THE WATCHMAKERS' HAND-BOOK.

BY

CLAUDIUS SAUNIER.

INTENDED AS A WORKSHOP COMPANION FOR THOSE WHO ARE ENGAGED IN WATCHMAKING AND THE ALLIED MECHANICAL ARTS.

ENGLISH EDITION.

TRANSLATED, REVISED, AND CONSIDERABLY AUGMENTED

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Extract of Sections on Snailing

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right to left or left to right. The finger is advanced through a definite distance and the operation repeated, and so on.

A very good watered surface can be produced with soft charcoal. With a view to increasing the regularity in the marks, a rule may be laid on the object, against which the charcoal is brought.

Parallel watering is usually done mechanically, but any watchmaker can secure regularity by the following simple device :—

Fix a graduated rule *t g* across the cork (fig. 3, plate IX.) and two pins A A, to form stops for preventing the stick or stone from travelling too far. A division of the rule is made to correspond with the line *v v* ; and, when the first line has been traced, advance the object by one, two or three graduations of *t g*, according to the interval that is to be left between successive undulations. Then trace the second wave, and so on.

173. Wavy and curvilinear smoothing.—These are of two kinds ; some are entire circles, which we shall proceed to consider ; others radiate in curves from the circumference to some other point of a circle as, for example, many of those that are met with on keyless ratchet wheels. The latter will be discussed farther on, when discussing the smoothing of steel (**178**), for the process is identical for both steel and brass, except that with the latter-named metal and nickel the stick may be replaced by a strip of zinc or tin, and coarse rouge is used.

174. Circular snailing or spotting.—This is produced on a special tool by which several motions can be given to the object, but watchmakers, as a rule, so seldom have occasion to trace this class of ornament, that it will suffice to explain how it can be produced by the appliances that everyone has at hand.

The universal mandril may be employed for the purpose, but, in that case, the operation is a very slow one, whereas,

well done, and if the oilstone dust used be of good quality, the object will after being cleaned, present a beautiful uniform white surface in which the graining is still visible. Experience and knack are everything in the proper conduct of such an operation, especially in its concluding stage.

The surface may be cleaned in pure benzine mixed with a little sulphuric acid, followed by a very clean buffstick, which will impart a brilliancy to the metal.

M. Beau recommends fine Turkey oilstone powder mixed with turpentine as the best preparation for rapidly producing a dead smooth surface on steel-work.

Workmen that are constantly engaged in graining employ a foot-wheel for the purpose. The ground glass is fixed so that, although not rotating, a small circular motion is communicated to it. The steel is then simply held against it; indeed, several pieces can be grained in this manner at once.

To the methods above described we would add the following, which is successfully practised by several English workmen :—

They lightly fix the ratchet, for example, by its edge, and finish the smoothing with a piece of pith more or less charged with pure charcoal powder and fine oilstone dust. Here also knack is mainly instrumental in ensuring success.

178. Snailing.—To produce the snailing on a fusee or on keyless wheel-work, the device shown in fig. 18, plate VI., and described in paragraph **376**, can be used. The ratchet or fusee is mounted between one pair of centres and driven by a cord from a foot or hand-wheel. The copper or iron lap, having a diameter equal to about three times that of the surface to be snailed, is charged with fine emery powder and oil, or oilstone dust, &c., and set in contact with the face of the steel, which thus causes it also to rotate. The direction of the snailing will be the same, whether the rotation is to the right or left. If it be required to change the direction, the relative positions of the two pieces must be reversed.

It has been already observed that brass and nickel can be

snailed in the same way, employing a zinc or tin lap and coarse rouge (**173**). In some cases, hard wood laps can be used for these softer metals.

In keyless steel wheels a beautiful snailing can be obtained with Arkansas stone mud (or, in its absence, the greasy mass from an oilstone) mixed with polishing rouge.

With reference to the little tool shown in fig. 18, plate VI., it may be observed that, if the axes of both the steel piece and lap were driven by bows or otherwise, the surface would be polished and not snailed.

In the absence of the tool here referred to, any workman can easily construct one for the purpose which will adapt to the mandril or a foot-lathe : in order to help him in doing so we will describe one designed by M. Cadot, of Paris.

179. *Tool for snailing.*—This is shown in fig. 5, plate IX., and we would at the outset observe that it can be used equally well for polishing. To a shoulder at the extremity, A, of a piece of steel rod, B (which takes the place of the slide-rest cutter) is riveted an L-shaped piece $c\ c^1\ d$, and to the point d is firmly fixed by a screw or rivet, the upright piece $d\ h$ parallel to $c^1\ c$; this piece is enlarged at h so as to give a bearing to a hardened steel screw, with a hollow point, in the axis of B : the lap is supported between this screw and a hole in the centre of A. The figure will suffice to indicate the form of this lap which is dished internally as shown by the dotted line. It is made of iron or copper if intended for use with hardened steel.

The piece to be snailed is fixed to a chuck of the foot-lathe (or to one of the chucks adapted to the mandril described in par. **403**) and, having fixed the rod B in place of the cutter, the lap is brought, by means of the slide-rest screws, in contact with the steel, taking care not to set it up to the centre, as snailing that starts from the centre is not so good. Having charged the lap with fine emery and oil, &c., the object is rotated and it sets the lap also in motion.

It was mentioned above that this tool can be employed

for polishing: for such a purpose use fine rouge, replace the lap by one of bronze or bell-metal, fix a ferrule at *i*, and, while the object turns in the lathe, rotate the lap with a bow.

By fixing a rod at L instead of at B, the tool is at once adapted to be used in an ordinary pair of turns, as it can be fixed in place of the T-rest; but it is not so easy to secure parallelism of the two surfaces.

180. To restore the watered surface in nickel movements, &c.—Although the following is employed for nickel (or rather German silver) it may be well to observe that it is equally applicable to all other metals.

As these nickel movements are not gilt subsequent to being repaired, it frequently happens that the water marks on the surfaces do not correspond. By the aid of the following device watchmakers can correct this fault, but we must warn them that, as in all operations involving dexterity, they must first make experiments in order to acquire the requisite manual skill.

On a small open frame C C, fig. 1, plate XIII., fix several parallel bars *f l*, *e d*, &c., and on two of these adjust a slide *p o n m*, with two strips glued underneath so that it can travel up and down between *a* and *b*. On *p o n m*, fix a guide of convenient form, as G; and, after cementing the piece, say A, that is to be watered on a board resting on the bench, place the frame C C above it and trace the figure of the guide with a pegwood stick charged with polishing material. The same figure can be reproduced in parallel rows as the guide can be moved up or down.

By varying the shape and position of the guides, the water lines can take the form of waves, festoons, circles or ovals. In the two latter cases the guide has apertures of the requisite form, and the board that carries A, not being more than half the size of the aperture, can be moved about by hand or by a tool.

If preferred, one of the bars, as *e d*, can be graduated

vice, a glass or metal polisher may be applied to the surface. The movement of which the disc is capable will ensure flatness being maintained.

376. *Another tool for facing ratchets and pinions.*—An old depthing tool is very easily converted into one fo smoothing, polishing and snailing surfaces. It is only necessary to support the pinion or ratchet between one pair of centres as indicated in fig. 18, plate VI., and between the other pair an arbor that carries a small lap (of steel for smoothing and copper for polishing), with the edge bevelled off as shown by dotted lines. The flat face is charged with a suitable material and brought in contact with the pinion, and they are set in motion by separate bows on their respective ferrules. (See also article **178.**)

377. Tool for polishing staves, thick pivots, &c.—This is the same depthing tool modified in two particulars (fig. 18, plate VI.).

(1.) The lap is not bevelled at the edge; it is, on the contrary, thick and exactly square with the face.

(2.) The two runners that carry the lap are united by being clamped to a metallic arc *b d*, and are free to slide lengthwise in their poppet-heads; they can thus be moved as a whole towards the right by hand, while a spiral spring *h* tends to force them towards the left. This backward and forward movement carries the lap along the revolving axis from the extreme end of the pivot to its shoulder.

Barrel arbors, centre-wheel pivots, &c., can be conveniently polished on such a tool. The two bows should be so arranged that the arbors rotate in opposite directions.

If a new depth tool is employed for polishing its accuracy will obviously be destroyed, but one that has already become unserviceable is excellent for the purpose. In its absence various appliances can be obtained at the tool-shops that can be adapted.

378. Tool for flat polishing.—The following is unquestionably the most simple :—

A similar arrangement applied to the screw that is worked by the handle *c* would enable the workman to ascertain at once the diameters of sinks, and would render it possible to divide a straight line into equal parts in a manner already described (**47**).

ACCESSORIES.

AND MISCELLANEOUS OPERATIONS TO BE PERFORMED IN THE MANDRIL.

420. With a view to simplify the work, we will here give, in a collected form, a number of operations that may be performed in the mandril, among which the practical watchmaker will easily be able to distinguish those that can be done in the ordinary lathe; we will also describe numerous accessories that the workman should make for himself, if he is desirous of making his mandril still more generally useful.

CHUCKS.

403. Prepare a number of chucks of the form shown in fig. 4, plate VI. Some of these carry a small bar with screws by which an object may be clamped firmly to the chuck, an arrangement which is also shown at A, fig. 10, plate VIII.; others have a hole drilled through their axis; others again have a projecting arbor, &c. They may also be made with a flat face on which to cement objects in the ordinary manner.

As it is often necessary to have a considerable surface to cement, for example, a watch-plate, one or more may be made of the form shown at T, fig. 1, plate VII. The lower plate being clamped in the dogs, the disc *e* will be free. If this disc be of bronze or steel it may be used as a lap; if of brass, it may be turned true and used as a wax-chuck, &c.

The chucks should, as far as possible, be well made, so that they can be truly centred by means of the pump-centre.

One or two may be made of the form *x a b f g*, fig. 1, plate V., having a strong wood screw at the centre that will serve to carry a piece of hard wood, a use of which will be referred to when we consider the making of clock spring-boxes (**568**).

TO CENTRE AN OBJECT.

404. When there is a hole at the centre on the side towards the face-plate, as is usually the case, it is only necessary to place this hole over the point of the pump, pressing it inwards, and then to clamp the object in the dogs, as already explained (**389**); the pump is then drawn within the body of the arbor. Very often, however, there is no central hole, or there is only a mark on the face that is towards the cutter; in such a case it becomes necessary to centre from the front or by the circumference.

405. To centre from the front.—If the object is held by wax on a plate, it may be centred as in the ordinary lathe while the plate is hot, by resting a piece of pegwood on the T-rest with a point placed in the central hole, and observing whether its free end remains stationary.

After the plate has cooled, the accuracy of the centring should be tested by means of a long piece of pegwood which rests on the T-rest brought close up to the object. The pegwood is held parallel to the lathe-bed, and, if the centring is satisfactory, its outer end will not move. The detection of any slight movement is greatly facilitated by placing some fixed object close to the free end of the pegwood. If a motion is still observed the centring is imperfect, and must be corrected in the manner explained below (**407**).

406. *Perrelet's method of centring.*—In principle, this is identical with the one just described; but the pegwood

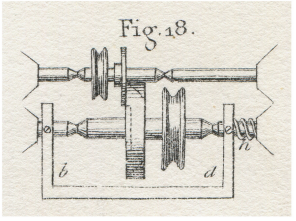

Plate VI, Figure 18

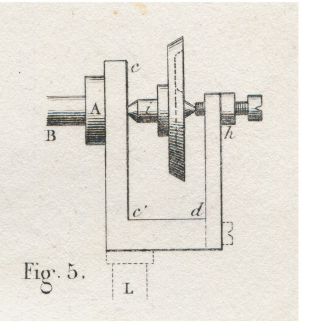

Plate IX, Figure 5

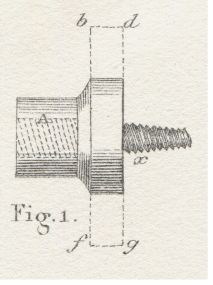

Plate V, Figure 1

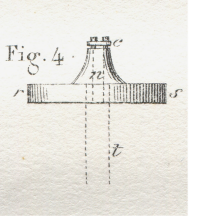

Plate VI, Figure 4

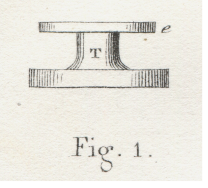

Plate VII, Figure 1

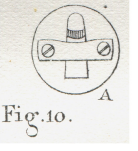

Plate VIII, Figure 10A