The Restoration of a Lift & Force Pump (with update)

An interest in hand water pumps was kindled at a very early age but did not take off as a serious pursuit until I finally reached both my retirement and dotage, although I know not which of the two came first!

My particular fascination with the lift and force pump is rooted in my belief they represented a more advanced water handling technology than the more familiar lift pump with just a spout as an outlet. They afforded a means of not just raising water from a well but also to a point much higher than the pump and distributing it in bulk to where it is wanted rather just to the level of the spout. It also dispensed with the need to manhandle pails or bowsers. A lift and force pump formed the link in technology between a lift pump and the now familiar mains water supply, I guess. Furthermore, another attraction of this type of pump to me is that when restored it has copious amounts of shiny brass, bronze and cast iron, the glitter factor!

The pump was purchased through e-bay from a vendor in Great Yarmouth who had some 20 years ago rescued it from a skip, no less, when working for a water company. He had kept it as a 'garden feature' since then after dousing in several layers of black paint! To demonstrate its authenticity prior to placing online for sale the vendor had scratched some of the paint off the barrel to prove it was made of brass. No maker or founder mark is in evidence so presently there is no clue to its provenance.

Pump as purchased

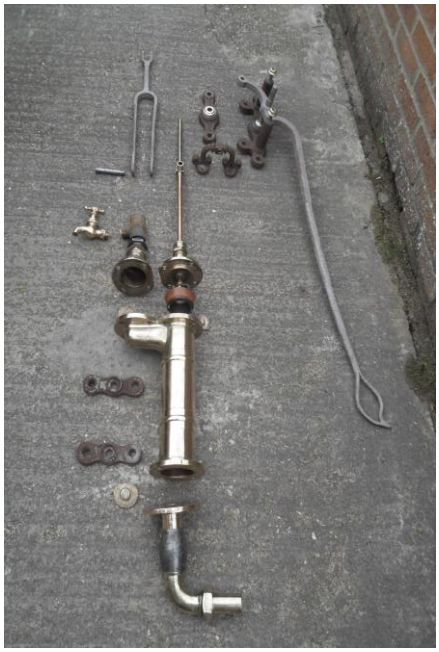
Pump dismantled

I set about dismantling the pump which fortunately was relatively easy given that brass nuts were placed on steel studs of the fulcrum plate and the cast iron brackets which hold the brass barrel in place were fixed with steel bolts. So generally there were no common metal fixings that can cause problems with dismantling. Such instances are steel against steel or steel with cast iron, like in the case of the steel clevis pin connecting the bow with the bearing on the operating rod. Removal necessitated the use of graphite-based easing oil, the judicious use of a hammer and elbow grease. Brass against brass as in two bolt fixture for plunger clack valve caused a bit of a headache as both sheared off during dismantling!

All the cast iron components such as the pump handle, fulcrum plate and housing, the bow, the operating rod guide and the two brackets for mounting the barrel were sandblasted by a friendly local blacksmith for the princely sum of three bottles of wine! All the painted components were stripped using the widely available NitroMors and, again, much elbow grease! This revealed some very nice joint work fashioned in lead, where the brass inlet pipe is fixed to the bottom plate of the barrel and where the outlet and ½″ brass tap were fitted to the hold-up/retaining valve housing. This type of work is reminiscent of the days when this was done by telephone engineers on underground cables via manholes in the pavement.

Polishing was done on a temporary modified 6″ electric grinder with a succession of 6″ sisal, stitch and soft cotton mops, i.e. from coarse abrasion then soft with the application of metal polishing wax compound, first course then finer grit. Afterwards a nice sheen was obtained with the aid of 6″ Scotch Brite discs in descending order of grit.

A new oil filled bronze bush was purchased as the original was severely worn to one side. Its external diameter turned was down to size to enable it to fit the cast iron operating guide. This was done by hand on a wood turning lathe with the bush held in place on a wooden arbor! The bush was pressed into place with the aid of an engineers' vice.



Sandblasted & polished parts

Lead jointing

Leather clack valves

The new bush fitted to the operating rod guide

Stuffing box & plunger assembly

All the ferrous components were coated with easily obtained Kurust, followed by two coats of red oxide and three coats of smooth black Hammerite paints.

All clack valves flexible materials had deteriorated and needed to be replaced. These were fashioned from 4 mm leather for the bottom gasket/clack valve, the top of the barrel gasket/hold-up housing/clack valve and 4mm silicone rubber for the plunger clack valve. I found 4 mm leather for clack valve in the last-named location was, owing to its relatively small size, very inflexible. The original material was 4 mm butyl rubber and this gave a clue that leather might not be entirely suitable. It was replaced by blue 4mm silicone rubber. The two $^{5}/_{16}$″ BSW cheesehead slotted brass bolts retaining the plunger clack valve, which sheered-off during dismantling, were re-bored and tapped. The replacement bolts were of the stronger slotted round headed variety to assist with future replacement of the silicone rubber clack. Each of these bolts were further held in place with hexagon brass lock nuts.

The stuffing box was packed 5mm square graphite gland rope with washers top and bottom to replace the originals and cut from 4 mm leather.

The ½″ brass tap was re-seated and fitted with a leather washer, several of which I have had new for about four decades!

All components were assembled and the pump fitted to a backboard made from 8″ wide x 2″ thick elm treated with many coats of yacht polyurethane. New ½″ BSW steel bolts, brass washers and nuts were used. The operating rod guide was affixed with four 1¼″ x No. 16 steel countersunk screws, rather large by present day standards and were salvaged a while back from a WW II utility dining table!

The pump was fitted to an outside wall adjacent to the well and plumbed in using 1¼″ BSP galvanized steel fittings and widely available McAlpine PVC waste water fittings. The intake in the well incorporated a non-return (check) valve and an access plug just above the ground to assist in draining the pump during a severe freeze-up. This access plug has proved a blessing in disguise as it also facilitated priming the barrel in the event of this being necessary. This was achieved by use of a garden hose pipe with the Hoselock jet fitted and this held in place with a suitable size cork with a centre bore. This procedure in a few words is like providing the pump with an enema!

By the use of two ball valves (red handles in photos below) the water from the pump can be pumped directly into a pail via the spout, or fed into an 85 l PVC header tank from which water can be drawn off via the spout or the ½″ brass tap which

came with the pump. Overflow, from the storage tank feeds by gravity into a 210 l water butt. This well water is much infinitely cleaner than the rainwater hitherto fed into the butt which was derived from the lee side of the house and always became contaminated with moss. It was not at all good to use for the watering salad crops…..it had a long-lasting strong odour to say the least! I found it advisable to turn off the top ball valve when the system was not in use otherwise the hydrostatic pressure created by the water in the header tank created a bit of a challenge for the pump stuffing box.

Please note much of the initial sheen on the brass and bronze was lost when chromium sulphate used in the tanning of the leather leached out ably aided and assisted by scale from hard water! Next spring the brass components will be re-polished *in situ* and treated with metal lacquer.

Pump & Header Tank

Priming the barrel

Sources of materials:

Metal polishing: Metal Polishing Supplies Ltd, Portsmouth, PO3 5NU.
Bronze flange bush: Simply Bearings Ltd, Leigh, Lancs, WN7 3XJ.
4 mm leather: Leather and stuff, Whitchurch, Salop, SY13 3HE.
4mm silicone rubber silicone rubber: Nicholas Phillips, Devizes, SN10 2EY.
75 mm Plunger leather plunger washer: W. Robinson & Sons (EC) Ltd, Hainhault, Essex, IG6 3WR.
85 l PVC Header tank: Etills, Royston, SG8 6NA.
5mm Graphite gland packing for stuffing box: The Seal Extrusion Company, Glemsford, Sudbury, Suffolk, CO10 7PZ.
Clevis pin (58 mm x 14 mm): Farol Ltd, Agricultural Engineers, Milton Common, Oxon, OX9 2NZ.
½″ and ⁵/16″ BSW brass and steel nuts, bolts and washers: several suppliers via e-bay.
1¼″ BSP galvanized steel pipe fittings: Pipe Fittings Direct, Bedworth, Warks, CV12 0AT.

Michael K. Woolford, Oxford, 09.12.2017

AMENDMENT 2019/2020

5 mm thick leather was used in the fabrication of the gasket/clack valve assemblies in order to make the restoration of the pump as authentic as possible. However, there was a drawback which might have been simply down to the lack of quality of the leather purchased. Continual lateral leaching of water through the porous leather (in spite of being clamped between mating surfaces) and the resultant staining of the brass work (Heaven forbid!) with water soluble chromium sulphate, used in modern day tanning, it was decided in 2018 to replace the leather with 5 mm brown coloured silicone rubber sheet.

However, there was yet another drawback which became apparent with using this material: clamping down the mating brass surfaces at both ends of the barrel resulted in the lateral spread of the silicone rubber, rather like the contents of an overfilled sandwich being lost on taking the first bite! However, this lateral spread of the rubber was not only confined to the edges of the gasket visible to the outside world but internally to such an extent that the two clack valves were rendered inoperative!

In winter of 2019 it was decided to replace the silicone rubber with 5 mm brown neoprene rubber which appears to have a higher density than silicone rubber and thus less likely to be prone to lateral spread when clamped between mating surfaces. And it worked!

With both the silicone rubber and later the neoprene rubber efforts, all mating surfaces were treated with the proprietary gasket seal blue Hylomar.

Sources of materials:

Silicone and neoprene rubbers: TYM Gaskets and Seal, Devizes, SN10 2EY.
Hylomar: Halfords motor stores.

Michael K. Woolford, Oxford, 23.04.2020