



Colour-case hardening: the last word in form

While an armour coating is the intention of the hardening process, the colour finish adds unique character to our best shotguns

WRITTEN BY DOUGLAS TATE

Gunmaking's golden age by common consensus began with the Edwardian era and, for me at least, extends through to the present day. Maharajas and rich Americans piling their lockplates with gold, silver, platinum and even precious stones has proven a recipe for gun-trade success but Englishmen prefer plainer fare. The perfect lines of a British best require nothing more than a dash of scroll plus a measure of colour-case hardening, which is the icing on the native cake but it is no mere

frillery; it serves to protect and provides a splash of vivid colour where none would otherwise exist.

The inestimably meticulous Richard St Ledger does most of the hardening for the fine London gun trade. What Elvis is to rock 'n' roll Richard St Ledger is to colour case and the quality of his craftsmanship speaks for itself. "In our view the traditional method of colour-case hardening used by St Ledger produces the best results, giving a brilliance and depth to the colours that cannot be achieved using other methods." So says Daryl Greatrex, managing director of

Holland & Holland. Chris Batha at Charles Boswell agrees: St Ledger is "acknowledged as the finest in the world for this work".

Among Britain's independent gunmakers, both David McKay Brown in Scotland and Robin Brown in the Midlands colour-case harden their own guns. I asked about hardening's origins. "In the early days of gun manufacturing, the 18th century, wrought iron was used for the frames and lockplates of the muzzleloaders. It was soft and easy to machine, to work using hand tools and also for polishing and engraving," says McKay Brown. "The process of case hardening



provided a durable, hard-wearing, glass-hard surface and the parts became rigid."

In his chapter on "engraving and finishing" in *The Modern Shotgun*, Major Sir Gerald Burrard appears to suggest that in the old days the engraving was there to provide some sort of decoration to the metal when the case hardening wore and that the real beauty was the colour hardening. I put this to Robin Brown. "Never heard of the engraving being there to show up once the colour has gone," he said. "New one on me. Some guns had minimal engraving and the colour was the decoration, true. Border-engraved guns, for instance."

Jonathan Irby, James Purdey & Sons' head of sales, offers a similar stance. "Purdey, like all best gunmakers, has always considered the engraving to be the primary ornamentation of a gun. Indeed, when the company briefly made multiple grades of guns, the difference between 'A' and 'B' was purely the level of engraving. A finely engraved gun will always be more highly prized than a plain, colour-hardened gun and this is reflected in

Above left: colour hardening at AA Brown & Sons' workshop in Alvechurch, near Birmingham

Above: a colour-case hardened AA Brown & Son shotgun, blues and browns showing through

the artistry applied to muzzleloaders of the 18th and 19th century.

"The colour finish was, and is, the by-product of the hardening process," he continues. "This is favoured as providing a hard surface, with a certain level of flex underneath, rather than a glass-hard finish. For many years it was the only method of hardening gun actions and those sent out 'in the black' are unhardened actions with an anti-rust finish applied, as it was only intended to be a temporary state. There is a small number of blued actions in the records but, again, this appears to have been used as an anti-rust finish for guns built for wildfowling as they can have very fine engraving."

MATERIALS SCIENCE

Hardening incorporates carbon into the molecular structure of the surface steel and occurs when hot steel is splashed into cold water. The process gives the outer steel an

armoured skin that prevents wear and corrosion while retaining the interior, ductile, shock-absorbing strength. (In materials science, ductility is a solid material's ability to deform under tensile stress.)

I'd heard gunmakers were secretive, guarding their recipes like alchemists, but both Robin Brown and David McKay Brown were nothing if not forthcoming. I asked how the rich blues and golds were achieved. "Cleanliness is paramount," says Robin Brown. "The work must be totally grease free when it is packed in the bone charcoal, which must also be as grease free as possible. If there is a small amount of grease or oil in the medium, closely mottled hardening is likely to be the result with strong possibilities of flaking. Flaking is when the top finish of the hardening colour flakes off leaving a pale grey showing underneath. Hard to hide and usually would lead to a rehardening."

Bone charcoal is a mixture of finely and coarsely smashed and ground animal bones procured from an abattoir. In the past, other adjuncts were not unusual, according to David McKay Brown. "It was common to use not only wood or bone charcoal but other →

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materials, such as clippings from horses' hoofs and scraps of leather." In some ateliers, bits of hardware – washers, bolts or even specially shaped blocks of steel – are wired to the backs of less dense components such as triggerplates, locks and straps to distribute colour more evenly.

Once the components to be coloured are clinically clean, the procedure known as the packing of the pots begins. Care is taken to make sure large components such as the action body are centred in the bone charcoal and that no two pieces touch. Next the pot goes into a preheated kiln. "One of the best-known men for colour-case hardening in the Birmingham quarter was Bill Woodward," says David McKay Brown. "Bill would judge the length of time it took for his box to come up to temperature by the time it took him to drink a couple of pints in the pub. Good results can only be achieved by a great amount of trial and error. There is a great number of variables, such as the type and size of the charcoal, the quality and temperature of the water, the temperature of the box before quenching, the position of the parts within the box and on it goes."

EXPERIMENTAL HARDENING

"Starting from the time I was an apprentice," says David McKay Brown, "I have always experimented with colour-case hardening and although over the years I had hardened a number of boxlocks, some of the results were disappointing, to say the least. Once a triggerplate broke in two due to brittleness. So when it came to hardening my first round-action gun, which had taken four years to build, I was very nervous. I made the charcoal from gardeners' bonemeal fertiliser by toasting it in a heavy frying pan. The smell could be detected at Hamilton Cross, 500 yards away. Malcolm Appleby had engraved the gun and asked if I could produce a good blue. One of my men was recording the procedure. I quenched the action body and on taking it from the water I exclaimed, 'Well, if

HARDENED PARTYGOERS

Stefano Rizzini likes to tell the story of when his father and uncle first visited the United States to promote the Rizzini brand. They attended a trade show during the coldest Chicago winter on record, they were overdressed, the venue was overheated and they braced themselves with strong drink. When they eventually stepped outside into sub-zero weather one turned to the other and said: "We've just been colour case hardened!" It's funnier in Italian.



Above and below: the steel has to be heated up before being splashed into cold water, thus incorporating carbon into the molecular structure and, effectively, giving the gun a hardened protective coating





Top: the AA Brown & Sons' shotgun before colour-case hardening. Above: the coloured action, which may have to be polished and filed by the finisher if there's been distortion

Malcolm wants blue, he has got f***ing blue.' What a relief. That recording was played time and time again over a stout dram. Today, using an electric kiln and a programming box – ours is the same as ones used in power stations – there are still challenges to overcome." Temperature and timing are crucial; the higher the temperature, the shorter the bake and vice versa. It's essential that all metal parts are left unpacked,

contained in their envelope of bonemeal as it is deftly tipped into the douche. Exposure to the atmosphere can cause unwanted dull grey colours. Or, as Robin Brown puts it, "If an area is grey it is usually because the steel item came in contact with air [oxygen] during the tip. We would say it had flashed. Looks awful and a bad flash would have to be rehardened to overcome it. We do all we can to avoid a flash."

After the quench, the essential bits and bobs are put back into the still-hot pot to dry then swiftly lacquered and oiled to resist rust. What these pyrotechnics produce are stunning colours, with a little shrinkage and distortion the only pitfalls. Thomas Girtin, in his chapter on James Purdey & Sons in *Nothing but the Best*, noted that the plash perverted parts. "It will be found that after this process distortion has taken place: it is the job of the finisher to reconcile all the pieces that will not now fit... He polishes and files and removes varnish and generally makes the gun once again workable and attractive."

GUN REASSEMBLED

Only after the distorted parts are fastidiously freed using fine emery cloth and lapping paste can the trigger pull-offs and ejectors be regulated. "After the case-hardening the gun is reassembled and can be considered finished," says Major Sir Gerald Burrard. "The sideplates and the action are sometimes given a coat of thin varnish to protect them and preserve the colour. But this varnish soon wears off, seldom lasting more than a season. For this reason I have made it a practice with one gun of mine, which has an exceptionally beautiful colouring, to have the sideplates revarnished at the end of each season. The result has certainly been →

gratifying and the colour is as good as ever, although other guns made at the same time have lost theirs.

"The colour of case-hardening steel is different, comprising the most beautiful shades of browns and blues. But, unfortunately, this colour is not permanent and gradually fades in use. It is not difficult to get a good colour; nor is it particularly difficult to obtain the correct degree of hardness; but it is a matter of considerable difficulty to get a combination of beautiful colour and proper hardness."

The colours themselves are perishable from sunlight and wear. The remaining colours on vintage guns offering a rule of thumb indication of cosmetic condition. Rubbing, wear and wiping can result in fading. This fading is varied and occurs first along edges. Some prefer brilliant cobalt others the fade

of old blue jeans, some gold others khaki. The ideal, at least for me, is a comfortable, used appearance; worn Levi's with an old work shirt.

For those who prefer fresh, vivid colours, no better example exists than the dust wrapper of *Westley Richards & Co: In Pursuit of the Best Gun, 1812-2012*, first edition. "We chose a case-colour-hardening background as this is a very significant feature, found in our best guns since 1812. To produce the background we cut and polished the largest book format plate that would fit in the furnace at Ray St Ledger's hardening shop. The plate was given to Richard St Ledger with a request to harden for vivid colours, which he provided." So wrote Westley Richards' media officer Rachel-Elizabeth Harris on the company's The Explora blog site. The result is unencumbered, unique and entirely appropriate for a gunmaking history. There may be other ways to complete a shotgun; French-grey, bluing and coin-finish all have their advocates.

I put it to Robin Brown that the rise in popularity of coin-finish was because it does not distort metal? "In the case

of my hardening you are wrong. I harden the gun, which comes out hard and coloured. I then coin finish if required. There is minimal distortion, if any. A coined finish based on a soft hardening will give a gun a short life and be prone to corrosion."

Jonathan Irby says, "The main reason that a 'coin' finish is now so popular is that colour-hardening has a tendency to make the fineness of the engraving harder to see."

David McKay Brown offers this: "The coin finish is achieved by rubbing over the surfaces with a fine abrasive after the heat treatment process of case hardening. When no colours are required, as with a coin finish, one of the modern techniques producing less distortion can be preferable to the traditional case colour. We case colour every gun even if it has to have a coin finish. The work is done inhouse and with more control. In my opinion, the beauty of a gun is in its graceful and elegant lines, with the engraving tastefully cut, not distracting from the

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overall design. The colours of case hardening are a dressing, which wears off with use bringing the engraving to life."

In recent years, improved technology has dramatically reduced distortion and this, together with dedicated specialists such as Richard St Ledger, has removed many of the inconsistencies from the case-hardening process. Yet, ironically, it is the inconstancy of result that makes the mottling and colour of each gun unique. For singular results, colour-case hardening is the absolute last word in form. ■



The dust jacket for this tome on Westley Richards features a case colour-hardened plate.



David McKay Brown has experimented with colour-case hardening ever since he started as an apprentice