

**THE OPTICAL MANUAL:
OR HANDBOOK OF
INSTRUCTIONS**

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The Optical Manual: Or Handbook of Instructions by T. Longmore

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T. LONGMORE

**THE OPTICAL MANUAL:
OR HANDBOOK OF
INSTRUCTIONS**

THE OPTICAL MANUAL, OR HANDBOOK OF INSTRUCTIONS

FOR THE GUIDANCE OF SURGEONS
IN TESTING THE RANGE AND QUALITY OF VISION
OF RECRUITS AND OTHERS SEEKING EMPLOYMENT
IN THE MILITARY SERVICES OF GREAT BRITAIN,

AND IN DISTINGUISHING AND DEALING WITH

OPTICAL DEFECTS

AMONG THE OFFICERS AND MEN ALREADY ENGAGED
IN THEM.

BY

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PREFACE TO THE THIRD EDITION.

THE circumstances under which I was led to put forth this Manual of Instructions for testing and dealing with the various conditions of vision liable to be met with in persons seeking employment, or already engaged, in military service, have been explained in the two previous editions of this work, which were published in the years 1862 and 1874, and do not require repetition. Since the second edition of the Manual was published, so great have been the changes in some of the practical parts of optical manipulation, and such advances have been made in respect to length of range, and capacity for accurate fire, in the weapons which soldiers now have to deal with, that many passages of the Manual of that date have become obsolete, and the present edition has had to be less revised than re-written.

When the increased and increasing importance attached to men becoming experts in the use of firearms of all descriptions at very long ranges is remembered, it may reasonably be expected that before long even greater attention will be given by all persons in this country who are engaged in military pursuits to questions of quality of eyesight, and that more information will be demanded on the subject from medical officers than has hitherto been required from them. In the army, the firearm with which the infantry soldier has to become familiar is his rifle, and this is an instrument which in practice he can only use with thorough efficiency when he has visual power enough to enable him to see clearly the objects which he is required to aim at, and to form an accurate judgment of their distances, whatever may be the range over which the projectile discharged from it has to pass. A great deal of attention has been given of late years to improving the modes of instruction in musketry practice, and very recently important changes have been made in it, with a view to insure perfection, not so much in hitting a definite mark on a target, as to

ensure accuracy of aim under conditions similar to those which are likely to occur when the soldier is engaged actively in the field ; but whatever may be the mode of instruction, so long as the rifle is such as it is, and objects of limited sizes, such as men, are to be fired at from distances of eight or nine hundred yards and upwards, an adequate power of eyesight must evidently be the prime ingredient necessary to ensure the success of the marksman. The more this fact is appreciated, the more the importance will be felt of giving attention to the subject of the quality of eyesight of every one who aspires to effective employment of a rifle. It hardly seems too much to anticipate that, in respect to army service, at some future time the visual quality of every recruit will be as much recorded on his entry into the army as his height, chest measurement, weight, or any other of his physical conditions which are now registered ; for some of them, considering all the sanitary precautions and personal care that are now taken to preserve the physical efficiency and good health of the soldier, have lost much of the importance that belonged to them in former days, and can hardly be regarded as equal in value to the amount of visual power which the man possesses, so far as his usefulness during the period he is engaged on active service is concerned. Military efficiency, the personal safety of troops, and economy of expenditure of ammunition, are all involved in the capacity of soldiers for making an accurate use of the firearms placed in their hands. It is certain that the capabilities of the rifle can only be completely turned to account by persons who possess normal acuteness of vision, at least as regards the right eye, and it seems to be manifestly important, therefore, that the qualifications of each man who is destined to be a rifleman should be thoroughly known on his starting in the service ; so that, on the one hand, the time and efforts of instructors may not be wasted in trying to teach men matters which from natural causes they may be totally incompetent to acquire, whatever labour may be devoted by themselves or others to the attempt, and also, on the other hand, that the men may be distinguished and made known to commanding officers, who possess the necessary optical qualities for becoming sure and reliable marksmen.

Not improbably as further advances are made in musketry instruction, a greater influence will be exerted by physiological optics on certain parts of the teaching. The objects painted on

targets and employed in "educating" men in the use of the rifle at the various range practices have not been designed, as shown in the text, on an uniform visual standard, but seem rather to have been settled, especially as regards their dimensions at the various distances at which they are usually placed for firing practice, according to the proportions which have been considered, from personal observation, to be the most suitable for marks to be aimed at. There is apparently no sufficient reason why all such objects should not be fashioned on a regularly graduated scale of dimensions and configuration in relation to distance, and be in exact accordance with the optical conditions, so far as the objects themselves are concerned, under which they would present themselves as marks to be fired at in actual warfare. If a series of objects on such principles should be brought into use, the quality of sight necessary for a satisfactory execution of the contemplated task at any particular range of practice could be defined with almost mathematical precision.

Medical officers at present only have to determine the question whether a man is optically fit for military service so far as the possession of a set minimum standard of vision is concerned; but in performing the duties of recruiting, they may have in the future to answer several questions of a more complex kind. They may be required to furnish information on such questions as the following: Is the man visually qualified to become a marksman up to the longest range for which the rifle is capable of adjustment? If not fit for a complete marksman, up to which class of practice does his visual power admit of the man being advantageously trained? If not fit for the use of an arm of precision in the first line of the army, is he fit for duty in the ranks of the Militia or Volunteer forces? If not fit for the duties of a rifleman, is he visually qualified for service in the Commissariat and Transport, or for any other corps or department of the army? After a sufficient number of records on these subjects have been accumulated, a conclusion may be arrived at on certain questions, which are regarded under different aspects in different armies, and which may well admit of different solutions in different countries; as, for example, whether the proportion of men in this country, whose sharpness of sight is inferior to the normal standard owing to refractive defects, is so great as to render it advisable, from a military and financial point of view, to allow correcting spectacles to be used in the ranks

of the army? and, in case of a decision being come to that it is advisable, whether the permission to wear them should be restricted to spectacles of certain descriptions, and if so, of what descriptions?

I do not think it too much to assert that an acquaintance with the subjects described in this Manual, combined with a moderate amount of practice, will enable medical officers to furnish satisfactory information, when required, on the various points to which I have alluded, as well as on any others of a similar nature that may arise, and to carry out any orders that may be issued in respect to visual examination, or to correction of ocular defects among the officers and men of the army, in all ordinary cases which depend on faults of refraction or accommodation. At the same time it should not be forgotten that under the usual circumstances of service, in consequence of the multitudinous duties which devolve on medical officers, it would be too much to expect that more than a limited number among them will find the time or opportunities for becoming experts in ocular investigations. Arrangements will probably still have to be made, as hitherto, for complicated and doubtful cases of defective vision to be sent to general hospitals, and referred to medical officers who have acquired a particular acquaintance with the visual conditions which are liable to be encountered, by having had the means of carrying out extended observations of them at such institutions, and where also there will generally be the opportunity of using special optical appliances, which cannot be expected to be found at more limited establishments.

Although the metrical system of numeration of lenses and of measurement in general is now ordinarily employed by ophthalmic surgeons, and is no doubt destined to supersede the duodecimal system everywhere, there are still many practical difficulties in the way of its adoption by British military medical officers in the different parts of the world in which they have to perform their duties. They have not, as a rule, cases of lenses numbered in dioptries available for their use; the ordinary appliances for measurement at their command are divided by inches; and these will probably remain the conditions in respect to such matters until the metre becomes the standard of measurement for the ordinary purposes of society and commerce. It thus becomes necessary for British medical officers to be acquainted with both systems of measurement, and to be able to convert readily the expressions in

the metrical system which they meet with in scientific works, into their relative values on the duodecimal system. The means of doing this are fully explained in this Manual, and where references are made to optical measurements in the body of the work, they are usually stated in figures belonging to both the metrical and duodecimal systems of measurement.

In the former editions of this work, a second part was devoted to a description of the ophthalmoscopic appearances and diagnostic signs of the principal morbid states liable to be met with in the structures within the ocular cavity. This part is omitted in the present edition, because the Treatises and Manuals in which these diseased conditions are described are now very numerous, and also because in many instances they have the advantage of being accompanied by illustrative drawings, which are of special value to all those who are engaged in a study of such subjects. The present work is, therefore, now limited to a study, theoretical and practical, of those varieties of the visual function, which for the most part are independent of morbid processes, and in considering these conditions of sight, their bearing on military service is always kept in view. I have at the same time added short explanations on a variety of optical matters more or less directly connected with visual examination and the correction of visual defects, a knowledge of which is essential to a right understanding of the principles on which the practical part of the work is conducted. Experience in teaching the modes of conducting the visual examination of recruits and soldiers, and the practical correction of visual defects, has proved to me the need of such information being given, and I hope that some of the explanations and matters of fact, which it has been found necessary to impart in the course of instruction at the Army Medical School, may prove to be serviceable as memoranda to medical officers in the larger sphere of the Army Medical Department itself.