### Re: Brake overhaul - levers

*Written by alecrb at May 07, 2015 11:33 pm*

Interesting topic!

My experience on my 1933 16/80 is that the original Lagonda machining was first class - must have been a tough place to be an apprentice. Holes are where they should be and individual parts are made to high standards of accuracy and practice. I don't know about the new company's standards...

The oddly-spaced holes may have been to direct more of the braking effort to the front, but I'm not familiar with the LG45 brake layout so that's just a guess.

I'm a mechanical engineer, not a metallurgist, but my two cents' worth is:

With old castings and forgings, it's hard to be sure what the composition of the metal really is. This does mean that your weld repair should be done by someone who really knows their stuff. Cast steel should be every bit as good as its wrought counterpart for tensile strength and ductility (except that it won't have its yield strength raised by cold working). The same steel, but forged, will have somewhat better strength in the direction of metal flow, but forging was probably chosen more for cost reasons than for better properties.

As I said in an earlier posting, if I have to repair a worn hole, I will do it with brazing in a thin steel sleeve. The temperature for brazing is well below anything that will cause trouble for the lever metal, whatever it is, and the braze strength approaches that of steel. To me it's the least risky option.

Having said that, there are many ways to solve the same problem!

Alec

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### Re: Brake overhaul - levers

*Written by Colin M34 at May 08, 2015 12:31 am*

Hi Guys

I agree with Alec's comments - especially his comment about brazing in a sleeve being the least risky solution. As an electrical engineer I love it when a well-fluxed solder or brazing joint gets to the right temperature and the metal runs in nicely. As Alec says, this takes place at a much lower temperature than welding and you build a second sight when this is correct. This is most satisfying.

Colin

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### Re: Brake overhaul - levers

*Written by DavidLG45 at May 20, 2015 7:31 am*

Many thanks for all the comments.

In the end I spoke to LMB in Belgium. I felt as a Lagonda specialist they'd do a good job. They are now done and I await their return.

I will post some pix when I have them back.

David

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### Re: Brake overhaul - levers

*Written by bill at May 20, 2015 8:27 am*

For some reason I didnt see this post originally.

I had a similiar problem on a different car. I did not have the brake levers I required but I knew all the correct dimensions etc. I also had some originals as patterns.

The 2 levers on the left of the original photo of this post would be fairly simple to make.

I made them out of EN 24T. First I got a supplier to sell me a block of EN24t - roughly the correct overall size. I used the lathe to make the larger

central hole and then drilled the other holes separately.
Then I spent a long time cutting /filing the correct shape.
Job done !
I think you could also make the 3rd from left lever in the photo in the same way.
The one on the right would be more difficult but could still be carved out of a solid block.
I was advised beforehand that EN24T was perfectly strong enough for the job and probably stronger than the original anyway !
Any comments from the metallurgists among us ?

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**Re: Brake overhaul - levers**
*Written by DavidLG45 at May 20, 2015 2:03 pm*

Thanks Bill for your suggestion. As you say the first two wouldn't be hard to cut from solid. The other two would need a fairly big chunk of steel - the bottom bar in the third lever is foreshortened in the photo and in reality is about 2.25 inches long and would be a lot to cut away. I suppose you could turn the main tube on a lathe once the bulk of the metal was removed, and then bore the long hole. Third one would also need a large block. I'm sure it could be done, but time consuming.

What did you use to cut the bulk of the unwanted steel away?

David

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**Re: Brake overhaul - levers**
*Written by bill at May 21, 2015 8:49 am*

I used a 1mm cutting disc on a 4.5 inch angle grinder (maybe used 2 or 3 discs in total - but only about 80p each) and then used a 40 grit flap disc on the same type of grinder (I find that a flap disc is much "kinder" to use than a hard disc).
I also cut out a large "U" shape brake pedal (about 10" X 10") by the same method.
Not too much effort involved but quite a lot of time !

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**Re: Brake overhaul - levers**
*Written by DavidLG45 at May 21, 2015 10:05 am*

Thanks Bill. That doesn't sound too difficult.

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**Re: Brake overhaul - levers**
*Written by Bill LG45 at May 21, 2015 10:35 am*

Hi David
To add to previous comment by the other David: Lever three is the compensator on the front axle, if the holes for the brake rod clevis pins are not set at the same distance this will result in unequal pull on the brake rods and the brakes will tend to pull to one side.
I see you sent them to LMB ...Hopefully they will sort them out for you satisfactorily but should you or others need to get some made I offer the following:
Agree with Colin in so far as I believe these Girling parts would have been forgings and not castings. When the hot metal flows in the forging die and follows the shape of the component it makes it stronger due to the improved grain structure ( just like the head of a drop forged spanner).
Having said that, as a Design Engineer in a past life, I have successfully designed cast housings which were subject to very high shock loads and survived rigorous shock testing before going into service. These were made of special cast ductile iron with a minimum elongation of 12% as opposed to ordinary cast iron which has elongation typically less than 0.5%. Ductile iron is also referred to as "spheriodal graphite" cast iron. The free carbon within the grain structure is in the form of spheres whereas in ordinary cast iron the free carbon is in the form of flakes making it very brittle and a crack will readily propagate from the end of a flake which is in effect a flaw with a very small radius leading to extremely high stress at that point. NB: "Elongation" is a measure of the toughness or resistance to fracture and is the amount a test specimen stretched prior to failure when tested under

tensile load.
In practice you can take a piece of 12% ductile iron, clamp it in the vice, hit it with a 4lb hammer and bend it over 90 degrees... it will behave like a piece of wrought steel. Try that with ordinary cast iron and it will snap off at the first blow!
I would be good to know the original specification that Girling used but how to discover that eh?
Whatever material is used it must be sufficiently ductile not to be prone to fracture and 12% elongation was what we accepted as "not brittle".
So tensile strength is not the only property to be considered...EN24T as mentioned by others, has elongation of 13% as well as being relatively high tensile strength so looks like a reasonable selection to me but recommend that seeking advice from a qualified metallurgist would be prudent as care needs to be taken with the heat treatment. Information I found on the internet below:

817M40T - EN24T steel is a high tensile alloy steel renown for its wear resistance properties and also where high strength properties are required. EN24T is used in components subject to high stress and with a large cross section. This can include aircraft, automotive and general engineering applications for example propeller or gear shafts, connecting rods, aircraft landing gear components.

817M40T / EN24T Steel Mechanical Properties

Size 63 to 150 mm, Tensile Strength 850-1000 N/mm², Yield Stress 680 Min N/mm², Elongation 13%, Impact 54 Izod J, Impact 50 KCV J, Hardness 248/302 HB

Hardening EN24: Heat uniformly to 823/850°C until heated through. Quench in oil.

Tempering: Heat uniformly and thoroughly at the selected tempering temperature, up to 660°C and hold at heat for two hours per inch of total thickness.
Tempering between 250-375°C in not recommended as this can seriously reduce the steels impact value.

Stress Relieving: Heat slowly to 650-670°C, soak well. Cool the EN24 tool in a furnace or in air.

EN24T steel is available from stock in round and flat bar and in plate.

One thing is for sure, there is a need to be very careful when making replacement brake parts or repairing them as if one of these failed in service and was the cause of an accident the potential consequences are horrifying!
Hope this helps
Bill

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**Re: Brake overhaul - levers**
*Written by DavidLG45 at May 21, 2015 11:39 am*

Hi Bill,

Thanks for your input. I found the same info that you quoted relating to heat treatment etc. If I did need to replace the parts I think cutting from solid would be the best option and maybe making the areas round the clevis pin holes a bit more chunky. Followed by some expert heat treatment etc. Casting seems to be out.

I take your point about lever 3 pulling unevenly and it would be better if the holes were equal distance but in fact it won't pull unevenly as the lever pivots from higher up and will just shift to the side to compensate. See attached diagram.

David

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**Attachments:**
Lagonda-LG45-front-layout.jpg (filesize: 116.99 KB)

### Re: Brake overhaul - levers

*Written by alecrb at Apr 09, 2016 11:35 pm*

Following up on this thread, I refurbished some levers by brazing steel plugs into the worn holes, milling them flush and then redrilling the holes to the correct diameter and location. Pictures attached (I hope). Also made a new cross-shaft as well, but that's a different story!

Alec

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**Attachments:**

levers before.jpg (filesize: 107.75 KB)

levers after.jpg (filesize: 98.31 KB)

brake x-shaft assembly rh end.jpg (filesize: 91.51 KB)

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