Note on the regulation of the pressure on the artery in the application of the sphygmograph / by Bathazar W. Foster, M.D.

NOTE ON THE REGULATION OF THE PRESSURE ON THE ARTERY IN THE APPLICATION OF THE SPHYGMOGRAPH.

BY

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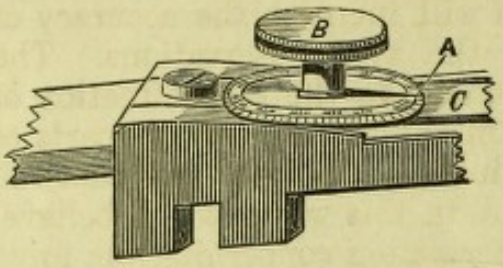
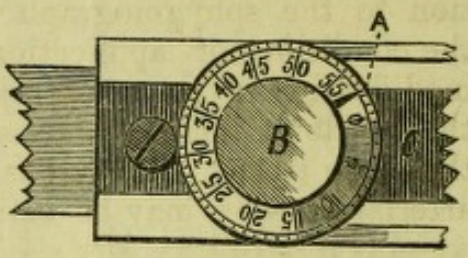
THE sphygmograph of Marey has already won a high position as an instrument of physiological and clinical research, but it nevertheless possesses imperfections, especially in the means afforded for regulating the pressure upon the artery under examination. All who have worked with the instrument with any constancy must have regretted the inefficiency of the pressure screw ("*vis de réglage*," Marey), but as yet no satisfactory alteration has been suggested. In using the instrument as hitherto sold, it is often necessary after its application to vary the amount of pressure exercised upon the vessel by means of the pressure screw, in order to obtain a fair average trace of the pulse movements. When the sphygmograph is applied to the forearm, this screw certainly enables us to increase the pressure by causing the descent of the spring which rests upon the artery, but it affords us no information concerning the amount of extra weight thus bearing upon the vessel, and it gives us no aid in ensuring the exercise of the same pressure in any two unconnected observations. A practised observer can no doubt soon regulate the instrument so as to obtain the most perfect trace, but the unskilful hand finds no small difficulty in so doing; and owing to the great modifications in the trace which may be produced by varying degrees of pressure, often obtains imperfect or erroneous results. And as the screw has to be readapted in nearly every case, no amount of practice can enable the experimenter in making a second observation after any interval, to exercise with certainty, exactly the same amount of pressure, unless the screw has meanwhile been carefully retained in its position, a condition incompatible with frequent use.

In consequence of these difficulties, I suggested some months'

back[1] an addition to the screw, which I have since had applied and used with advantage.



A, Index. *B*, Pressure-screw. *C*, The spring.



Screw seen from above.

The woodcuts represent two views of the pressure screw (B), as placed in Marey's sphygmograph, and show also the additions I have made. These consist in connecting an index (A) with the screw, around which a circle has been described and graduated. The index moves along with the screw, and indicates on the circle the pressure equivalent in any observation.

By this simple arrangement, without any alteration in its form, the sphygmograph may be made much more reliable in the hands of beginners, for each one will be able to record at the side of the pulse trace, the pressure exercised upon the artery beyond that necessitated by the application of the instrument. Moreover, in making a series of observations[2] in the same or even in different cases, the spring can be fixed at that point which allows it to follow most accurately the movements of the vessel, and the conditions in all being thus rendered practically the same, the conclusions based upon a comparison of the traces become much more trustworthy. In cases of aortic aneurism, there can be no doubt that the most valuable assistance in diagnosis may be occasionally obtained from a careful com-

[1] Physiological section, British Association Meeting, Nottingham, 1866.

[2] Mr. Meyer, of Great Portland Street, made the above-described alterations for me, and calculated the equivalents of pressure to be as follows:

When the index points to 5, the extra pressure equals 20 grammes in weight.

,,	7	,,	31	,,
,,	10	,,	40	,,
,,	12	,,	52	,,
,,	15	,,	64	,,
,,	18	,,	79	,,
,,	20	,,	93	,,
,,	25	,,	123	,,
,,	30	,,	160	,,

A scale increasing more gradually would no doubt be preferable. This could be easily arranged, as every instrument would have to be graduated according to the elasticity of its spring. I have remarked in several sphygmographs which I have examined a wide difference in this respect. Wolff also particularly mentions this in his 'Charakteristik des Arterien Pulses.' Leipzig, 1865.

parison of the pulse traces collected on opposite sides of the body; and as important conclusions may be drawn from very slight deviations in form, we can scarcely overrate the value of any addition to the sphygmograph which will increase the accuracy of the conditions of application in the two observations. The modification in the screw will also aid in the determination of the effects of increased pressure in influencing certain parts of the pulse trace. Marey has, for instance, pointed out that the arterial tension may be estimated in this way, and, I believe, we may also obtain very useful information concerning the force of the ventricular systole.

In conclusion, I may observe that while ordinarily the use of the pressure screw brings an unusually large extent of the spring in contact with the vessel, this may be avoided in the case of the radial, by a little attention to the relations of the artery (Wolf, op. cit.) An increased prominence of the ivory pad which rests upon the vessel, or a slight alteration in the curve of the spring, would, however, obviate this difficulty. I am aware that the slight addition suggested in this note by no means dissipates all the difficulties surrounding this question of pressure, but it will, I hope, be found useful in increasing the accuracy of the application of the sphygmograph. I have now used this plan for twelve months, and if its description leads to the proposition of any more perfect arrangement, it will certainly not have been devised in vain.

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