NATIONAL HEALTH INSURANCE.

FIRST ANNUAL REPORT

OF THE

MEDICAL RESEARCH COMMITTEE,

1914–1915.

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Presented to both Houses of Parliament by Command of His Majesty.

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Medical Research Committee,

(*National Health Insurance.*)

The Right Hon. Lord Moulton of Bank, K.C.B, L.L.D, F.R.S. (*Chairman*).

Christopher Addison, Esq., M.D., M.P.

Major Waldorf Astor, M.P. (*Treasurer*)

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C. J. Bond, Esq., F.R.C.S

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Colonel Sir William Leishman, C.B., F.R.S

W. M. Fletcher, Esq., M.D. Sc.D., F.R.S (Secretary)

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NATIONAL HEALTH INSURANCE.

FIRST ANNUAL REPORT OF THE MEDICAL RESEARCH COMMITTEE, 1914–1915.

St. Stephen's House,

Westminster, S.W.

18th October, 1915.

To the Chairman of the
National Health Insurance Joint Committee.

Sir,

The Medical Research Committee beg leave to submit the following report upon their work during the year ending the 1st October, 1915.

In presenting for the first time a Report upon a completed year, of work, the Committee think it may be found desirable for the sake of historical completeness that an account should be given here in the first place of the circumstances in which the Medical Research Committee received their constitution and approached the task of forming schemes for the effective use of the Medical Research Fund.

I.— INTRODUCTION.

The Medical Research Fund.

The Medical Research Fund consists of an annual sum calculated at the rate of one penny in respect of each insured person in the United Kingdom, payable out of moneys provided by Parliament, which has been retained for the purposes of Research in accordance with the proviso to Section I6 (2) (b) of the National Insurance Act, 1911.

For the year 1914, the sum thus available amounted to about £55,000 ; in normal circumstances it may be expected to increase slightly in each successive year in accordance with the natural growth of the population and the increase in the number of insured persons. The Fund for the year 1915, however, will show a diminution owing to the enlistment of insured persons in H.M. Forces.

Regulations made by the Treasury assigned to the National Insurance Joint Committee the duty of making Regulations as to the manner in which the Fund should be applied for Research, and the Joint Committee in due course made provisional Regulations on the 20th August, 1913, and substantive Regulations on the 21st March, 1914. It is these Regulations (see Appendix, page 49) which now govern the administration of the Medical Research Fund.

The Administration of the Fund.

The following account of the administrative system adopted in these Regulations may be quoted from the Report for 1913-1914 on the Administration of National Health Insurance* :—

> The basis of the system established by these Regulations is to be found in the recommendations made in the Final Report of the Departmental Committee on Tuberculosis.† The Departmental Committee expressed the opinion that a Minister or a Government Department could not make the best possible use of the research money without having the advantage of the advice of a number of different persons, and obtaining the assistance of experts in the carrying out of the work. For these reasons the Committee recommended the establishment of two bodies to be concerned with the administration of the money, one, the larger body, to exercise functions of a general advisory character, the other to be more directly concerned with the disbursement of the money, framing a scheme of research work and a budget of expenditure, making periodical reports, generally organising and supervising the research work wherever carried on, and performing similar duties of an executive character.
>
> The Regulations of the Joint Committee accordingly set up two bodies, one consisting of 42 persons, called the "Advisory Council for Research," and one, the smaller executive body, consisting of nine persons, called the "Medical Research Committee."
>
> The Advisory Council for Research consists of representatives of the Royal Society, of all Universities of the United Kingdom, of the Royal Colleges of Physicians and Surgeons in England, Scotland, and Ireland, of the King Edward VII. Hospital Fund for London, and of the Government Departments concerned in matters of Public Health and cognate matters. In appointing the Advisory Council, invitations were issued, in the case of Universities to the Vice-Chancellors, in the case of the Royal Colleges to the Presidents, and similarly in the case of other bodies, requesting these bodies to appoint representatives on the Council. In addition, nine other persons were invited to serve in a personal capacity, on the grounds that their experience was such as to be likely to assist very materially the deliberations of the Council. The necessity of securing the widest possible representation in constituting the Advisory Council resulted in the appointment of 42 members, as opposed to the maximum of 30 recommended in the Report of the Departmental Committee.
>
> The constitution of the Medical Research Committee reflects the recommendation of the Departmental Committee's Report that the majority, but not all, of the members should be scientific experts. The practical necessity of keeping the number of the Medical Research Committee

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* [Cd. 7496] pp 19-21. Wyman and Sons, Ltd., price 2s. 5*d.*

† [Cd. 6641] pp 13-16. Wyman and Sons, Ltd., price 2½*d.*

small, so as to facilitate frequent meetings and despatch of business, prevented the Medical Research Committee being based on representative lines, and also required that the members should be most carefully selected in the light of the qualifications which they could bring to the special nature of the problem to be handled. Accordingly, invitations to serve on the Medical Research Committee were sent personally to those persons who seemed, after the most careful consideration, to be best qualified, and not to the heads of any scientific body or bodies with which the members might be associated. Members of the Medical Research Committee accordingly serve not in a representative but in a personal capacity.

The Regulations, besides setting up these two bodies, defined the relations between them, and also between them and the Ministerial head of the Joint Committee. These relations may be summarised as follows:—

The Regulations impose upon the Medical Research Committee the duty of framing schemes for research and of submitting them for the approval of the Chairman of the Joint Committee, which must be obtained before any money can be expended on such schemes. The Chairman of the Joint Committee, before approving such a scheme, is required by the Regulations to consult the Advisory Council for Research, and, after the approval of the Chairman of the Joint Committee has been obtained, the scheme commences to operate and money can be expended thereunder.

It may he added, that advice has been obtained to the effect that the application of the Research Fund is not limited to research in tuberculosis, but that the money may be expended on research into any disease to which insured persons are subject.

The Medical Research Committee and Schemes of Research

The first Members of the Advisory Council and of the Medical Research Committee were formally appointed to serve for three years from 20th August, 1913.

The Regulations lay down that after that period three members of the Committee, to be selected in such manner as the Committee may determine, shall retire at intervals of two years, but shall be eligible for reappointment. The members of the Council are eligible for re-appointment after the period of three years.

The Medical Research Committee, under the chairmanship of Lord Moulton, began without delay to consider the organisation of the new State resources for the advancement of medical knowledge. During the summer and autumn of 1913 the Committee closely studied the numerous questions connected with the formation of a national scheme of medical research, and before proceeding to the choice and distribution of particular subjects for research to be initially undertaken they desired to seek approval for the general outline of the policy they were led to propose.

Their general scheme was submitted to the Minister in the following terms:—

Type of Research—The object of the research is the extension of medical knowledge with the view of "increasing our powers of preserving health and preventing or

combating disease. But otherwise than that this, is to be the guiding aim, the actual field of research is not limited and is to be wide enough to include, so far as may from time to time be found desirable, all researches bearing on health and disease, whether or not such researches have any direct or immediate bearing on any particular disease or class of diseases provided that they are judged to be useful in promoting the attainment of the above object.

Method of conducting the research.—The organisation by which this research will be carried out should consist of the following departments:—

1. A competent body of investigators of the highest class in the permanent employ of the scheme and devoting their whole time to research under it. They would supplied with proper laboratories, duly qualified assistants, etc., and would ordinarily carry on their researches in such laboratories.

2. Skilled investigators in the permanent or temporary employment of the scheme who would be engaged in procuring their material clinically or otherwise in connection with Hospitals or other Institutions furnishing the requisite opportunities for so long. This material would in some cases be worked upon in local laboratories, and in some cases at laboratories provided for them elsewhere under the scheme, and sometimes by a combination of both methods.

3. Individual investigators not in the employment of the scheme who are carrying on independent investigations of a kind which are suitable to form a part of, or to be co-ordinated with, the research under the scheme, and to whom it is desirable to give help either in money or otherwise to enable them better to carry out their researches.

4. Statistical Department.—This will mainly consist of persons in the permanent employment of the scheme who will be engaged in enquiries relating to diet, occupation, habits of life and other matters bearing upon the incidence of disease, and who will collect and deal with all types of vital statistics, including the distribution of disease, the relative frequency of special types of lesions in diseases, such as tuberculosis and in general with all statistical investigations useful either as preliminary to research or as confirmatory of its results. It will probably have to consider and advise how the statistical material provided for under the Insurance Act should be dealt with.

It is hoped that when the scheme is in actual work there may become associated therewith a Bureau through which those engaged in research unconnected with the scheme or otherwise working on kindred questions may be able to obtain information, references to special publications and other help of a like nature.

All these four departments are essential to the success of the organisation and are intended to co-operate one with another and will be used separately or together

according to the nature of the work in hand. It is neither possible nor desirable to lay down any hard and fast lines of demarcation of their spheres of action.

The Committee estimated roughly that £60,000 would be needed for the provision and equipment of the Central Research Institute, and proposed that this capital expenditure should be spread over two years, leaving in each of those years about £25,000, as to which they proposed that about £10,000 should be devoted to the expenses of administration, of the libraries and information bureau, and of research centralised in the Institute or immediately within the control of the Committee, while about £15,000 should be assigned to researches prosecuted by approved investigators at the Universities and other research centres maintained by funds voluntarily provided. After the first two years and the completion of the initial capital expenditure, larger amounts would be available for the expected growth in the current research work, both centrally and at local institutions, as the schemes for research reached their full development.

It will be seen that this general plan for the future work of the Committee marks clearly a line of policy by which part, but only a part, of the new national fund for research is devoted to work centralised in laboratories under their control and carried out by a scientific staff to be directly appointed by the Committee, while the other and larger part of the fund is allocated to the support of workers and their investigations in laboratories and institutes not directly under the control of the Committee. It is a fundamental feature of this general scheme that independent investigations within the voluntary and private institutions in which almost the whole of the research work hitherto carried out in Great Britain, with little, if any, support from State authorities, should receive assistance from the Medical Research Fund, in so far as their work is appropriate to medical research, or capable of being co-ordinated within a general scheme for the organised advancement of medical knowledge.

The general principle here laid down and finally approved by the Minister, after a meeting of the Advisory Council held on 4th December, 1913, is consonant with the recommendation of the Departmental Committee on Tuberculosis, who in remarking that, "hitherto, apart from the small annual sum expended by the Local Government Board and actual grants for particular objects, the State has, in the main, left Research to voluntary agencies," express not only their high approval of the valuable work in medical research which has been rendered by voluntary effort in the past, but also their opinion that the aim of those responsible for the organisation of research under the National Insurance Act should be "to stimulate and co-operate with the voluntary agencies.".

The Chairman of the Joint Committee, in signifying his approval of the scheme so outlined, gave it with the proviso that the sum, (£60,000) estimated for capital expenditure should be spread over the first five instead of over the first two years, and this modification of the proposal of the Committee was communicated to the

members of the Advisory Council on 19th December,1913, by a circular letter from Lord Moulton, as Chairman of the Council. At the same time, with a view to the establishment of a Central Research Institute, the Provisional Regulations made by the Joint Committee dated 20th August, 1913, were modified so as to allow the Medical Research Committee to acquire land or interest in it, or erect buildings and provide their maintenance, and this modification appeared in the substantive Regulations dated 21st March, 1914, which now govern the work of the Committee.

Establishment of a Central Research Institute

The policy of limited centralisation with liberal provision for the support of coordinated work at local centres having been approved, the Committee proceeded to make provision for the establishment of a Central Research Institute with a permanent, scientific staff, and to frame detailed schemes of research to be prosecuted either centrally or by independent workers outside, or both.

After the meeting of December 4th, 1913, the Committee negotiated for the purchase of the Mount Vernon Hospital building at Hampstead, with its freehold site and grounds. The structure of this building made it suitable for conversion, into an institute for research, and its position appeared to the Committee to give it exceptional advantages in amenity and convenience. Negotiations for the purchase of the building and grounds were proceeded with, and on March 25th, 1914, the Committee finally contracted to buy them upon terms they regarded as favourable to themselves, and paid a first instalment of the purchase money. In accordance with Article 9 (I) of the Regulations, the Chairman of the Joint Committee appointed Lord Moulton and Mr. Waldorf Astor to be the Trustees of the Committee in whom the property was vested. The cost of the freehold site and buildings, to be spread over five years, was £35,000. Plans were prepared in detail for the utilisation of part of the buildings as a research hospital with 15 to 20 beds, and for the adaptation of the rest of the building, to the purposes of laboratory work.

With a view to appointments to the permanent scientific or administrative staff, a memorandum was prepared for the information of those to whom the Committee desired to offer engagements in their service, and regulations of service were drawn up, and approved by the Chairman of the Joint Committee, to be observed by those accepting positions offered by the Committee.

With the sanction of the Minister, appointments were made to the permanent scientific staff which are given in detail below under each of the four departments of the Central Institute, and Dr. W. M. Fletcher, Fellow of Trinity College, Cambridge, was appointed (from 1st July, 1914) to be Secretary of the Committee.

So far as possible the terms of engagement for members of the staff and the rules of their service were assimilated to those laid down for H.M. Civil Service. Except in two cases (those of the Secretary and of the head of the Bacteriological Department) the Committee engaged themselves to make provision for annuities maturing at the age of 60, or upon a later cessation of service, in lieu of pensions.

Proposals from the Governing Body of the Lister Institute For Amalgamation.

The Committee were already engaged upon plans for the adaptation of the Mount Vernon buildings to their new purposes, when the suggestion was made to them by the Governing Body of the Lister Institute that the Institute might under certain conditions be offered to the Nation to be the Central Institute under the control of the Committee. It will be readily understood that the previous undertakings of the Committee at Mount Vernon made their consideration of this very important and generous proposal more difficult than it would otherwise have been, but negotiations were at once entered upon by representatives of the two bodies.

One of the chief elements of doubt in the minds of the Committee was related to the important question of the provision of hospital beds for research in connection with their research laboratories. This was removed altogether, however, by the generous and spontaneous action of Lord Iveagh, who offered, in a letter of 18th May, 1914, to build at his own cost a research hospital of 50 beds on a site next to the Lister Institute and in connection with it, as a part of the proposal for the transference of the property of the Institute to form a National Institute for Medical Research.

It has been said already that the proposals made by the Governing Body were made subject to conditions. These were:—

(1) That representation on the Executive Committee of the National Scheme should be adequate to safeguard the interests of the Lister Institute.
(2) That suitable employment for the large majority of the present staff of the Institute should be provided.
(3) That details of the programme and budget of the National Scheme should command the approval of the Governing Body.

In the opinion of the Committee the acceptance of the Lister Institute necessarily involved the abandonment of their Mount Vernon scheme. It would have been impossible for them to undertake the direction of, two separate Institutes of the kind even if the question of cost had not been, as it was, prohibitive. They did not, however, anticipate serious difficulty in disposing, if necessary, of their liabilities at Mount Vernon without loss.

It did not seem to the Committee possible or desirable to come to a decision upon the important issues involved without applying to the general question the test of framing a provisional scheme for the proposed administration of the Institute in all essential details, and the framing of such a scheme was also necessary with a view to the satisfaction of what the Committee regarded as the reasonable conditions which the Governing Body of the Lister Institute had attached to their proposals.

The scheme so framed contained the following principal provisions corresponding with the conditions of the Governing Body's proposals, and these received the sanction of the Chairman of the Joint Committee.

(1) *Representation.*

It was agreed that two members to be appointed by the Minister from the present Governing Body of the Lister Institute should be added to the Medical Research Committee. When either of the two seats upon the Committee became vacant for any reason it would be filled by the Minister, who would appoint to it a person suggested by the Council of the Royal Society and approved by him in consultation with the Council of the Society.

(2) *The existing staff of the Lister Institute.*

The Medical Research Committee expressed their willingness to provide appointments, not only for the majority, but for the whole, of the members of the scientific staff of the Lister Institute at Chelsea. They believed that the employment they would propose would be found not less suitable and congenial than that in which those gentlemen were then engaged. The scheme set out a suggested distribution of the combined staff for Research into several departments, and it was arranged that the conditions of service and of pension should be similar for all members of the staff, whether appointed by the Committee or previously appointed by the Governors of the Lister Institute.

(3) *The programme and budget of the National Scheme.*

Details of these were given, together with detailed estimates of the distribution within the Central Institute of the financial resources provided respectively by the Lister Institute and the National Medical Research Fund.

The full scheme in detail, as approved by the Medical Research Committee, with the sanction of the responsible Minister, and by the Governing Body of the Lister Institute, was circulated by the Committee to the Members of the Advisory Council in a Memorandum dated 14th July, 1914, with an explanatory letter dated 13th July, 1914, giving the history of the negotiations and the position of the Committee in

the matter. These papers were forwarded to the Advisory Council on 20th August, 1914, after a delay in the press due to the outbreak of war.

Some subsequent negotiations on matters of detail were entered upon later, and as a result it was further arranged that in the event of the recommendations of the Governing Body being adopted, the property of the Institute should be placed in the hands of three official Trustees as an endowment of capital for the benefit of National Medical Research, the income of which should be regularly placed to the credit of the Research Fund. Two of the Trustees were to be appointed at the outset by the Lister Institute and, subsequently upon vacancies, by the Royal Society, and the third Trustee by the Treasury.

Various discretionary powers were to be vested in the Trustees and the following provisions were made to safeguard the original purposes of the endowment, and were agreed to on 27th July, 1914, between the Hon. Treasurer of the Lister Institute and representatives of H.M. Treasury.

> In the event of the Government at any future time materially diminishing its contribution to the Medical Research Fund, or ceasing wholly to utilise the Institute or its endowment for Medical Research which, for the purpose of this clause, shall mean the pursuit of new knowledge by observation and experiment with the object of furthering the education of disease and alleviation of suffering, the Trustees may by a majority appeal to a Court of Law to cancel the present user of the property, and to empower the said Trustees in consultation with the Royal Society and with Viscount Iveagh or his successor in the title for the time being, to submit for the approval of the Court a new scheme, to be controlled in such a way as may be thought best, for the appropriation of the whole property in their hands for the furtherance of Medical Research.

The Governing Body on 17th July, 1914, agreed finally to recommend to the members of the Institute that they should "offer to the Nation as a nucleus towards a National Institute of Medical Research, the whole organization and resources of the Institute" on the understanding that the amalgamation should be effected on the basis of the scheme which had been agreed upon.

The outbreak of the war postponed the date of the statutory meeting of the members of the Institute summoned for the purposes of considering this recommendation. The meeting was ultimately held on 18th November, 1914, when it was found that the necessary constitutional support of the members was not given to the proposals of the Governing Body. The negotiations were accordingly suspended.

Meanwhile the work of the scientific staff already appointed by the Committee had begun and will be described in due course below.

THE PREPARATION OF RESEARCH SCHEMES

Assisted by the special studies of their own members and by suggestions received from various sources outside, the Committee had been engaged in reviewing the directions in which it appeared most desirable in the first place to initiate or to encourage research work for the improvement of medical knowledge. At the same time the Committee had endeavoured to acquaint themselves thoroughly with the resources, both personal and material, of the Universities and other centres of medical research throughout the kingdom. Members of' the Committee severally or together had visited nearly all these centres, and had everywhere received the fullest possible assistance from the Heads of the laboratories. For the courtesy which has been uniformly shown them the Committee would desire to express their most cordial acknowledgments. From many of the centres of research reports have been received from time to time in explanation of the chief needs and opportunities of their several departments.

The outbreak of war intervened just as the Committee were completing their Schemes of research, framed with estimates of expenditure, for submission to the Chairman of the Joint Committee in accordance with the Regulations. The changed circumstances, and the sudden call for medical and pathological assistance in military directions, interfered greatly with the plans of the Committee, but their revised Schemes were submitted to the Minister on the 31st October, 1914, together with an explanation of certain preliminary lines of policy which the Committee proposed to follow in making grants in aid of research. This list of' schemes then submitted also contained proposals for special work to be undertaken by the Committee in direct connection with the war and for the assistance of the Army Medical Department.

The meeting of the Advisory Council, to whom the Committee's schemes had been referred by the Chairman of the Joint Committee for consideration, was held on the 17th November, 1914. The schemes and provisional policy of the Committee were subsequently approved by the Minister, with a small addition to one of the schemes which had been suggested at the meeting of the Advisory Council and had been incorporated by the Committee upon reference to them by the Minister.

These schemes in the form then approved were subsequently published in full by the Medical Press.

It was apparent then, as the Committee pointed out, that as the war continued the research work organised with a view to peace conditions was likely still to further diminish, and the special work undertaken in connection with the war to increase progressively. In the account to be given below of the work which has actually been done during the year it will be seen that these expectations have been realised.

After the approval of these first schemes for research, including the beginning of the enquiries organised for the War Office, the Committee found early and repeated

occasion for the rapid organisation of pathological work in connection with military objects and for the safeguarding of the health of the large part of the male population enlisted in H.M. Forces. For these emergency schemes approval, was obtained from the Chairman of the Joint Committee from time to time without reference by him in each emergency to the Advisory Council.

On 11th May, 1915, Mr. Montagu, then Chairman of the Joint Committee, caused a White Paper* to be prepared for the information of Parliament, in which a summary was given of the work undertaken by the Medical Research Committee in connection with the war. By direction of Mr. Montagu the following letter was addressed to the Advisory Council on the 26th May, 1915 :—

St. Stephen's House,
Westminster, S.W.
26th October, 1915.

Sir,

I beg leave to forward to you, at the request of the Chairman of the National Health Insurance Joint Committee, a White Paper in which a summary statement is given of the work which has already been undertaken by the Medical Research Committee in connexion with the war. It will be seen that the immediate occasion for the preparation of the White Paper was a question asked in the House of Commons by Sir Henry Craik on May 11th.

I am desired further by the Chairman of the Joint Committee to say that during the progress of the war the amount of scientific work arranged by the Committee, as shown in the pamphlet submitted to the Advisory Council at their last meeting for the assistance of the medical services of H.M. Forces, or for the conduct of special enquiries likely to be of immediate value to the War Office or other Government Department in the present emergency, has not only increased, as is shown in the White Paper, but is likely still further to increase during the present year.

For this reason the Committee have not submitted to Mr. Montagu, as Chairman of the Joint Committee, a new list of Schemes of Research for the present year irrespective of the war, but have only recommended, where it has been found practicable, certain supplementary additions to the schemes which were laid before the Advisory Council last year by the Chairman of the Joint Committee, and finally approved by him. These additions are greatly less in extent than those parts of the approved schemes which have already been postponed temporarily in consequence of the conditions of war. Mr. Montagu acquiesces in the view of the Committee that it is expedient to refrain at the present time from making any calls upon members of the medical profession and its allied branches for the purposes of Medical Research which might conflict with the active prosecution of work more urgently required in directions specially connected with the war.

Upon the question whether the Medical Research Committee should place their services, together with all the resources under their direction, freely at the disposal of the National Executive in the existing circumstances, Mr. Montagu feels assured that there will be no difference of opinion among the members of the Advisory Council, and accordingly he does not propose at this time of strain to summon a special meeting of the Advisory Council, for consultation with regard to the emergency activities of the Committee connected with the war.

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* Interim Report on the work in connection with the War, undertaken by the Medical Research Committee. [Cd. 7922.] Messrs. Wyman and Sons, Ltd. Price 1*d.*

I am directed, however, to point out that, as indicated in Mr. Montagu's answer given in the House of Commons on the 11th May, a full Report of the work of the Medical Research Committee since its inception, including its recent work in connexion with the war, is in course of preparation by the Committee, and it is Mr. Montagu's intention to lay this Report before the Advisory Council as soon as possible,

I am,
SIR.
Yours faithfully,
W. M. FLETCHER.

Having given this summary account of the general course pursued by the Committee in their first period of work, deflected as it was by the unexpected disturbing influences brought to bear upon it during 1914, in part by the Lister Institute negotiations and in far greater degree by the war, an account will now be given of the research work which has actually been done under the direction or on behalf of the Committee up to the 1st October, 1915.

II.—THE CENTRAL RESEARCH INSTITUTE AND ITS DEPARTMENTS.

THE MOUNT VERNON BUILDING, HAMPSTEAD.

Owing to the delay in the equipment of the building as the Central Research Institute, which was occasioned by the Lister Institute negotiations, it remained unaltered and unoccupied until October, 1914, though some necessary structural repairs to the exterior were carried out. Upon the outbreak of war the building was placed at the disposal of the War Office for use as a military hospital in case of special need. For this purpose it was soon urgently required, and since November, 1914, the building, with temporary extensions built in the grounds, has been occupied as the Hampstead Military Hospital.

It has been already mentioned (p. 8) that at the time of the original purchase of the building, arrangements were made by direction of the Chairman of the Joint Committee for deriving the unpaid balance of the purchase money equally from the Research Funds as they became available in the four successive years 1915–1918. The expenditure of the Fund for 1914 upon research schemes did not begin, however, until that autumn, and began then in amount greatly reduced by the war, while, on the other hand, the special war expenditure did not in 1914 reach its present development. The Committee accordingly sought and obtained permission from the Minister to complete the purchase in March, 1915, from the balance of the Fund for 1914. The necessary formalities, complicated by reference upon certain points to the Charity Commissioners, are in process of settlement. The Committee are now able to look forward to the resources of the Fund being free in the near future from the expected burden of instalments of purchase money and of the annual interest which would become due in respect of those remaining unpaid.

For the four Departments already constituted with a view to the Central Research Institute, temporary accommodation has been provided elsewhere, and the work of these Departments will be described separately.

Department of Bacteriology.

Staff: Colonel Sir Almroth Wright, C.R, M.D.,F.R.S.
(appointed 1st August, 1914), assisted by

S. R. Douglas, M.R.C.S., L.R.C.P.
(late Captain I.M.S.) (appointed 1st August, 1914).

The following have been engaged temporarily for special purposes and periods.—

Captain W. Parry Morgan R.A.M.C.

Leonard Colebrook, M.B., B.S.

H. H. Tanner, M.B., B.S. (Lieut. R.A.M.C.).

It has been seen that the Lister Institute negotiations delayed the proposals of the Committee to make further permanent appointments to this Department and delayed also the preparation of laboratories for its work. Owing to these negotiations, moreover, the Committee at the outbreak of the war had not then been able to provide any direct opportunities for clinical research in connection with this or the other scientific Departments.

The inoculation Department at St. Mary's Hospital, and with it the clinical facilities which Sir Almroth Wright had at the time, would probably have ceased altogether upon his withdrawal to the service of the national research scheme, but the Committee found that by a reasonable financial arrangement they could secure the use of beds at St. Mary's Hospital for research work by Sir Almroth Wright, or other members of their staff, for so long as the Committee were without clinical resources of their own. Incidentally such an arrangement allowed the possibility of Sir Almroth Wright and his assistants maintaining their laboratory work uninterrupted until laboratories under the control of the Committee were ready.

It was proposed accordingly that the Committee should offer to pay St. Mary's Hospital, through the Committee of the Hospital Inoculation Department, £2,500 for the year from the 1st October, 1914, for the use of 25 of the beds then under Sir Almroth Wright. This sum was to include the whole of the expenses of the hospital service of all kinds for the beds, full or empty, and the selection and the medical care of the patients was to be under the control of the Medical Research Committee acting through their

scientific staff. It was to be understood that the beds would be available for researches conducted by other members of the staff with the approval of the Committee, but it was expected that the great majority of the beds would be used in connection with work in the Bacteriological Department.

While these proposals were under consideration, war was declared, and the reasons given already for the proposed temporary maintenance, by the Committee of the Inoculation Department and research beds at St. Mary's Hospital, from the point of view of the normal research work which had been contemplated, appeared to the Committee to be greatly strengthened by the outbreak of war and the urgent need for special bacteriological and clinical studies connected with it. The scheme was approved by the Chairman of the Joint Committee and accepted by the Committee of the Inoculation Department. An option for the extension of the scheme for a second year was obtained, and, with the approval of the Minister, due notice has been given that the scheme will be continued for a second year.

The whole services of the Department have from the beginning of the war been made available for enquiries of military importance. During the first months of the war Sir Almroth Wright and his staff appointed by the Committee gave the whole of their time to assist at the Inoculation Department of St. Mary's Hospital in the preparation of vaccines for the use of H.M. Forces, and during that time very large quantities of anti-typhoid vaccine and anti-sepsis vaccine were supplied, as they have continued since to be supplied by the Inoculation Department, to the Admiralty, the War Office and the French and Belgian Armies.

Sir Almroth Wright, in September, was appointed Consulting Physician to H.M. Forces overseas, with the rank of Colonel, and he has since prosecuted important researches at Boulogne, bearing specially upon the pathology and treatment of infected wounds. In these he has been assisted for various periods by Captain Douglas, Captain Parry Morgan, and Dr. Tanner.

The results of these inquiries led to the circulation by the War Office of a Memorandum to medical officers with the Forces at home or abroad with regard to their application in practice.

Sir Almroth Wright published later (*Proc. Roy. Soc. of Medicine*, April, 1915) a more detailed account of his work upon wound infections and of some new methods for the study of the various factors that come into consideration in their treatment. He has more recently investigated the conditions for generalisation in the body of infections from wounds, and certain practical questions of the irrigation of wounds with therapeutic solutions. The results are now in process of publication.

In June, 1915, the staff at the laboratories at Boulogne was further augmented by the addition of Captain W. d'E. Emery, M.D., R.A.M.C (T.), Dr. A. C. Inman (Hon. Lieut., R.A.M.C.), and Captain S.W. Patterson, R.A.M.C, who have engaged in

special researches allied closely to those of Sir Almroth Wright. Captain Emery has studied in particular the infections associated with gas production in wounds.

The Committee have also maintained three members of Sir Almroth Wright's staff in work under his direction at the Inoculation Department of St. Mary's Hospital in part this work has been in connection with that at Boulogne, for which the laboratory in London has been serviceable as a kind of base for supplies. A large part of the work here, however, has been in connection with the epidemic of cerebro-spinal fever during the first half of 1915, and will be referred to again below.

It should be mentioned here that in accordance with the rule laid down for the Civil Service, every member of the Committee's staff to whom H.M. Commission as a military officer has been given, receives the amount of his salary from the Committee, less the amount of his military pay.

Department of Bio-Chemistry and Pharmacology.

Staff: H. H. Dale, M.D., F.R.S. (appointed 1st July, 1914),

assisted by

G. Barger, M.A., D.Sc. (appointed 1st July, 1914).

A. J. Enwins, D.Sc. (appointed 1st October, 1914).

G. S. Walpole, D.Sc. (appointed, 1st May, 1951 for two years).

The staff of the Department were enabled to begin work from the beginning of July, 1914, in laboratories in the Lister Institute, generously placed at the temporary disposal of the Committee by the Governing Body.

From November, 1914, when the proposals of the Governing Body for the fusion of their interests with those of the Committee had been negatived by the members of the Institute, the Committee were enabled by the kindness of the Governing Body to hire four rooms at the Institute, for the purposes of their Biochemical Department, and more recently a fifth room has been added.. These rooms have now been equipped by the Committee, who have arranged that the laboratory furniture and apparatus will be available for transference without loss when the time comes for the establishment of the staff at the Central Institute of the Committee.

Much time during the year has naturally been consumed in bringing the Department to full equipment in circumstances of war peculiarly unfavourable to conditions of supply, but the Lister Institute very generously mitigated these difficulties from time to time by the temporary loan of apparatus and otherwise.

The following investigations have been conducted in the Department:—

(*a*) A general survey has been made of the alkaloids not prominent from the point of view of their detailed pharmacological actions but giving promise of therapeutic importance. Several of these have been selected and detailed work has been done upon their action on protozoa and on higher animals. Two of them are new alkaloids and their chemistry is under investigation.

(*b*) Work has been done on the nature of the toxic principle found in one of the organisms which have been held responsible for "gas gangrene" resulting from infected wounds. The interesting negative result was obtained that the effects described previously by others were due to the presence of a large quantity of ammonium salts.

(*c*) Investigation has begun of the chemical relatives of papavarine, which has had a recent therapeutic vogue. This has been postponed during the present pressure of work.

(*d*) Experiments are proceeding with regard to the nature of the substance causing Ehrlich's diazo reaction in typhoid urine. This seems likely to lead to some important conclusions.

(*e*) Some extensive work has begun upon the subject of "anaphylaxis." It will be explained below (p. 29) that the Committee have in view a co-ordinated scheme of work upon the various aspects of the phenomena grouped under this head, both in this Department and in certain centres of research outside. Dr. Walpole has been attached for a period of two years to this Department for co-operation in this work and he is dealing more especially with the problems in colloidal physics which are fundamental to the general enquiry.

Dr. Dale and Dr. Barger have published a short paper on "Liver Nitrogen in Anaphylaxis" (*Biochemical Journal*, December, 1914), and Dr. Dale has ready for publication work upon the role of different pure proteins of horse serum in the anaphylactic reaction.

(*f*) Much time has been given to a systematic examination of the rates of absorption and distribution in the animal tissues of particular synthetic drugs, varying chemically in structural constitution, the main object of the enquiry being to put the standardisation of drugs by biological tests, upon a scientific, instead of its present purely empirical, basis.

(*g*) Work has been begun upon the chemotherapy of Bilharziosis in relation to the recent discoveries of Lieut-Colonel Leiper (see p. 39 below).

(*h*) Outside the normal activities of the Department special work arising out of the war has been undertaken. Much of this has been done in connexion with the synthesis of certain drugs, and in other directions enquiries of a confidential kind have been conducted for the War Office and other Government Departments.

Department of Applied Physiology.

Staff: Leonard Hill, M.B., F.R.S. (appointed 1st July, 1914),

assisted by

B. Moore, D.Sc., F.R.S. (appointed 1st July, 1914).

Martin Flack, M.A., M.B. (appointed .1st August, 1914).

It has also been necessary to provide temporary accommodation for this Department. From the times of their appointments Dr. Hill and Dr. Flack were permitted by the courtesy of the London Hospital Medical School to carry on experimental work on behalf of the Committee in the Physiological laboratory in which they had previously occupied teaching positions as Professor and Lecturer respectively. Similarly Dr. Moore, who was Professor of Biochemistry in the University of Liverpool before accepting appointment to the Committee's staff, was generously allowed by the University to use his former laboratory for the purposes of his new duties until the end of the year, the. Medical Research Committee defraying the actual expenses for the materials used.

From January 1st, 1915, however, the Committee have been enabled to hire, upon a yearly agreement, from the London Hospital Medical School, three suitable laboratory rooms, and these have been temporarily equipped for the purposes of the Department. Here the staff have been engaged in active work together throughout the year. The chief activities of the Department have been, in the following directions:—

(*a*) The resources of the Department have been given to work in connexion with the research scheme to be mentioned again below for the investigation of the incidence of phthisis in relation to particular occupations and industries. Dr. Hill and Dr. Moore were both appointed members of the Special Investigation Committee appointed to deal with this subject, and they have paid a large number of visits to boot and shoe factories, to leather and hide works and printing shops. In connexion with these visits, experimental work has been done in the laboratory upon questions of ventilation and other physiological conditions of work. These, studies have been closely correlated with statistical enquiries carried out by the Investigation Committee. A Report has been

presented by the Investigation Committee upon the Boot and Shoe Industry, and a Report upon the Printing Trades is in process of preparation.

(*b*) A prolonged series of observations has been carried out in connexion with practical problems of ventilation and upon the rates of heat loss from surfaces under different physical conditions. An account of these researches is now ready for publication. In connexion with this work observations have also been made upon the physiological values of different forms of clothing and of textile materials.

(*c*) Dr. Moore has continued the study of certain precipitation forms of colloids and has published some of his results (*Proc. Roy. Soc.*, Vol. 88, 1915). An investigation is in progress upon the effects of inorganic colloids upon animals, which has relation to the recent statement that "pellagra" is caused by chronic ingestion of such colloids.

(*d*) Dr. Hill with Dr. Flack and Dr. McQueen have published an account of their work on the measurement of arterial pressure in man, which has a direct bearing upon some important clinical problems (*Proc. Roy. Soc.*, Vol. 88, 1915).

(*e*) In collaboration with Dr. Fildes, an investigation has been carried out as to the conditions of union between inorganic antiseptics and the serum of a wounded surface, and comparative experiments are being made upon the effects of employing different heavy metallic ions.

(*f*) The whole resources of the Department have been made available for certain special enquiries in connexion with the war. Much work of a confidential kind has been done with regard to the characters and effects of poison gases and in other directions. Dr. Hill has visited France to demonstrate and advise upon the treatment by oxygen inhalation of men injured by harmful gases. In this connexion apparatus has been devised in the department for giving inhalations of oxygen at higher concentrations than those usually obtainable over long periods of time.

Dr. Hill, with .the permission of the Committee, has been appointed a member of the Health of Munition Workers Committee (Ministry of Munitions of War), and the resources of the Department have been placed at the disposal of the Committee for such specific experimental enquiries as may be needed in the course of their work.

Statistical Department.

Director: John Brownlee, M.D., D.Sc. (appointed 1st July, 1914).

For the first three months after his appointment Dr. Brownlee worked in the Lister Institute, where accommodation was temporarily provided for him by the hospitality

of the Governing Body. He was then engaged in studying the natural history of phthisis considered statistically, and the mathematical forms of epidemic disease. A special investigation was also made into the general effect of unhealthy conditions upon the death-rate at different ages. During this period the Department was equipped with modern mechanical apparatus for calculation and rapid mathematical analysis, and with other appliances.

After the beginning of the War the Committee offered to place their resources at the disposal of the War Office for medical statistical purposes. The offer was accepted by the Army Council and The Department has undertaken and is now conducting the whole compilation of the statistics of the sick and wounded from the Home and the Expeditionary Forces. At a later date the collection and Analysis of the statistics will be carried out with the aid of the most recent mechanical methods.

For the purposes of this very important work and for the better accommodation of the Department the Committee hired the house at 34, Guilford Street, Russell Square, and, equipped it with the necessary furniture and clerical staff. Card indices are being compiled from the returns provided from official sources, and typists are engaged at military hospitals throughout the country to secure the rapid collection of information from the hospital books. Returns from the Forces overseas are transmitted to the Department at a certain period after the current date for the extraction of their records. The Committee are greatly indebted to the London Divisional Office of the Labour Exchanges under the Board of Trade for the rapid, and economical organisation of the women workers employed upon the indices. For the detailed organisation and supervision of the extensive work, both at Guilford Street and at the hospitals, Mr. M. J. C. Meiklejohn was appointed Staff Officer.

In the view of the Committee the compilation and analysis of these medical statistics, in the circumstances of the present time, will have a general value in providing information in various directions with regard to the health and stamina of the male population of these islands, in addition to its particular value from the special points of view of military requirements and of the Army Medical Service. It is hoped that the organisation of the work during the War will allow a much more rapid and complete manipulation of the material after its Conclusion than would have been possible otherwise. The Committee may also allow themselves to believe that this work by their staff has given material assistance to the War Office in checking by contemporary observation and report the manner in which the regulations with regard to records have actually been followed in widely different places and conditions during the recent times of emergency and pressure.

In addition to this purely statistical work, Dr. Brownlee and his staff have also undertaken the sorting and classification of the medical and surgical case sheets from the Military Hospitals, which are called in by the War Office and sent at intervals to Guilford Street. These records, though they vary between wide extremes of value,

embody a very important mass of information which it is desired to make available in the most effective way for the purposes of permanent record in the official Medical History of the War. Dr. Matthew Young has been engaged temporarily to assist Dr. Brownlee in this work. It has already been found that the classification and summarising of these case sheets greatly facilitate the supply of information with regard to the later history of patients in this country, which has been sought for special purposes by Medical Officers with the Forces abroad for the guidance of their treatment of the cases at earlier stages.

Apart from this work on behalf of the War Office, Dr. Brownlee has continued the normal work of the Statistical Department. For his assistance in actuarial calculations Mr. H. L. Trachtenberg B. A., A.I.A., has been appointed for a period of service in the Department. Work upon the statistics of phthisis has been continued. Part of this is included in the Report of the Special Investigation Committee (Occupations and Phthisis) upon the Boot and Shoe Industry, but a more considerable portion will shortly be ready for publication. In co-ordination with the enquiry, by Sir Ronald Ross into Measles (see below, p. 46), a statistical study is being made of the epidemiology of that fever.

The services of Dr. Brownlee and his assistants have also been given to a special statistical investigation of the male population of the German Empire and its distribution in present circumstances, and the results of this have been supplied to H.M. Government.

Some of the results obtained during the year have been published by Dr. Brownlee in the following papers:—

Investigations into the Periodicity of Infectious Diseases by the Application of a Method hitherto only used in Physics.

Public Health, March, 1915.

On the Curve of the Epidemic.

British Medical Journal, May 8th, 1915.

Four Studies in the Meaning and Relationship of Birth and Death rates.

II. Density of Population and Death Rate (Farr's Law)

III. The Constitution of a Death Rate.

IV. On the Range of Instances in which Geometrical Progressions describe numerically processes of life, i.e., those processes which might be explained by a monomolecular reaction.

V. On the difficulty that in applying the laws of physical chemistry to life processes, indices occur which suggest the actions of fractions of a molecule.

Journal of Hygiene, Vol. xv, No. 1, July 30th, 1915.

Historical Note on Farr's Theory of the Epidemic.

British Medical Journal, August 14th, 1915.

Library.

The Committee have not been able in the special circumstances of the year to proceed with the formation of the Library, which must be regarded as a necessary part of a Central Research Institute. The subject is now under consideration.

Committtee And Secretarial Offices.

Temporary offices were taken for the Committee at St. Stephen's House, Westminster, in August, 1914. The question whether the offices of the Secretary to the Committee should ultimately be within the Central Institute or be provided separately and nearer to the official districts of London has been left for later settlement.

III.—GENERAL SCHEMES FOR RESEARCH.

In presenting their first list of Research Schemes in October, 1914, for approval by the Minister the Committee explained that the beginning of war had already interfered disastrously with the plans for research which the Committee had previously prepared. Nearly everywhere the staffs of pathological laboratories had been depleted by the loss of men taken for military or medical duties, and much delay had been necessary for the adjustment of the proposals of the Committee, many of which they had been obliged to recast.

'The recommendations even then made by the Committee had to be regarded as contingent in many instances upon the requirements of military duties, and it was expected that a good deal of the work proposed might have to be delayed for many months.

As the war proceeded and the need for medical and scientific assistance increased with the growth of the forces engaged, this expectation was realised, and the research work done on behalf of the Committee in directions not specially connected with the war has progressively diminished. Of the Research Schemes finally approved by the Minister after the meeting of the Advisory Council in November, 1914, the following have actually been initiated, and it will be seen that many of those begun have been subsequently postponed.

TUBERCULOSIS.

Special Bacteriological Problems.

At Edinburgh, Prof. Ritchie has been provided with a whole-time chemical assistant for the study of the chemical influences determining virulence and other characters of tubercle bacilli. This work has been suspended since June for the duration of the war.

At Manchester, and later in London, Prof. Boycott has been provided with a whole-time assistant for his work upon the chemical conditions of bacterial growth, with special reference to tuberculosis.

At Cambridge, Dr. Stanley Griffith has been engaged in whole-time research work on behalf of the Committee, in continuation of his earlier work for the Tuberculosis Commission, and he has been able to extend during the year his studies upon the attenuation and upon the mutations of type of the bacillus. His work has been done in the Field Laboratories near Cambridge, where the Committee have provided the necessary expenses. Publication has been made of some of his results (*Lancet*, June 19, 1915), and another communication is being prepared for the press.

Presence of the bacillus in the Blood, Much's granules &c.

Most of the work designed under this heading has been postponed but in London Dr. R. G. Canti, at St. Bartholomew's Hospital, and Dr. Carnegie Dickson, at the City Road Hospital, have been able to make a beginning of their proposed part-time work on this subject.

Pathology of Infection of Tuberculosis.

At Dublin, under Prof. McWeeney's direction, .Dr. W. D. O'Kelly has given whole-time work and Dr. O'Farrell part-time work to the investigation of the types of bacilli in surgical tuberculosis of children.

At Edinburgh, Dr. A. P. Mitchell has been able to give part-time work to the continuation of his former studies of bovine and human tuberculosis in children. Dr. W. Campbell has worked upon the generalisation in the body of tuberculosis infection, but postponed it in June in order to do military work.

The value of Tuberculin treatment.

At Midhurst, the Committee have provided clerical and visiting assistance to Dr. Bardswell for his work in following the after history of cases treated at the King Edward VII. Sanatorium, and this work, has been maintained throughout the year. The Committee have made arrangements for similar work, co-ordinated with this, to be done at the Alton Hospital, under the direction of Dr. Gauvain, and also at the Peamount Sanatorium, Dublin.

At Edinburgh, under the direction of' Prof. Lorrain Smith, and with the collaboration of Sir Robert .Philip, Dr. James Miller for six months gave part-time to work upon the effects of graduated doses of tuberculin, but has now postponed it to take a military commission.

Immunity Problems.

At Oxford, whole-time work by Dr. Ward was begun in Prof. Dreyer's laboratory, but postponed after two months.

In London, Dr. Teale has been provided with an assistant and some special laboratory expenses for his work on the relations of anti-tryptic and other chemical factors to the conditions of infection, especially of tuberculosis infection.

Radiography in the diagnosis of Tuberculosis.

Important work at Manchester and in London arranged under this head has been postponed, but some related work will be mentioned below in connexion with diseases caused by dust inhalation.

Effects of non-specific Treatment.

In Dublin, Dr. Crofton, with an assistant provided by the Committee worked upon the chemotherapy, of tuberculosis for several months until commissioned for service abroad.

The incidence of Phthisis in relation to particular occupations.

A special Investigation Committee was appointed to deal with this subject. Its members are: Dr. Addison (Chairman), Dr. Hill, 'Dr. Moore and Dr. Brownlee of the Committee's scientific staff, Dr. E. L. Collis Medical Inspector of the Home Office. Factory Department, with the Secretary of the Medical Research Committee.

The Investigation Committee have instituted an enquiry into the incidence of phthisis in relation to occupations at certain selected centres of industry; namely, Birmingham, Bradford, Leicester, Manchester, Sheffield, Cardiff, and Belfast. With the co-operation of the Medical Officers of Health for those Boroughs, the Committee are collecting for statistical analysis the returns of phthisis in factory workers, correlated with particulars supplied by the tuberculosis visitors.

Special study has also been made of the incidence of phthisis in the boot and shoe trade, and a report has been submitted to the Medical Research Committee giving the results. In this report the possibilities and advantages of a sanatorium in which the patients might be provided with work at their own trade, regulated in amount by their physical condition, are discussed.

A second report, upon phthisis in the printing trade, is in course of preparation.

RICKETS.

At Glasgow an important scheme of work has been arranged and generally directed by Prof. Muir and Prof. Noel Paton, which includes an attack upon this disease along separate lines of enquiry. Systematic social and dietary investigations in the city have

been organised, and these are being conducted by Miss Ferguson, with the help of a band of voluntary workers. Miss Madge Robertson, M.B., Ch.B., has received a whole-time research grant, in part for assistance in the medical superintendence of this visiting work, and in part for histological work. Dr. Findlay has given part-time in continuation of his work upon experimental Rickets, and, with the assistance of Dr. Madge Robertson, upon its morbid histology. Dr. Renton has given part-time work upon the effects of thymuscetomy and their relation to experimental Rickets. A chemical assistant has been supplied for work under Prof. Noel Paton upon metabolism in Rickets, connected with the other parts of the enquiry. Additional laboratory assistance has been provided by the Committee, as well as the special expenses of the whole scheme of research.

The following special enquiries in relation to Rickets have been undertaken at other centres:

Deficiency factors in diet.

In this investigation an attempt has been made towards the systematisation of hospital dietetic records with regard to children developing Rickets.

At Bristol, Prof. Walker Hall, after arranging the preliminaries of an organised enquiry in the city and district, postponed further work to give assistance in connexion with military hospitals.

In London, similarly, work arranged, under the direction of Dr. Corry Mann at the Evelina Hospital has been postponed, after a few months' work. Dr. Mann has reported to the Committee upon his preliminary results.

Relation of fat metabolism to Rickets.

In London, Dr. J. A. Gardner has studied the absorption of cholesterol and its distribution in the body in Rickets. Prof. Plimmer has kindly assisted this work by supplying occasional material from the Zoological Gardens.

At Sheffield, Prof. Leathes has been supplied by the Committee with a whole-time assistant for his work under this heading.

Analysis of general metabolism in Rickets.

At Leeds, Prof. Leyton has been supplied with a whole-time assistant for routine work in the analyses necessary for special studies of metabolism.

Determination of growth factors with special reference to Rickets.

At Cambridge, Mr. Winfield has given whole-time work under the direction of Prof. Hopkins to the study of the unknown but recognisable factors in diet, determining growth without apparent relation to energy supply.

At London, Dr. E. Mellanby has given part-time work, with an assistant supplied by the Committee, to the study of experimental Rickets and its relations to conditions of oxidation.

THE HYGIENIC RELATIONS OF MILK.

It appeared to the Committee, in view of the very large and scattered body of researches which have been published upon this subject, that it would be desirable to bring together for the convenience of workers and for the guidance of future research, the knowledge already available, with a summary of the experimental evidence on which it is based, and a full bibliography. With the permission of the President of the Local Government Board, the Committee accordingly invited Dr. Janet Lane-CIaypon, Assistant Medical Inspector to the Board, to prepare a monograph and critical review of the existing international literature upon the hygienic relations of milk, in extension of her special reports upon parts of the subject which have already been published by the Local Government Board. An honorarium will be paid to Dr. Lane-Claypon, and the Committee will provide the whole cost of publication. It is proposed to issue the work in a convenient and saleable form, and there is reason to think that the receipts upon sale will make the final cost of publication negligible. The Committee attach importance to this project, and it is hoped that if a monograph of this kind on a special subject proves to be useful for the stimulation and guidance of research, and perhaps also for the assistance of public health bodies, monographs upon other special subjects may be produced in a series. Dr. Lane-CIaypon's work is nearly ready for the press.

Methods of Sterilisation.

At Birmingham, preliminary work under the direction of Sir Oliver Lodge and Prof. Leith upon the electrical purification of milk has been begun, but is postponed for the present. It was hoped to extend at Birmingham the investigation of this process previously carried out in Liverpool.

Contamination of Milk.

At Reading, Dr. Stenhouse Williams is conducting an important enquiry into the persistence in pasture lands of tuberculous infection caused by infected cattle. He has been supplied with a whole-time assistant, and the Committee have provided the rent of experimental fields, and laboratory expenses.

At Dublin, Dr. Wigham and Dr. Speares have given part-time work under the direction of Prof. O'Sullivan to a study of the bacteriology of the Dublin milk supply.

The cellular elements of Milk.

At King's College, London, Prof. Hewlett and Mr. Revis have re-Investigated some points in this connexion and have published as an interim communication the results of work upon the technical methods necessary for the enquiry (*Lancet*, 24th April, 1915).

RHEUMATIC INFECTIONS.

At Bristol, Dr. Carey Coombs began work upon the bacteriology and morbid histology of rheumatic infections, but has now postponed this in favour of military work. It was hoped to begin also under his direction a study of the incidence of rheumatic infections in different parts of the city.

Work upon experimental rheumatic infections, which it was hoped to relate closely to the work at Bristol, was undertaken by Prof. Beattie, with the help of a whole-time assistant, but this has been necessarily postponed, together with similar work at Reading by Dr. Donaldson, in connexion with it.

DISEASES OF THE NERVOUS SYSTEM.

At Cardiff, Dr. A. J. Howell has studied the microchemistry of the cerebro-spinal fluid, especially tuberculosis meningitis, and Dr. R. V. Stanford, at the City Mental Hospital, with an assistant provided by the Committee, has worked at the improvement, of microchemical methods of analysis, and their adaptation to the study of the cerebro-spinal fluid in pathological conditions.

Dr. F. Sano, of Antwerp, has given wholetime work to the study of lesions of the brain, especially those of the speech centres, working at the Claybury Asylum Laboratory under the direction of Prof. Mott. He has published some preliminary results (*Proc. of Roy. Soc. of Med.*, 1915, Vol. VIII), and a further communication is in preparation.

THYROID SECRETION.

At London, Dr. P. P. Laidlaw, with Mr. Finnemore, has worked at Guy's Hospital on the chemical relations of iodine to the thyroid secretion.

At Cardiff, Mr. M. H. Renall has given part-time work to investigating the etiological importance, of iodine in endemic goître.

CHRONIC (RHEUMATOID) ARTHRITIS.

This disease has been the subject of special study by Dr. Strangeways at the Research Hospital equipped for the purpose at Cambridge by voluntary subscriptions. The Committee had hoped to support a development of the work here in the direction of surgical treatment, but from the beginning of the war the hospital has been lent to the War Office for the accommodation of wounded officers. Dr. Strangeways, however, has been able to give a large part of his time to a continuation of his previous work on the morbid anatomy of chronic arthritis. He has received a research grant from the Committee for this and for further study of the pathological material already accumulated at the hospital. A report upon this recent work is now ready for publication.

DUST INHALATION AND PULMONARY DISEASE.

The Committee have taken part in a general scheme of research in extension of previous work upon this subject, which was arranged in consultation with representatives of the Home Office and coordinated with work already undertaken in special directions on behalf of a Committee of South African miners. The part taken in the joint scheme by the Committee has been the subvention of the following work, arranged in consultation with Dr. J. S. Haldane.

At Liverpool, Prof. Beattie has been provided with a whole-time assistant for the continuation of his work upon the effects produced by dangerous dusts (*e.g.*, powdered flint) and harmless dusts (*e.g.* coal dust) respectively.

At Oxford, Dr. A. E. Mavrogordato has received a whole-time research grant for assistance to Dr. Haldane in his studies of the effects produced by dusts in mines and workshops. The special expenses of the histological and other laboratory work done at Oxford have been defrayed, and an allowance has been made for travelling and other expenses.

At Stoke-on-Trent, Dr. Mellor, Director of the Pottery School, has been given a grant in respect of his work upon the chemical and physical characters of dangerous particles.

In addition to this group of researches, a grant has been made for additional experiments by Dr. Barwise, of Derby, upon the effects of the inhalation of gritstone dust on the Incidence of phthisis.

At St. Helens, the Borough Council have supported work upon the radiography of phthisis, with special reference to the results of coal-dust inhalation. The Committee have made a grant for the completion of this work by suitable control observations.

ORAL SEPSIS.

At Cardiff, Dr. H. A. Scholberg, with Dr. Mitchell Stevens, has given part-time work to a study of the relations of oral sepsis to other diseases among industrial workers.

For the present other work upon this subject has been deferred.

DIABETES.

At London (St. Thomas's Hospital), Dr. H. McLean has received a grant for part-time work, and has been provided with a whole-time assistant for his studies of the glycolytic activity of the blood in cases of diabetes, for which special clinical opportunities have been put at his disposal in the hospital. New technical methods have been developed for the determinations required, and a preliminary account of the results obtained is in course of publication.

At St. Bartholomew's Hospital, Dr. J. Trevan is giving part-time work to a study of acetonuria, especially in conditions of salicylism.

ANAPHYLAXIS.

The studies under this heading already undertaken in the Biochemical Department have been previously mentioned. It is hoped at an early date to appoint a special Investigation Committee for the closer co-ordination of schemes of work in this direction. In the meantime the following researches have begun at other centres.

At Leeds, Prof. Leyton has been given assistance in his work upon anaphylactic shock, with special reference to the cardio-vascular system.

At London (St. Bartholomew's Hospital), Dr. A. E. Stansfeld has worked with a part-time grant at hypersensitivity in asthma and allied clinical phenomena considered in relation to anaphylaxis.

DISEASES OF THE HEART.

The development of cardiographic studies under Dr. Thomas Lewis at the University College Hospital, London, has provided an obvious opportunity for co-ordinated work at this centre. In their first list of schemes of research the Committee arranged to provide Dr. Lewis with a medically qualified assistant giving part-time work, and to make a further grant to the support of the cairdiographic department.

At the same time a grant was made to Prof. Starling for the provision of optically recording apparatus to be used at University College in physiological work correlated with the clinical work carried on at the hospital. The establishment of this apparatus has begun, but the work, in which it was proposed that Dr. Evans, with a grant for part-time work, should assist Prof. Starling, has been postponed.

More recently a scheme for the investigation of military cases has been arranged in connexion with the Cardiographic Department of the Hospital, and will be mentioned below (p. 44).

GENERAL PATHOLOGICAL RESEARCHES.

At Cardiff several investigations of a miscellaneous character have begun, Mr. Shaxby has given part-time to a study of the biophysics of Brownian movement. Prof. Emrys Roberts has studied the infections by organisms belonging to the group Eudomyees, and under his general direction, Mr. T. H. Burlend has received a part-time grant for work upon the morbid histology of ductless glands, and Dr. H. Evans for work upon bacilluria, with special reference to the coli group. Dr. S. J. Ayre has made special studies of diphtheria in local areas where it is both epidemic and endemic.

At Edinburgh, Prof. Lorrain Smith has been provided with a whole-time assistant (Dr. Rettie) for chemical work in connexion with his researches upon the lipoid content of organs and its relation to different conditions of toxaemia, and the following researches have also been prosecuted.

Dr. John Anderson has received a grant for the clerical expenses involved in a statistical enquiry into the deaths of children during the administration of anaesthetics, with special reference to the condition of *status lymphaticus*.

Dr. W. B. Drummond has received a part-time grant for his work in the preparation of a Binet scale for the blind and the grading of alternative mental tests.

Dr. John Tait has received a part-time grant for work upon the blood cells and the vascular endothelium. Some of the results of this work are being published (*Proc. Roy. Soc.*, 1915).

Dr. W. R. Logan has worked in Prof. Ritchie's laboratory at the anaerobic bacteria, with special reference to epidemic infantile diarrhoea, but has postponed further enquiries upon accepting a commission.

IV.—WORK IN CONNEXION WITH THE WAR.

At the outbreak of war it became obvious to the Committee that they were charged with the administration of State resources for scientific and medical work which ought as a matter of course to be placed freely at the disposal of the National Executive, and especially of the Army Medical Department, for suitable use in connexion with problems arising out of the war.

It appeared to the Committee that if any justification were necessary for such an application of the funds under their direction, having regard to their origin, it could be found in two-fold degree. Upon the formation of the large new armies, many questions relating to their health became problems belonging to the welfare of the country at large. The special circumstances of war, moreover, and the numerical magnitude of some of its results, seemed likely to give, and have been found in experience to give, unequalled opportunities for study and research, of which the outcome may bring lasting benefits to the whole future population.

The Committee accordingly sought and obtained permission from the Chairman of the Joint Committee (see page 13 above) to offer assistance in the first place to the Army Council with a view to the special needs of the Army Medical Department. Of the work that has been done in this connexion and on behalf of other Government Departments the following summary is submitted.

The Central Research Institute And Its Departments.

It has been noticed already that the Mount Vernon building at Hampstead, with its grounds, has been lent to the War Office for use as a Military Hospital, and that the resources of each of the four scientific Departments have been employed for special war work. Of this work the largest and most costly single undertaking has been the compilation of the Medical Statistics of the War on behalf of the Army Council.

Pathological Work at Military Hospitals.

In the rapid mobilization of the General Territorial Hospitals the arrangements made for the service of pathologists and the equipment of pathological laboratories in the hospitals were not in all cases adequate at the beginning.

The Committee offered to assist the War Office by making additional provision, so far as possible, for pathological work at all the military hospitals needing it. This offer was gratefully accepted by the Army Council, and the Council issued instructions that officers in charge of the various military hospitals should at once communicate their needs for pathological assistance to the Secretary of the Committee.

These needs were found to vary widely in different places, both in character and amount. At some of the large Territorial Hospitals complete arrangements had been made for routine pathological and bacteriological work; at others practically none.

In general, where officers had been commissioned for this work, grants were made by the Committee for the better equipment of laboratories and for the supply of apparatus not found in the current War Office list for requisitions, or of special apparatus for particular purposes outside the common routine of hospital work. At many of the centres, grants have been made for part-time work by pathologists without commissions, whose work in some cases is carried out in adjacent laboratories belonging to University or other bodies. In certain cases the Committee have equipped special laboratories within military hospitals for the purposes of routine work, or for the conduct of special enquiries, or both.

In several cases the Committee were able to bring to commanding officers offers of voluntary work or of laboratory accommodation made by neighbouring pathologists, and in many cases the fact that the question of pathological work had been raised was followed subsequently by the appointment of commissioned officers to duty as pathologists, and the first provision of pathological laboratories. Actual expenditure by the Committee in this direction has, in fact, become unnecessary in some cases in which it was at first needed and offered, and it has tended to diminish in proportion as routine work by pathologists has been increasingly regarded by commanding officers of the Territorial and Military Hospitals as an indispensable part of hospital service. Grants made by the Committee have accordingly become more exclusively devoted to specialised work or to investigations required for particular purposes.

In the circumstances, it appeared to the Committee that it was useless and undesirable to attempt to draw a line between routine work and special research work, and that it was not improper to assist the former from the Medical Research Fund. Apart from the military exigencies of the time, routine work in proper hands may be expected very often to suggest and to give an opportunity for research work. It was hoped, moreover, that the results of purely routine examinations—as for instance, those of the bacteriology of infected wounds—might provide, if adequately recorded and correlated, valuable gains in knowledge and in methods of treatment.

Expenditure from the fund has been incurred in respect of the following Military Hospitals:—

General Hospitals (Territorial Force).

Cambridge (1st Eastern):

A laboratory for special enquiries has been equipped by the Committee, for work additional to the routine work done in another laboratory in the hospital. The work

here has been chiefly in connexion with cerebro-spinal fever and will be referred to below. A grant has also been made for special apparatus to be used for the study and treatment of muscular degenerations after injuries to nerves.

Brighton (2nd Eastern):

A whole-time assistant bacteriologist has been provided for routine work and for special enquiries.

Camberwell (1st London):

For five months an assistant has been provided, and some apparatus, for special enquiries by Captain Andrewes.

Chelsea (2nd London):

Dr. Dudgeon has investigated infected wounds at St. Thomas's Hospital in connexion with this General Hospital and has been provided with two part-time assistants.

Wandsworth (3rd London):

Some additional apparatus has been provided, and a grant made for some special laboratory expenses in work by Captain Warren.

Denmark Hill (4th London):

Captain Emery has been provided with assistance for routine work, and for enquiries into the anaerobic infections of wounds.

Leeds (2nd Northern):

A grant has been made for special equipment, and for the expenses of work by Dr. Matthew Stewart upon coliform organisms in wounds. Additional apparatus was provided for work by Captain Vining.

Sheffield (3rd Northern):

A grant has been made for the expenses of a special enquiry by Prof. H. R. Dean (Captain R.A.M.C.T.) into anaerobic wound infections, and more recently for the expenses of routine work for the hospital by Prof. Sholto Douglas.

Leicester (5th Northern):

A grant has been made for part-time pathological work and some special apparatus has been provided.

Aberdeen (1st Scottish):

A grant has been made for special apparatus and equipment in the pathological and research department of the hospital.

Edinburgh (2nd Scottish):

Pathological assistance by Dr. James Miller has been provided, and special work by Dr. Rutherford on wound Infections.

Glasgow (3rd and 4th Scottish):

A pathological assistant has been provided to serve both hospitals, and expenses for work directed by Prof. Muir (Lt.-Col. R.A.M.C.T.).

Birmingham (1st Southern):

Expenses have been provided for assistance given to the hospital by Prof. Leith in the University laboratory.

Bristol (2nd Southern):

The pathological laboratory was equipped by the Committee.

Oxford (3rd Southern):

A grant was made for special work in connexion with the hospital by Prof. Dreyer and two colleagues at the University laboratory.

Plymouth (4th Southern):

Some laboratory expenses were provided for Captain Pethybridge.

Liverpool (1st Western):

Assistance has been provided for work done in the University laboratories by Prof. Glynn and Prof. Beattie.

Manchester (2nd Western):

Grants have been made for pathological work under the direction of Prof. Délépine. This has been directed to special work in connexion with typhoid infections and cerebro-spinal fever, and will be referred to below.

Cardiff (3rd Western):

Captain Scholberg has been provided with a part-time assistant. Expenses have been provided for the collection of material from the scattered group of hospitals, and some laboratory expenses have been defrayed.

Other Military Hospitals.

Belfast:

A whole-time assistant has been provided for Dr. W. J. Wilson in his work in connexion with military hospitals of the Belfast district.

Royal Free Hospital, London:

Further assistance by a woman bacteriologist has been provided for work in connexion with the military wards.

Endell Street Military Hospital, London:

Dr. Helen Chambers has been provided with a woman assistant to leave her more free for special enquiries.

Duchess of Connaught Hospital, Cliveden:

A grant has been made for special equipment in the laboratory.

Welsh Hospital, Netley:

A laboratory attendant and expenses of apparatus have been provided for Dr. W. MacAdam for work upon anaerobes in septic wounds.

Reading War Hospital:

A grant has been made for additional equipment in the laboratory.

British Red Cross Hospital, Netley:

A whole time bacteriologist (Dr. J. P. Dunn) has been provided to assist Captain Tidy.

Devonport Military Hospital:

A grant has been made for part-time work by Dr. Warren Crowe and for a part-time assistant. The whole-time services of Dr. Shearer have been provided, especially in connexion with work upon cerebro-spinal fever to be referred to below.

Queen Mary's Military Hospital, Whalley:

A grant has been made for apparatus and equipment.

Guernsey:

A grant has been made for part-time pathological work.

Royal Herbert Hospital, Woolwich:

Special laboratory expenses have been provided for work by Dr. W. E. Bullock and Dr. B. R. G. Russell (Lieuts., R.A.M.C.) upon anaerobic infections of wounds. A grant has been made for work by Dr. K. Goadby in collaboration with surgeons on the staff upon the treatment of wound sepsis by autogenous vaccines.

At an early stage of the war, the Committee made arrangements to provide for the performance of Wassermann tests, undertaken by Dr. Fildes of the London Hospital, for any military hospitals without the necessary facilities. Several hospitals took advantage of this, but more recently this assistance has become unnecessary.

Special Enquiries.

The Committee Invited Colonel Sir William Leishman, one of their members, to indicate in his capacity of Adviser in Pathology to the British Expeditionary Force the chief directions in which it appeared desirable that special enquiries should be at once instituted, and a memorandum containing his suggestions was drawn up and circulated to all the suitable research centres. Many of the questions raised in the memorandum were selected by particular pathologists and made the basis of immediate work. The results of these investigations have been communicated to him from time to time, and reports have also been obtained from expert sources upon particular questions when need has arisen.

The following researches upon special subjects have been arranged or assisted by the Committee.

Antiseptics.

No subject for research has served of more urgent importance than that of the pathology of infected wounds considered with a view to their effective treatment. It is not an exaggeration to say that the recent experience of septic wounds inflicted under the conditions of the European battlefields has revealed previously unsuspected difficulties in treatment which the resources of modern surgery have not been able to overcome.

Sir Almroth Wright, with his staff supplied by the Committee, has directed at Boulogne the chief part of his work to the study of infected wounds and their treatment. His provisional results, in which emphasis is laid upon the value of physiological methods of wound treatment, as contrasted with antiseptic treatment by artificial bactericides, have been published as already mentioned (p. 16). His work is still in progress. Meanwhile, the treatment of wounds by a hypertonic salt solution without antiseptics, to which his work drew attention, is being extensively used in practice and is giving results regarded by many as superior to those obtained by the ordinary use of antiseptics.

The Committee, however, have also supported further enquiries into the actions, experimental as well as clinical, of particular antiseptics, and of new preparations of antiseptic value.

At London the Committee have provided work by Dr. Fildes and by Dr. Rajchman upon the bactericidal powers of certain antiseptics, and in particular those of preparations of malachite green and mercuric salts. This work was done in collaboration with Surgeon General Cheatle, who made the parallel clinical observations at Haslar. Their preliminary results have been already published (*Lancet*, July 24th, 1915).

At Edinburgh an investigation has been carried out by Prof. Lorrain Smith, assisted by Dr. Murray Drennan, Dr. Rettie, and Dr. William Campbell, into the antiseptic action of hypochlorous acid, and they have brought forward two special preparations, one in powder, recommended with a view to first-aid dressings in the field, and the other

a solution, which have given valuable clinical results in the experience of many surgeons. An account of their work was published in the *British Medical Journal*, July 24th, 1915.

Quite independently of this work at Edinburgh, another set of observations upon hypochlorous acid as an antiseptic was instituted at Compiègne by Dr. Dakin, who prepared a solution of hypochlorous acid closely similar in some respects to that recommended as the result of the work at Edinburgh, and he proceeded to examine further a long series of aromatic compounds containing the chloramine group. His experimental work was followed by clinical observations conducted by Dr. Carrel, while in the preparation of the substances examined Dr. Dakin was assisted by Prof. Cohen at Leeds, for whom the Committee provided a whole-time chemical assistant for this purpose. The results of Dr. Dakin's work were published in the *British Medical Journal*, August 28th, 1915.

Dr. Dakin has now come to England, and the Committee have provided a grant for his whole-time services in further investigations into the effects of antiseptics and the treatment of infected wounds. He has proceeded on behalf of the Admiralty to the Mediterranean, and will be given exceptional opportunities for applying and reporting upon the methods which have already given good results in France and in this country.

The Committee are hoping to obtain reports from surgeons and bacteriologists at many military hospitals, who have undertaken to apply and estimate in practice the results of these several enquiries made on behalf of the Committee. In particular, grants have been made for special laboratory and clinical study of the antiseptic preparations already mentioned, to be carried out by Dr. Dudgeon and his assistants at St. Thomas's Hospital, and by Dr. David Sommerville at the Hampstead Military Hospital, in both cases with the collaboration of surgeons.

Typhoid and Paratyphoid Infections.

At Manchester the Committee have supported a special investigation in Prof. Déléphine's laboratory by Dr. Dawson, upon the methods of diagnosing typhoid infections in previously inoculated men, a chief result of which has been the description of a method in which blood reactions with *Bacillus enteritidis* are used as a means of diagnosis. A preliminary account of this work has been published in the *British Medical Journal*, July 24th, 1915.

At Oxford during the early months of the war, Prof. Dreyer with Capt. Ainley Walker and Capt. Gibson, studied the same problem of distinguishing between the reactions of inoculated men and those in cases of fresh active infection, and have used Prof. Dreyer's macroscopic agglutination method. Their results were published in *The Lancet*, February 13th, 1915. This work was continued by Prof. Dreyer in France, and applied by Dr. A. C. Inman, who received a grant for the purpose from the Committee, in hospitals at Wimereux. The results of their work there were published in *The Lancet*,

July 31st, 1915. The method has now been adopted widely both at home and abroad, and the Committee, to meet the need for a supply of standard typhoid and paratyphoid agglutinable emulsions, and standard agglutinating sera, have established at Oxford, under Prof. Dreyer's direction, a department for the necessary standardisation, and have arranged for the supply of emulsions and sera to military hospitals, together with the simple apparatus needed for their use in agglutination tests and in the measurement of agglutinative values. Dr. A. D. Gardner has been appointed by the Committee to give whole-time assistance at Oxford in the standardisation department, and a grant has been made for the whole expenses of the department.

Standard cultures and sera, with apparatus, have already been supplied upon request to upwards of a hundred military laboratories in this country and abroad, and it is hoped that their use will not only aid the diagnosis and study of the typhoid and the *a*- and *b*-paratyphoId infections but also allow accurate comparisons to be drawn between the records of observations made by various observers in different places at different times. This unification of records may be expected to add greatly to the general value of the large volume of work upon these infections now being done.

Prof. Dreyer and his colleagues have also applied to military cases at Oxford his method of separating *Bacillus typhosus* or *para-typhosus* rapidly from mixtures of these with other organisms, by the use of particular wave-lengths of light. The results were published in *The Lancet*, March 27th, 1915. For the further study of the method the Committee have supplied the necessary apparatus for independent work in its application, by bacteriologists in military hospitals at Boulogne, London (3), Leicester, Netley, and Alexandria.

Cholera Expedition to Galicia.

Dr. John Freeman, with an interpreter, was sent by the Committee in the autumn of 1914 to Galicia, where he enjoyed the temporary rank of Lieut.-Colonel in the Russian Army, in order to investigate the various strains of cholera infection, endemic, or epidemic, in that district, and to bring to this country cultures of the chief strains. It appeared important to the Committee that these strains should be available for the preparation of vaccines in view of the possible eventuality of a transference of infection to the Allied Forces in the western theatre of war. The results of the expedition were placed at the disposal of the Inoculation Department of St. Mary's Hospital, which has been able already to supply large quantities of anti-cholera vaccines to the Serbian Government and to the British Forces in the Mediterranean area.

Bilharzia Expedition to Cairo.

The Committee have co-operated with the War Office and with the London School of Tropical Medicine in sending an expedition to Cairo to apply the results of recent

discoveries with regard to the life history of Bilharzia, and to extend them by the investigation of the species of Bilharzia which is endemic in the Nile Delta. In certain districts here from 80 to 90 per cent, of the native population are infected, and are a potential source of danger to other persons. The expedition had for its immediate practical object a settlement of the best prophylactic measures to be taken for the protection of the military forces in Egypt, but it had in view also the complete investigation of the natural history of the primary infecting agents. 'The War Office provided temporary commissions for Dr. Leiper, and for his two assistants. Dr. Cockin and Dr. J. G. Thomson. The London School of Tropical Medicine granted permission to all three members of their staff, while retaining their appointments, to accept commissions for the period of the enquiry. The Medical Research Committee made a grant to cover the expenses of the actual investigations, including the expenses of the laboratory and field work and the hire of boy collectors.

The expedition has been completely successful in its immediate purpose. Lieut.-Colonel Leiper has succeeded in demonstrating that Egyptian Bilharziosis cannot be directly communicated from man to man, but is only transmitted through a fresh-water snail, in which its alternate form is parasitic. The mode of Infection has been followed experimentally with material taken from infected molluscs collected in the endemic area.

This new knowledge of the various stages in the alternate generation of this species from man, through the snail, to man again, and of the characteristics of the indeterminate free-swimming forms, has transformed the future basis of preventive measures, which rested formerly upon the previous work by Loos and others at Cairo. It is now known as the result of this expedition that transient collections of water are quite safe after recent contamination, and not, as thought before, unsafe; and further, that all permanent collections of water, such as the Nile, the canals and the marshes, are always dangerous from the possible presence of the snail as the essential intermediary host, instead of being, as on the former hypothesis, not easily liable to be infective. Again, it is now known that an infected area may retain its infection at least for many months through the persistence of intermediate hosts, while the previous work led to a belief that all water in a given area would become safe in thirty hours if reinfection by the human population were prevented. It was argued formerly that infected troops could reinfect themselves and convey the disease to other parts of the world, but it is now known that they cannot reinfect themselves or spread the disease in other parts of the world, except where a local snail can act efficiently as carrier. Many other fundamental revisions of hygienic practice will also depend upon the new knowledge of the facts.

Since there are certain physical conditions almost peculiar to Egypt which are inimical to the Bilharzia intermediate forms and the snail carrier, these, if properly exploited by scientific supervision of the irrigation, which is under Government control, may be expected without great expenditure to bring about in the course of a few years complete eradication of a disease which has ravaged Egypt for centuries.

The expedition determined the special precautionary measures in regard to the treatment of water which are sufficient to safeguard the military forces for immediate purposes.

A full account of the work done is now appearing in successive numbers of the R.A.M.C. Journal, and the Committee are giving assistance to the preparation of some of the material for publication.

Upon Colonel Leiper's suggestion, and in collaboration with him, Dr. Dale is making experiments in the Biochemical Department of the Committee with a view to finding therapeutic agents of curative value for the disease when once acquired.

Cerebro-Spinal Fever.

In recent years there has been an epidemic of cerebrospinal fever upon a small scale during the earlier months of each year in this country. Early in the present year the disease reappeared in the normal course, and may also have been introduced independently by visiting troops. The concentration of large bodies of troops in billets and camps presented favourable conditions for the propagation of the disease, and the Committee, cooperating throughout with the military authorities, have given every assistance in their power for its investigation and the control of the epidemic.

Dr. Mervyn Gordon was appointed by the Committee to organise and direct the bacteriological work done on their behalf. The Committee have provided him with a whole-time salary and have lent his services to the War Office to direct the bacteriological work done in connexion with the military forces in all parts of the country, the War Office having obtained for him an honorary commission. After arranging work at the various centres and advising upon the administrative measures to be taken, Major Gordon has been engaged in important researches into the disease, and the characters of the different strains of the *meningococcus* which have been isolated. Of this work a preliminary account has been published (R.A.M.C. Journal, May, 1915), and a further paper is in preparation. The Committee have supplied Major Gordon with whole-time assistance by Dr. Macaulay Hine (Honorary Captain) and by Dr. E. G. Murray, and his work with them has been carried out in the R.A.M.C. laboratory at Millbank, which has served as a centre for the supply of *media*, and other apparatus for the work done in the provinces.

The Committee have made further grants for work done on behalf of the War Office in this connexion by Dr. McIntosh at Woolwich, Dr. Claridge at Norwich, Dr. Finlayson at Brighton, Dr. Solly and Dr. Adkins at Exeter, Prof. H. J. Hutchens at Newcastle, Mr. Vines at Cambridge, Dr. Tylecote at. Manchester, Prof. Walker Hall at Bristol, Dr. S. B. White at Nottingham, Dr. Warren Crowe and Dr. Shearer at Devonport, Prof. Dean at Sheffield, Dr. Purce of Belfast, and Capt. Scholberg at Cardiff.

The Committee have also placed their research beds in St. Mary's Hospital at the disposal of the War Office for a special investigation by Dr. Colebrook, assisted by Dr. Tanner, into the sterilisation of positive contacts infected with the *meningococcus*. The results of this work are now ready for publication.

With a view to the co-ordination of the results of all the experience which has been gained during the epidemic, which extended from January to June, and for the guidance both of the administrative measures which must be prepared for the probable outbreak in the early months of next year and the guidance also of future research, the Committee have appointed as an Advisory Committee Prof. F. W. Andrewes (Captain R.A.M.C.T), Prof. R. T. Hewlett and Prof. W. Bulloch, to consider and report upon the work which has already been published in connexion with the outbreak, as well as the reports which have been received privately by the Committee from their workers. The members of this Committee (except Dr. Bulloch) will receive a small honorarium for their services. They will prepare a critical summary of the work which has been done, and their report will be placed at the disposal of the military authorities with a view to such action as may seem desirable.

Meanwhile, as the outcome of experimental work already begun at Millbank and elsewhere, the Committee have given assistance to special researches upon the chemistry of bacterial actions, with a view to the elucidation of problems connected with the cultural characteristics of the *meningococceus* and the agencies which appear to affect its growth and virulence.

This work, begun in close association with the study of cerebro-spinal fever, seems likely to develop into a general scheme for research bearing upon manifold problems of bacterial disease, and it may be described under a separate heading.

Chemical factors in bacterial growth.

At Millbank, Lieut. Davies began work with Major Gordon upon the chemical factors concerned in the growth of the *meningococcus*, and upon his leaving for service abroad this work has been continued by Dr. F. E. Taylor at King's College, London, who has received a part-time research grant from the Committee.

At Cambridge, closely allied work was originated in the research laboratory of the Committee at the 1st Eastern Hospital, and will be continued by Mr. H. W. C. Vines. This will form part of a co-ordinated scheme of work under the general direction of Prof. Hopkins, not confined to the study of the particular organism of cerebro-spinal fever. Mr. H. Raistrick has received a whole-time grant for work here upon the chemical results of bacterial growth. A grant has also been made for connected work upon the physicochemical conditions of growth in bacterial cultures, by Mr. S. C. Cole, in collaboration with the Hon. H. Onslow, and the special laboratory expenses for both sets of researches will be provided by the Committee.

Neurological Enquiries.

The Committee have assisted the War Office in arranging for the better coordination of the study and description by trained observers of the important groups of neurological cases at military hospitals. This assistance has been given by the Committee as part of the work they have undertaken for the War Office in the compilation of the medical statistics of the war. In the view of the Committee, however, the proper preservation of the neurological records will have great scientific value and importance, quite apart from their immediate historical or military significance. If the abundant observations now being made by skilled observers can be adequately recorded and collated, valuable gains to knowledge must emerge, and these may be expected in the future to benefit directly the proper guidance of treatment, in civil no less than in military practice.

In conjunction with workers abroad, nearly fifty neurologists in London and at the various provincial centres are now working upon a common plan, the Committee providing certain printed forms, diagrams and apparatus. A card index is being compiled with reference to the full clinical records in individual hands. Notes upon the experience obtained by various observers have been circulated by the Committee and meetings of those engaged in the work have been held.

In connexion with this scheme, grants have been made for part-time work by several uncommissioned physicians for special assistance in the study of cases both of structural nervous injury and of functional nervous disorder due to physical concussion, mental strain and other conditions. In London, particular assistance of this kind has been given by Dr. Antony Felling, Dr. F. M. E. Walshe, Dr. Percy Saunders, and Miss Peake in Edinburgh; by Dr. W. B. Small at Manchester, by Dr. J. S. B. Stopford; at Liverpool, by Dr. Philip Nelson. At Moss Side, Dr. W. H. R. Rivers is similarly on behalf of the Committee assisting Major Rows in the study and treatment of functional cases there. At Claybury, Dr. A. Mussen is giving whole-time work to the preparation of microscopical material in connexion with fully recorded cases under the charge of neurologists elsewhere, who may not have time or opportunity in the circumstances of their military duties for the necessary histological work.

The Committee have given secretarial assistance also for supplying information to medical officers abroad, with regard to the progress of cases of cerebral or nervous injury received in this country with a view to the guidance of the treatment of the cases in their earliest stages.

Testing of Salvarsan Preparations.

Subsequently upon the outbreak of war, the Board of Trade suspended the patent and trade mark of the drugs Salvarsan and Neo-Salvarsan in favour of two manufacturing firms. Licence was granted by the Board to Messrs. Burroughs Wellcome &

Company for the manufacture, in this country of these preparations, which they sell under the names of Kharsivan and Neo-Kharsivan, and to the Société Anonyme des Établishments Poulenc Frères of Paris for the sale, through agents in Great Britain, of the same products under the names of Arsenobenzol-Billon and Novarsenobenzol-Billon.

Although the manufacture in both these instances adopted distinguishing trade names for their preparations, the latter are not merely similar substitutes for, but are chemically identical with, Salvarsan and Neo-Salvarsan, and they differ in no known respect from Ehrlich's original products; either in their final constitution or in the details of their preparation.

Apart from the dangers, open to chemical estimation of what may be called the ordinary toxicity belonging to these preparations there may be associated with them other toxic products of unknown constitution, which arise through uncontrollable accidents of preparation. The necessary safeguards against these can only be provided in the present state of knowledge by animal experiment, of which the result gives evidence of the total toxicity, from whatever source it comes.

The Board of Trade licence in both the above cases, therefore, was granted subject to the condition that all samples of› these drugs sold in this country should be submitted to biological tests by an authority approved by the Board. In the special emergency of the war the Medical Research Committee, at the request of the Board of Trade, accepted for the time being the responsibility of directing these biological tests.

The tests are performed by experts approved by the Committee, and a certificate signed by the Secretary of the Committee is issued to allow the sale of each batch of which samples have passed satisfactorily the proper tests. The out of pocket expenditure incurred in the testing is charged to the manufacturers.

When the Committee were invited to undertake this work, there was no time for any elaborate preliminary investigation of new methods of biological assay. The public need for immediate and abundant supply was urgent, and the existing stocks of German production were found to be too low to allow delay. The Committee entrusted the details of the work to most competent pharmacological workers, who took as a basis for the biological control, supplementing the chemical tests of the manufacturer, the methods and standards which had previously been found adequate in Ehrlich›s Institute. These tests have been regularly applied, and at an early date the experimental work which was done under their direction showed in the opinion of the Committee, that the problem of the successful manufacture of the Salvarsan compounds in England and France had been solved. This opinion has more recently been confirmed by clinical reports received from medical officers working in various special hospitals.

By the communication from time to time to the manufacturers of certain findings of scientific workers entrusted with the problem by the Committee, assistance has

been given wherever possible towards the establishment of fully satisfactory technical manufacturing methods.

In the course of this work investigations have been made which give promise that improved technical methods for the performance of biological tests of the kind needed for this purpose may shortly be reached.

Acute Nephritis.

At the request of the Director-General of the Army Medical Service, the Committee organised a special enquiry into a group of military cases of Acute Nephritis (Epidemic Dropsy). The Committee arranged for the reception of cases in two of the military wards at St. Bartholomew's Hospital. Those have been under the care of Captain W. Langdon Brown, whose clinical observations were correlated with bacteriological work supplied by the Committee under the direction of Captain F. W. Andrewes. The Committee also provided chemical assistance by Dr. Trevan and Dr. Mackenzie Wallis, Interim reports were made to the military authorities from time to time, as various etiological questions were settled in succession. A preliminary account of the work by Captain Langdon Brown has appeared in the R.A.M.C. Journal (July, 1915), and a complete report will be published shortly. This work has already given results of considerable medical interest beyond the immediate military requirements of the investigation.

Dysentery.

The Committee have arranged for the organisation of special bacteriological work by Dr. Rajchman and Dr. G. T. Western at the London Hospital and by Captain Douglas and Dr. Colebrooke at St. Mary's Hospital, in connexion with the types of dysentery in the London district coming from the Mediterranean Expeditionary Force.

Work by Dr. Logan, under the direction of Prof. Ritchie at Edinburgh, upon forms of dysentery has also been provided.

Industrial Fatigue and the Health of Munition Workers.

A research grant for part-time work has been given to Mr. P. Sargant Florence for enquiries into physiological fatigue in factories, and its estimation by reference to output and to the incidence of accidents, in continuation of work previously done by Mr. Florence on behalf of a Committee of the British Association. The services of Mr. Florence have been placed at the disposal of the Health of Munition Workers Committee (Ministry of Munitions of War) for certain enquiries needed in their work.

Disorders of the Soldier's Heart.

The Committee have arranged a scheme of study under the general direction of Sir James Mackenzie for investigation of cardiac disorders of military importance.

Special beds have been reserved by the War Office in the military wards at University College Hospital for the reception of certain groups of cases. Dr. Thomas Lewis (Captain, R.A.M.C.T.), assisted by Captain Cotton (CA.M.C.), detailed for the purpose by Surgeon-General Carleton Jones, Director of Medical Services, Canadian Contingent, has charge of these beds, and the apparatus of the cardiographic department in the Medical School of the Hospital, previously mentioned as assisted by the Committee, will be available for this special work. For the investigation of cases in which the cardiac disorders depend upon infective conditions, part-time bacteriological assistance by Mrs. Briscoe, M.B., has been provided for work under Dr. Teale's direction. With the approval of Sir Alfred Keogh the Committee have provided Sir James Mackenzie with assistance by Dr. R. M. Wilson, for the examination of military cases elsewhere, and of recruits and for help in the organisation of work by particular medical officers at provincial centres who have undertaken to collaborate with Sir James Mackenzie in this enquiry. Secretarial assistance is supplied at the Committee's offices.

Gunshot Wounds of the Chest.

Prof. T. G. Brodie (Capt., C.A.M.C.) and Prof. J. J. Mackenzie (Capt., C.A.M.C.) have been detailed by Surgeon-General Carlton Jones for special work upon the structural changes of the lungs and of the breathing capacity supervening upon gunshot wounds. The Committee are collaborating by the provision of a grant for laboratory expenses, and for skilled assistance in the technique of gas analysis by Dr. W. C. Cullis and Mrs. Tribe, in the laboratories of the London School of Medicine for Women, where the experimental work is carried out. Dr. Garrett Anderson and Dr. Flora Murray have given facilities in the Endell Street Military Hospital for clinical observations and the enquiries have already led incidentally to the adoption of a system of breathing exercises which have been found useful in certain convalescent cases. A preliminary publication of the results is now in preparation.

Captain A. H. Caulfield (C.A.M.C.), also detailed by Surgeon-General Carlton Jones, is investigating at St. Bartholomew's Hospital particular infections of the pleural cavities, and the Committee are providing the necessary laboratory expenses. This work has given results of interest in connexion specially with streptococcic infections and these will now be followed up with a view to possible advances in the treatment of generalised streptococcic infections.

The Committee have given printing and secretarial assistance to Col. Sir John Rose Bradford and Capt. T. R. Elliott in their study of these cases abroad and of the later history of the patients during and after hospital treatment.

Classification of Anaerobic Organisms.

At London, a grant has been given to Dr. James McIntosh for whole-time work, and to Dr. P. G. Fildes for part-time work, in a joint investigation of the morphological and cultural characters of anaerobic organisms associated with wound infections. These observers are employing a new technique for the production of atmospheres free from traces of oxygen.

Measles in Military Camps.

With a view to peace conditions, the Committee had provisionally framed an extended scheme of research upon measles, combining laboratory investigations in London and elsewhere with statistical work by Dr. Brownlee. In consequence of the war this has been suspended in large part, but in connexion with some serious outbreaks of measles among the troops earlier in the year, work was arranged, under the direction of Sir Ronald Ross, in the Marcus Beck Laboratory of the Royal Society of Medicine; and Sir Ronald Ross conducted, on behalf of the War Office, an investigation of the cases as they arose. The Committee have provided him with clerical assistance and a research grant for his direction of the laboratory work. Under his direction Dr. J. W. Cropper has given whole-time work for the Committee to the investigation of the haematology of the cases.

Skin-Grafting of Wounds.

Dr. N. C. Lake has received a research grant for part-time work at the Charing Cross Hospital laboratories upon the growth of tissues in vitro, with special reference to possible improvements in the technique of skin-grafting. The special expenses involved will be met by the Committee.

X-Ray Work at Military Hospitals.

It appeared desirable that special steps should be taken to protect orderlies or inexperienced assistants in the X-ray departments of the large number of newly equipped hospitals from the grave dangers of exposure to X-rays. The Committee submitted accordingly a memorandum to the War Office on the subject, containing a table drawn up for the Committee showing the results of an experimental investigation into the relations between the minimum thickness of lead glass and lead rubber of particular specific gravities necessary for effective protection against the rays, and the Committee offered the services of an expert physicist, if required, to inspect the efficiency of the actual precautions observed by the X-ray operators and assistants at military hospitals.

Grants for minor expenses have been put at the disposal of Captain Thurstan Holland, of Liverpool, Captain Bythell, of Manchester, and Captain Shaxby, of Cardiff, for enquiries into special questions and for the preservation of special plates with a view to the medical history of the war.

Miscellaneous Enquiries.

The Committee have assisted work at Edinburgh in connexion with the defensive use of respirators against poison gases, in addition to work upon the same subject carried out in the scientific departments of the Committee. Special work has also been done at Edinburgh for the Committee upon the pathology of "Trench Frostbite," and the results have been published by Prof. Lorrain Smith, Prof. Ritchie, and Dr. James Dawson in *The Lancet*, September 11th, 1915. Reports have been obtained by the Committee upon special subjects for the assistance of medical officers with the forces abroad, including trench rheumatism, prophylaxis for dysentery, and the prevention of flyborne diseases.

Medical History of the War.

In addition to the general compilation of the medical statistics of the war and the special scheme already mentioned for the coordination of neurological work, the Committee have provided secretarial assistance and printing expenses in connexion with the collection and study of particular groups of cases in military hospitals. The information so obtained is likely to give results of scientific value beyond the military and historical purposes for which they will be made available for publication in the official medical history. At the same time, the mechanism for their collection has allowed the rapid supply of information to medical officers overseas with regard to the after-history of cases for whose treatment they are responsible in the initial stages. The chief subjects already dealt with have been gunshot wounds of the chest, arterial injuries, fractures of the femur, fractured joints, epidemic dropsy, and wounds of the abdomen.

With the permission of the Committee, their Secretary has been appointed (honorary) Joint Secretary of the War Office Committee for the Medical History of the War.

V.—CONCLUSION.

In concluding this account of the work which has been done on their behalf during the year, the Medical Research Committee would venture to take the opportunity of expressing their sense of responsibility in the duty laid upon them of wielding the new and potent instrument which has been placed in their hands by the State, for the assistance and coordination of the efforts of scientific men towards the advancement of medical knowledge and the diminution of preventable pain. While the war has disturbed, and in many directions widely deflected their plans, it has nevertheless been a gratification to the Committee to find that the organisation which it has fallen to

them to initiate has, even in its infancy, been found directly applicable and useful to the special needs of the present time.

The existence of a national Medical Research Fund, established by historical accident so shortly before the war, and without any foreknowledge of it, has made it possible to bring auxiliary agencies rapidly to the service of Government Departments, and especially to that of the Army Medical Department in its varied and vitally important activities. Sir Alfred Keogh, Director-General, A.M.S., has more than once made the most generous acknowledgment of this assistance, and the Committee on their part would desire to express their thanks to him for giving them repeated opportunities, not only of offering some service to the military forces, but also of using the occasions arising from immediate practical need, for enquiries of which the results seem likely to bring benefit, whether directly or indirectly, not only to the troops now engaged, but to the population at large. It must be recognised, too, that It is inherent in the nature of all new knowledge of this kind, gained by organised enquiry, that its benefits are valuable, not only in the particular emergency which may have called for them, but for all succeeding time.

The Committee would also venture to acknowledge their indebtedness to the three successive Chairmen of the National Health Insurance Joint Committee under whom they have worked, for having allowed them the most complete freedom, within their constitution, to bring flexible and rapid assistance to the national need on occasions of emergency, with the least possible delay in the motion of constitutional machinery.

In normal circumstances it would now be the duty of the Committee to recommend to the Minister new schemes of organised research for the coming year. So far as research work not directly connected with the war is concerned, however, the Committee cannot hope to initiate fresh work until the conclusion of hostilities is in sight. They have indicated already the directions in which normal research work has still been possible, notwithstanding the war, and they have recommended that so far and so long as these possibilities remain, the continuation of these researches within the limits of the schemes previously proposed may be approved for a further year, and that the Committee may be empowered within those limits to arrange such modifications of detail as seem desirable from time to time, in view of particular personal and local circumstances.

On the other hand, the schemes of work undertaken for the War Office or other Government Departments in connexion with the war must be expected to increase rather than to diminish. For the work already done, the approval of the Minister was given, subject to his receiving complete details of the emergency arrangements which, from the nature of the case, could not be submitted to him at their inception, and the Committee have asked further that a provisional approval of this kind may be given

again with a view to their work in the coming year, in order that they may continue in the same way to bring the resources of the Medical Research Fund as effectively as possible to the fulfilment of the national requirements.

I am,

Sir,

Yours faithfully,

MOULTON,

Chairman of the Medical Research Committee.

W. M. FLETCHER,

Secretary of the Committee.

APPENDIX.

STATUTORY RULES AND ORDERS, 1914.

No. 418.

THE NATIONAL HEALTH INSURANCE (MEDICAL RESEARCH FUND) REGULATIONS, 1914, DATED MARCH 21, 1914, MADE BY THE NATIONAL HEALTH INSURANCE JOINT COMMITTEE AS TO THE APPLICATION OF MONEYS MADE AVAILABLE FOR THE PURPOSES OF RESEARCH BY SUBSECTION (2) OF SECTION 10 OF THE NATIONAL INSURANCE ACT, 1911 (1 & 2 GEO. 5, C. 55).

The National Health Insurance Joint Committee, in pursuance of the powers conferred on them by subsection (2) of Section 16 of the National Insurance Act, 1911, and by the National Insurance (Joint Committee) Amendment Regulations, 1913, hereby make the following Regulations :—

1. These Regulations may be cited as the National Health Insurance (Medical Research Fund) Regulations, 1914.

2.—(1) In these Regulations, unless the context otherwise requires—

The expression "The Act" means the National Insurance Act, 1911: The expression "the Joint Committee" means the National Health Insurance Joint Committee.

(2) The Interpretation Act, 1889, applies to the interpretation of these Regulations as it applies to the interpretation of an Act of Parliament.

3. All sums which may be retained for the purposes of research in accordance with the proviso to sub-section (2) of Section 16 of the Act either by the Joint Committee or by any of' the several bodies of Commissioners appointed for the purposes of Part I of the Act shall be paid at such times and by such instalments as the Joint Committee may direct into a fund, to be called the Medical Research Fund, under the control and management of the Joint Committee, and any such moneys may be paid to that Fund and applied for those purposes in accordance with these Regulations at such times as the Joint Committee may direct during the financial year in respect of which they are

provided by Parliament, notwithstanding that they would not, if not so retained, be available to be paid or credited to Insurance Committees until the commencement of the calendar year next following the date upon which the provision becomes available.

4.—(I) A Committee shall be constituted for the purposes of research, called the Medical Research Committee, of which the persons whose names appear in the First Schedule to these Regulations shall be the first members.

(2) The first members of the Committee shall hold office for a period of not less than three years from the 20th day of August, 1913, and thereafter three members of the Committee, to be selected in such manner as the Committee may determine, shall retire at intervals of two years, but shall be eligible for re-appointment.

(3) Any vacancy whether casual or otherwise which may here-after occur among members of the Committee shall be filled by appointment by the Chairman of the Joint Committee; but any person appointed to fill a casual vacancy shall only hold office for the remainder of the period of office of the member in whose place he is appointed.

5.—(1) There shall also be constituted an Advisory Council for Research, of which the persons whose names appear in the Second Schedule to these Regulations shall be the first members.

(2) The first members of the Advisory Council shall hold office for a period of three years from the 20th day of August, 1913, and shall be eligible for re-appointment.

(3) All appointments to the Advisory Council, whether in the event of any casual vacancy or otherwise, shall hereafter be made by the Chairman of the Joint Committee in such manner and for such periods as he may determine from time to time.

6.—(1) The Medical Research Committee shall appoint one of their members in writing to be Treasurer of the Committee, and it shall be the duty of the Treasurer to receive on behalf of the Committee all sums payable to the Committee out of the Medical Research Fund.

(2) The Committee may appoint such officers and servants and may expend such moneys for the administrative purposes of the Committee (Including travelling expenses and subsistence allowances for members and staff as it thinks fit, subject, as to the number of such officers and servants and their remuneration and as to the scale of travelling expenses and subsistence allowances, and as to the amount of such moneys, to the approval of the Chairman of the Joint Committee.

7.—(1) The Medical Research Committee shall from time to time prepare schemes for research, including, if the Committee think fit, schemes for inquiries and the collection and publication of information and statistics, and shall submit such schemes to the Chairman of the Joint Committee for his approval.

(2) Every such scheme shall contain an estimate of the expenditure necessary for the carrying out of the scheme, and shall specify the period within which such expenditure is to be incurred.

8. Subject to the provisions of these Regulations, the Medical Research Committee may, for the purposes of any scheme approved as aforesaid, apply any moneys received by the Treasurer of the Committee from the Medical Research Fund in the purchase or other acquisition of land or any interest therein, or any plant, furniture or other chattels, and in the erection, alteration, or maintenance of any building or other works, and in the payment of any costs, charges and expenses of, or incidental to, the said scheme or any powers conferred by or pursuant to these Regulations.

9.—(1) The Chairman of the Joint Committee may from time to time by writing appoint two or more members of the Medical Research Committee to be trustees of the Committee, and the provisions of the Trustee Act, 1893, shall apply accordingly.

(2) All property purchased out of moneys received by the Treasurer of the Medical Research Committee from the Medical Research Fund or otherwise acquired for the purposes of the Committee, shall be vested in the trustees for the time being of the Committee, and in the case of land on trust for sale with full powers of management and disposition.

(3) No interest in land shall be acquired by the Medical Research Committee under these Regulations, or under any scheme made in pursuance thereof, without the consent in writing of the Chairman of the Joint Committee.

(4) The trustees shall execute a declaration of trust declaring such trusts and containing such powers and provisions relating to any property for the time being vested in them or the proceeds of sale thereof as the Chairman of the Joint Committee shall, subject to the provisions of these Regulations, approve.

10. Before approving any scheme so submitted to him by the Medical Research Committee, the Chairman of the Joint Committee shall consult the Advisory Council for Research.

11. There shall be paid from time to time out of the moneys standing to the credit of the Medical Research Fund—

(*a*) to members of the Advisory Council for Research, travelling expenses and subsistence allowances, upon a scale to be approved by the Chairman of the Joint Committee, incurred by them in attending meetings of the Council;

(*b*) such sums as the Chairman of the Joint Committee may direct, as honoraria to members of the Medical Research Committee, not being the Chairman of the Committee or members of the Commons House of Parliament;

(*c*) such sums as may be required for the administrative purposes of the Medical Research Committee ;

(*d*) such sums as the Chairman of the Joint Committee may from time to time direct to be paid to the Medical Research Committee for the purposes of any scheme or schemes approved as aforesaid.

12.—(1) The accounts of the Medical Research Fund shall be made up for each financial year ending the 31st March, and shall be audited in such manner as the Treasury may direct. Any balance standing to the credit of the Fund as at the end of any financial year shall, if the terms of the Parliamentary grant so provide, be carried forward to the next financial year.

(2) Any moneys from time to time standing to the credit of the Fund and not for the time being required for the purposes of these Regulations may, if the Joint Committee so direct, be invested in any securities for the time being authorised as investments for approved societies under sub-section (2) of Section 56 of the Act.

13. The accounts of the Medical Research Committee shall be audited in such manner as the Treasury may direct.

14. Save as otherwise expressly provided in these Regulations, no moneys shall be paid by way of salary, fee, or otherwise, out of the Medical Research Fund to any members of the Medical Research Committee or of the Advisory Council for Research.

Given under the Seal of Office of the National Health Insurance Joint Committee, this 21st day of March, in the year one thousand nine hundred and fourteen.

(L.S.) R. W. HARRIS,

Clerk to the National Health Insurance Joint Committee.

First Schedule.

The Right Hon. Lord Moulton of Bank, LL.D., F.R.S. (Chairman).
Christopher Addison, M.D., M.P.
Waldorf Astor, M.P.
Sir T. Clifford Allbutt, K.C.B., M.D., F.R.C.P., F. R.S., Regius Professor of Physic, University of Cambridge.
Charles John Bond, F.R.C.S., Senior Honorary Surgeon, Leicester Infirmary.
William Bulloch, M.D., F.R.S., Bacteriologist to the London Hospital and Professor of Bacteriology in the University of London.
Matthew Hay, M.D., LL.D., Professor of Forensic Medicine and Public Health, Aberdeen University.
Frederick Gowland Hopkins, M.B., D.Sc, F.R.S., Reader in Chemical Physiology in the University of Cambridge.
Brevet-Colonel Sir William Boog Leishman, M.B., F.R.S., Professor of Pathology, Royal Army Medical College.

Second Schedule.

The Right Hon. Lord Moulton of Bank, LL.B., F.R.S. (Chairman).
Miss L. B. Aldrich-Blake, M.D., M.S.
Sir W. Watson Cheyne, Bart., C.B., F.R.C.S., F.R.S.
Sir William S. Church, Bart., K.C.B., M.B.
Sidney Coupland, M.D.
David Davies, M.P.
Sheridan Delépine, M.B.
Sir James Kingston Fowler, K.C.V.O., M.D.
Sir Rickman J. Godlee, Bart., F.R.C.S.
Sir Alfred Pearce Gould, K.C.V.O., F.R.C.S.
David Hepburn, M.D.
E. G. Hort, F.R.C.P. Edin.
Arthur Latham, M.D.
Sir John McFadyean, M.B.
W. Leslie Mackenzie, M.D.
J. C. McVail, M.D.
W. J. Maguire, M.D.
S. H. C. Martin, M.D., F.R.S.
Robert Muir, M.D.
Alexander Napier, M.D.
Sir George Newman, M.D.
Arthur Newsholmc, C.B., M.D.
J. M. O'Connor, M.B.
Sir William Osler, Bart., M.B., F.R.S.
A. C. O'Sullivan, M.B.
Marcus S, Paterson, M.D.
Sir Robert W, Philip, M.D.
Sir Willam H. Power, K.C.B., F.R.C.S., F.R.S,
H. Meredith Richards, M.D.
Lauriston E. Shaw, M.D.
Albert Smith, M.P.
J. Lorrain Smith, M.B., F.R.S.
T. J. Stafford, C.B., F.R.C.S.I.
T. H. C. Stevenson, M.B.
Harold J. Stiles, F.R.C.S. Edin.
Sir Stewart Stockman, M.R.C.V.S.
W. St. Clair Symmers, M.B.
Miss Jane Walker, M.D.
Norman Walker, M.D.
J. Smith Whitaker, M.R.C.S., L.R.C.P.
Sir Arthur Whitelegge, K.C.B., M.D.
G. Sims Woodhead, M.D.