CLASSIC CAMP STOVES

The online resource for the stove collector & enthusiast

making pump washers

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Author	Message
kaw550red	Posted: Fri Sep 08, 2006 4:33 pm Post subject: making pump washers quote

Joined: 22 Aug 2004
Posts: 190
Location: Durham North East England

INTRODUCTION

I am writing this at the instigation of George Linnekar. I thought that I had already done a post on this subject but if I have I cannot find it.

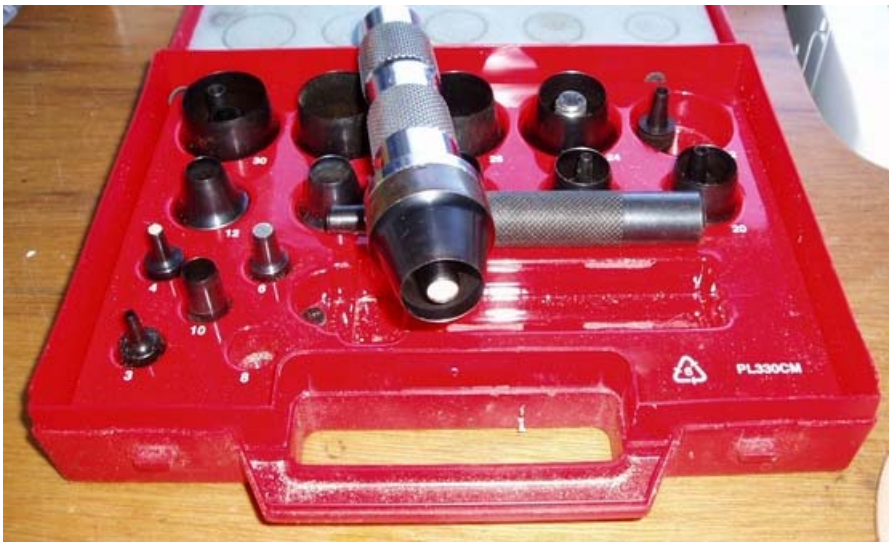
It is not intended as a comprehensive post about how to make pump washers but as a source of information to develope your own techniques for making them.

If you have leather, a hammer, a set of punches and a stove you have the means to make a pump washer that works. Really the idea of how to make pump washers originated in the States. Someone on the website had a lot of difficulty "tyre levering" a new pump washer into the tube and took about an hour to do it. He wrote in asking for advice. An American answered and said to soak the pump washer well with oil and reverse the piston, insert the assembly into the tube and leave it for 24 hours. The pump washer gets compressed into the tube size. Taking it out and putting the piston round the right way gives a snug fitting pump washer when it is reinserted in the tube. I thought that if this worked with a poorly formed washer it might work with a water soaked plain leather washer and it did. The rest is just a natural progression from using the pump tube as a mould.

PHOTOGRAPHS

Please excuse the quality of my photos as I have not had time to edit them and most are as they came off the camera

PUNCHES



These are some of the punches that I use for washer making. The main set allows holed washers to be punched in one operation. They are expensive BUT their cost is soon recovered by the savings in the cost of commercialy made washers. They were obtained from www.axminster.co.uk and are part number JLB330. Other punches are in the box as well as the standard set.

LEATHER

One of the hardest things to find for pump washer making is the leather. Ideally it should be about 1.75 mm thick but you can use 2 mm however it has to be compressed more when it goes into the mould so is more difficult to use. I currently am using some pigskin coasters which were bought of ebay but I am nearly out of them so if anyone knows a source of a stiff leather about 1.75 mm thick please let me know

BASIC PUMP WASHER MAKING

You may find it difficult to believe but apart from a hammer and the punches this is all you need to make pump washers

You can make the pump washers using pump pistons and pump tubes. I use 22mm diameter blank washers for the small diameter washers and 24 mm diameter blank washers for the large ones. Ideally the holes in the middle of the blank washers need to be about 7 mm if you use this method. The holes have to be stretched onto the pump pistons. If you cut them 8 mm the holes stretch as you are inserting the pistons into the tube and you can get a perfectly formed washer with an enlarged hole making it almost useless. Soak the leather washers in warm water for about half an hour before placing it on the piston and locking it in place with the nut. With this method you fit the soaked washer onto the piston with the rough side of the leather nearest the nut. The pump piston is fitted to the pump rod the WRONG way round. Pushing the piston into the tube shapes the leather and actually produces the best pump washers however you really need pump pistons with brass nuts or you get staining of the leather. Also it is better not to have the valve end on the pump tube so that the air can get at the washer. Screwing the pump lid to the tube helps keep the piston square in the tube. Once the washer has dried out the pump piston can be turned round the right way, oiled and inserted into the pump tube.

I cannot remember whether I have used the pump tube of a tank to make the washers but theoretically there is no reason why it cannot be done but it will take longer to dry out than using a pump tube out of the stove.

MORE ADVANCED METHODS

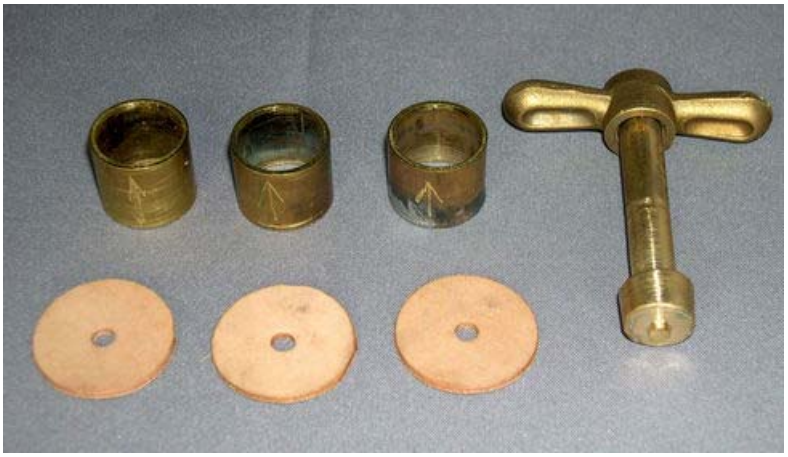


Photo by George Linekar

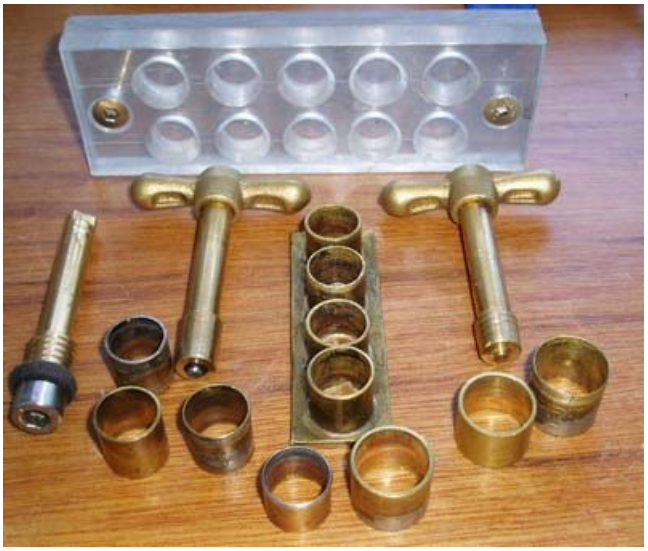
This is a slighty more advanced method of making the washers using short lengths of pump tube. The tubes need cutting with pipe cutters to get square cut ends. This leaves a burr inside the tube which must be removed. The entries into the tubes are slightly tapered to ease entry of the wet blank washer and the arrows are to make sure that it faces in the right direction. The holes in the blanks are 4 mm diameter and fit on the pin of the former. This is to help prevent the blank going crookedly into the mould. The operative word is help. The blanks seem to take on a mind of their own and it can be difficult to get them to go in straight.

The formers are made from the stems and handles of old taps. Their diameters are the same as the pistons of the two common sizes of pumps.

Place the soaked washer over the former pin with the rough side towards the mould. Place the mould on a flat surface and push the soaked washer into the mould with the former until it hits the flat surface. Remove the former. This is easier if it is turned at the same time as as you are pulling out. Put the mould on its side so that the air can get to both sides and allow the washer to dry. When dry push out of the moulds and cut an 8 mm diameter hole in the centre of the bottom of each washer. The reason that this is left till last is because the leather can stretch when you push it into the mould. Cutting it before it had dried could mean that the hole was too big for the piston.

Photo by George Linnekar

Basically this is just a progression of the last method. The tubes have been brazed to a plate to keep them together. There is a hole at the bottom of each tube to allow the formed washer to be pushed out of the mould and to allow it to dry out quicker



These are a selection of the pump washer making tools that I have made to date. You do not need tubes to act as moulds. A flat plate with the correct sized holes drilled in it works as well. The smaller sized pump tubes are 14 mm diameter and the bigger ones are 18 mm diameter. The idea with the plastic back plate was to see if I could make the angle between the bottom and side less rounded. It made no diffference at all. The clear back plate let me know that I had not improved it quite quickly. The idea was that the plate stayed in position whilst forcing the blanks into the mould and then was hinged round to help stand the mould on edge to quicken drying. Whilst it does act as a stand it does nothing to improve the washer shape. The mould was made out of polycarbonate.

FINISHED WASHERS

Generally I try to get a square open end to the washer but do not worry if it is slightly out of square or slightly uneven. The washers work just as well as the square ended commercial ones and probably get distorted in the pump tube when they are fitted to the tank. I have been surprised at how often notched and damaged pump washers were still functioning in some of the stoves that I have bought and if those misshapes work it seems pedantic to try to produce a perfect washer which is out of sight.

ECONOMIC STOVE RESTORATION

If you are interested in restoring stoves at economic prices some of these other posts might interest you.

http://www.spiritburner.com/forum/viewtopic.php?t=2837&highlight=washer+making

http://www.spiritburner.com/forum/viewtopic.php?t=2847&highlight=washer+making

http://www.spiritburner.com/forum/viewtopic.php?t=2428&highlight=washer+making

http://www.spiritburner.com/forum/viewtopic.php?t=2451&highlight=

SPECIALS

If you are interested in making specials there are some of my specials part of the way down this post. They are baseed on 96 and 00 tanks

http://www.spiritburner.com/forum/viewtopic.php?t=2418&highlight=specials

REPLIES

PLEASE DELAY ALL REPLIES UNTIL DOUG WEISE HAS ADDED HIS PIECE TO THIS POST. THAT WILL ALLOW READERS TO GET THE FULL PICTURE OF THE CURRENT SITUATION WITH WASHER MAKING WITHOUT SHORT REPLIES BREAKING COMING BETWEEN THE TWO ITEMS

Regards Bryan Miller

_____

Bryan Miller

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exeter_yak

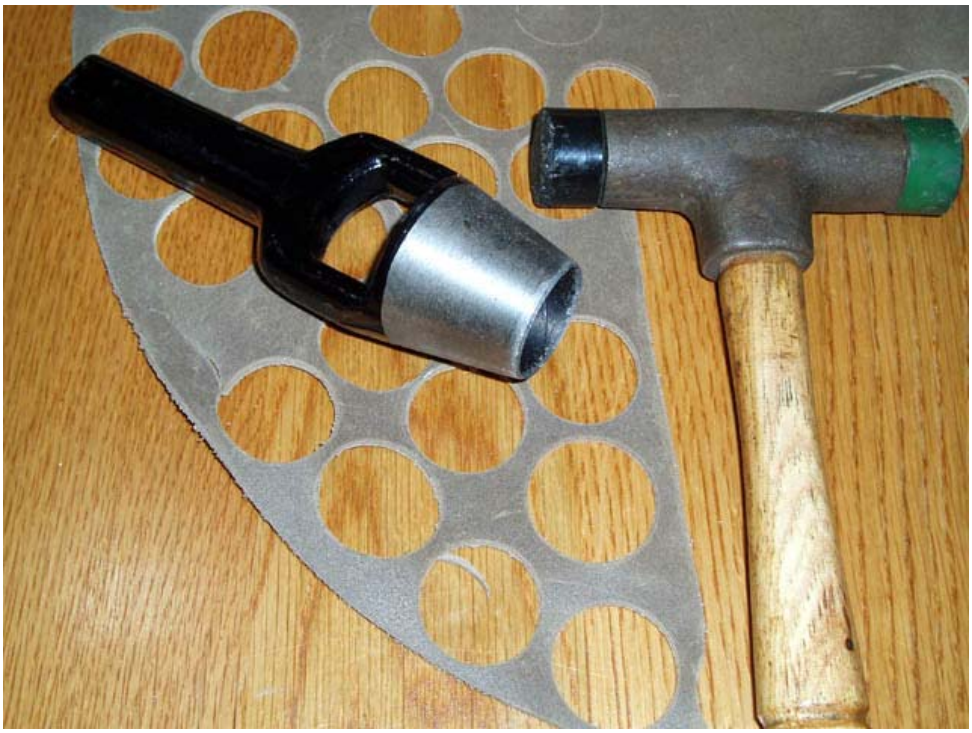
Joined: 03 Mar 2006
Posts: 20
Location: Massachusetts, USA

Posted: Fri Sep 08, 2006 6:55 pm Post subject: quote

Hello, and thanks Bryan and George,
My pump leather making started after receiving beneficial help from Bryan Miller and George Linekar a number of years ago.

My background and some available materials in my shop allowed me to learn from Bryan and George, then experiment using plastic I had on hand. I made single devices first, then after a few tests I made some larger scale blocks to allow making multiple leather cups for the pumps on my stoves that needed them. I am restricting photos and method description just to the larger size because they are easier to make to start, but the process is the same for the smaller ones.

I found some leather punches on ebay for cutting the disks but there are some other ways to perform the work also. I like the looks of Bryan's set up but could not find that type of punches. My leather shown here is just under 2mm in thickness. An arch punch is shown and to preserve the punch I use a plastic faced hammer to drive it.
[img]

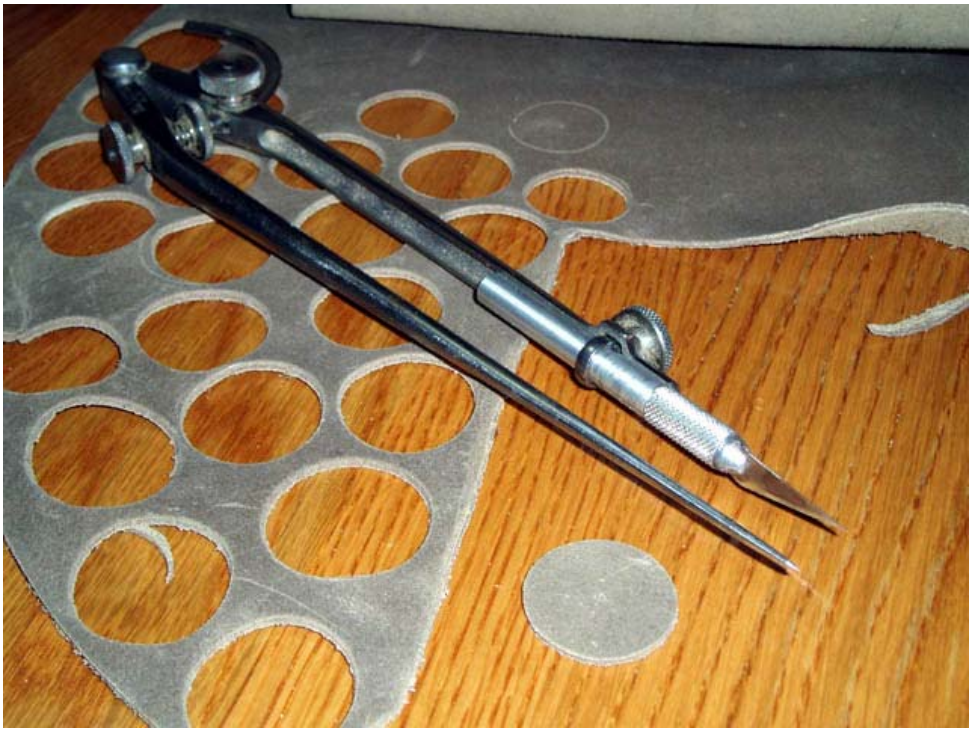


[/img]

It is best to do punching over the end grain of a piece of wood, stood up on end or placed in a vise.

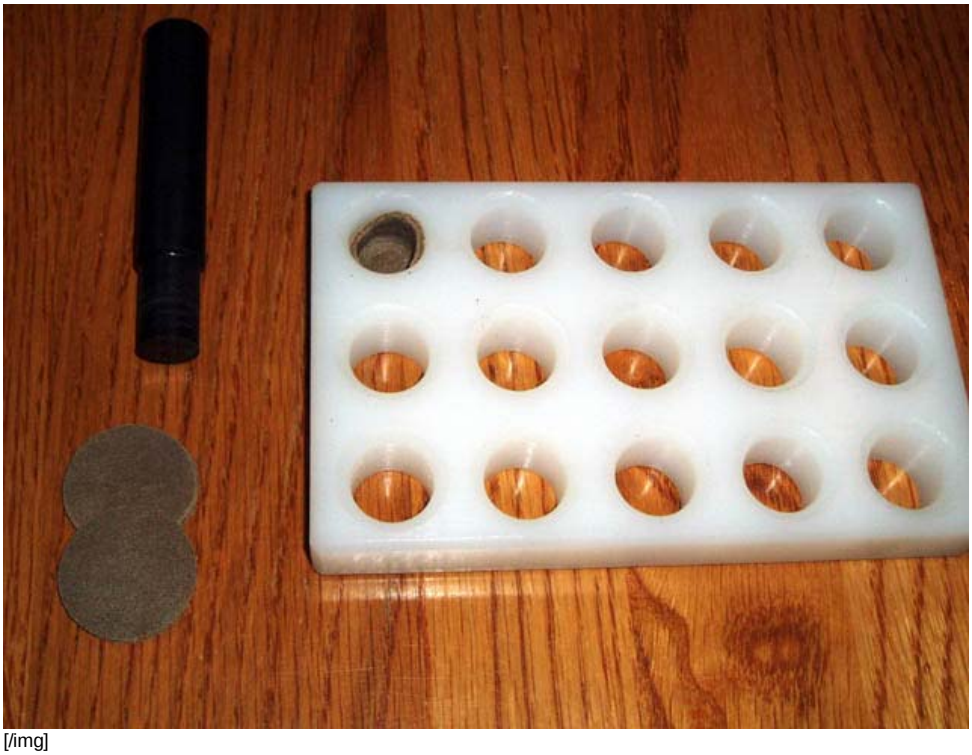
Here is another way. This is a standard compass with an exacto knife and blade installed. Align the blade so that it is on track or leading outward. Whilst this looks awkward and appears like it would be a real chore, with a good blade it takes two turns and you are through the leather. A disk cut with the method is shown.

[img][/img]



[img][/img]

I use a machined block of UHMW plastic with radius on the top corner of each hole, and a push tool made from Delrin rod. There are many other materials that could be used, including metal as in Bryan's original post.
[img]

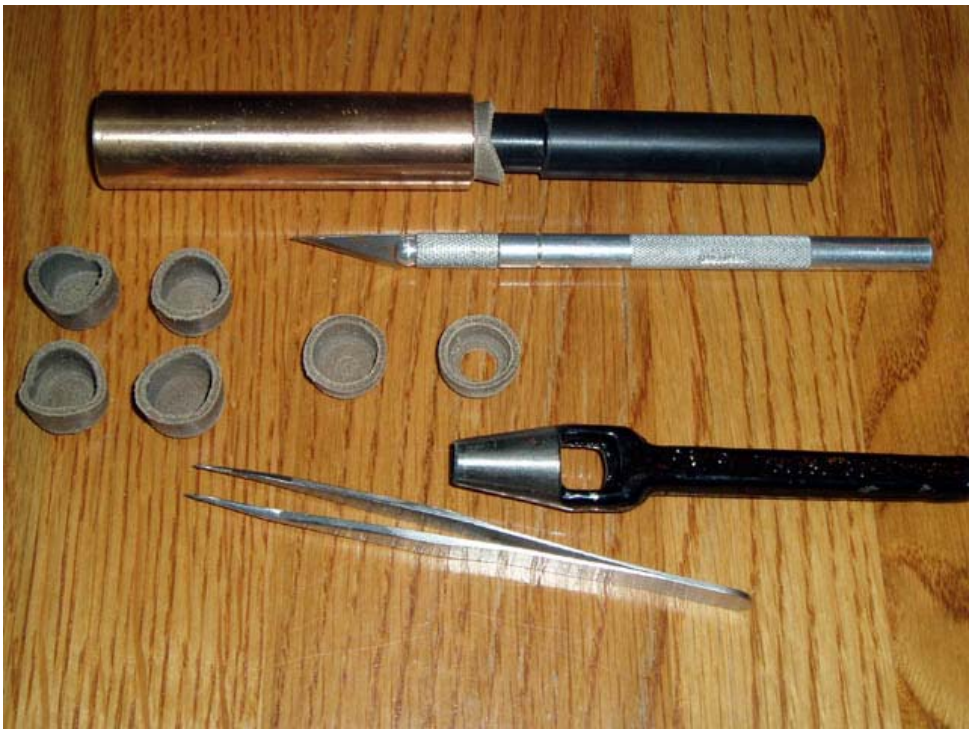


[/img]

After soaking leather disks in water overnight, I push them into my plastic block (fuzzy side out) using the push tool, then remove the push tool with a rotating wiggle of sorts so that it does not remove the leather cup, and then press in another wet disk in the next hole in the block of plastic. I usually make about 8 at a time to start, but there are usually one or two that are unruly and come out badly. They are still useable usually, but when making a lot of them you can afford to be fussy if you like. It takes another 8 hours or possibly less for them to dry in the block. After drying most of the parts just fall out of the plastic block. Using a brass rod with a flat bottomed hole I push each dried cup into it in turn, using the same push tool and trim with an exacto knife, then pull out the push tool and extract the cup. This can be done by hand, including the 45 degree feather on the edge of the cup by rolling the bar

whilst cutting carefully with the blade. I'm lazy though and use a lathe at low speed to do the cutting using the same tools as shown. After the cup is trimmed, I then cut the center hole which eliminates the stretching of the center hole issue.

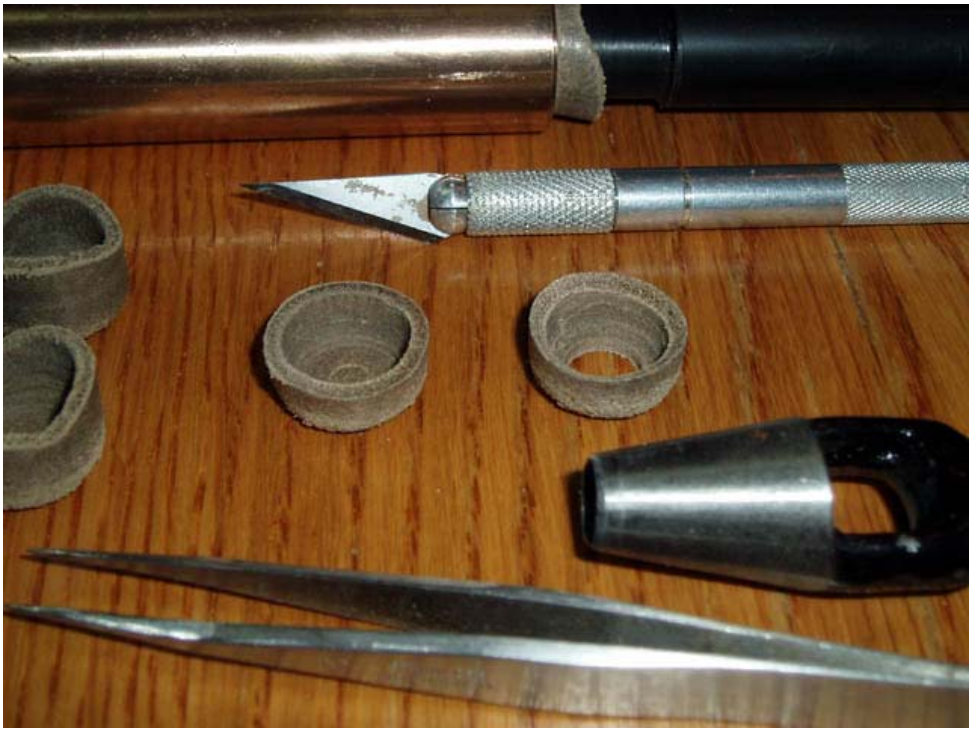
[img]



[/img]

Here is a closeup so that the feathered edge of the leather cup can be seen. The leather cups will also work without the feather (beveled edge) and they do not need to be perfect and pretty to work. You may as I did, eventually get the right process down where your parts are nearly indistinguishable from originals. I think it is all part of the fun, including the saving money part.

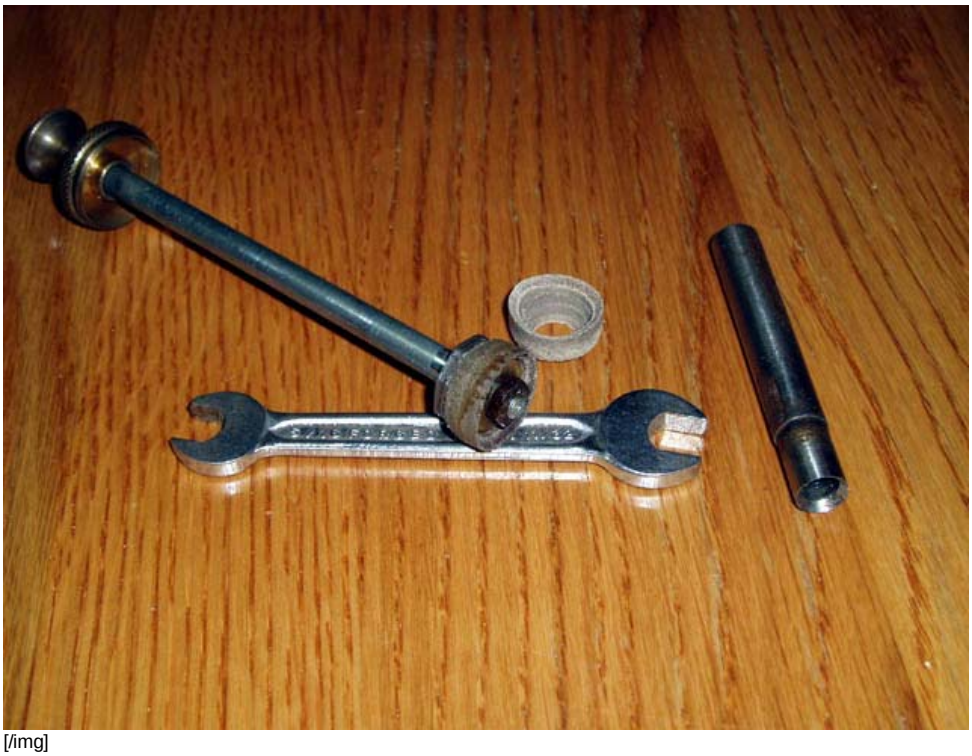
[img]



[/img]

Here is a completed part mounted and oiled on the pump shaft from an Optuimus 5R stove, with an unoiled sample next to it. Also shown far right in the photo is a home made punch which could be made with something as simple as sharpened steel tubing.

[img]



[/img]

Regards,
Doug

_____
So many stoves, so little time.....

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kerophile

Posted: Fri Sep 08, 2006 8:05 pm Post subject: Leather pump washers. quote

Joined: 23 Sep 2004
Posts: 138
Location: Scotland

Hi, I would just like to thank Bryan and Doug for taking the time to tell us how they make high quality pump washers. Really good informative posts!
Like all professionals they make it look easy! However, we all know that a lot of thought, work, and trials went into the development of these tools and the associated techniques.
Thank you for sharing your hard-won experience.
Best Regards,
Kerophile.

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nzmike

Posted: Fri Sep 08, 2006 11:10 pm Post subject: quote

Joined: 15 Dec 2005
Posts: 430
Location: Napier, New Zealand

Lovely stuff! I have a couple of stoves that need new leathers (about 6 or 8 actually)) and undoubtedly will need more in the future. I love the low tech approach to just about anything and this reeally does it for me

_____
I say we dust off and nuke the whole site from orbit, it's the only way to be sure.

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fyldefox

Posted: Sat Sep 09, 2006 1:01 am Post subject: quote

Joined: 30 May 2005
Posts: 1165
Location: St Annes on Sea, Lancashire, England

Great thread Gents !

More kit to get

_____
Keith

Tempus omnia revelat

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lobey_d

Joined: 02 Aug 2004
Posts: 152
Location: Scotland

Posted: Sun Sep 10, 2006 6:45 pm Post subject: quote

Masterclass

Bryan (and others), I've been searching for leather sources also and emailed this ebay seller who suggests the sample shown may be suitable. A lot of washers from 11sq ft . What do you think - possible?

_____
Jim

O wad some Power the giftie gie us, to see oursels as ithers see us!
Robert Burns 1786

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kerophile

Joined: 23 Sep 2004
Posts: 138
Location: Scotland

Posted: Sun Sep 10, 2006 7:36 pm Post subject: Pump leathers quote

Hi Lobey d.
Looks good! I believe the 1.4 to 1.6 mm thickness is the stuff for small stoves and the 1.6 to 1.8mm for the larger stoves. BUT.... It is an awful lot of leather if we have got it wrong!
I would be willing to run some trials if we were able to get a small sample from him. The fact that it is natural unfinished leather is an advantage for our application.
We need an opinion from Bryan and Doug.
Regards,
Kerophile.

Last edited by kerophile on Mon Sep 11, 2006 6:01 am; edited 1 time in total

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Ian
Site Admin/Moderator

Joined: 26 Jul 2004
Posts: 2484
Location: West Yorkshire

Posted: Sun Sep 10, 2006 8:01 pm Post subject: quote

If 4 or more go for it the cost to each individual is hardly likely to break the bank.

_____
Ian

Let he who has not singed cast the first stove.

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exeter_yak

Joined: 03 Mar 2006
Posts: 20
Location: Massachusetts, USA

Posted: Mon Sep 11, 2006 1:08 am Post subject: quote

Hello all,
For the larger pump washers I have been using 2 mm thickness . It is a bit on the thick side, but I had purchased about 6 square feet a year or two ago. I have to do a little fancy finger work to get the disks pushed in, and it sometimes takes a couple tries at getting it into the mould centered, but it works. 1.8-1.9 mm would probably be better for me but I have not found leather of that thickness yet. With 2mm I am just able to do it, and now with all this recent experimenting I have a lot of them made and ready in the spares box.

This morning I completed some tests using some 1.5 mm leather for small pump washers. It is a little softer than my 2 mm thick material but the finished parts work very well in a stove (Opt 96). I have only a small amount of the 1.5 mm size leather so I am looking for a more substantial piece still. The softer leather was much easier to get into the mould on each first try. I will eventually go after a larger piece of 1.5 mm thick leather and will specifiy medium stiffness .

I am still using a leather disk size of 1.125 inch diameter (28.6 mm) for larger pump cups, and have revised my leather disk diameterfor the smaller size to 1.0 inch (25.4 mm) as I was having some trimming issues with not having enough material unless the molding of wet disks was nearly perfectly centered. I also made some edits to the brass part with square bottom round holes that I use for final trimming. It is double ended now and can be used for either size pump washer depending on which end you use. I think my set up is now complete.

Good luck with finding suitable leather for purchase for those who are pursuing the method. I think that finding the right thickness of leather is the more difficult part of this process.

Regards,
Doug

_____
So many stoves, so little time.....

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kaw550red

Joined: 22 Aug 2004
Posts: 190
Location: Durham North East England

Posted: Mon Sep 11, 2006 9:37 am Post subject: Leather suitability

quote

> **lobey_d wrote:**
>
> Masterclass
>
> I've been searching for leather sources also and emailed this ebay seller who suggests the sample shown may be suitable. A lot of washers from 11sq ft . What do you think - possible?

Hi Jim

Thanks for that link. From the description it sounds ideal. The leather for tool holders is similar to the leather that I have been using. I have taken the plunge and bought one sheet. I have ordered the 1.8/2.0 mm thickness in the hope that it will be nearer 1.8 mm than 2.00 mm

Your searches seem to be more effective than mine. I had previously bought some leather off ebay which consisted of assorted offcuts. Whilst it did make washers they were not as good as those made from the pigskin like leather.

I have always assumed that the commercially made pump washers were stiff because they were made out of a stiff leather but it has just ocurred to me that they may be stiff because the leather is compressed a lot during making.

Once the leather comes I will try it out and if it is suitable for washers sell parts of it to reduce my outlay.

I will let you know what happens

I have heard that the uppers of old leather shoes make reasonable pump washers but have never tried it. I used to have a pigskin briefcase and that leather would have been ideal. Naturally I threw it out a long time ago. You may have disguarded leather items around the house tthat would provide free materials for making the washers.

Regards Bryan

_____
Bryan Miller

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profile pm

David Shouksmith

Joined: 28 Jul 2004
Posts: 1633
Location: Great Lumley - cultural capital of N.E. England

Posted: Mon Sep 11, 2006 12:13 pm Post subject: Re: Leather suitability

quote

> **kaw550red wrote:**
>
> Once the leather comes I will try it out and if it is suitable for washers sell parts of it to reduce my outlay.

I'm in, Bryan...

_____
Post Tenebras Lux

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profile pm email

lobey_d

Joined: 02 Aug 2004
Posts: 152
Location: Scotland

Posted: Mon Sep 11, 2006 12:32 pm Post subject: Re: Leather suitability

quote

> **kaw550red wrote:**
>
> Your searches seem to be more effective than mine. I had previously bought some leather off ebay which consisted of assorted offcuts.

Yes Bryan, I found the offcuts too. Then I tried searches with "hide" and "skin" and found this type.

> **kaw550red wrote:**
>
> Once the leather comes I will try it out and if it is suitable for washers sell parts of it to reduce my outlay.

I'm in too, please.

_____
Jim

O wad some Power the giftie gie us, to see oursels as ithers see us!
Robert Burns 1786

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profile pm

fyldefox

Joined: 30 May 2005
Posts: 1165
Location: St Annes on Sea, Lancashire, England

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Posted: Mon Sep 11, 2006 2:14 pm Post subject: quote

Me too !

Cheers

_____
Keith

Tempus omnia revelat

profile pm email

David Shouksmith

Joined: 28 Jul 2004
Posts: 1633
Location: Great Lumley - cultural capital of N.E. England

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Posted: Mon Sep 11, 2006 2:19 pm Post subject: quote

...and Trevor (shagratork) will definitely be interested...

_____
Post Tenebras Lux

profile pm email

oops56

Joined: 23 Oct 2005
Posts: 654
Location: proctor vt

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Posted: Mon Sep 11, 2006 3:15 pm Post subject: leather quote

me too hurry

_____
Robert 63{oops56]

profile pm

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