Making Springs For Old Guns

Don't Lose Your Temper

by Fred Flintlock

NOTE: *The text within this article refers to colour images, which unfortunately have not been able to be used within these pages. Readers with internet access can however download a colour version of this article from*: www.mlagb.com/blackpowder

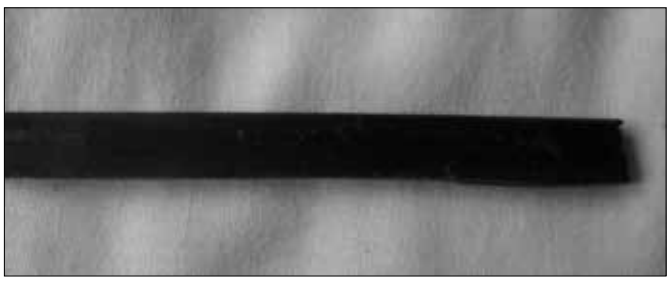
The feedback I am getting would indicate that some people are having trouble with the colour method of tempering. No matter. I commend you. You gave it a go and did not sit on your fundamental orifice saying "it can't be done". I suggested starting with revolver springs because the investment in time and material is minimal and some setbacks can be accepted. However you will eventually come across some weirdly shaped spring that involves much work. To then see it break the first time it is stressed, is very disheartening. It is, therefore, imperative that tempering, preferably by the colour method, be mastered NOW.

First of all. A suitable spring steel stock must be used. A spring cannot be made out of mild steel. It will not harden out sufficiently. Secondly any attempt to reclaim old spring steel, will only end in failure. Most springs are manufactured by industrial methods, that we cannot emulate at home, using metal alloyed specifically for that method. In order for the procedures that I outline to be successful a spring steel stock suitable for OUR purpose is necessary. Peter Dyson will supply. Yes I know. I previously made a trigger/bolt spring from hacksaw blade. I also pointed out that this was about the only spring that could be made from this material.

So let's assume that all filing and fitting has been done and it is time to harden and temper. For the purposes of this article I am using a piece of spring steel stock that I would much rather keep to make a spring. I am doing this in order that the colours will be as accurate as possible. So, sit up at the back there and pay attention.

Hardening

Turn the blowlamp up as high as it can go and heat the embryo spring until it is glowing red hot. As hot as you can get it. Then, quickly, drop it into a bucket of water. It is now hardened but it is too brittle to use. When taken from the water it will be all black and 'orrible. [*See photograph 1*]. Before it can be used it must be tempered. Do not get confused by terminology. Some people say 'draw the temper', some say 'tempering back'. All the same thing.



Photograph 1

Tempering By Colour

1. Having retrieved the spring from the water, polish it back to bright, white, shiny, metal using emery cloth, wet and dry paper. Anything that is to hand.

2. Now hold it by one end using a pair of snipe nosed pliers. Put the blowlamp on as low a flame as possible and wave the spring about at the end of the flame. The idea is to heat it up slowly and uniformly. As it heats up the colour of the metal will change due to the thickness of the oxide film forming upon it. At one stage it will suddenly turn quite a beautiful dark blue. Into the water with it quick.

3. You will almost certainly find that the spring will NOT heat up uniformly and that some parts of it will be blue while others are not. Do not worry unduly. When part of it is blue - into the water with it. If you hold it in the flame for too long then you will notice your nice blue colour becoming paler. You are losing your temper. Your spring will now look something like *photograph 2*. Observe the blue colour at one end. Note that the other end is still bright. If any attempt is made to use the spring in this condition then it will snap at the junction of the blue and the bright metal.

Photograph 2

4. Dry the spring. Now, holding it by the blued portion heat it in the blow lamp until the rest of it is blue. Then into the water with it. On removing it from the water it will look something like *photograph 3*. Note the small area in the middle, that is still bright metal. If the spring is bent then it will snap at this point.

Photograph 3

5. Dry it off again and this time holding by any convenient point, heat in the blowlamp until that small bit in the middle is blue. Back into the water quick. On removal the whole spring should now be blue. [*See photograph 4*]. Tempering is now complete.

Photograph 4

6. The spring is now ready for use, at least so far as tempering is concerned, but if it should be too strong then it is quite acceptable to weaken it by filing. Contrary to what most people think springs are reasonably soft, once the surface hardness has been broken, and can be filed quite easily.

7. If you are unsure about your tempering then it is quite permissible to polish the spring bright and to temper it a second time. That is to say repeat steps 1 to 7 all over again. However do NOT, REPEAT, NOT, harden it again. This would nullify your first tempering. In fact, until you gain confidence it may be a good idea to temper it for a third time and this time concentrate on any fold in the spring. It won't damn well break now.

Don't Go Soft On Me

Now having installed your newly made spring. Let us imagine that you pull the hammer back and release it. It does not fall with a satisfying snap but just flops down. On examining your spring you find that it has remained in the stressed position and failed to spring back. What's gone wrong? The answer is that you have over tempered the spring and have softened it. This is annoying but not the end of the world. Just heat the spring red hot once more and dress it back out to the shape that it should be. Allow to cool naturally then check that your spring is the right shape. Then harden again as outlined above and re-temper it. This procedure cannot, however, be repeated too often. It seems permissible to heat the metal red hot as often as necessary provided that you then allow it to cool down naturally. However hardening seems to be a different matter. After being hardened three or four times you will find that the metal remains soft and will not re harden. It is for this reason that I have commented several times in my articles to allow to cool naturally when possible. Only drop in water when it is your intention to perform the hardening operation. Remember what I said in the second paragraph. This is a metal specifically alloyed for our purposes. Harden it too often and you destroy that attribute but so far as I can make out, tempering does not alter the character of the metal presumably because it does not get hot enough.

What The Colours Mean

Various temperatures are traditionally associated with tempering colours and with different uses of the tempered steel. We are only concerned with springs. The colours are, of course, subjective. 'What do you mean by straw colour'? Common sense is necessary. However to quote Oscar Wilde, "the trouble with common sense is that it is not that common".

Anyway here are the colours and associated temperatures.

Yellow	215C	
Pale Straw	225C	
Straw	235C	
Reddish Dark Straw	255C	
Brown Red	265C	
Light Purple	270C	
Dark Purple	285C	
Dark Blue	295C	*This is it, the colour you want*
Blue	305C	*You are losing it*
Pale Blue	315C	*Into the water with it quick*

Finally

This is about as far as book learning can take you. The student must make his own way from here and following the above precepts must make his own mistakes. Remember that we give the name "experience" to our mistakes. Once you have mastered this method of tempering you will wonder why you ever found it difficult and then will never use any other method. Do not think that you are the only person who has ever had trouble dealing with metal. The early metallurgists, a superstitious lot, had such difficulty that they thought devils inhabited the metal they were working on. The name for nickel was derived from 'Old Nick' or the devil himself. However the name 'Old Nick' came from Niccolo Machiavelli (1469 - 1527) who some thought WAS the devil himself. Yes nickel is named after a 15th century Italian politician or the devil, whichever you prefer. In the same vein goblins were thought to inhabit cobalt and the name comes from the German word for elves, or kobolds. As I said in my first article in Spring 2009, many superstitions still linger. Today we are more scientific in our outlook and realise that our problems are caused by the operation of Murphy's Law. There are various definitions of this universal and immutable scientific fact but the usual one is "that if anything can go wrong it will." This law was first formulated by that eminent Irish scientist Edzel Jonah Murphy, when he felt his French letter split.

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