RESTORING MY GARDEN VILLAGE PUMP 2009-17

2 June 2009. Since moving into our early 19th century cottage, some four years ago, I had been keen to try and restore the hand pump in the garden to full working order and having now discovered the Village Pump website I hoped I could make progress with this project. The notes below were compiled throughout the 7 year process (with a pause in the middle).

The cast iron pump housing stands on a sandstone top cap which is split to allow the down pipe to pass through. This capstone is now several inches below the present surface level. I have previously partly separated the top cap halves to look into the well which is stone lined and appears to be in very good condition. The well is 10ft deep with 3ft of clear water plus a few inches of silt. The down pipe is intact and reaches the water. The bottom of the down pipe is blocked. Until now I had assumed was just silt and debris, but since reading your article on how the pump works, I wonder if it is non-return valve. *(I later found out that it was simply a wooden bung.)*

The bad news is that the pump is missing all its internal mechanism, presumably removed for repair at some time and lost or forgotten about. The inside of the pump housing is in pretty good condition, though I assume it will need to re-smoothed before a new piston is fitted.

Ideally, I would like to remove the pump housing and down pipe, which is now fused into one piece with rust and consequently rather heavy, so I would need to hire some lifting device. Before doing this, I will research the info on your website to try to find a source for a new internal mechanism.

2 Sep 2009. I have finally managed to lift the pump housing and downpipe out of the well. On the previous attempt a couple of years ago using a tripod and single pulley I could not get enough mechanical advantage and failed. This time, with a lightweight scaffolding tower and a four block pulley system I cobbled together I was just able to raise the joining flange above the top split capstone. The bolts holding the flange halves together were very corroded but the faces were separated by quite a thick washer and so I was able to cut the bolts through the middle using an angle grinder. Once separated, the two sections were much more manageable.

The down pipe is an 8ft long cast iron pipe some 3½” OD and 2¾” ID with a 7'' dia joining flange. I don't know its exact weight, but I can only just lift it.

The bottom end of the down pipe had a huge build-up of soft corrosion which when cleaned off revealed a wooden bung in the end of the pipe, the bottom 9" of which is perforated.

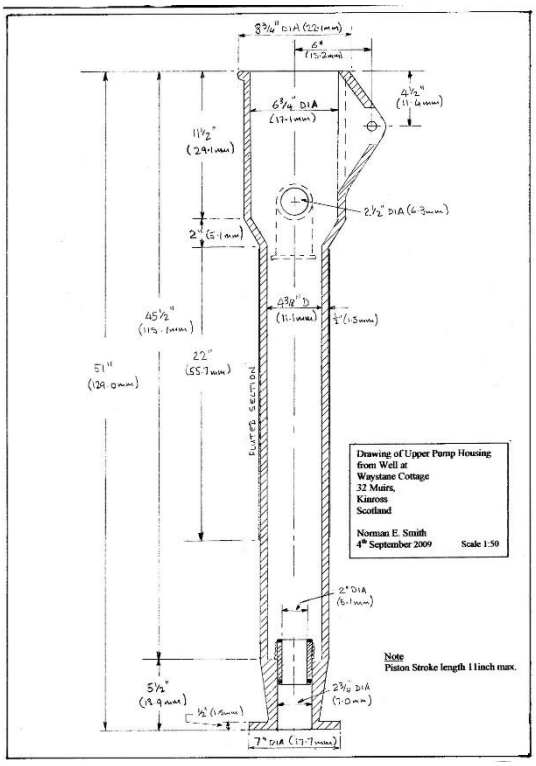
The good preservation of the bung makes me think it is probably elm. The down pipe appears to be in two 4' sections joined with what looks like a circumferential weld, but bearing in mind the age and material used, this does not seem likely. It is perhaps some sort of forged coupling.

Having got the pump housing lifted onto a horizontal cradle and measuring up the dimensions I noticed an internal restriction about 3½" from the bottom flange, which reduced the internal dia from around 3" to 2". This turned out to be a wooden plug about 3½" long, wrapped round with what could be leather and with iron rings top and bottom. The leather shows signs of horizontal corrugations. Unfortunately, I could only get it out in pieces, but I hope from the photos you might be able to work out what it is and advise me. It had two longitudinal rectangular slots about ¼" x ¼" cut in the sides of the inner core. *(I now know that this was the bottom clack valve.)*

The sad news is that cleaning up the outside of the housing has revealed some very bad splits.

I am going to get some more expert advice as to the possibilities of repairing it. If this proves impracticable, and as a last resort, I might have to consider putting in a liner. *(Which is what I did.)*

I am making up a dimensioned drawing of the pump housing which I will send to you in the hope that you will be able to advise me whether there is a possibility of getting a pump manufacturer to supply a piston/clack valve mechanism, or give me a design that I can ask a local blacksmith or machine shop to make.



29 Jun 2015. After four years of stagnation I have now restarted work.

For the first time, I lifted the two halves of the capstone and stood them on end so that I could properly access to top of the wellhead. Their weight meant that I had to employ what limited tools I had, a small hydraulic car jack, wooden levers and wedges, very carefully, to avoid damage to either myself or the capstones.

A view, above, of the beautifully constructed dry stone well lining.

The water surface is about 7' down and there is 2½' to 3' depth of water. As the water is as clear as when I last looked a couple of years ago, the feeding spring(s) must still be running.

I then built up the wellhead with two layers of bricks so that when replaced, the capstones would be at the modern garden level.

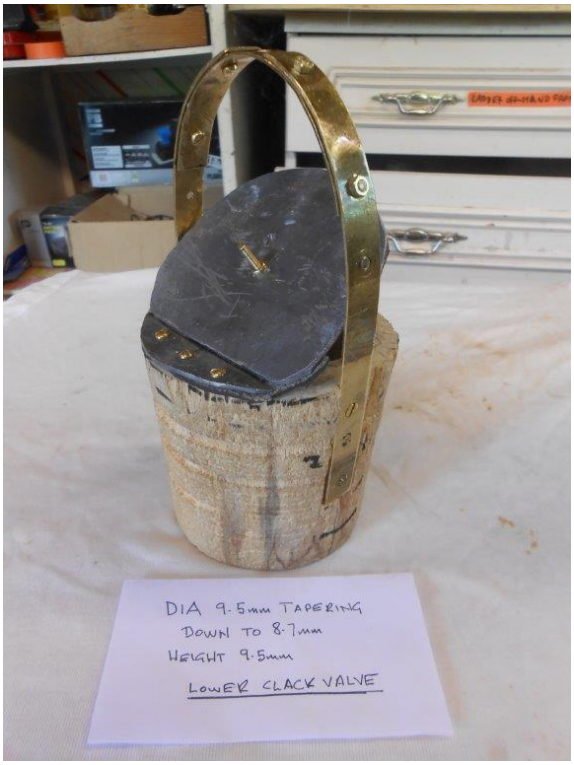
After I had the pump housing sand blasted in 2009 I decided that it was too badly split to repair and that the internal surface was so rough that it would need to be re-lined. To this end I have ground out and smoothed the inside, using an electric drill and grinding wheel on a long spindle together with a circular sanding disc on the end of a broom handle, so that it will now take a length of 4'' nominal internal diameter plastic drain pipe. This was very tedious exercise.

As I see it, the next step is to source a clack valve for the bottom of the housing to replace the one I could only remove in bits and pieces. The old one seems to have been hollow wooden cylinder held together with a couple of iron bands.

With regard to the upper piston valve, I tried to contact W. Robinson and Sons, to see if they have a suitable device, but 75mm is the max diameter they produce and I need 102mm. So I will now explore the possibility of making a wooden one, at least for the piston part of it, which I am sure will last out my lifetime.

19 July 2015. Putting me in touch with Howard Jones has been very valuable, as his design for the bucket valve seems to suit my requirements exactly. He phoned me the other day and is very interested in following my progress.

Attached are photos of the lower clack valve that I have made on my electric drill driven wood lathe. For the clack valve hinge, I used a piece of rubber wellington boot instead of leather, glued to the lead cover. I added the brass handle is to facilitate the installation and removal of the valve. (*I subsequently added a brass stiffener - as explained later).*



The next task was to source another and larger diameter piece of hardwood for the upper bucket valve.

6 Oct 2015. With holidays behind us now and enjoying a much needed “Indian Summer”, I thought it about time I gave you a progress report. Receiving your email in July with Howard Jones’ website, showing his demonstration pump system at Yetminster, gave me the design for a wooden bucket valve that I could make in my shed, although acknowledging it would probably not be correct for the age of my pump housing, which no doubt would have originally used one of metal construction.

I completed making my bucket valve a month or so back, though not without some hassle. I found a suitable piece of wind-fallen oak, which I turned on my wood lathe into a cylindrical billet.

I then cut a slot through this blank.

Having cut the slot through, I decided that the max diameter hole would be 1⅞", in order to leave sufficient wood at the sides for the flap valve to seat on to. This is a somewhat smaller diameter than I would have thought necessary, considering the bore of my plastic pump liner. What do you think? *(In fact it has turned out to be fine.)*

Unfortunately, the largest wood drill I had was 1", but I thought that having drilled out to that dia it would be easy enough to enlarge it with a chisel and mallet. How wrong I was.

Working against the wood grain I ended up with a ragged hole with fibrous sides that I could not clean out. However, some lateral thinking reminded me that in my boyhood days (WWII) a red hot poker was our tool of necessity for boring holes and that, even earlier, our ancestors used fire to make dugout canoes. With this in mind I burnt the inside of the hole with a blow torch and then scraped and filed out the charred surface. After numerous repeats of this sequence I managed to open the hole out to somewhere near the required diameter, at which point I was able to get a sanding disc in to grind it out to a smooth bore.

I have since spent many hours trying to make and fit a washer, but without success. The problem seemed to be not having the right material. I thought that the leather from on old school satchel would be ideal, but even after soaking it in olive oil and linseed oil, it remained too stiff to flare out to the diameter of lining tube. After trying several shapes and sizes I ran out of it and so replaced it with one made of several layers of butyl rubber pond liner.

In retrospect, I think my original leather washer would have probably worked as well.

To test it I sealed the end of a piece of the plastic liner and filled it water.

On the down stroke the clack valve opened and water rose above the bucket. However, I found I could only lift it out very slowly using all my strength. I put this down to the fact that washer was been forced out against the inside of the pipe and being rubber, was creating too much friction.

For a couple of days after that I played around with making a two piece flat bucket valve with a simple circular flat washer fastened between the two pieces. However, whilst drafting this it suddenly dawned on me that the problem was that my test rig was sealed at the bottom, so I was creating a vacuum on the up-stroke.

So I unsealed the bottom of the liner pipe, stood it on legs to allow water to flow into it and placed it in a larger container full of water. I was then able to pump water out of the pipe and back into the container. I realised that this set up did still not completely simulate the actual conditions, because there is no clack valve at the bottom of the pipe and no distance between it and the water source, but at least I had shown that the bucket valve itself works. Though at this stage I was still worried that the 1⅞” bore will not provide sufficient water flow.

My next plan is to fit the clack valve and liner into the pump housing, suspend in the water container and see if I can lift water to the top of the housing. Wish me luck.

8 Oct 2015. At your and Howard's suggestions, I have now reduced the OD of the top of the plunger to allow a better water flow past it, but am leaving the final shaping until I have worked out the design of the connecting rod and how to attach it to the plunger. I also intend to reduce the length of the plunger below the clack valve. With regard to your comment regarding the avoidance of the bucket valve jamming at the top of its stroke, I have always assumed that there needs to movement between plunger and connecting rod as with all piston/cylinder systems. *(Of course I realise that the original bucket valve would most likely have been made of iron rather than wood, but I don't have facilities for metal fabrication. Hence my good luck at you putting me in touch with Howard's design*).

Today I temporarily fitted the bottom clack valve and liner in the pump housing and placed the whole assembly into the water container and am pleased to say that I was able to pump a good flow of water out of the spout.

I am now hopeful that there is sufficient suction to draw water out of the well, even though there is an additional 7ft of lift to be considered and that I was probably moving the bucket twice the max stroke of the pump handle which is 12". My action was lifting the bucket so that the flap valve was about up to the level of the outflow, but I wonder if this is necessary. In theory I think that it does not matter where the bucket is in the water column, the 12" stroke will lift the same volume of water.

When I removed the bottom clack valve I was surprised to find that lead weight was distorted. This could not have been done by the bucket hitting it, as the brass hoop would have prevented it, so my only conclusion is that it was caused by water pressure. To prevent this in the future I stiffened it up by adding a brass plate.

The next tasks were to repair the extensive splits in the body of the pump housing, and refitting and sealing in the clack valve and liner tube. But I will not install the housing outside until I have made the connecting rod/handle assembly and tested it. So it may be some time before I have any significant further progress to report.

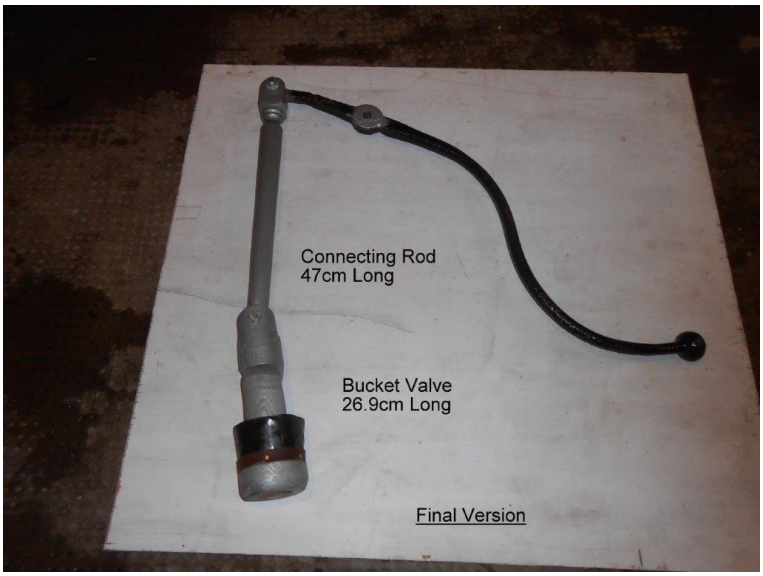
However, after weeks of struggling with the washer on the bucket valve, I am now optimistic that I can finish the project successfully.

16 Jun 2016. I see it was October 2015 that I sent you my last update, but I'm glad to report that the project is now successfully finished.

My last email was at the stage where with the bucket valve on the end of a broom handle I was able to pump water out of a container. But my final version was to use 3mm thick gasket rubber I got from a friend who works for Scottish Water.

I then had the job of re-fitting and sealing the clack valve and plastic liner, repairing and filling the splits in the housing body, making the connecting rod/handle assembly and replacing the pump and down pipe in the well. I made the connecting rod from a hardwood table leg.

Having made one of medium length, I thought that having a short one which brought the bucket valve up to the level of the outlet pipe, would provide max water flow. I then re-thought that rationale and concluded that the lower the bucket valve, the shorter the column of water to be lifted on the upstroke and hence a lower vacuum to be created. So this is the length I ended up using. The image below shows the final arrangement of bucket valve/connecting rod/bucket valve.



The other thing I did was to put metal bushes in all of the pivoting joints so that the pivot bolts would be a better fit.

As you can see, the pump handle holes were very worn. As for the wooden parts, I put the metal bushes in to reduce future wear.

The next task was to deal with the splits in the pump housing which were quite extensive.

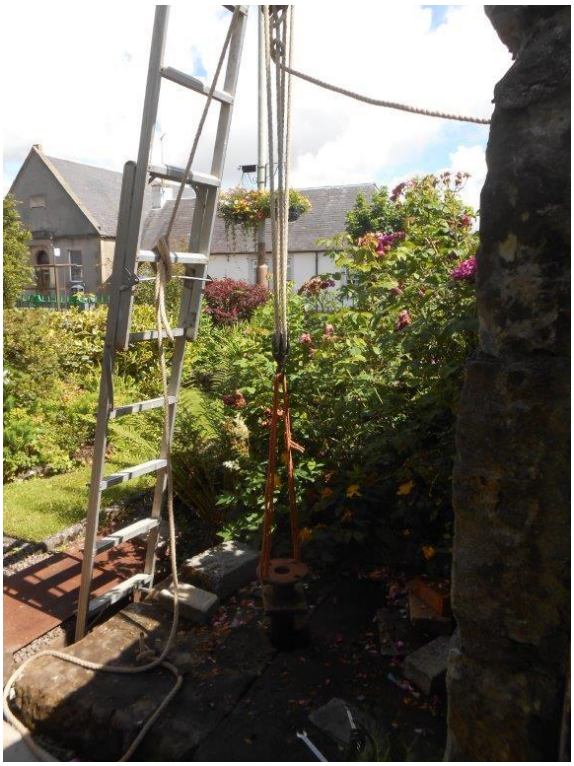
I repaired this by putting fibreglass filler into the splits and closed them with a circumferential clamp which I fashioned out of a toughened metal hoop from a wooden barrel.

The result is shown below.

So by the middle of December 2015, I was ready to reinstate the pump into the well, which, as I explained last year I had built up to the modern garden level.

I temporarily placed the down pipe in the well to get it out of the way and capped it off, but decided to leave further outside work until the spring (2016). As usual with this project, this date slipped and I did not get re-started until August (2016).

Because the down pipe and pump housing were now separated, I only needed a relatively low gantry for my pulley system to lift the pump housing into place.

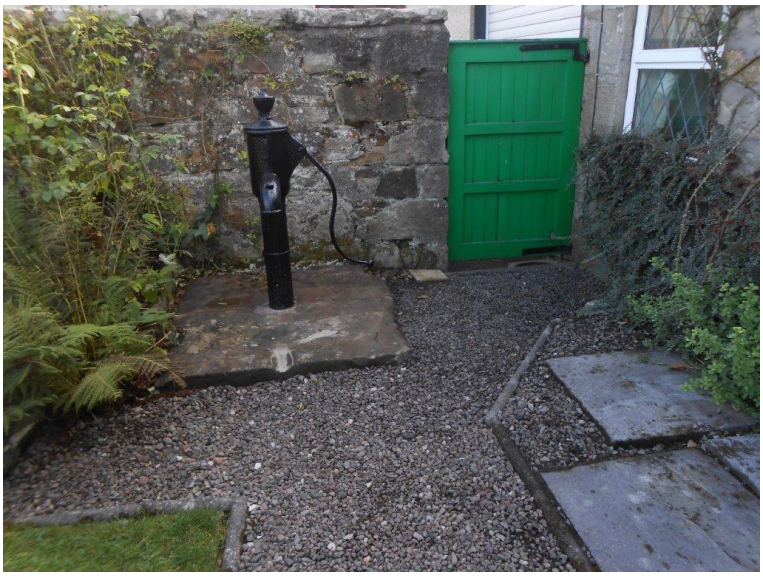


The photos below show the sequence of reconnecting the pump housing to the downpipe.

I then lowered the whole assembly to its correct position and closed and cemented the two halves of the cap-stone together.

So finally, in early September 2016, after priming with water, and after seven strokes, I pumped up the first water from the well in at least a generation.

The last task was to re-align the path now that the capstone was above the garden level.



The pump takes 7 strokes to lift the water which is as expected, as the stroke is approx 1ft and the water level is some 7ft down. The pump delivers 1.9 litres per stroke, which seems consistent with a bore of 10cm (4'') and a stroke of 24 or 25cm (10 or 11''). The only problem is that the rubber material I have used for the bucket valve does not soak up the priming water and so does not retain its sealing properties, so that I have to prime the pump even only five or ten minutes after use. So I am still on the lookout for some soft leather of a suitable thickness and some 13" x 4½". Do either of you have anything to offer?

It has taken far too long, but I am really pleased to have completed the restoration, which I only achieved because of the advice and encouragement I received from both of you. I appreciate that the restoration does not return the pump to its original design and condition, in that it now has a plastic liner and a wooden bucket valve, but a least it preserves it for the foreseeable future.

Norman Smith,
Sep 2016