

articles in back numbers of the *Circular*, but believe it would be for the best interests of the Canadian trade, who require the services of skilled workmen, to educate them by such articles. I am proud, too, of THE TRADER's new form and neat get up, able editorials and newsy columns, and though it may not be as large as the *Jewelers' Circular, Watchmaker and Metal Worker* and *Jewelers' Journal*, all of which I take, nor as prolific as the *Jewelers' Weekly*, or *Manufacturing Jeweler*, it is to me now just as interesting. Formerly, I looked upon it as the organ of hardware and kindred trades, now as a full-fledged watch doctor and perambulating jeweler. You have my blessing. Take as your motto "Faugh a Ballagh," and press on to victory. Our greeting shall be "*Ceade Mille Feallie*," "*Erin go Bragh*," "*Ne Plus Utram Extelsis*," "*E Pluribus Unum*" and much good will result to the trade from your bold step.

Respectfully yours,

H. WOODSIDE.

A PRACTICAL TREATISE ON

THE BALANCE SPRING.

Including Making, Fitting, Adjusting to Isochronism and Positions, and Rating, also Adjustment for Heat and Cold

BY EXCELSIOR.

PART I.

(14.) The screw or piece by whose color we are guided should be hardened, as hard steel colors more rapidly, or with less heat, than a soft piece would do, and consequently there is less danger of reducing the temper too low. Some makers color or heat their springs once only; others clean the bluing off the color piece and blue again; some even heat their springs five or six times. My own opinion is that if the spring has been properly made, hardened and polished, one bluing is sufficient. But if it has scaled in hardening, or minute imperfections, roughness or cracks are feared, it will be safer to heat twice, but never more than three times. If the spring, after that, breaks under the test named in (12), it may be considered imperfect, unless it was packed in animal charcoal, when it will break even after the sixth bluing if bent cold. Such a spring, if smooth and perfect, may be blued three times, and will be sufficiently soft. It is understood, of course, that the color-piece requires a greater heat to bring it to a blue the second time than when it was hard, and still greater the third time, so that in reality it will be reduced to a lower temper or made a little softer at each bluing, although the color is exactly the same each time. This is also the case with the spring: but this need not be whitened after each heating, nor even loosened (if on a block) till done.

(15.) Another point is to avoid what are known as false colors. The color-piece, or some part of it near the middle of the whole mass, if practicable, is first ground off with the oil stone, or even Scotch gray. This bright spot must then be slightly dimmed again, by rubbing the finger over it once or twice before coloring, for the degree of temper cannot be closely judged from the color of a very bright piece, as will be found by trial. In coloring flat springs, as hereafter directed, the color-piece may be screwed in the center of the plates, holding them together, or in the centre of the spring-cover of the bluing-pan, and the heating should be very slowly and evenly done,

the center of the hair-spring resting just in the center of the pan, and the cover also being central.

(16.) Before leaving the subject of coloring springs, I may add that it furnishes us a ready means of discovering whether they are equally hardened or not. For instance, if the wrapping (10) touches the spring in some places and does not in others, the former will be harder when quenched. So if the wrapping is lapped on one side and thicker than on the other, the spring will not be so hard in the former places as in the latter. Thus we may test after cleaning the block, but before loosening the spring, by arranging the block to revolve freely between the centers of the "turns," then suspending a trough or half cylinder of sheet copper under it, reaching up on each side, protecting it from the blaze, but leaving the upper half exposed to view. Now apply the heat to this copper trough, which in turn will communicate it to the block, and the latter will be heated more evenly than could be done by applying the blaze directly to it. The block must be constantly turned by a piece of peg wood, and the lathe centers loosened up when it expands. When the spring reaches a purple in its darkest part, take away the lamp and trough, still turning the block till it has cooled somewhat, when an examination will reveal any inequality of temper. Any soft places will be indicated by a lighter color, in spots or streaks, according to its cause. Even the course of a carelessly applied binding wire may be traced. Should any such appearance be found, it must not be passed over as a slight matter, for it is proof positive that the spring is incapable of fine performance, and it must either be re-hardened, or, if it has been scaled in the first hardening, it must be rejected entirely and a new one made.

(17.) *Making flat spiral springs.* Spiral hair-springs are made on a tool which slightly resembles a winding-arbor, one end being held firmly in the sliding tongs. Instead of a ratchet wheel there is a round piece of flat brass or platinum, one-half inch in diameter, fast on the arbor, and another similar plate which can slide on the arbor as its center, with a nut outside to screw it up towards the first one. Between these two flat pieces a space is left equal to the breadth of the proposed springs to be made. The arbor has a shoulder between these pieces, and two or three slits are sawed down into this shoulder in the direction of its length, with a fine saw. Two, three or more springs are wound up at once, the number depending on the space to be left between the coils of the spring when finished. The fewer springs wound up at a time the closer the coils of each will be. In making Breguet springs, only two are wound up at once, so that the coils shall be very close together.

(18.) The wire being cut into lengths of six or eight inches, or enough for a spring, the ends are fitted snugly in the slits in the shoulder, singly or together, the loose plate slipped on the arbor, which keeps the ends of the wire in their places, and the nut screwed up so as barely to leave the wire free between the plates. The pieces are then laid straight, and a pair of hand tongs or other weight clasped on the outside wire, which, hanging down from the winder, presses on the coils as the arbor is turned—the different wires being prevented from twisting, and occasionally pulled a little to insure close coiling. When the wire is all wound up, take hold of each piece in turn with the pliers, commencing with the one at the center, and pull gently on it to be sure that all is tightly coiled up, and fasten the end by twisting it sideways over a notch in the edge of the plate fast on the arbor, something as thread is fastened on a spool.