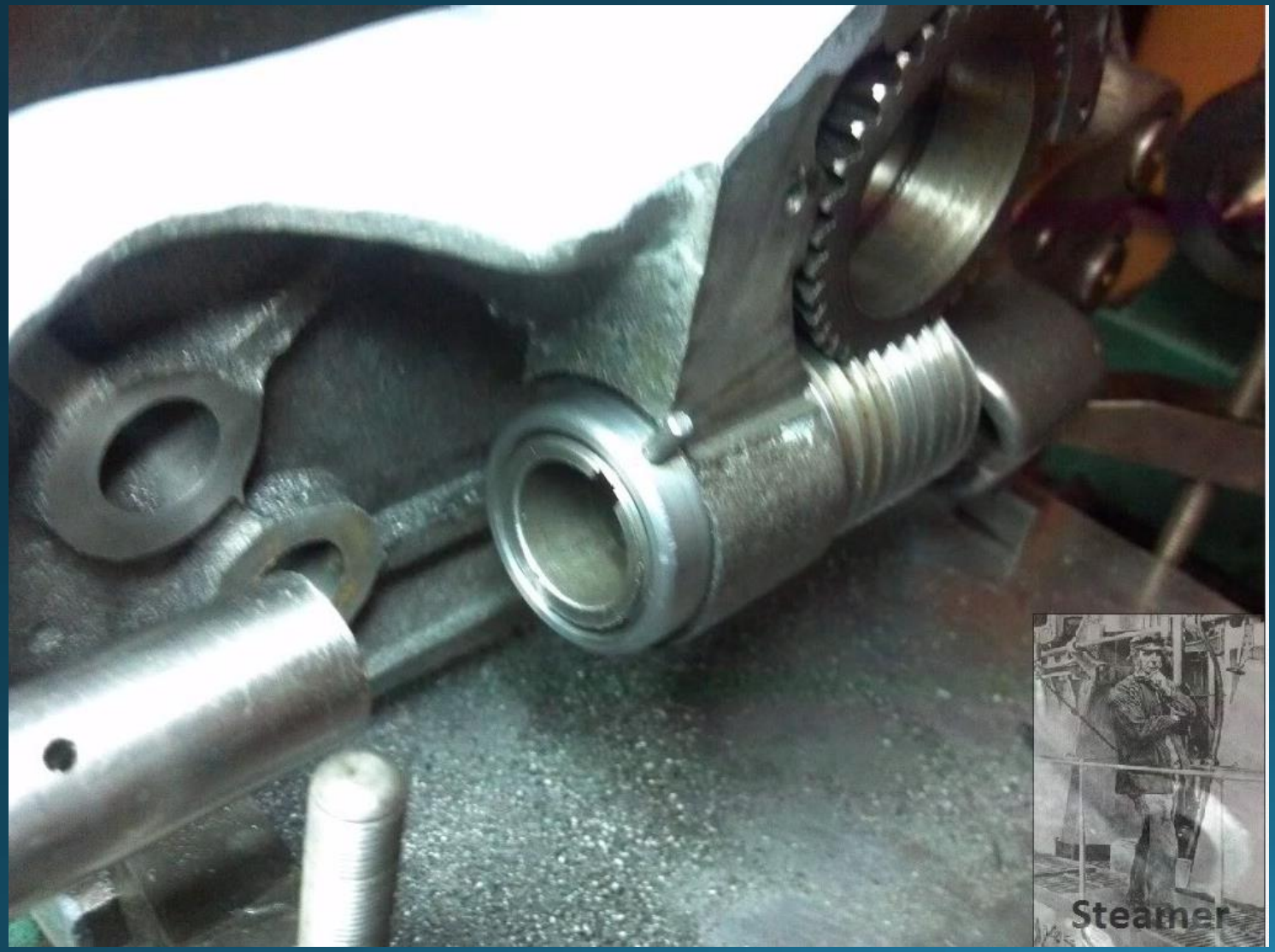
Bushing going into place prior to boring

Apron



Bushing installed just prior to boring the bushing to size
Notice wick slot that is blind now. When bored to size, this
Slot opened up and a new factory oil wick was installed.

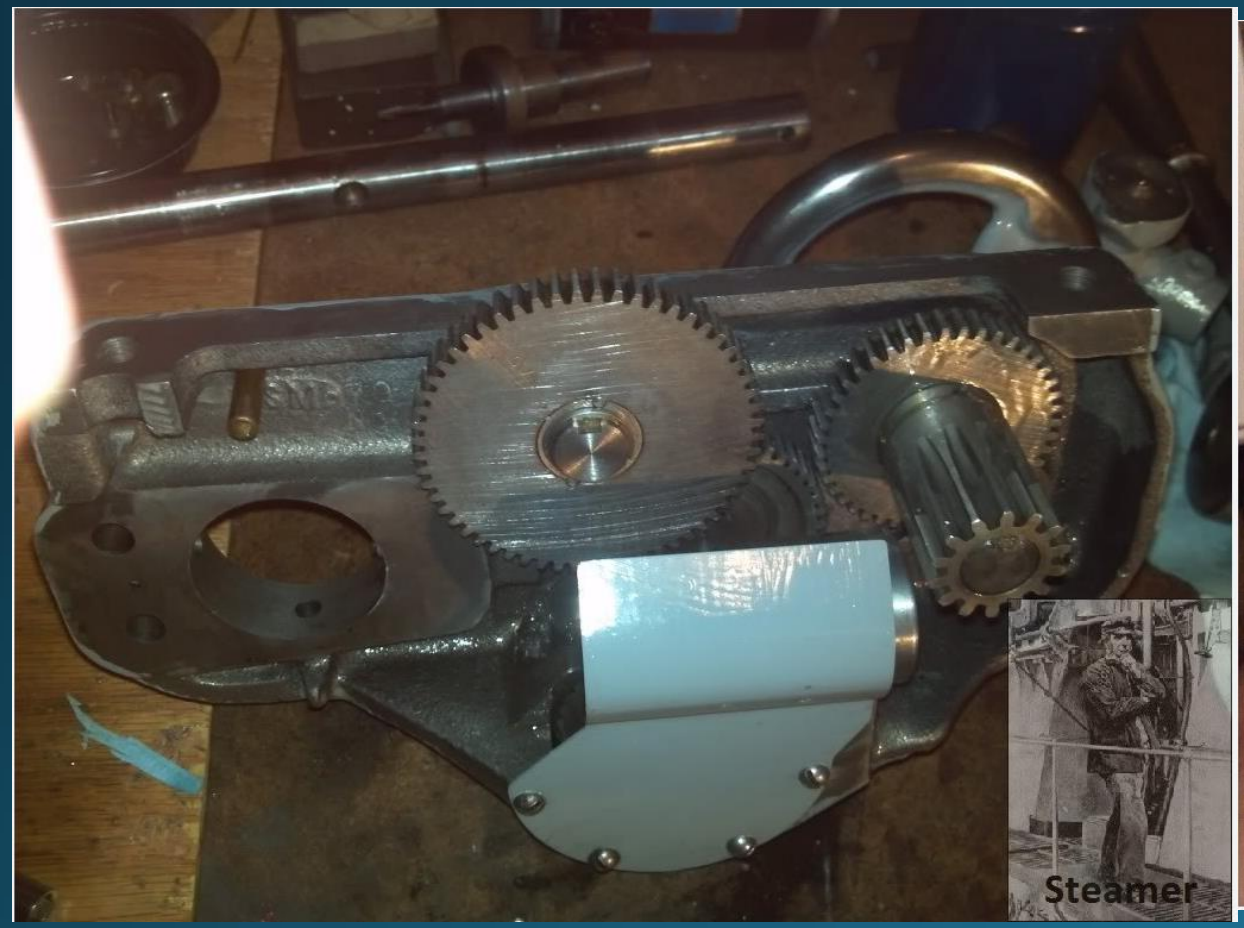
Apron



New bushing and worm gear
In place and meshed quite well

I also was able to find NOS
Half nuts to replace my worn
Ones. Good to go!

Apron



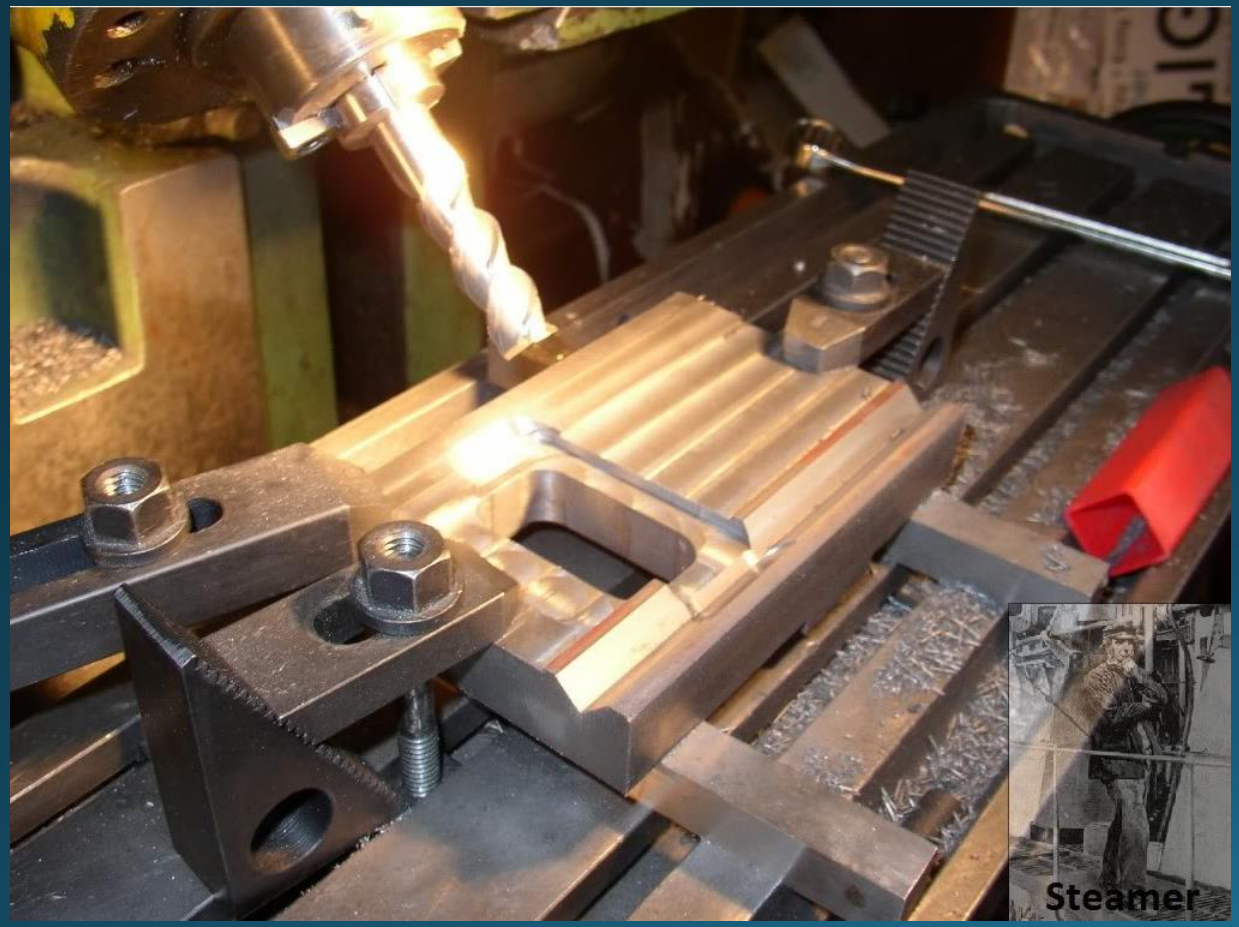
Tailstock and base

Existing one was 0.018" low and
Worn with a severe"rocker".

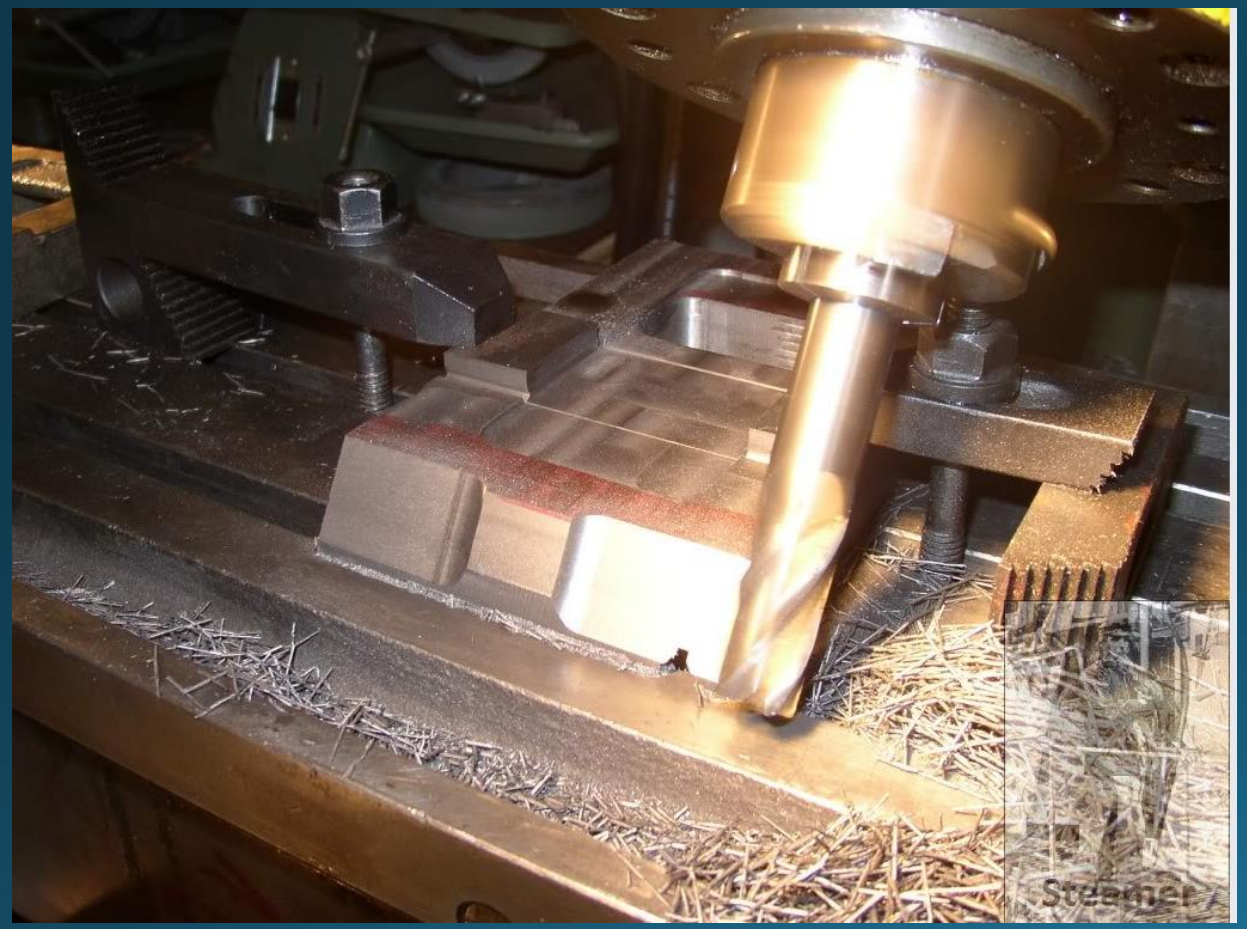
Several alternative were thought of
Add a pad to the top or bottom
Shims (NO WAY!!!)
Lower the headstock....a lot of work

Or Make a new base...which is what
I chose.

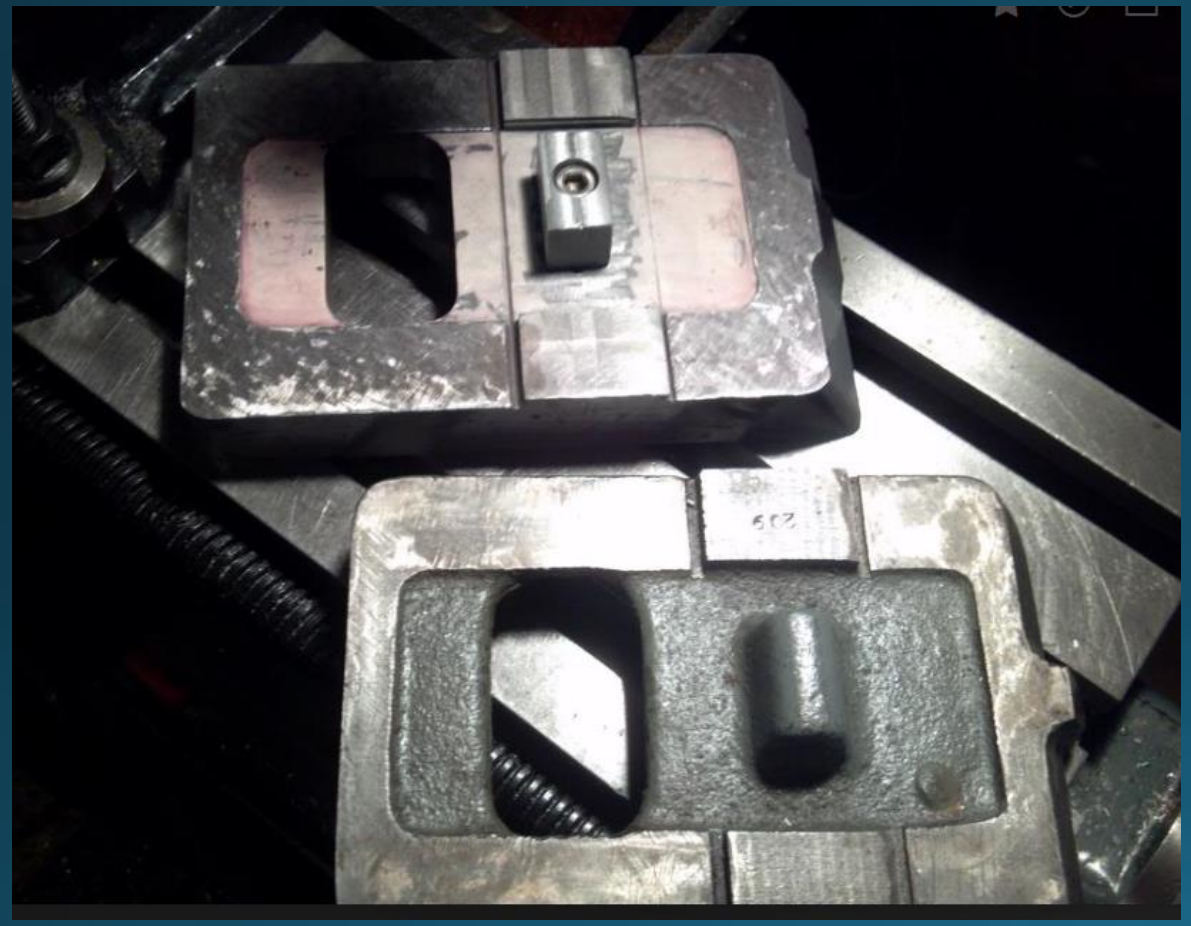
Tailstock and base



Tailstock and base



Tailstock and base

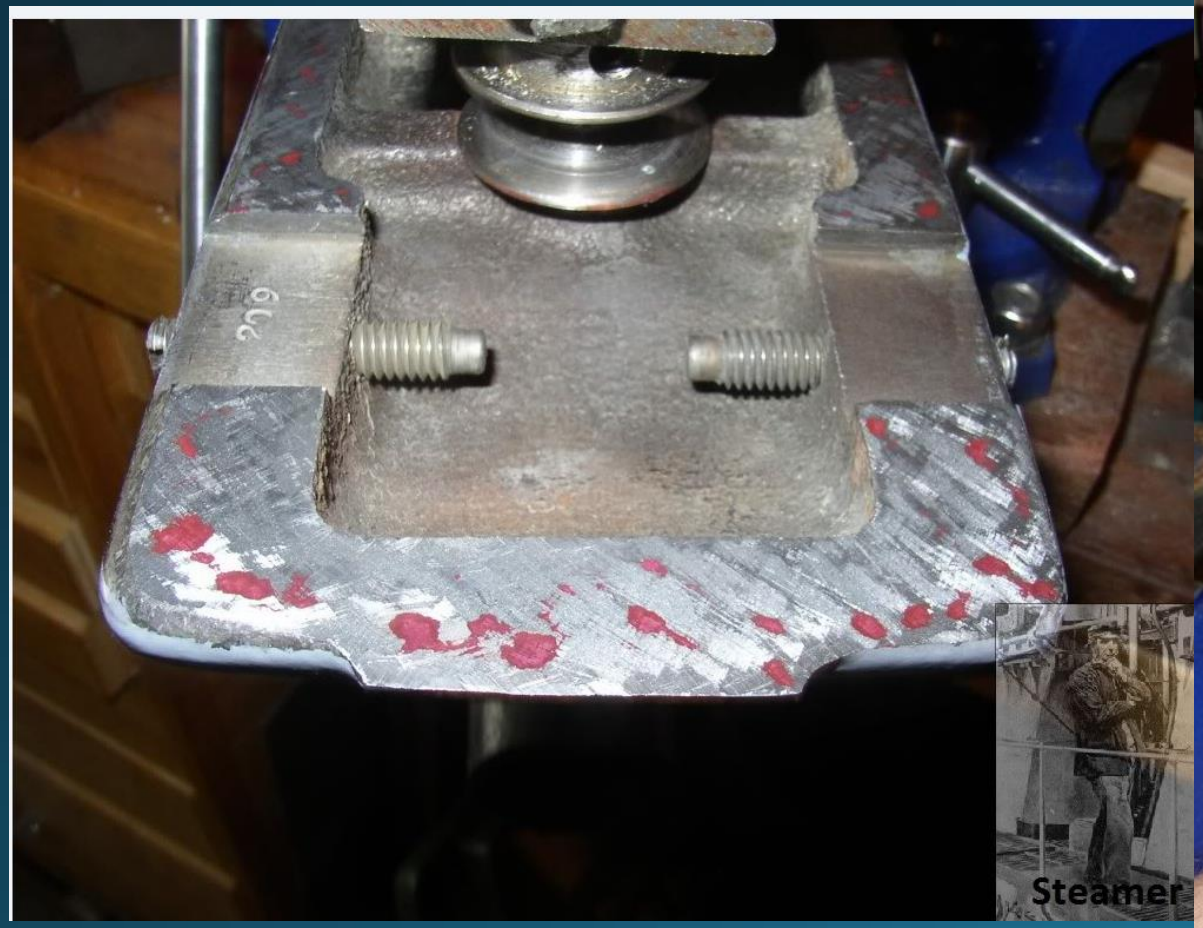


New base above

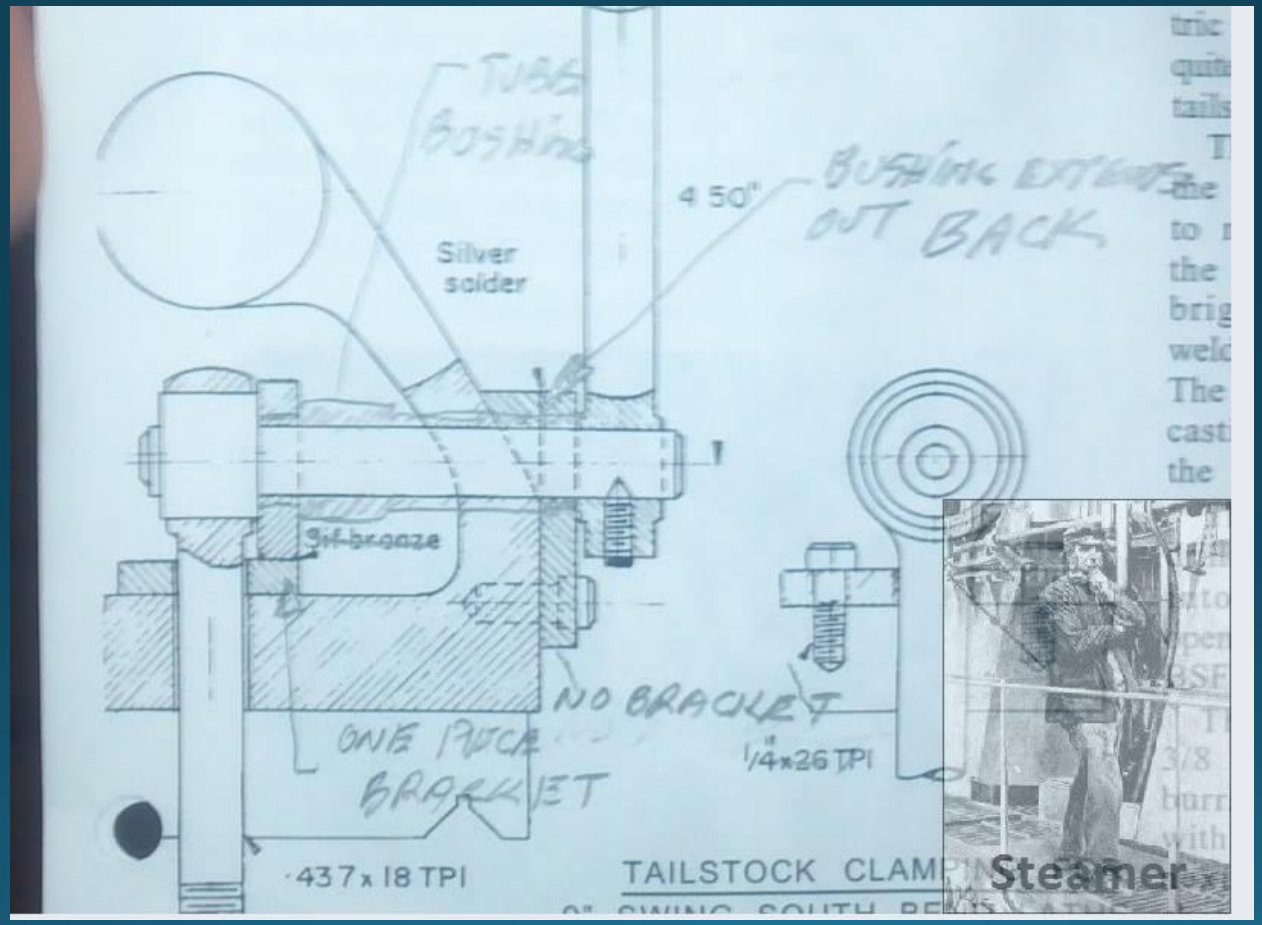
Old base below

Tailstock and base

Existing tailstock had dings from being dropped apparently…I re-scraped the bottom In process in this photo…



Tailstock and base



Tailstock and base

Tailstock and base

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Tailstock and base

Tailstock bore

Set up a knee on the boring table. I bored the housing till it just cleaned up and no more being careful to align the base with the horizontal axis of the lathe.

Tailstock and base

I then made up a lap to smooth up the bore and make sure it was round.

I made a plug gage to determine actual size of the finished bore

Tailstock and base

Tailstock and base

Tailstock and base

The old quill had the nut pinned in place. I decided To machine the quill and leave just this Remnent as the nut for the new quill. I then installed It into position with Loctite. It worked quite well!

Tailstock and base

Lapping the quill to size.

You'll notice the roping chatter on the quill? It didn't show up until after I started to lap the quill to size. The part in the photo was slightly tapered with the left side being 0.0002" larger than the Right side. Once it was to size, the roping disappeared. I suspect that to be a artifact of the spindle bearings on the Logan.

Tailstock and base

The base/top assembly machined to be 0.005" high. From there it was scraped into alignment in the Horizontal and vertical plane….but not yet…..8-)

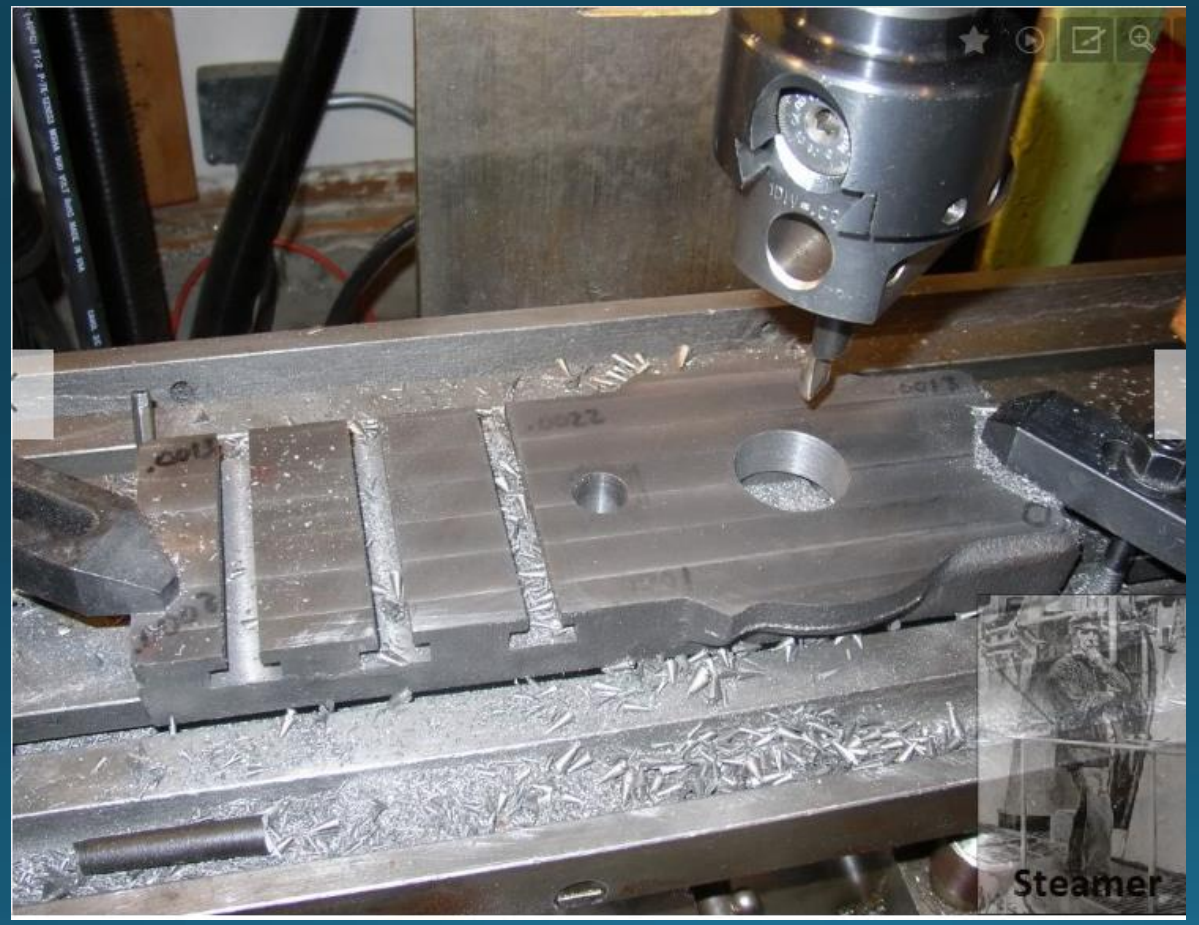
T slotted Cross Slide

I bought the T slotted cross slide casting from Metal Lathe Accessories.

This was some of the nicest cast Iron I've ever Machined. Great stuff, good machining allowance And a stable casting.

Definitely recommended

T slotted Cross Slide

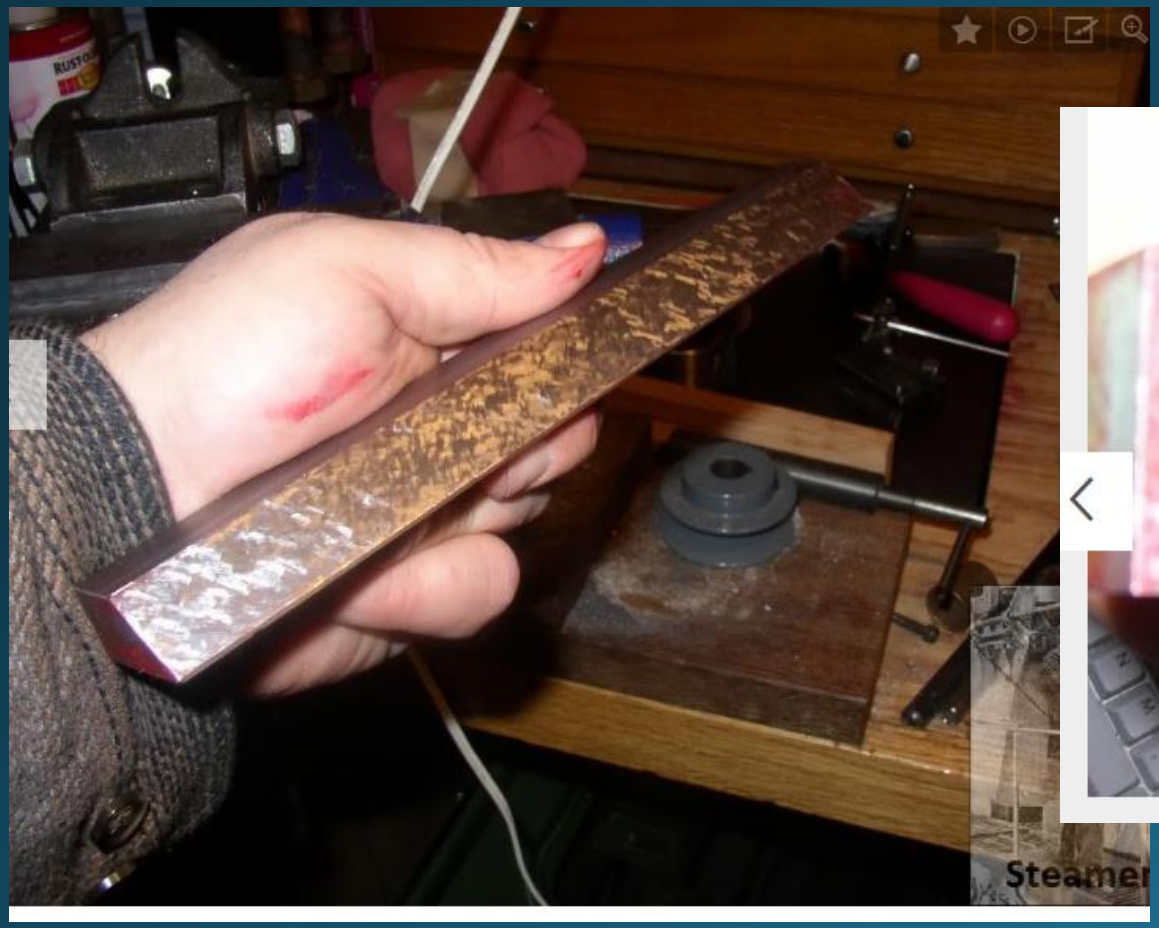


T slotted Cross Slide

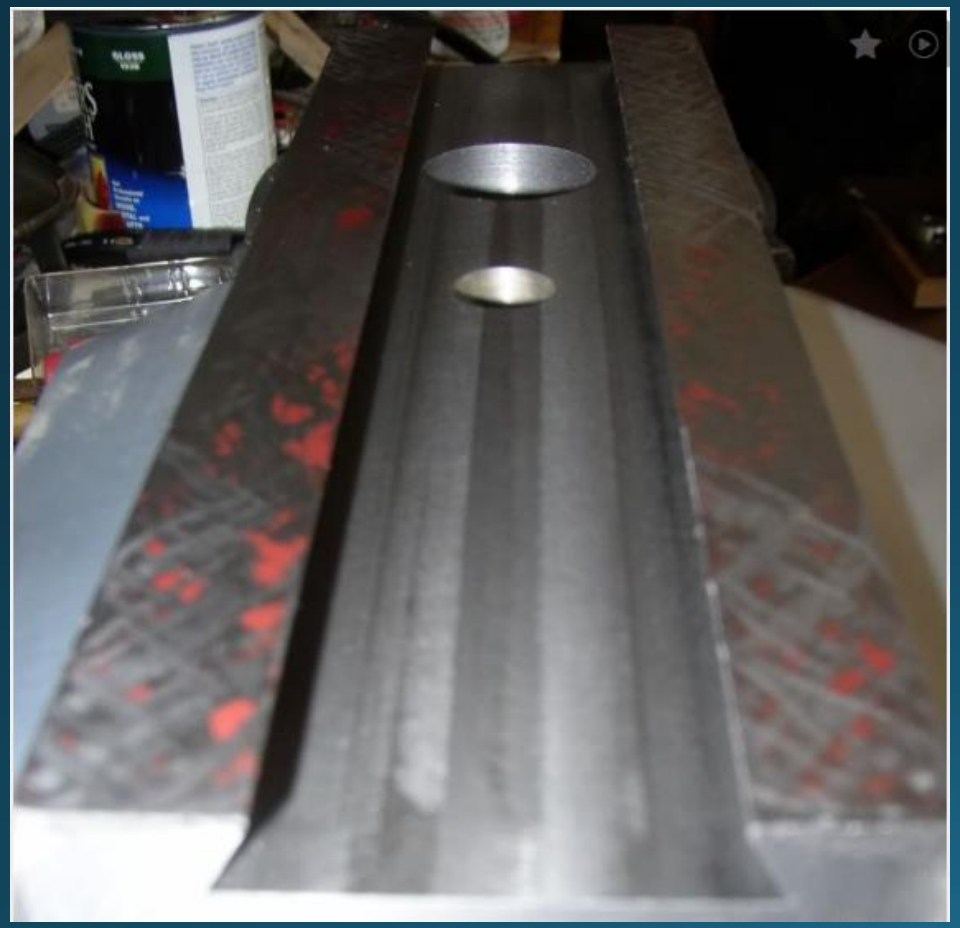
T slotted Cross Slide

T slotted Cross Slide

Two of my scraping masters



T slotted Cross Slide



T slotted Cross Slide

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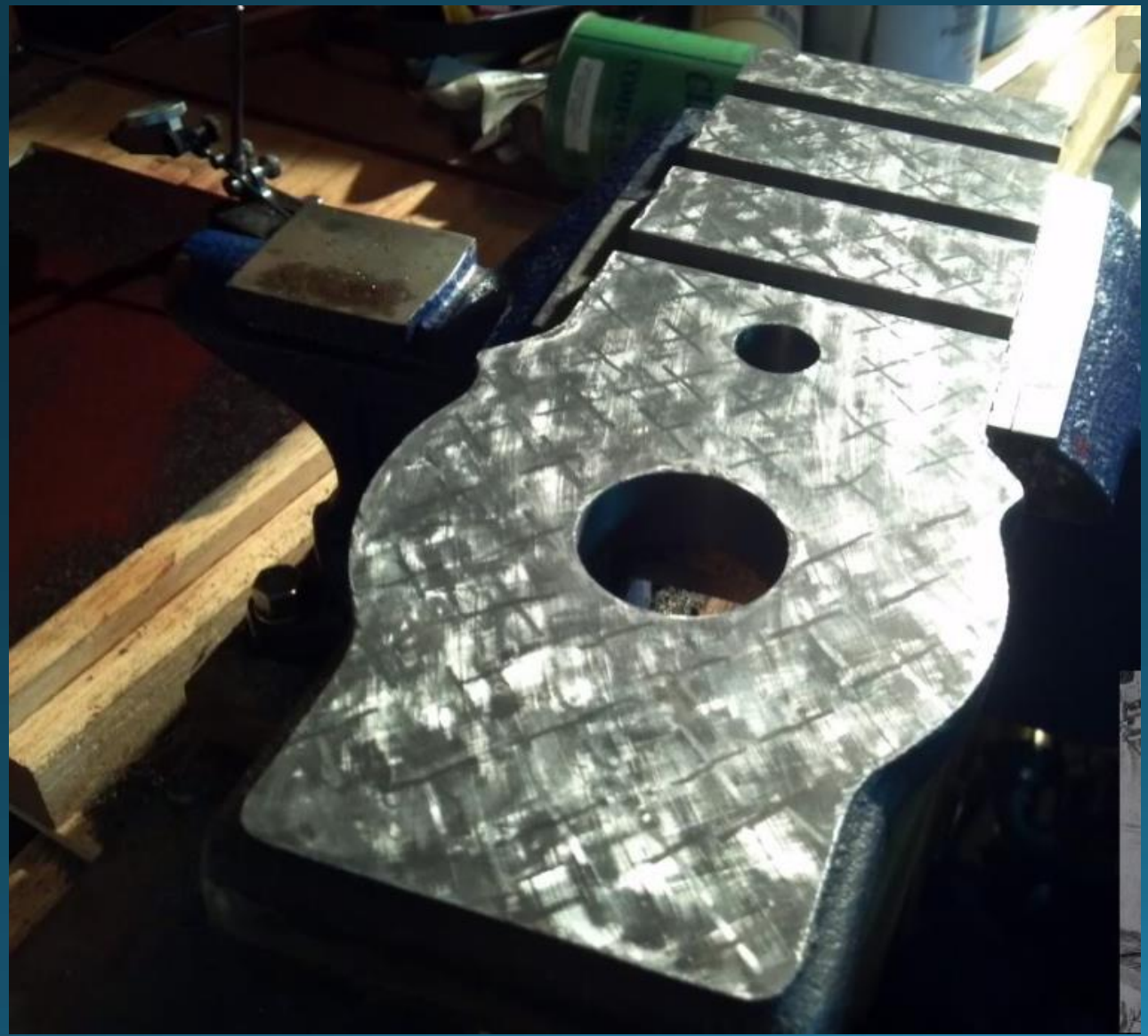
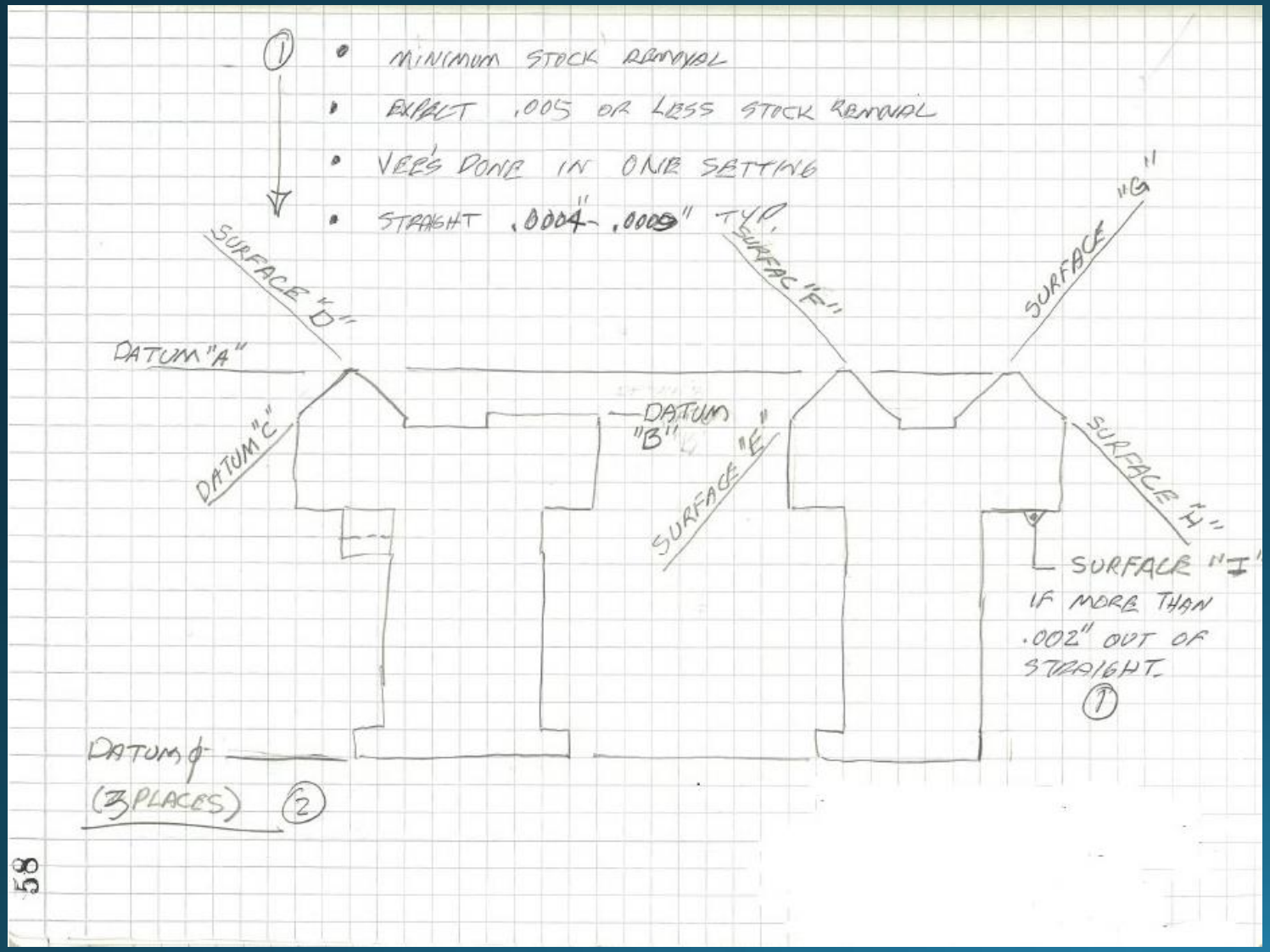


The Bed



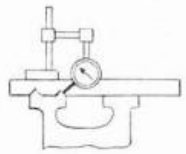
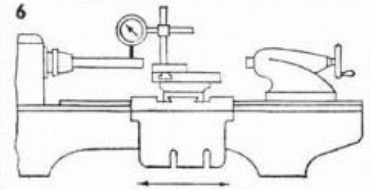
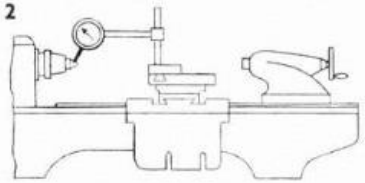
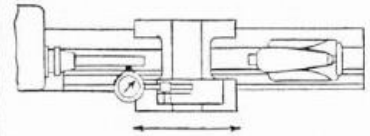
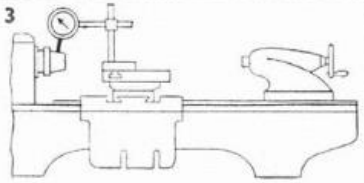
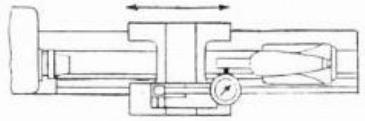
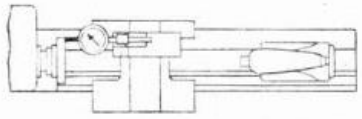
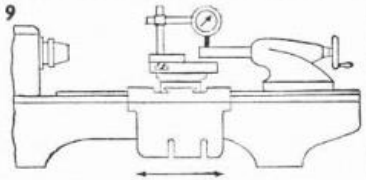
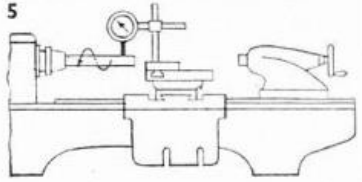
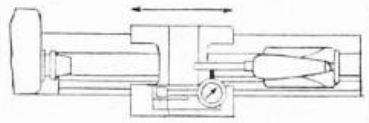
The key surfaces to be ground on the bed as conveyed to the grinding house.

The Bed

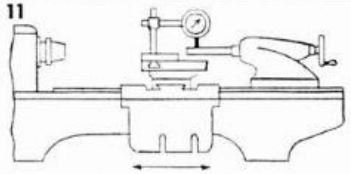
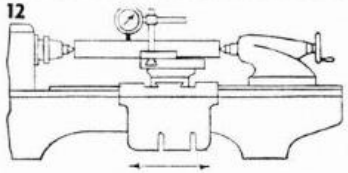
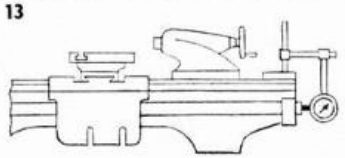
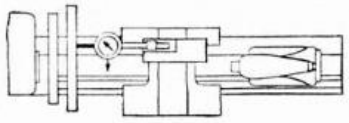
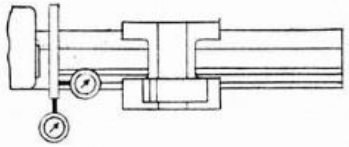
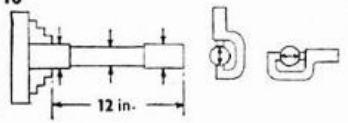
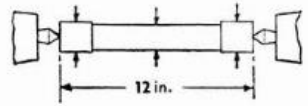
They are pretty when they come back…..Tests showed it straight to about .0003”

The Bed

The Specification

TEST	PERMISSIBLE ERROR / ACTUAL ERROR	TEST	PERMISSIBLE ERROR / ACTUAL ERROR
1  TAILSTOCK WAY ALIGNMENT	Max. Reading along length of Bed 0.0005" in 48 in. / 0.000	6  HEADSTOCK ALIGNMENT—VERTICAL	High at end of 12 in. Test Bar rising towards Tailstock End 0 to 0.0005" / 0.000
2  SPINDLE CENTER RUNOUT	Total Indicator Reading 0 to 0.0004" / 0.000	7  HEADSTOCK ALIGNMENT—HORIZONTAL	At end of 12 in. Test Bar 0 to + 0.0006" toward tool pressure / 0.000
3  SPINDLE NOSE RUNOUT	Total Indicator Reading 0 to 0.0003" / 0.000	8  TAILSTOCK SPINDLE ALIGNMENT—HORIZONTAL	Forward at end of Spindle when fully extended 0 to 0.0004" / 0.000
4  CAM ACTION OF SPINDLE	Total Indicator Reading with Indicator on face of Spindle 0 to 0.0003" / 0.000	9  TAILSTOCK SPINDLE ALIGNMENT—VERTICAL	High at end of Spindle when fully extended 0 to 0.0005" / 0.000
5  SPINDLE TAPER RUNOUT	Total Indicator Reading at end of 12 in. Test Bar 0 to 0.0006" at end of Spindle Nose 0 to 0.0003" / 0.000 / 0.000	10  TAILSTOCK TAPER ALIGNMENT—HORIZONTAL	End of 12 in Test Bar 0 to + 0.0008" toward tool pressure / 0.000

The Specification

TEST	PERMISSIBLE ERROR / ACTUAL ERROR
11  TAILSTOCK TAPER ALIGNMENT—VERTICAL	High at end of 12 in. Test Bar 0 to 0.0005″ / 0.000
12  VERTICAL ALIGNMENT OF HEAD AND TAIL CENTERS	High at Tailstock 0 to 0.0008″ / 0.000
13  LEAD SCREW CAM ACTION	Maximum 0.0003″ / 0.000
14  CROSS SLIDE ALIGNMENT	To face hollow or concave only on 12 in. diameter 0 to 0.0005″ / 0.000
15  FACE PLATE RUNOUT	On diameter 0 to 0.0005″ on face at normal diameter 0 to 0.001″ / 0.000 / 0.00
16  WORK MOUNTED IN CHUCK	Max. deviation from true roundness 0.0001″ Must turn cylindrical 12 in. length of workpiece 0.0008″ / 0.000 / 0.000
17  WORK MOUNTED IN CENTERS	Must turn cylindrical on a 12 in. length of workpiece 0.0004″ / 0.000
18 LEAD SCREW LEAD PER FT.	± 0.001″ / 0.00
19 BACK LASH ON CROSS FEED SCREW / ON COMPOUND REST SCREW	0.004″ / 0.00 / 0.004″ / 0.00
20 INDEXING OF SQUARE TURRET	Indicator Reading 0.001″ / 0.00

Scraping sequence from here.

- Compound top.
- Compound Base to compound top using compound top as a gage
- Compound base to top of T slotted cross slide using T slotted cross slide as the gage
- Cross slide dovetail to T slotted cross slide using T slotted cross slide as a gage
- Saddle geometry (parallel to ways and cross slide dovetail perpendicular to axis of saddle travel

Compound top and compound base

The flat ways of the compound showed to be still flat and in good condition. The top of the compound Was not parallel to the base, so I scraped it in to within 0.0005" The ways on the compound base mated well with the Compound. Little work was needed

Compound base to Cross slide

Notice the un marked area near the Nose of the compound. This is wear as A result of chips getting under the Compound and wearing away the surface

In this case it was about 0.001" but it Covered about 180 of arc at the front of The compound base. This can Contribute to chatter by making the Compound less stiff. Clean you cross slide Before you move it!....

MARKING SHOW HEAVY FOR PHOTOGRAPHIC REASONS

Saddle dovetail way to T slotted cross slide

The saddle dovetail was a complete mess
Very worn with ridges This photo was
After several passes. Using the T slotted
Cross slide as a gage for both surfaces
Of the dovetails. There is enough float in
The leadscrew nut in the vertical direction
To accommodate quite a bit of adjustment.

About .005" needed to come off.

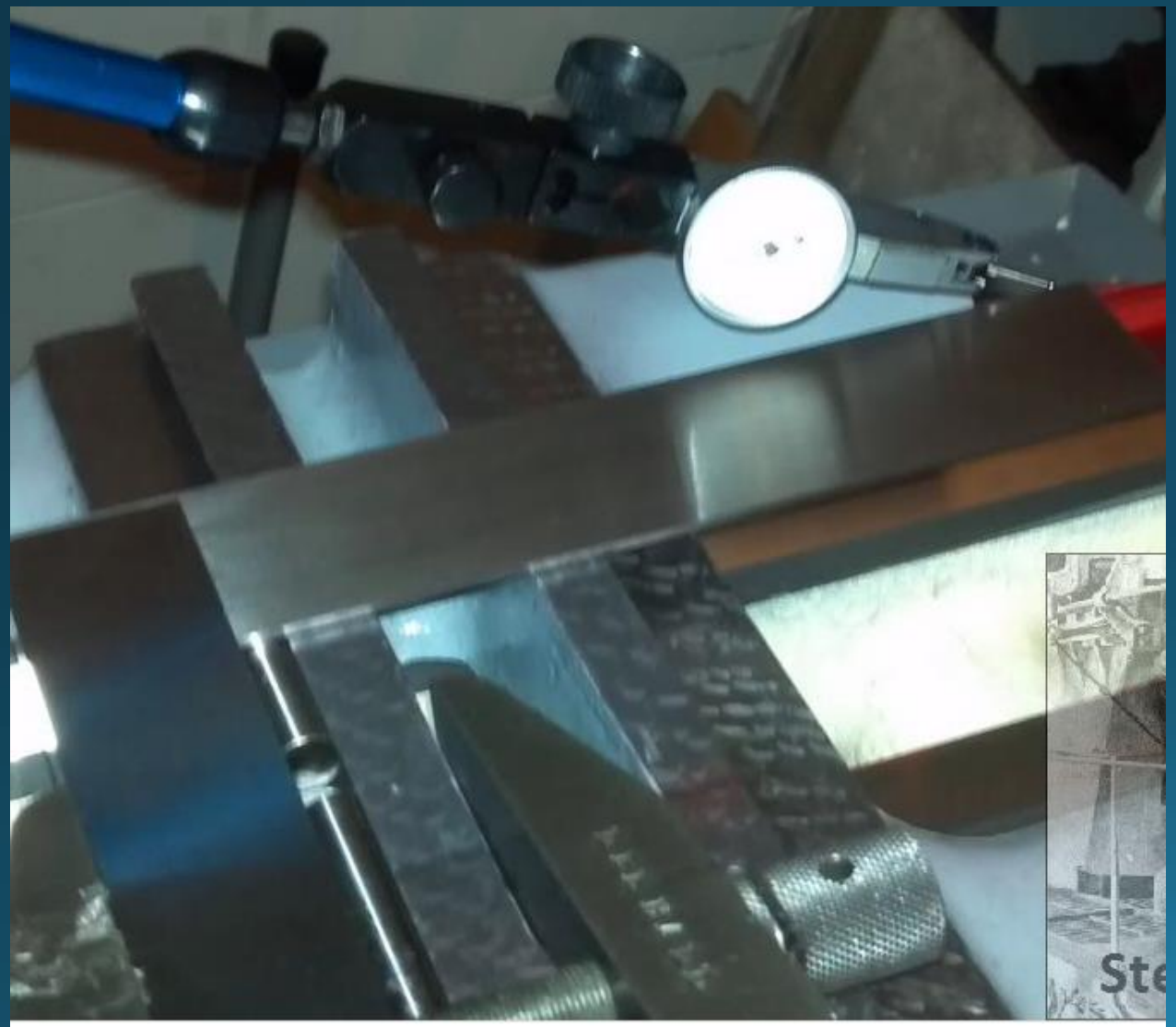
Saddle to the Bed

The saddle geometry should be parallel in both directions to the leveling surfaces of the lathe.

On the Southbend, those surfaces are the tops of the V Way's within .0005"/12" in both directions.

Additionally, the cross slide master dovetail should be square to the axis of the lathe to within 0.0005/12"

Checking the squareness of the cross slide dovetail to the axis of the lathe



Using precision gage pins in the dovetail
And lightly clamping the precision square
To the dovetail .

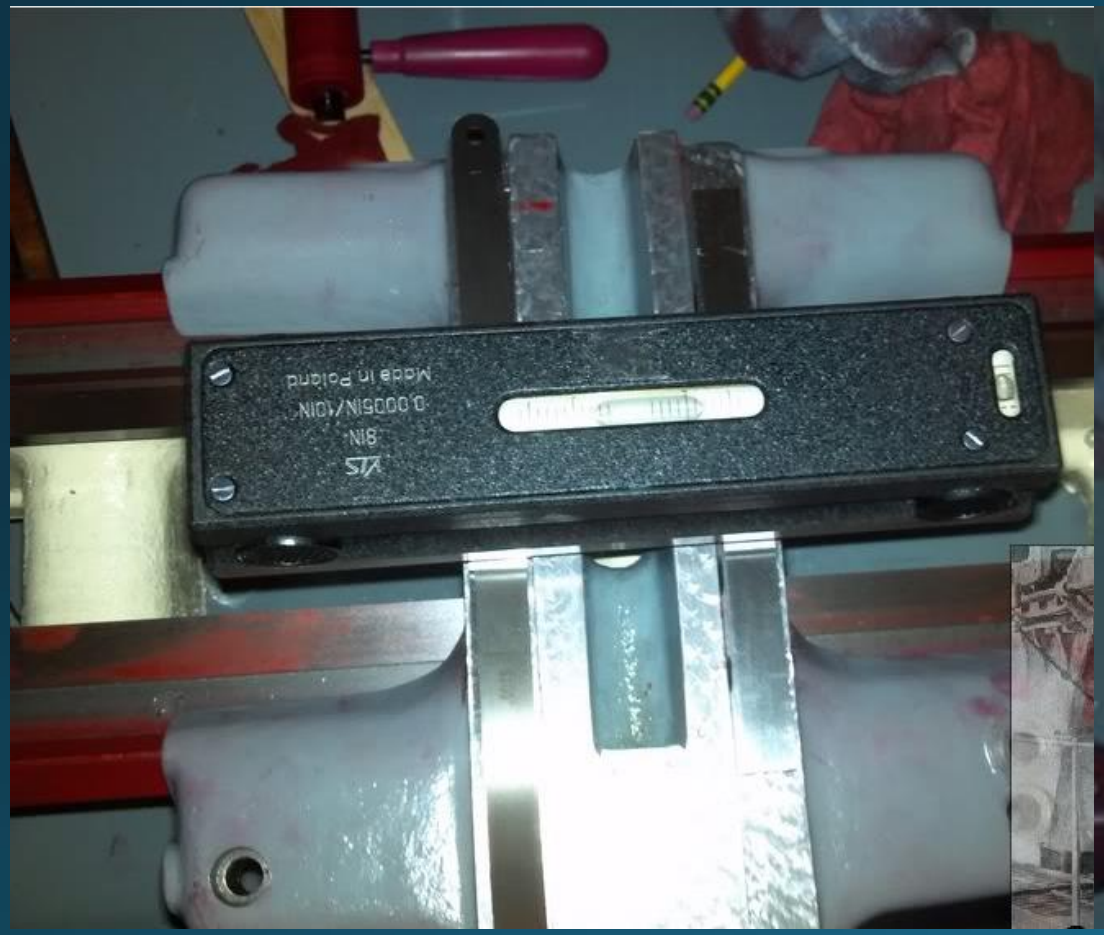
.0005”/12

Checking level

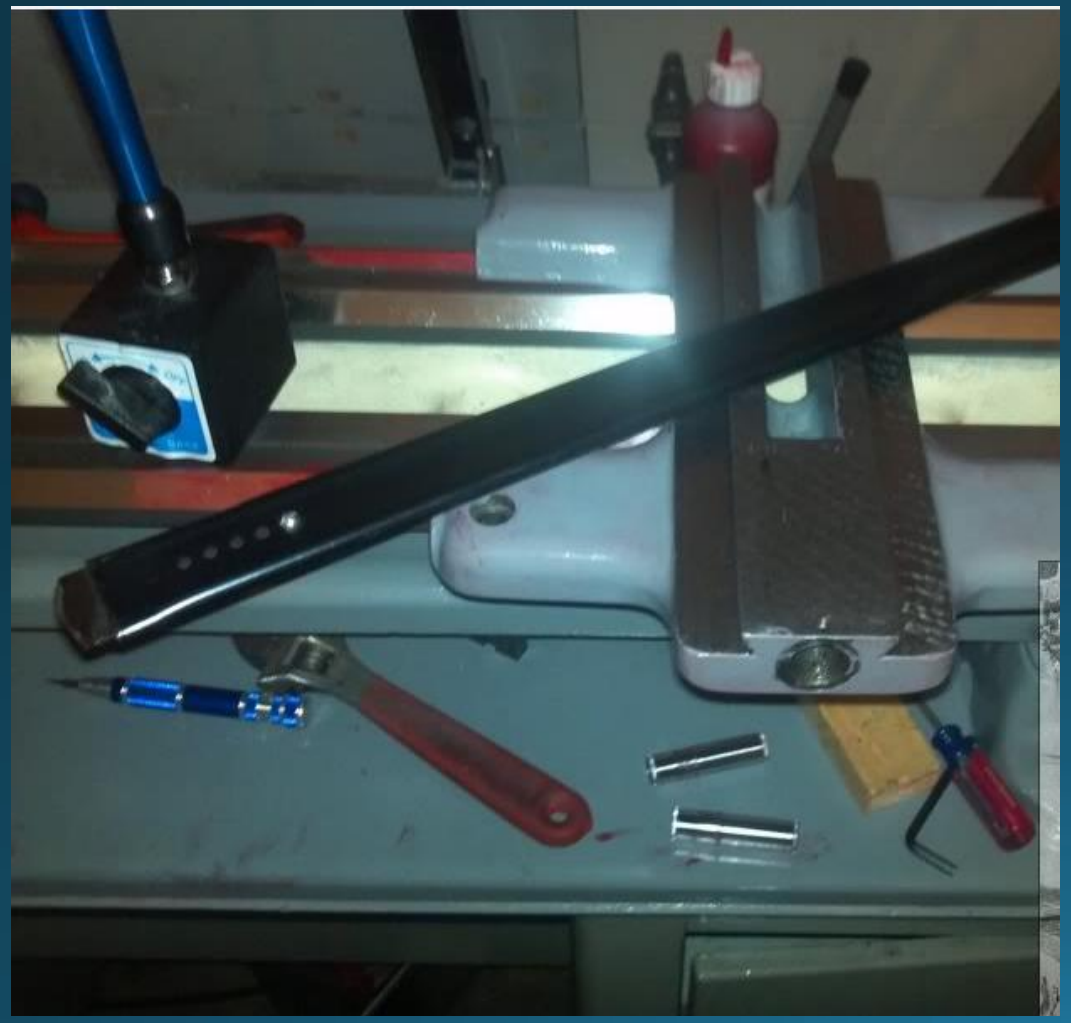
Level needs to be checked every time you Start work on the lathe. Only after carefull Leveling can any measurements be taken.

Here the bed is being checked for level. I have 123 blocks and know good parallels set up on Saddle flat ways to check level in both directions To determine how much needs to come off, it is Useful install shim stock under the parallels near The Saddle V ways.

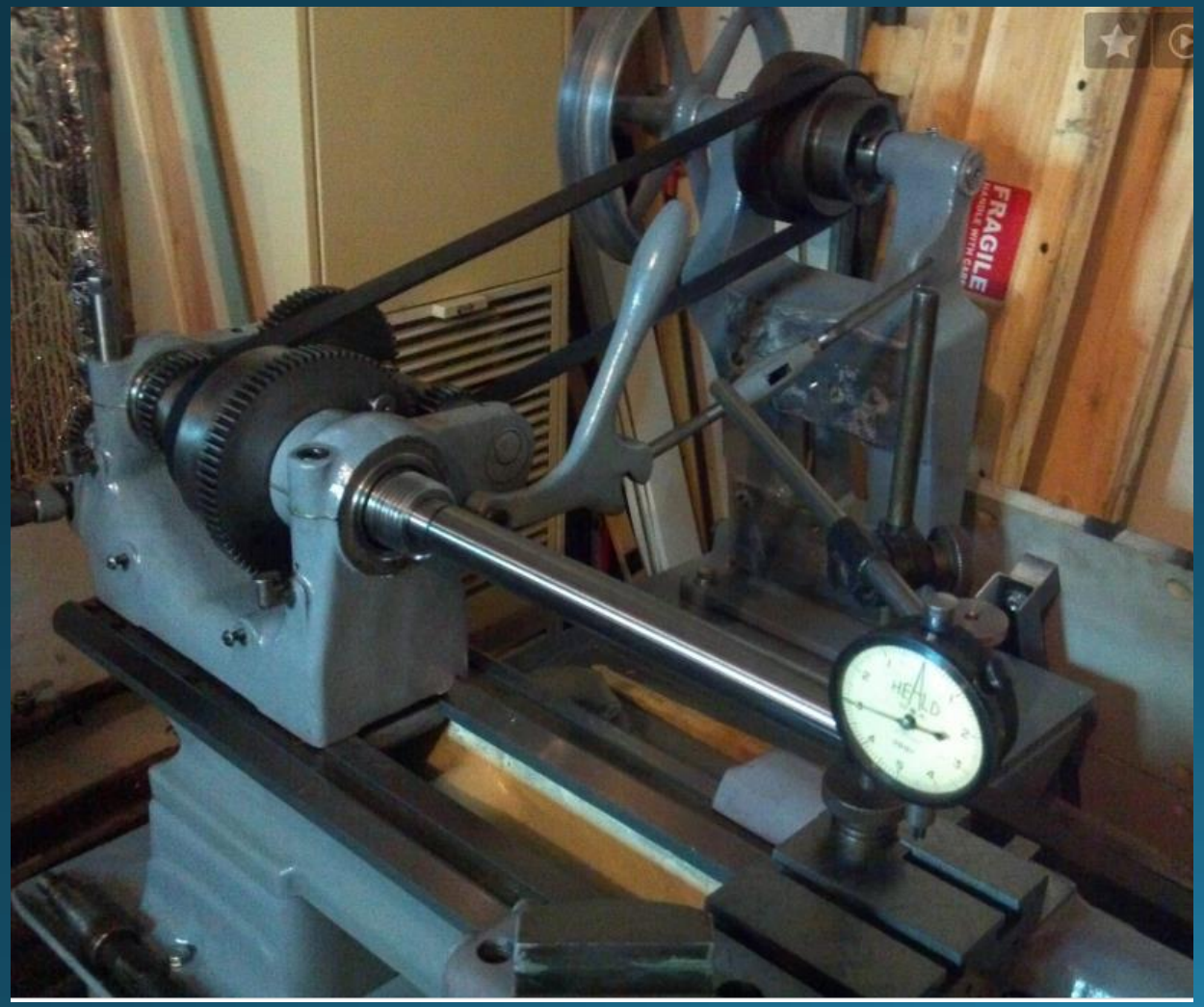
The two set ups for checking level



Tools of the trade

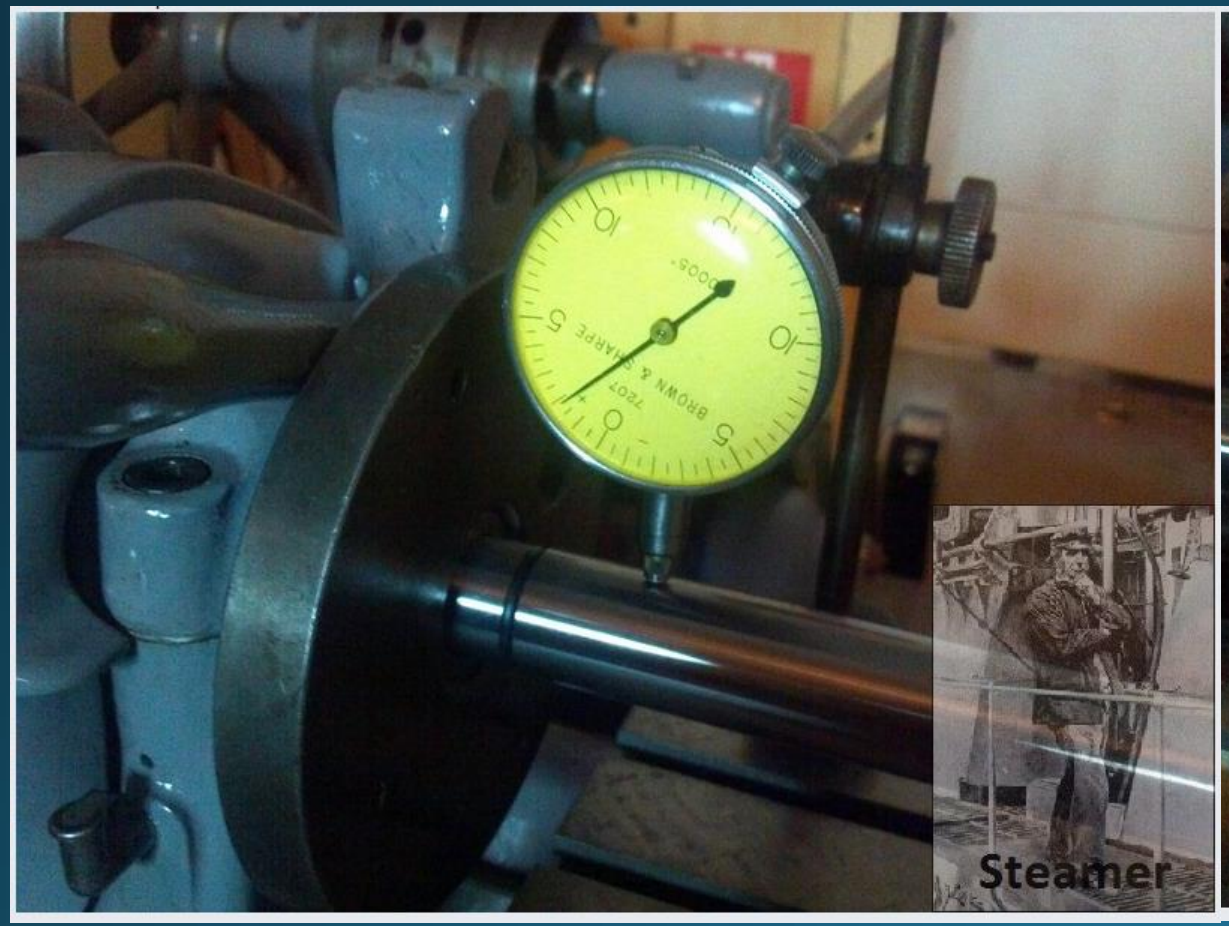


Lastly. The headstock and tailstock alignment



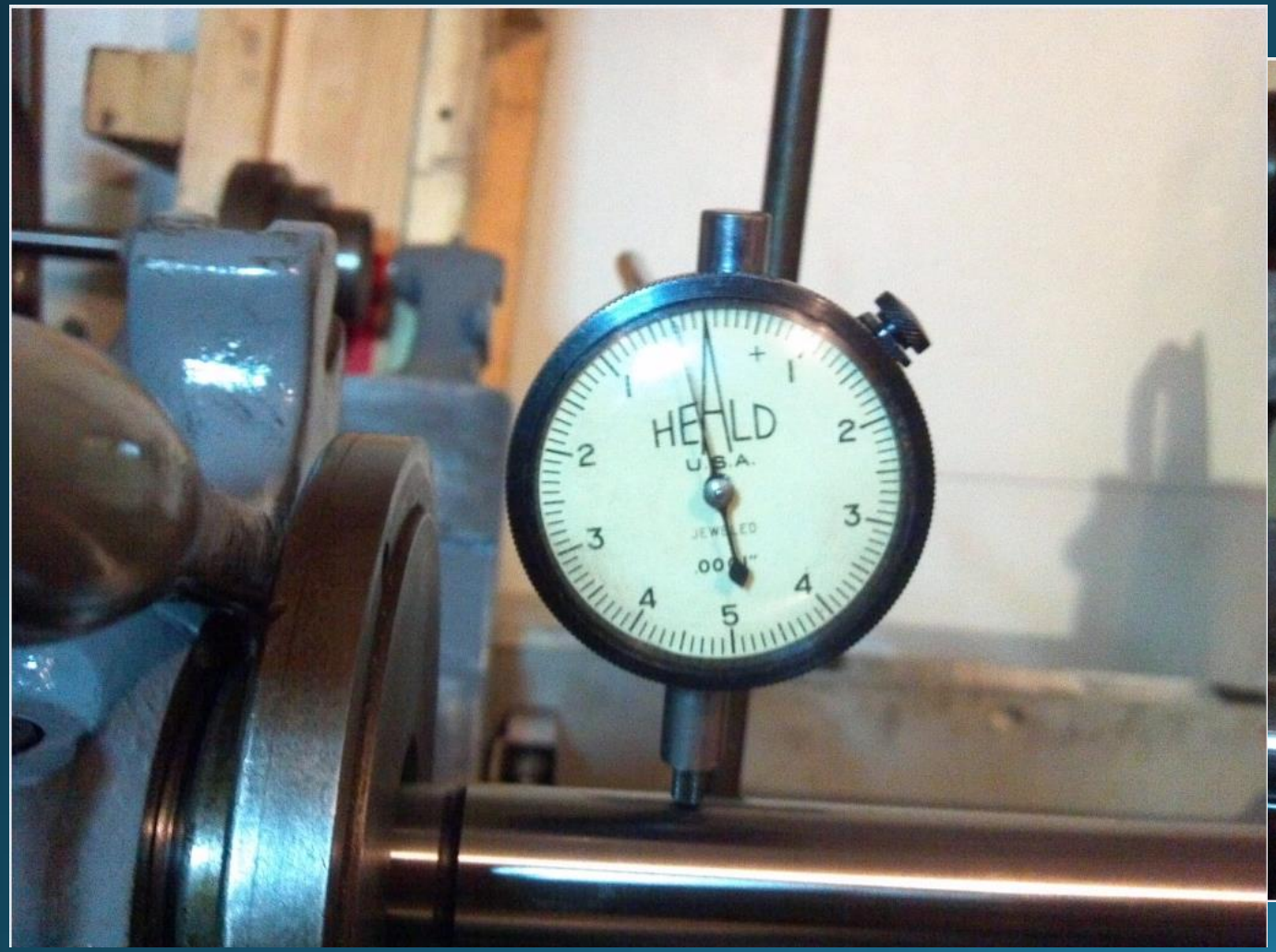
Headstock and tailstock
End of bar up and to the front by 0.0005”/12”

Initial reading were not good!



Initial reading were not good!

After much work on the headstock ways

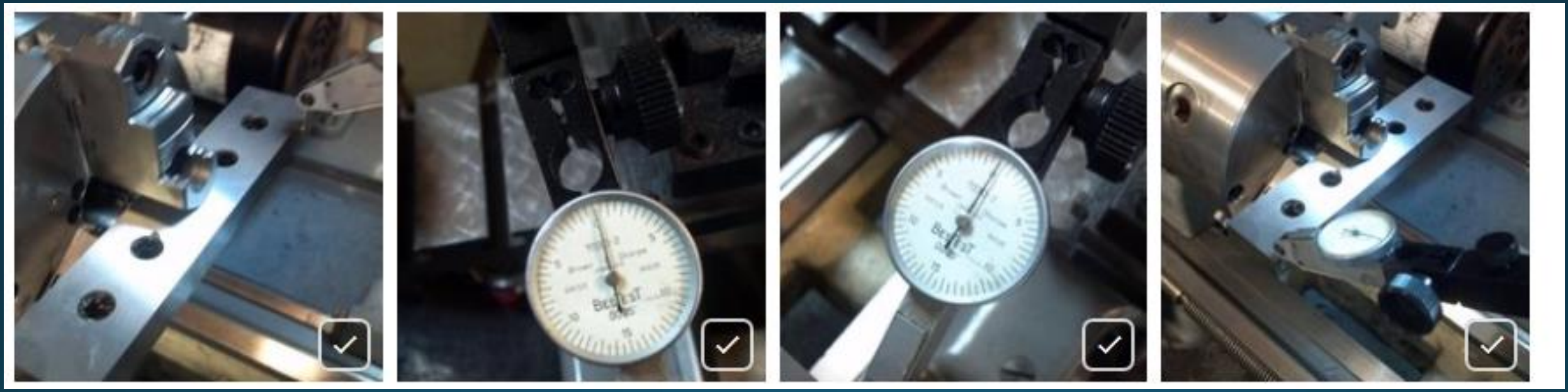


After much work on the headstock ways

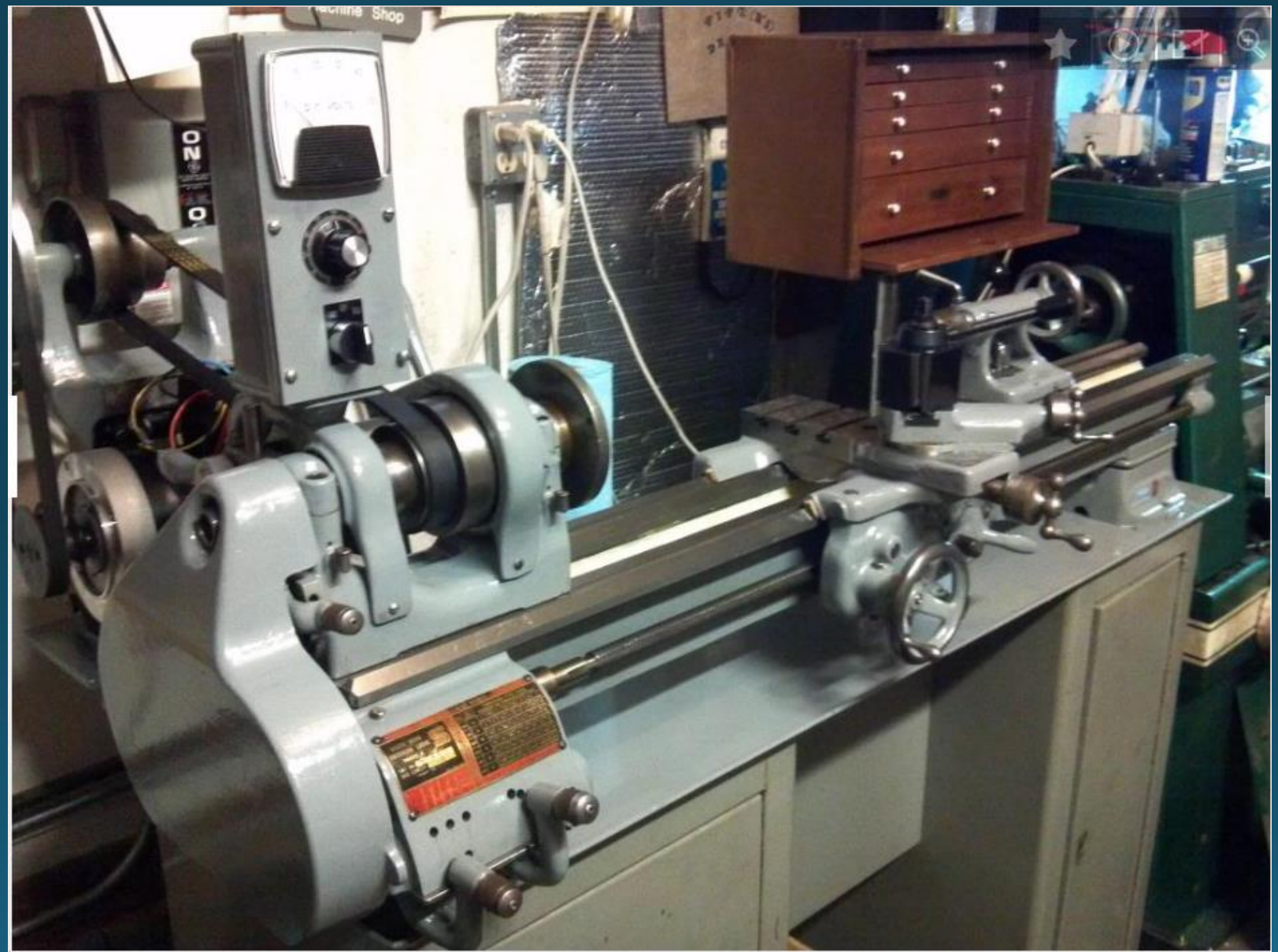
Setting the tailstock height

Tailstock point up and towards the front 0.0005”/12 and 0.000/0.001” higher than the Headstock.

Checking concavity



Finished Lathe



Additional items

- The saddle rack needed to be shimmed down 0.03”
- I replaced the standard switch with a VFD drive WORTH IT!
- I outfitted the lathe with a bunch of tooling and new chucks

Tooling