

The check valve detail.







## **Dog Bone Fitting**

Dog Bone fitting for articulated engines. I later found that by using 5/16" stock and leaving the center at 5/16" it keeps the center section from sliding into the female end thus keeping the fitting centered better







### **Automatic cylinder drains**











# **Gas Tank Valve**

The gas tank valve must draw from the top. On the top example a hole is drilled at the top of the valve. On the bottom one, a pickup tube is routed to the top of the tank.



## Jet





## **Small Valves**

I use these small valves to control lubricator flow, blow down. generator steam flow and tender water heating among other things.



# **Pop Off Valve**

Avery small pop off valve.

Small Pop of - Smin OD 3 cheete table 3mm X. Smin Thread 135 85.062 D - 6;+ 0469 3×.5 m -Drill #29 TAP 8-32 + 286 deep Sma 174-2 ×463 -> + 1054 + 200-> OB. Fligher H ,045 \* 7 100 . 0

The stainless handle here helps keep the fingers from getting burnt.

SMAll HAND VALUE KNOD - CUT 5/16" Square from 18 SS Grind out shape with drend, noto zip OV Angle grinder cut off Tool Moun Ted in Vise TURN TO FIT hole IN KNOD 5 dir -for # 0- NING 045 di 1-10 SS Screwile point in Lathe 140 2 **Smokebox Hinge** oup rivets 1000 - grind To match door -.188-Smokebox door hinge glue hinge strap to door (implace). with CA glue-then duill rivet holes Through straps and door - remove straps clean off glue and use rivers to hold . Things in place while silver soldering strap

# Compression Tubing Fittings

# Axle Pump

An axle pump is a smaller version of the hand pump with a few exceptions... the check valves are inside the pump body. The check valves must be perfectly sealed or it will leak back against the boiler pressure (hand pump usually is used at start-up). Check ball travel is limited to 1/8 of the ball diameter (.015" for a 1/8" ball)

Here is a sketch of one which tries to show the design. The orange hole does not go all the way through but connects the yellow and blue holes with the large cylinder hole and is plugged at the entrance.



Here is the only shot I have of a pump body which hasn't been fully drilled out. Note the threaded plugs with the long pins which will restrict the ball movement. They are sealed with RTV or thread lock and are screwed down till they contact the ball and then backed off 1/2 turn.



Here is the preferred connections. A 3/32 hole is drilled to the check valve hole and then a 1/8" hole is drilled deep enough for a good solder job and then a 5mm male fitting or a 1/8" tube is attached.



Banjo fittings can be attached but if you do that on the top of the outlet hole, you will need to drill holes in the plug used for the ball limiter.



Here is a leak proof banjo fitting. It is made from 5/16" stock with a 5mm thread and the 0.270 flat recess is made with a small boring bit or 7mm end mill 0.030 deep. The o-ring is 5mm id.



An eccentric hole can be done on a four jaw chuck or just shim up the three jaw like this.



After the hole is drilled, the piece is re-chucked and turned out like this.



Here is a ball bearing eccentric. This will last forever and cause less drag but the throw is limited.



Here is the pump for the ball bearing eccentric. It has a Scotch yoke which is cut from 1/\*" brass and has sheet brass on both sides which keeps it centered on the bearing. You can see the cross hole plug on the side of the pump. The mounting plate also acts as the pony truck mount. Fittings are attached to long copper tubes to allow access when the pump is mounted.



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