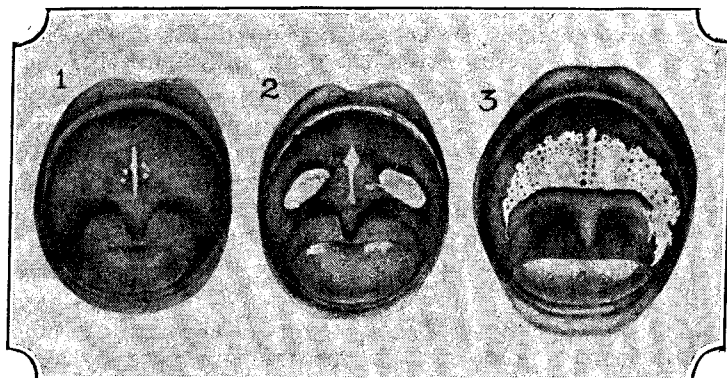


remained. Excellency Czerny, who writes of the great loss to German pediatrics from Epstein's death, fears that his clinic at Prague will be lost as a German teaching institution. That may well be, but the work which he initiated in Bohemia is, nevertheless, likely to outlive him. Epstein was himself a Bohemian, born at Neuhaus, and graduating M.D. of Prague University. Later he became a corresponding



1. Bohn's palatine nodules. 2. Bednař's pterygoid ulcers.
3. Epstein's pseudo-diphtheria.

member of medical academies in many lands. The pseudo-diphtheria of the new-born specially associated with his name he showed to be the end-stage of the palatine nodules described by Heinrich Bohn and the pterygoid ulcers of Alois Bednař, and all of them due to the mechanical cleansing of the mouth practised by the ignorant midwife or mother. The comparative series of three illustrations of this interesting infection is taken from Dr. A. R. von Reuss's "Diseases of the New-born." Stomach lavage in the suckling and sepsis occurring within the first few days of life were other subjects which Epstein made peculiarly his own. In a single year among 702 children at the Prague Foundling Institute he had 61 cases of septic gastric hæmorrhage. He was also an authority on the manifestations of tuberculosis at an early age.

Dr. I. D. Chepmell, who died on Christmas Eve at his house in Worthing at the advanced age of 90, practised for many years in London and in Paris. He ascribed his long maintenance of robust health to the practice of fencing, of which he was a keen exponent. One of his most distinguished and ever grateful patients was Robert Louis Stevenson. While he was in Paris he acted as Paris correspondent to THE LANCET.

A FIRST instalment of the usual New Year Honours contains the names of three medical men upon whom knighthoods have been conferred. These are Dr. William Leslie Mackenzie, medical officer to the Scottish Local Government Board; Dr. George Dancer Thane, professor of anatomy at University College, London, and principal inspector to the Home Office under the Cruelty to Animals Act, and Lieutenant-Colonel John Hewart, Member of the House of Assembly of the Union of South Africa and Assistant Director of Medical Services of the Union. Sir George Anderson Critchett has been promoted to knighthood in the Victorian Order, and the services of Dr. Robert Bruce Low, late assistant medical officer to the Local Government Board, are recognised by a Companionship of the Bath. To these and others whose names are recorded elsewhere in this issue we offer in the name of the medical profession hearty congratulation.

ON THE TEACHING OF MEDICINE.

BY W. HALE WHITE, M.D. LOND. & DUB.,
COLONEL, R.A.M.C. (T.); CONSULTING PHYSICIAN TO GUY'S HOSPITAL.

RECONSTRUCTION is in the air and it is much to be hoped that ere long the teaching of medicine will be reconstructed and improved. No one should take part in rebuilding the means by which those who study medicine are taught unless he has studied "Some Notes on Medical Education in England" by Sir George Newman, K.C.B. Every reader will feel, when he has finished this admirable pamphlet, that medicine demands such wide knowledge, such high training in clear thinking, such experience in the art of observation, such fostering of research, such judgment in separating the true from the false, and is withal of such importance, not only to individual sufferers but to the well-being of the community, that no trouble or expense is too great to get it taught as well as we know how. Most of us who have had experience of teaching medicine will surely agree with nearly all Sir George Newman's suggested improvements, radical as they are, and would like to see them carried into practice forthwith. The following comment is put forward partly in the hope of keeping alive interest in the matter and partly because the writer has for many years devoted much energy to the teaching of clinical medicine.

Post-graduate Teaching.

Towards the end of the "Notes" Sir George Newman tells us of four main things lacking, and the fourth is post-graduate teaching. It is in this that we are most deficient. Up till now the ordinary medical student has been taught, often by no means as well as he should be, teachers have been found, but frequently they have been atrociously paid, research has been carried on, but under difficulties that should never have hampered it, but the post-graduate in this country has been left without guidance and without any but the poorest encouragement except in the Services. We all trust that one result of the war will be a friendship between those speaking the French, Italian, and English languages, which will make some of us wish to go to our friends' countries and some of them to come to us to study medicine. The wealth of clinical material in London is so great that it is to this city they should be attracted, but unless we make things very different from what they were before the war there is little to tempt them here.

The first improvement in medical education should be to put post-graduate teaching in London on a proper footing, not only for the sake of our visitors and our own doctors who want to come back for a few months to bring themselves up to date, but for the sake of our own prestige. But if it is to be efficient it must be separated from the teaching of ordinary students; at least, that is my experience. Two courses are open, either to have a large hospital and medical school, complete in all clinical departments, devoted to post-graduate teaching only, and this is probably the best, or to have post-graduate teaching at ordinary medical schools, but during the months that the clinical teachers are engaged in post-graduate work they must be absolved from teaching the ordinary student either at the bedside or by lectures. He is best taught in most cases by the clinician who is not past 45 or 50; on the other hand, a post-graduate clinical teacher is probably at his best from 45 to 55, for then he has a wealth of experience, and let us hope has not become unprogressive and discursive. It might be a good thing if there were a separate post-graduate teaching institution, to promote a teacher who had been successful in interesting ordinary medical students in any British school to a clinical post in the post-graduate school, for we should thus be able to secure for it teachers who had already proved their capability to teach.

To put post-graduate instruction in London on an entirely new and a thoroughly efficient basis will require much money and much hard work, but most emphatically it ought to be done and on a large scale, for if first-rate teachers are provided a post-graduate school will attract large numbers of students. Should it be decided to have such a school separate from the ordinary medical school, the difficulty will be to find a large hospital, and it must be large, to provide sufficient clinical and post-mortem material. It must contain all the special departments of a modern hospital, including, if possible, buildings for infectious cases, mental cases, and a lying-in charity. Professors in the clinical subjects

must be appointed, and in addition, there must be professors of clinical chemistry, pathology, and bacteriology, each with well-equipped laboratories. All the professors must be so well paid that they will be able to devote their whole time and energy to teaching and research in the school. Teachers in clinical subjects other than the professors might be allowed private consulting practice. Wherever the post-graduate school is situated there should be close to it a large hostel, with a library, common rooms, and sleeping accommodation for the students who come to it.

The Medical School.

In a medical school teaching ordinary medical students there certainly should be properly paid professors of anatomy, physiology, pathology, bacteriology, clinical chemistry, and pharmacology, and if the preliminary subjects of chemistry, biology, and physics are taught at the school professors of these also. All should be experts in their science, capable of teaching, skilled in investigation, and able to help students to investigate and to think for themselves. It may be said that, judging by our experience, it will be difficult to find enough suitable teachers. The answer is that these posts have up till now in most cases been miserably paid. Let each of these professors have proper status and pay and plenty of men will be found. Supply follows demand. Hitherto many who would have enjoyed a life devoted to these subjects have been forced to the clinical side of their profession in order to gain a livelihood. It seems often to have been thought that all that is necessary to make an efficient school is to build laboratories. The man matters far more than the buildings in which he is housed. Sir George Newman would ensure proper payment by State aid, others prefer the addition to students' fees to be by endowment by private benefaction, but, be that as it may, the fundamental fact is that you cannot expect able men to take these posts unless you give them the position and income to which their ability entitles them. If it is objected, with regard to London, that with so many medical schools as there are there, it would be impossible to pay, as they should be paid, the large number of professors required, the answer is that there ought to be in some cases amalgamation between certain of the present schools; it is well known that something has already been done in this direction with regard to the earlier subjects.

Outline of Scheme.

Turning now to the purely clinical subjects, and taking medicine as an example, some such plan as the following would be, it is suggested, the best way to deal with it, and might, with necessary modifications, be applied to other clinical branches. To teach to the best advantage it is necessary to have plenty of material, and for a large medical school there ought to be, say, 220 medical beds. There should be a professor of clinical medicine who should be physician to 80 of these beds, and two other physicians with 50 beds each. There should be four assistant physicians, each seeing out-patients once a week, two corresponding to the professor, each with 10 beds, so that these assistant physicians should have beds into which they could send, from out-patients, patients whom they wished specially to watch. Of the other two assistant physicians one should correspond with each of the other physicians, and should in addition have 10 beds of his own, for the purpose just mentioned. When the professor is away on a holiday or from illness, his work in the wards should be shared by his two assistant physicians, and when either of the other two physicians is away his corresponding assistant physician should take charge of his beds.

In addition to his ward work, the professor should see out-patients one day a week, so that on five days a week medical out-patients will be seen; he and the four assistant physicians should do out-patient teaching on the days on which they see out-patients. Students will be appointed as out-patient clerks, who will make notes of the cases, and generally assist, and learn at out-patients from the professor or the assistant physician, as the case may be. The two physicians other than the professor should each do bedside teaching three days a week, and the professor should do bedside teaching five days a week. Every ordinary student will work in the medical wards as medical ward clerk for six months, for three of these with the professor and for three with one of the other physicians, half of the students being with each of these physicians; but as every student will work in the wards under the professor, he, having double the number assigned to each

of the physicians, will divide his clerks into two sets. Some of the abler students will have longer than six months in the medical wards, for they will hold the post of clinical assistant, and if qualified that of house physician. Both physicians and the professor will give clinical lectures, one being delivered each week.

The professor will devote his whole time to the duties of his office, he must have what laboratory accommodation he needs, he should be of such a temperament that he can teach clinical medicine and undertake research, and he must do everything he can to encourage and help all who wish to do research under him. It is to be hoped that the assistant physicians will pursue investigations with his sympathy.

Consideration of Some Details.

In details this scheme is a little different from Sir George Newman's. In the first place, the professor is not to engage in private practice. This, I feel, is the right line to adopt. If a man has an aptitude for private practice it is almost impossible for him to say he will only do a little. Quite apart from the fact that if it becomes part of his source of income he can hardly be blamed if he pursues it honourably, there are many cases, and often the most trying, which if he is asked to see he must see; he cannot refuse to go. The professor ought to be so well paid that he can always say he does not engage in private practice. He will then be freed from all its thousand and one worries, and he will have time to think out the problems of medicine that need investigation; he will not be liable to be called off from his laboratory work, and he will have leisure to direct research amongst those working under him.

In the second place, there are other physicians and assistant physicians than the professor. The advantages of this are many. It is desirable that the student should learn medicine from more than one teacher, for it is an art as well as a science, and it will be of distinct benefit to the learner to hear different opinions, to see different methods of treatment and diagnosis, and to observe different lines of thought. Every student on the plan suggested will get part of his training from the professor, a physician, and an assistant physician; this must widen his horizon and help to give him that breadth of outlook which is such a desirable part of real education. Further, no single professor could possibly treat and look after the numerous medical in-patients that a large school ought to possess. The student cannot have too much actual contact with patients, and each should have enough cases assigned to him for note-taking to keep him busy in the wards. He will pay special attention to his own cases, and will at the same time observe and learn under the direction of his teacher from the cases of his fellow-clerks. Also no single teacher can properly teach more than about ten clinical clerks at the same time, for he ought to get to know the minds of each of his clerks so as to help each individual one over his particular difficulties. Other students may come round with the professor and physicians, the more the better, for a large audience brings out the best in a teacher, but his particular attention must be his own clerks.

Lastly, it is much better for the professor himself to have others in the same school teaching medicine; both he and the others mutually stimulate each other. If there is more than one teacher of medicine, each is prompted to try his hardest, so that his teaching may be as valuable as, if not more valuable than, that of his colleagues.

Conditions of Appointment of Staff.

The assistant physicians should be well paid for their teaching, but they should be allowed private practice. In medicine this does not come in great amount to the young, so that the assistant physicians being properly paid would be able to throw nearly all their energy into teaching and investigation. The two physicians, other than the professors, should receive good payment for their bedside teaching and clinical lectures, but this need not be on the scale of the professor's pay, for they should be allowed private practice, and in order that they should be saved from the temptation in later years of neglecting their teaching for private practice they should retire from the hospital at an age certainly not later than 55, the precise age depending on how their private work interfered with that in the hospital and upon the quality of their teaching. The professor should retire at the age of 60. If something of the plan here sketched for medicine were applied to surgery perhaps other ages for retirement would be more suitable.

An advantage of this early retirement would be that the promotion of the assistant physicians would be quicker than it is now. Of the four assistant physicians, two might look forward, if they had proved their value to the school, to a full physician's post, one to a professor's post at his own or some other school, and perhaps one out of the four would ultimately teach at a post-graduate school or practise some special branch of medicine, and, bearing in mind such transference, possible losses from early death or ill-health, and the failure of some to be good teachers, four is often not more than enough to replace three. When an assistant physician is appointed the appointment should at first be for three years only, so that if it were discovered that he had not the art of teaching he need not be reappointed unless it were desirable for other reasons—such as brilliant research—that he should. Those on such a hospital staff who are allowed private practice should confine themselves to purely consulting practice. My object is only to give a general outline of the teaching of clinical medicine, as no mention has been made of how far assistants or demonstrators shall be employed for rudimentary teaching; the practice would vary in different schools.

Special Departments.

In a properly equipped medical school the special departments of medicine should present little difficulty. There should be a physician for children's diseases, who would see out-patients and have charge of a good-sized children's ward, and a physician for mental diseases, also with charge of out-patients and suitable wards for the treatment of early cases. The physician for skin diseases should also see out-patients and have some beds. Many of the commoner nervous diseases, such as cerebral hæmorrhage and chorea and tabes, are best taken into ordinary medical wards, so that the students can learn from them in the course of their ordinary medical work, for such cases will come before them very frequently in general practice, but probably it would be well to have a separate out-patient department for nervous diseases. It would be a great advantage to a medical school to have a fever hospital near to it. The students attending their course of fevers would not waste time going long distances, and those in charge of the general hospital and those in charge of the fever hospital would be able to meet frequently to interchange ideas, and the advice of the professors of medicine, pathology, and clinical chemistry, and the use of the corresponding laboratories would be of help to the physicians in charge of the fever hospitals for any investigations they might want to undertake. I am aware that in this sketch more beds have been assigned to medicine than is possible in some hospitals, but I have put forward the numbers here mentioned as the ideal number when the students are numerous.

Pharmacology and Therapeutics.

The complete medical school must have a properly paid professor of pharmacology with a well-equipped laboratory. The great want is a closer connexion between the professor and clinical work. It would not be wise to give the pharmacologist charge of beds, for he has usually done little clinical work, and before the drugs can be given to a patient the physician in charge must find out what is the matter with him; this is the duty of a clinician, who can usually do it better than a pharmacologist, whose training lies in devising experiments to discover the mode of action of drugs. But there should be close friendly coöperation between the clinician and the pharmacologist, who should be encouraged to go to his clinical colleagues and say, "I want to observe the effects of such and such drugs on such and such diseases; let me know when you have suitable cases, and I will come and make the observations I desire." The clinician would, by seeing the results of the observations, be adding to his own knowledge. Often, too, he would be able to suggest to the pharmacologist fruitful lines of research; it would be a great gain to the progress of medicine if researches at the bedside were made hand-in-hand between the pharmacologist and clinician and published under their joint names.

Sir George Newman has been unfortunate in the impression he has formed about the teaching of therapeutics. He says, "The case is diagnosed and its treatment prescribed, but such treatment is but rarely closely observed or assessed by the student," and again, "Is he a doer of the word, or only a hearer?" Every good clinical teacher, after he has explained to the students how the diagnosis is reached, goes on to talk

over with them the details of the treatment, not only by drugs but by many other methods; he discusses what kind of life the patient should lead, what he should eat and drink, where he should live, and what occupation he should follow; what therapeutic means other than drugs should be employed, such as massage, remedial exercises, electricity, X rays, and so forth; and while the patient is under observation in the hospital he from time to time points out the success or the failure of the therapeutic means that have been adopted. Every single patient that comes into the hospital ought to be the subject of a therapeutic discourse.

A first-rate medical school will have attached to it the necessary therapeutic departments—e.g., massage, remedial exercises, electrical and others, in which the student can see the carrying out of all these special treatments, but it will be a bad thing to have a special teacher of therapeutics—bad for the professor of medicine and the other physicians attached to the hospital, for they will cease to be first-rate physicians if they do not fully know how to treat their patients, and if they do know, why should they not impart their knowledge direct to the students, instead of its filtering through a professor of therapeutics? Should this subject be taken away from clinicians it will have an evil effect upon the students, for they will be encouraged to believe that the treatment of the patient is a thing apart. There has been too much of that in the past. The duty of the physician is to find out what is the matter with the patient, and to treat when possible the condition found. He should frequent the departments where special treatments are carried out, and he must keep himself abreast of all new therapeutic suggestions. He should have an open mind and be able to assess each mode of treatment at its right value. Sir George Newman quotes with approval a lecture course and the accompanying therapeutic clinic thus: "(3) to discuss the pathology of the case and the precise purpose of treatment; (4) to review the relative value of the means of accomplishing the object." This is exactly what the clinical instructor should do as part of his bedside and lecture teaching. If he does not do it he ought, and I hope that it is rare for the student to be "actually unaware of the medicinal treatment to which the patient is subject." If his clinical teacher has not made him aware of it great blame attaches to the teacher, and the cure lies not in appointing a professor of therapeutics, but in getting a better man to do the clinical teaching. However, there is little difference of opinion between Sir George Newman and myself, for although his report covers the whole of medical education, this is the only principal point in which I differ from him.

Pathology and Bacteriology.

Just as the clinical teacher will discuss with his hearers the diagnosis, prognosis, and treatment, so he should indicate to them the pathology of the disease from which the patient is suffering, for this will be necessary to explain the symptoms scientifically. Although the key to many symptoms is to be found in the pathological laboratory rather than the dead-house, yet there are few diseases without some morbid anatomy, and the bedside teacher will, out of hearing of the patient, indicate to his class what might be expected to be found on post-mortem examination, and if the patient dies he should take the students to the post-mortem room and point out how far the conditions found there can be correlated with those observed during life. The most essential thing in teaching medicine is to train the students to visualise what is wrong inside the patient. I frequently take my students away from the bedside to say to them, "Supposing we this very afternoon killed this patient, tell me what you would see on post-mortem examination, for unless you can do that you have not really conceived what is the matter with him."

The professor of pathology will not be the least busy of the professors; pathological research is so fascinating that he will have plenty of enthusiasts working under him whose work he will direct. In addition, he will have his own original work and lectures, so that while, of course, he will have complete control of the dead-house, and, if he likes, make some post-mortem examinations, a great many should be made by the assistant physicians, for, other things being equal, the man who has made most post-mortem examinations is the best physician and the best teacher of medicine. The greatest corrective to any slovenly habits of diagnosis is the knowledge that if the patient dies it may be open to all to see if the diagnosis is correct; therefore students must be taken into the post-mortem room as much as possible, and particularly

when a post-mortem examination is made on any of the cases they have seen during life. The advantage of this in training them to proper diagnoses cannot be overestimated.

The precise relationship of the professor of bacteriology to the professor of pathology will, no doubt, vary in different schools, but ample provision must be made for bacteriology, and the head of the department should be well enough paid to render private practice unnecessary. Indeed, in a large school he should not have time for it as there will be laboratories to be controlled, numerous investigations from in- and out-patients, classes for students, his own research, and many doing research under him who will need advice.

Modern advancements have made a clinical chemistry department absolutely necessary. Good laboratories are essential, and the professor should be on the same footing as those already mentioned. Experience has shown that a large hospital and school will keep him fully employed in routine work from the wards, in teaching, in his own researches, and in those of others.

Examinations.

Before we can get the medical students properly taught the prevailing system of examinations must be altered. There is no doubt that, as at present conducted, they impair teaching, especially the best, and frequently fail to separate the goats from the sheep. I have conducted many examinations, and am fully aware of their shortcomings. It is difficult to frame questions that cannot be as well answered by a student with a retentive memory for what he has read or been taught by a coach, as by one who has gained his knowledge by bedside observation. It is even more difficult to devise a clinical examination that shall fairly test the candidate who, when left quietly to himself, is quite good at his clinical work, yet "goes to pieces" when he feels that everything depends upon his hearing particular murmurs in a limited time. A teacher's opinion as to the fitness of a particular candidate to pass ought to be at least as good as that of the examiner who only knows his man for as many minutes as the teacher knows him for months. Somehow or other, a plan must be devised in which the bedside and laboratory work done by the candidate during his training counts in the examination. This will stimulate the teacher and stimulate the student.

"University Education."

There is no need here to try to explain what is meant by the phrase "university education," for it is fully and admirably expounded by Sir George Newman in Section 3 of his "Notes" and is there illustrated by noble quotations, of which perhaps the finest is that from John Henry Newman's Lectures. But this is certain, that in medicine of all professions the teaching should endeavour to reach the high ideals denoted by the phrase "university education," for he who practises medicine has to deal with a science as well as an art, his mind must be accustomed to the hard facts of the dissecting room and the laboratory, to the process of reasoning required to reach a diagnosis, to the skill necessary to conduct correct treatment, and to the judgment of the proper way of dealing with human beings. His education must not only have taught him facts but must have trained his mind how to think, how to appreciate the relative value of facts, and how always to be receptive of new discoveries and new aspects of old questions. Indeed, it is doubtful whether any profession requires that width of training implied by "university education" more than that of medicine.

The teachers themselves should remember, too, that all through their lives they must educate themselves. It has been too much the habit of some to remain in their wards, others in their laboratories. They should frequently meet; half an hour's conversation between a physician and a physiologist or chemist does immense good to both. In a medical school aspiring to reach a university standard there should be a common room in which all the teachers can meet and exchange views, and each should know the others well. Frequent meetings will have this further great advantage, it will encourage "team-work." In order to solve almost any medical problem it must be regarded from several standpoints. It is to be hoped, therefore, that in the future we shall see much more "team-work" than we have in the past. Speaking generally, "team-work" papers are more complete than those of individuals and contain fewer mistakes, for before publication each author has been able to be a friendly critic to the others.

THE STANDARD ILLUMINATION OF SNELLEN'S TYPES.¹

THE Council of British Ophthalmologists have been well inspired in investigating the circumstances under which Snellen's types are used in testing the vision of candidates for the public services. It has long been realised that in the absence of any standard method of illumination great injustice might be done to candidates. The conditions, for example, on a November day on a ground floor are hardly comparable to those of a well-lighted upper room in summer. The Council of British Ophthalmologists, which consists of the Presidents, past and present, of the Ophthalmological Society of the United Kingdom and of the Section of Ophthalmology of the Royal Society of Medicine as permanent members, is reinforced by elected members both from the society and from the section, and for the purpose of carrying out the investigation the following were appointed as a committee:—Sir George Berry (chairman), Sir Richard Glazebrook, C.B., F.R.S. (Director of the National Physical Laboratory), Mr. C. C. Paterson, O.B.E. (National Physical Laboratory), Mr. Leon Gaster (secretary of the Society of Illuminating Engineers), Mr. J. Herbert Fisher, Colonel J. Herbert Parsons, Mr. A. B. Cridland, and Mr. W. H. MacMullen, O.B.E. (secretary).

The report runs as follows:—

The effect upon visual acuity of variations in the illumination of test objects has been the subject of a series of careful investigations since the time of Tobias Mayer (1754). Two chief facts emerge from these researches: (1) That there is a rapid rise in acuity as the illumination is increased from zero up to about 2 foot candles; * (2) that above 2 or 3 foot candles there is scarcely any appreciable rise in acuity. The results obtained by different observers are not entirely concordant, the discrepancies being attributable to variations in the test object, contrast, size of pupil, &c. So far as the testing of visual acuity for clinical purposes is concerned, it appears to be sufficiently accurate to regard the results obtained with an illumination of 3 foot candles or more as valid and comparable under the ordinary conditions of clinical testing.

There is, however, no doubt that this minimum is by no means always ensured under the actual conditions in which the testing of candidates for military or other public services occurs. Apart from the fact, which should be borne in mind, that the test types often do not conform to Snellen's criteria, they are frequently dirty, thus diminishing contrast, are varnished, thus giving rise to disturbing direct reflection of light and are viewed under very great variations of daylight in rooms which are often ill-suited for the purpose.

It is possible to lay down precise and simple rules for the efficient illumination of test types, and we see no reason why these rules should not be generally adopted. For the public services it is, in our opinion, unfair to the candidates and detrimental to the services themselves that the examinations should take place under unsatisfactory, and often hurriedly improvised, conditions. The testing of visual capacity is now an essential part of the physical examination of candidates for a large number of the public services, such as the Navy, the Army, the Mercantile Marine, the Indian Civil Service, and so on. We are of opinion that these tests should be conducted under approved conditions, and that this object would be best attained if the examinations were held at properly equipped centres.

We fully recognise that variations of visual acuity arise from many causes other than the actual illumination of the test types, such as the condition of retinal adaptation, contrast between the test object and its background, the size of the pupil, lateral illumination, and so on. We think, however, that these effects can be minimised sufficiently for practical clinical purposes if the testing takes place in a moderately well-illuminated room, with the test types efficiently lighted, and with the careful elimination of any glaring lights, or bright objects from the candidate's field of vision.

We consider that the requirements are sufficiently well satisfied by the following means: Two ordinary 20 watt tungsten lamps (see diagram, L¹, L²) with straight filaments are fixed vertically 15 inches in front of the plane of the test card (A, B), one on each side, at a horizontal distance of 12 inches from the vertical plane normal to and bisecting the card. One lamp is placed higher than the other, one being opposite the junction of the upper and middle thirds of the card, the other opposite the junction of the middle and lower thirds. Opaque non-reflecting screens (S, S) are fitted, so as to prevent direct light from the lamps reaching the candidate's eyes.

This method ensures:

(1) Sufficient illumination. With new lamps the illumination on the test types will be of the order of 10 foot candles. The ordinary variations of current, deterioration of lamps, and the darkening of the test card with age will not reduce the brightness of the test card so illuminated to a value less than that of a perfectly white surface receiving an illumination of 3 foot candles.

(2) Sufficient uniformity of illumination. Whilst we are aware that the same result can be achieved by the employment of properly designed and carefully placed reflectors we have had to recognise in making these proposals that the testing of visual acuity must often be carried out in circumstances which do not admit of the use of

¹ Report on Standard Illumination of Snellen's Types used in Testing the Vision of Candidates for Public Services. Published for the Council of British Ophthalmologists by G. Pulman and Sons, Ltd., 24, Thayer-street London, W 1. Price 6d.

* One foot candle is the illumination received from a source of one candle power falling perpendicularly on a surface at a distance of 1 foot from the source.