

## Topic: GS4- all about performance Step 1-7

Original Thread URL: [http://www.mylargescale.com/forum/topic.asp?TOPIC\\_ID=45711](http://www.mylargescale.com/forum/topic.asp?TOPIC_ID=45711)

---

**Topic author:** Charles

**Subject:** GS4- all about performance Step 1-7

**Posted on:** 01 Apr 2007 16:40:50

The how and why to retrofit an Accucraft Steam engine that has Walschaert valve gear. The purpose and service of the SP GS4 was all about top notch transportation. To meet the commitment to the time schedule for the customer and ensure profit for the SP company needed an engine that could provide high speed passenger service.

The offerings in gauge one had been very limited with production run by Aster that had a price range out of range for most. Then there was a second coming for those with California dreams. Accucraft chose this engine as their first entry in the 1:32 market offering both alcohol and butane versions. Though the engine I have been working to improve to "high speed performance" with efficiency is alcohol; the butane will benefit from the retrofit.

### Combination levers.

The Accucraft GS4 was manufactured with a single eccentric type, in which the combination lever is a dummy which has no effect on the timing of the steam cycle. Such a design has been used in simple models to give a reversible valve gear. When combined with a valve having a minimum of lap will provide almost full stroke admission of steam.

The reason for a working combination lever (versus non-operational) is that it gives a correct admission timing, at or just after TDC (top dead center). This design allows cut off of the steam admission at less than full stroke of the piston. Cut off is why there are notches in the reverser. Once the change has been installed this provides expansive working, smoother running and economy of water and fuel. Locomotive overdrive in keeping with a main line image!

Without this correction the engine will be characterized by large steam usage and imbalance between water use, heat required and steam available. Once installed the engineer can properly engage the power, speed with a true economy of effort. While not at the level of Aster's (difference in cross porting, cylinder design, reverser, etc) but much like a standard gauge run than a run away narrow gauge engine.

The kit designed by Gordon Watson will take about six hours per side for the "rookie" like me to an improved installation of 4 hours total (including, timing, button up and test run) once you have the routine down.

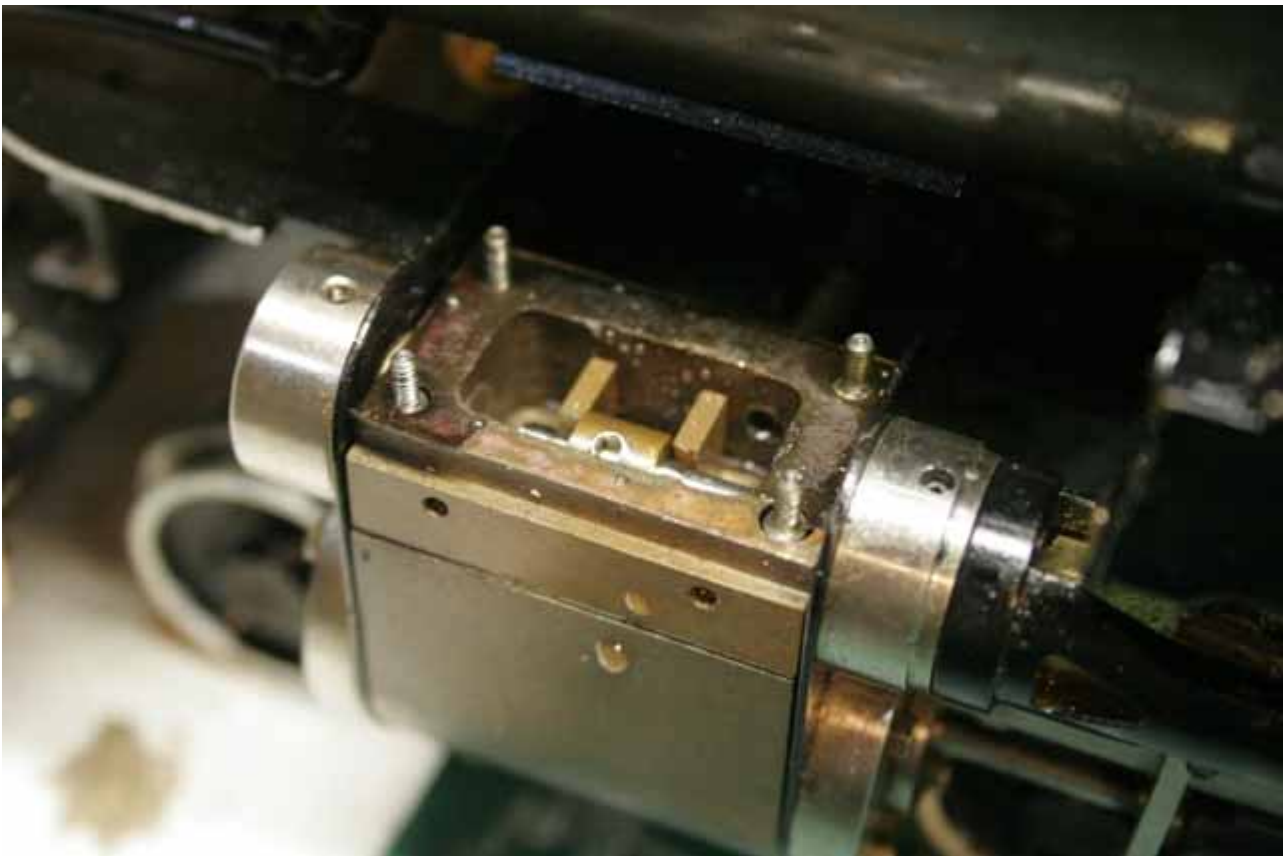
### Steps 1-7 (over 20 total)

- 1- Free up the slide valve
- 2- Mark the slide valve for timing
- 3- Locate area for bolt removal for combination level
- 4- remove the expand bracket 3mm 1.7mm bolts (since they are brass have a tendency to strip heads)
- 5-removal of expand bracket
- 6-removal of top screw on the radius arm
- 7- removal of small eccentric screw near the cylinder

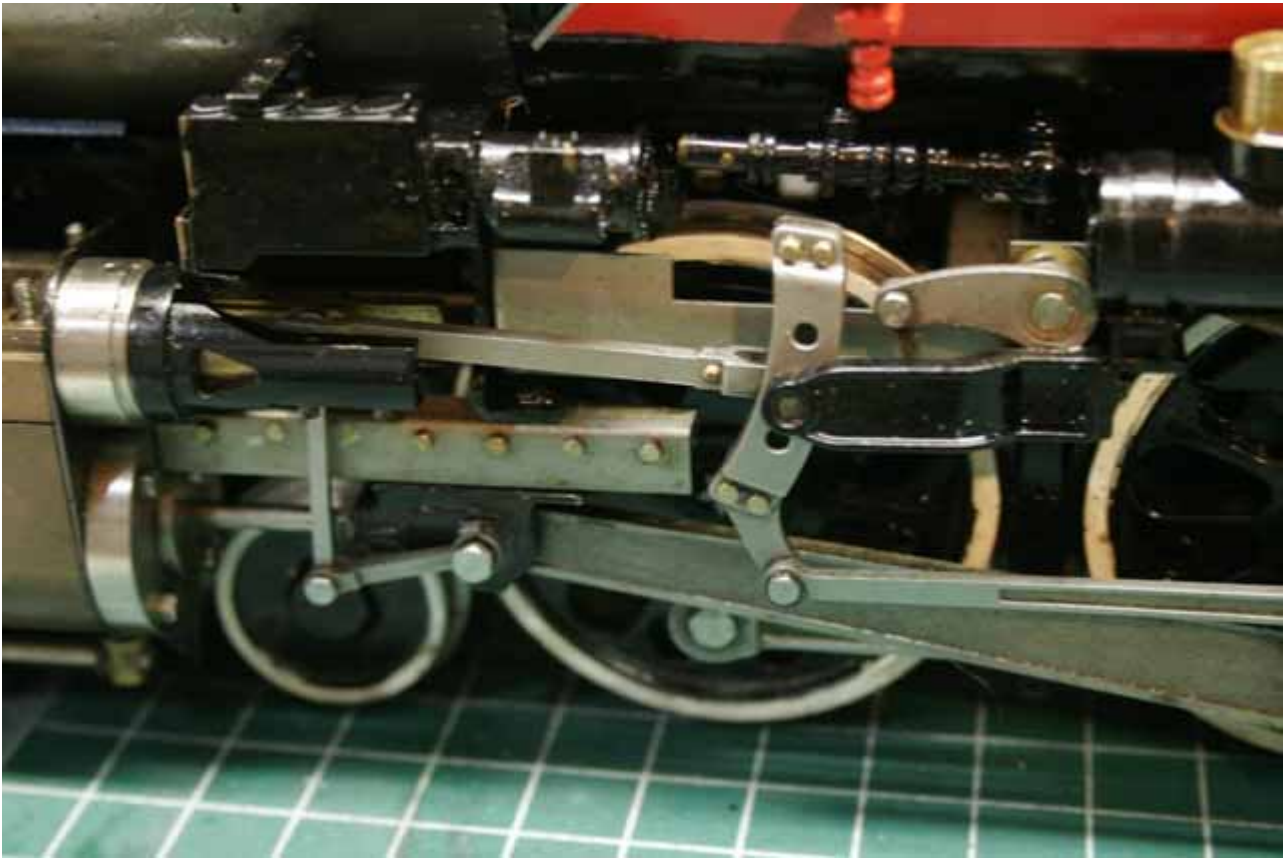
#1



#2



#3



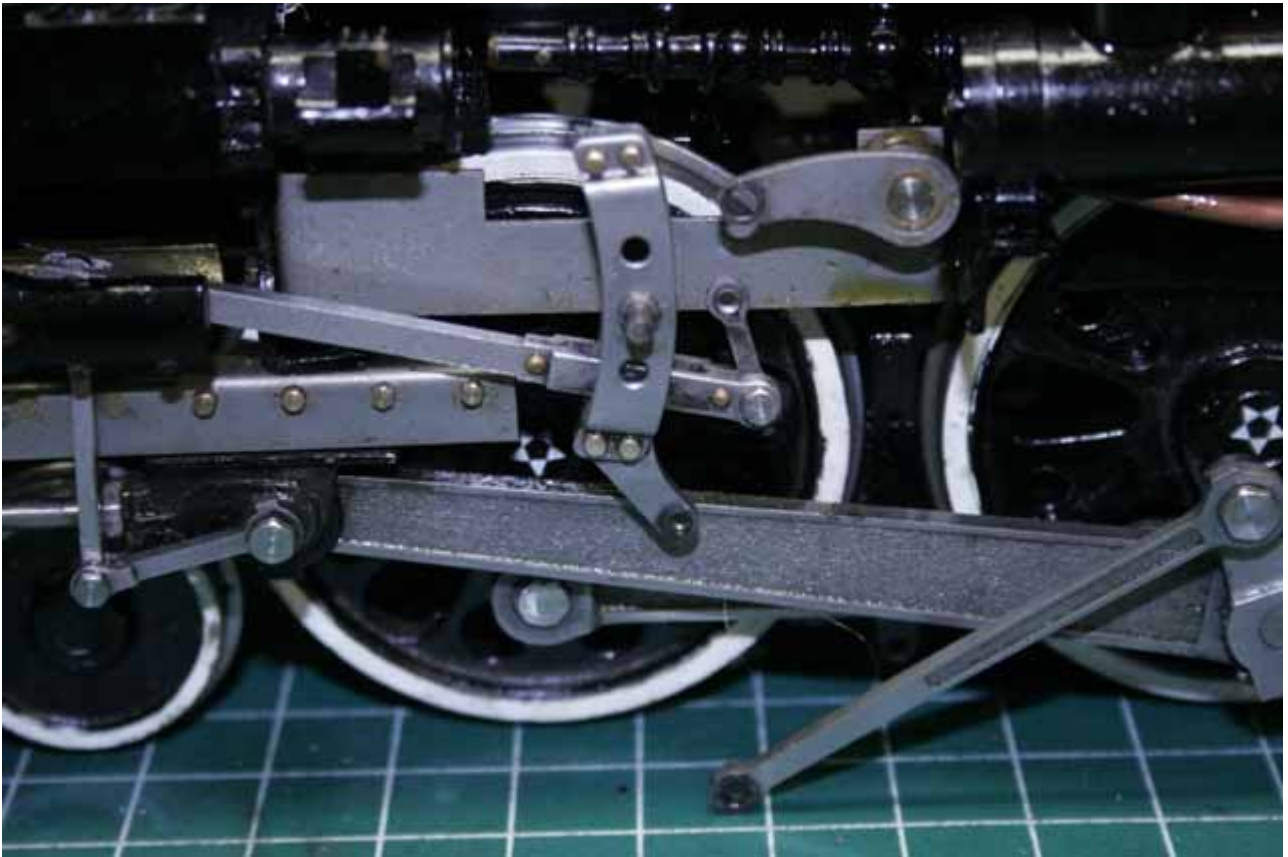
#4



#5 #6



#7



So far, easy- well life is not always so in any task as one will appreciate performs once one has done this job (along with admire Gordon for his skills)!

## GS4- Performance Step 8-12

**Original Thread URL:** [http://www.mylargescale.com/forum/topic.asp?TOPIC\\_ID=45722](http://www.mylargescale.com/forum/topic.asp?TOPIC_ID=45722)

---

**Topic author:** Charles

**Subject:** GS4- Performance Step 8-12

**Posted on:** 02 Apr 2007 05:25:20

The power and speed of the GS4 design can be denoted in the route and consist of coaches on most runs. The powerful Northern locomotive could cruise at 70 miles per hour and haul a 14 car train unassisted up a 2.2% grade through the mountains.

**8-** remove the small screw on combination lever near piston

**9-** combination lever and all parts loose pull out valve block

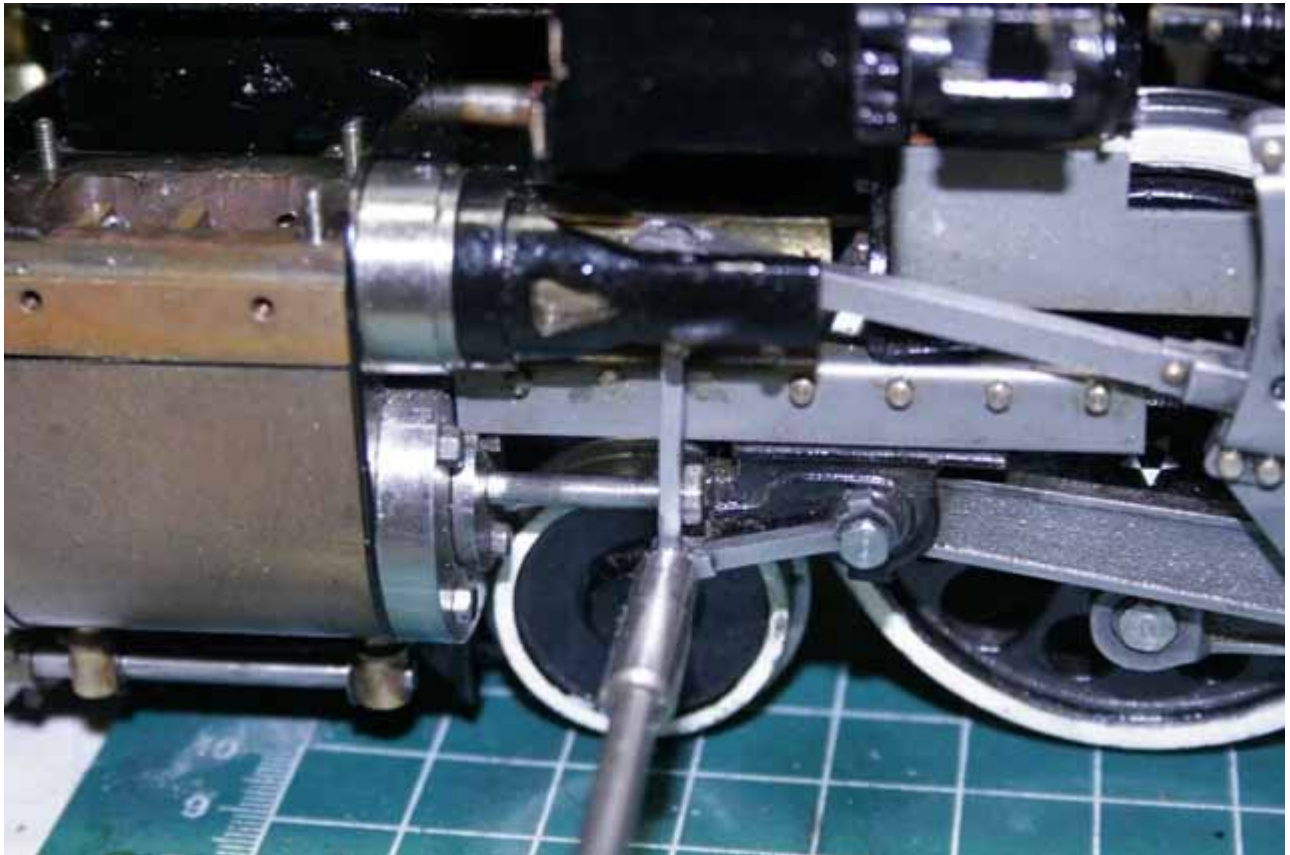
**10-** Careful removal as valve block is now showing (good to note here the orientation mark up arrow since it has worn in a particular way)

**11-** Complete unit is out ready for disassembly

**12-** Punch out with blunt object (we actually did the job with a small screwdriver) the pin holding parts together \*\*\*this can be time consuming and one of those moments when you begin to have second thoughts. In particular if the alignment of the holes for the pin are off just a bit or were drill somewhat smaller or just stubborn. Could be a session when the basic vocabulary (#!>^~) of four letter words may not describe the job at hand but you "swear" it helped get the pin out! One of the three jobs we have done took the major portion of a morning.

**12a-** (sorry about mislabel) main parts disassembled

#8



#9



#10



#11



#12





#12a

Note the lever in the forefront next to the pin. Top only has one hole in it. This will be a point of change with the new parts



## GS4 Performance 13-18

**Original Thread URL:** [http://www.mylargescale.com/forum/topic.asp?TOPIC\\_ID=45738](http://www.mylargescale.com/forum/topic.asp?TOPIC_ID=45738)

---

**Topic author:** Charles

**Subject:** GS4 Performance 13-18

**Posted on:** 03 Apr 2007 05:40:03

This is where you ensure that the movement will allow the maximum range of motion for the operation of the combination lever related to the reverser and cut off.

You can see the change in the new part from Gordon in have two top holes in the lever (laying down on the cutting board near 2.5 mark).

Filing is the skill at hand to complete this portion, in particular photo #14 and #16 show the groove that must be made to ensure proper motion.

- 13-** measurement for throw to and from same amount both directions (2mm)
- 14-** file forward and back on top of yolk for clear by the top pin (from flat to two grooves)
- 15-** file inside the yolk for clearance
- 16-** finish filing on top of yolk
- 17-** check of big pin for clearance on top of yolk
- 18-** checking motion forward and back

#13



#14



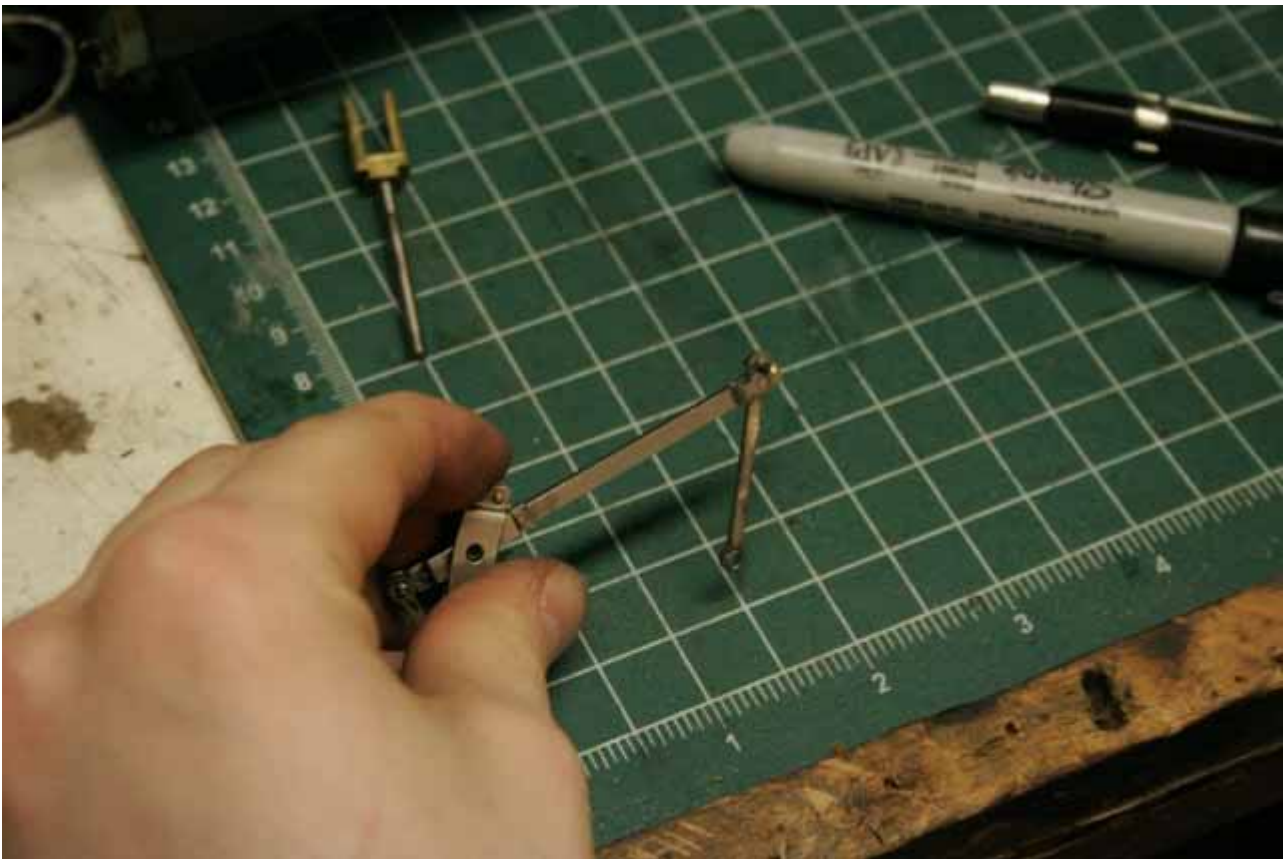
#15



#16



#17



#18



Also, note that prior to re-installing there are two bolt heads on the cross head that need to be filed to increase space for travel. On original setup this was compensated for by bending the rod.

Note in photo #8 in prior steps the two bolt head on cross head guide behind the combination lever have been filed down.

---

## GS4 Performance 19-21 Side #1

Original Thread URL: [http://www.mylargescale.com/forum/topic.asp?TOPIC\\_ID=45756](http://www.mylargescale.com/forum/topic.asp?TOPIC_ID=45756)

---

**Topic author:** Charles

**Subject:** GS4 Performance 19-21 Side #1

**Posted on:** 04 Apr 2007 05:18:51

The retrofit to improve performance is about 1/3 finished

**19-** file inside the valve block and check the components for fit.

**20-** reassemble the main components of combination lever check clearance by the "big pin" on the top regards the swing of the combination lever.

**21-** realign unit into the valve chest. Might need some filing of the body channel on the frame (particularly if you did not note the position of the valve block coming out of the assembly) or rotate for smooth movement as necessary. Check the movement of combination lever relative to the cross head guides for clearance

Besides doing the other side, two other aspects will be covered:

- 1) Smokebox components
- 2) Timing

#19



#20



#21



## GS4 Performance 22-27

**Original Thread URL:** [http://www.mylargescale.com/forum/topic.asp?TOPIC\\_ID=45773](http://www.mylargescale.com/forum/topic.asp?TOPIC_ID=45773)

**Printed on:** 25 Apr 2007

---

**Topic author:** Charles

**Subject:** GS4 Performance 22-27

**Posted on:** 05 Apr 2007 04:48:44

The valve chest and attachment of the motion gear are the areas to be completed.

**22-** Attaching the radius arm, the union link, valve stem and the slide valve

**23-** Alignment of the slide valve

**24-** Repeat #1-23 for the other side

**25-** Once all of this is finished for both sides then time the engine

**26-** Smokebox components: Blower and exhaust nozzles installed

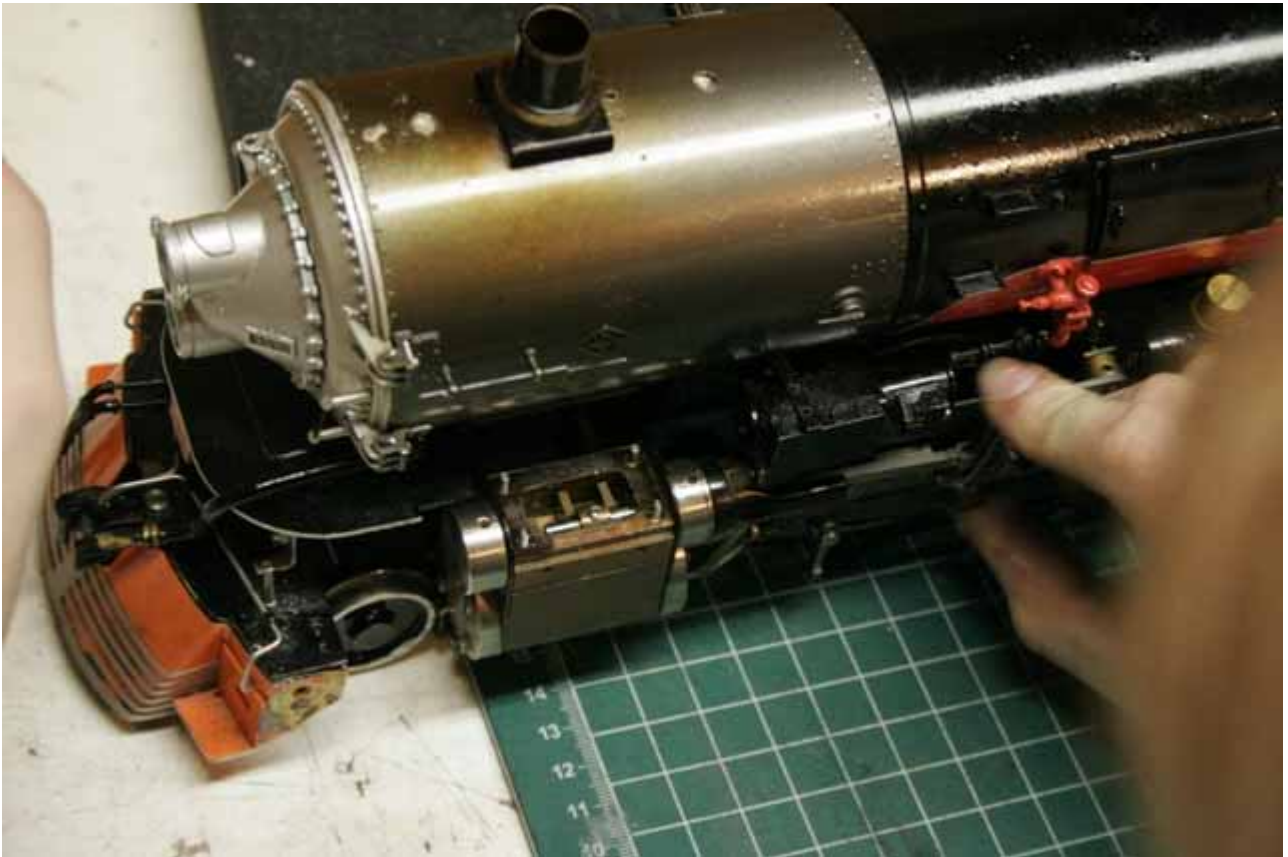
**27-** This retrofit along with proper wicks and a better baffle will allow for improvement and efficiency of your engine. Combine the baffle with a collar on the larger flue will direct the heat properly from the firebox through the boiler.

#22

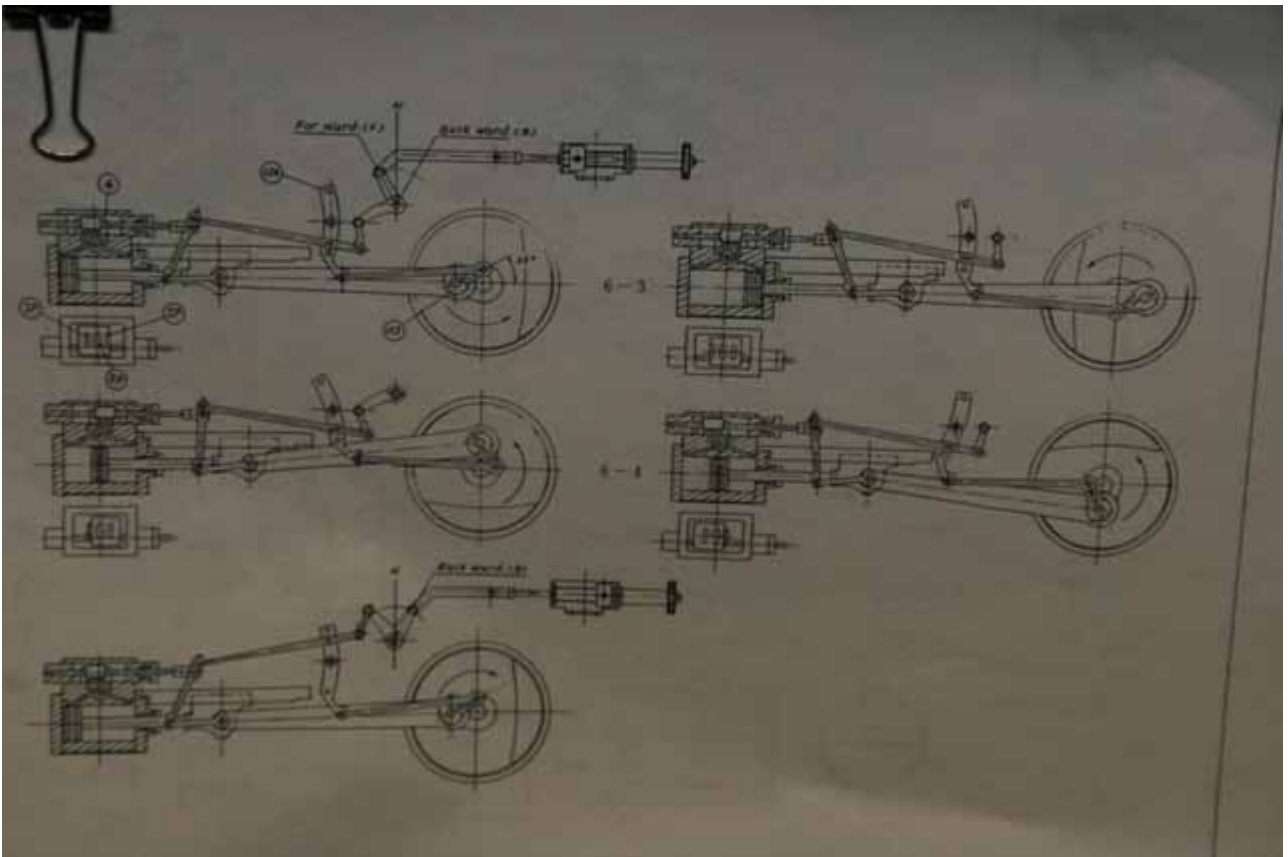




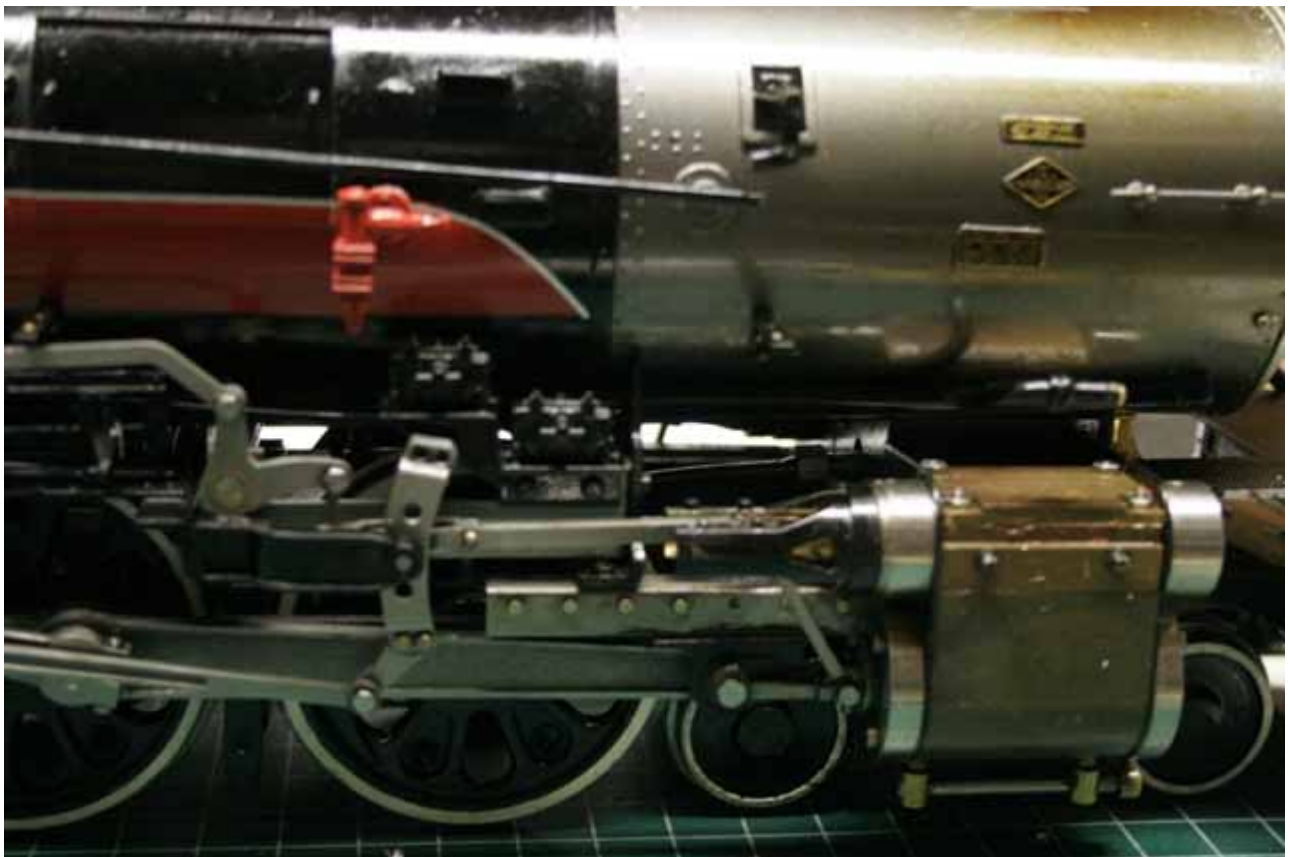
#23



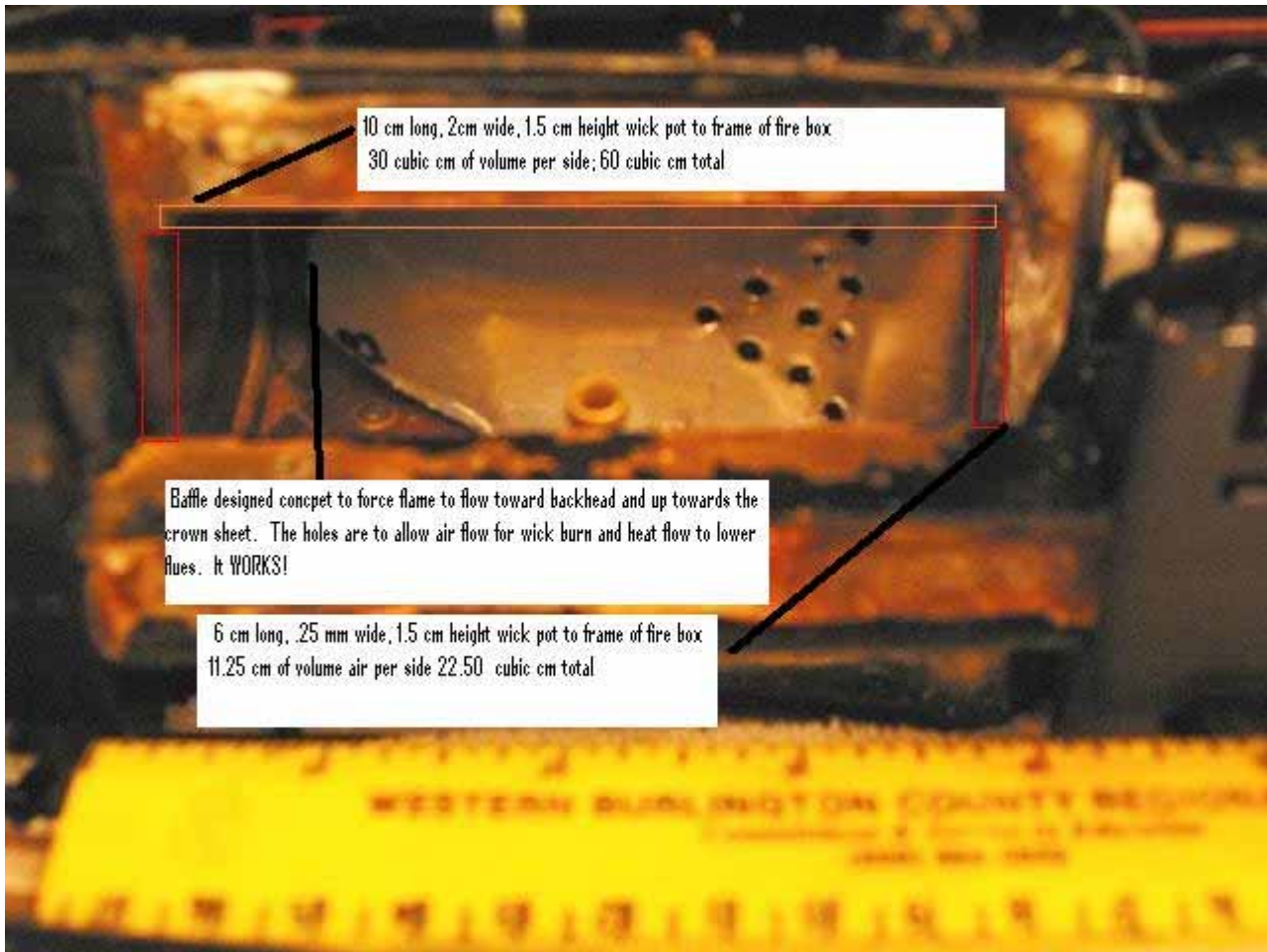
#25



#26



<http://home.new.rr.com/trumpetb/loco/wdiagram.html>



BTW- Most will have denote the top of the smokebox prior to baffle installation. The original engine had no baffle, (most with inefficient baffles) and the result is extreme heat/fires in smokebox. The baffle design with holes are not necessary just my theory regards heat transfer to lower flues relative to space with the baffle in place. The concept of a baffle firebox length at a set angle is based on established fundamentals with brick arches.

Performance test run:

[http://www.mylargescale.com/forum/topic.asp?TOPIC\\_ID=45456](http://www.mylargescale.com/forum/topic.asp?TOPIC_ID=45456)

## Replies:

**Reply author:** Charles

**Replied on:** 13 Apr 2007 17:40:32

Today was not ideal for a run relative to the weather: mid-40's, windy- 30 MPH, cloudy but it was the opportunity we had to test run 2 upgraded GS4. The performance checks on both engines were very satisfying. Combination of power, speed and economy have been established. Our next opportunity is to do some actual data collection. Both runs (at moderate speed in case the wind blow over the rake of cars) today were about 30 minutes including firing with one tank of fuel, water with the ability to run longer but lunch and the bitter cold wind made for only rationale to leave a GS4 static on the rails!

<http://1stclass.mylargescale.com/Ryan/GS-4/GS-4%20demo.MPG>

- 1- (Video) is the Stage 4 with a set up similar to Aster GS4 (cross porting, comb lever, etc)
- 2- The stage 3 setup that tops off with the combination lever action (ran beautifully)

**Reply author:** Charles

**Replied on:** 25 Apr 2007 04:40:02

Just a finishing point as to the conversions showing performance runs for the Gordon Watson overall which includes: working combination lever, cross porting, screw reverser, enlarging the steam pipes to cylinder, redesign water delivery system (axle, hand pump), new clack/check valve, new sight glass, new exhaust/blower, reworked rods and much more.

<http://1stclass.mylargescale.com/Ryan/PLS%2007%20meets/MOV00111.MPG>

Running with some classic Asters:

<http://1stclass.mylargescale.com/Ryan/PLS%2007%20meets/MOV00112.MPG>

---

**Reply author:** David Rose

**Replied on:** 25 Apr 2007 06:25:48

quote:

---

*Originally posted by Charles*

....redesign water delivery system (axle, hand pump), new clack/check valve...

---

Charles,

Does this engine use the same hand pump and check valve as the K-28. Did you cover the redesign in one of your GS4 topics?

---

**Reply author:** Charles

**Replied on:** 25 Apr 2007 07:30:48

Dave

Originally, the system in the GS4 was basically the same as the K28. We have redesigned in the GS4 engines using clack valves with balls, get rid of the valve system that is stock from Accucraft and new hand pump.

Here is Gordon Watson's overview and fix to stock unit:

axle feed pump didnt work! the valves in it are spring loaded with O ring seats.. thats fine on the delivery side. We have to remember that the suction side can only ever have 14PSI unloading the valve and the area of our valve seats is very small, so spring loading inlet side valves doesnt work! I counter bored the inlet banjo bolt to provide a seating for a ball valve and installed a small scewed sleeve up inside the pump body. to provide a lift limiter.the pump then worked fine and kept up with the boiler demand.

**Printed from:** myLargescale.com Forums <http://www.mylargescale.com/forum/>

© myLargescale.com / Model Railroads Online, LLC – All Rights Reserved