



THURSDAY, MARCH 9, 1922.

Editorial and Publishing Offices :

MACMILLAN & CO., LTD.,

ST. MARTIN'S STREET, LONDON, W.C.2.

Advertisements and business letters should be addressed to the Publishers.

Editorial communications to the Editor.

Telegraphic Address : PHUSIS, LONDON.

Telephone Number : GERRARD 8830.

Awards for Discovery and Invention.

AN example of the changed conditions brought about by the policy of Government encouraging the application of science to industry will be found in the "Report of the Inter-Departmental Committee appointed to consider the Methods of dealing with Inventions made by Workers aided or maintained from Public Funds." (pp. 25, H.M.S.O., price 6d. net). Before the War this subject was dealt with by Departments in a manner which frequently caused workers to desire arbitrators who, if not more sympathetic, might at least have knowledge of affairs, and act in accordance with some guiding principles. There were three courses which might be adopted by Government Departments, involving complete control, control by Government with delegation of its rights to its contractors but leaving commercial use to the inventor, and finally release from any obligation, with freedom to deal with invention as the inventor pleased. In those days, however, the cases coming up for decision were few, and the number of individuals affected small, whereas now Government employs a large body of persons on scientific and technical work, any of whom may, at any time, produce an invention. The importance of such an invention, although emanating from a laboratory belonging to the Fighting Services, may be even greater from a civil than from a military point of view.

Urgency was imported into the consideration of the question when inventions of commercial value began to be produced by the Department of Scientific and Industrial Research. Regulations had already been framed by that Department by which, while the results of an assisted worker who has chosen some field for extending knowledge, are under no restriction

as to publication, an obligation was imposed on him to consult the Department if he desired to make commercial use of his investigations. A patent might then be taken out in the joint names of the inventor and of an Imperial Trust, and the proportional interests of the Department, of the inventor, and of any co-operating bodies were determined by the Department. The inventor assigned all rights in the patent to the Imperial Trust, which it is understood found a difficulty in exploiting patented inventions commercially. Variation in treatment of the subject and the unsatisfactory nature of some of the prevailing conditions thus called for a settlement of the method of treating inventors aided or maintained from public funds, and of the method of utilising their inventions in industry.

The Report proceeds to consider the difficult subject of the ownership of inventions made in Government employment. It deals first with the case of research workers, and secondly with persons not specially employed on research, expressing the view that in connection with such questions as rewards and the enjoyment of commercial rights each case should be decided on its merits. It is clear from the context that, as regards inventions made by research workers, divergent views have been expressed by the numerous witnesses who have been called before the Committee, and the result of a consideration of these views is embodied in the following passage :—

"In the case of a research worker employed by Government, the view has been expressed that, since he is employed for the purpose of making investigations and is provided with equipment, accommodation and other facilities at the cost of the State, he should not, as a general rule, be entitled to a reward or to any rights in any invention made in the course of his duty. On the other hand, there is a feeling amongst scientific men that rewards for specially meritorious work would have the effect of encouraging further effort. While we are, on the whole, in agreement with the former view, we consider that these are questions which should be decided in the light of all the circumstances in each case, the general principle being that the invention is the property of the State, and that the reward to the inventor (either by way of a money grant or of a share of patent rights or otherwise) should be increased or diminished in proportion to the remoteness or proximity of the invention to the work for which he was engaged or for which he had special facilities or knowledge as the result of his employment."

From this statement it is apparent that the Committee appreciates that it would be unwise to lay down a rule governing all cases, and that in dealing with the question of rewards the merits of each individual case should be taken into consideration. To bring the matter to an issue certain principles are enunciated, the chief features of which are that a competent authority should define in the light of all the circum-

stances of the case the respective rights of the Government and of the inventor, and decide any reward to which he may be entitled; that where the rights in an invention capable of commercial exploitation belong to the Government, it should be exploited commercially for the benefit of the Government; and that the system of dealing with these matters should be uniform for all Government departments.

The mechanism for dealing with these matters is next sketched, and from the preceding argument it clearly has to take the form of a central organisation for all Departments of State. Accordingly it is recommended to set up an Inter-Departmental Patents Board having two main functions, one on the lines of the Royal Commission on Awards to Inventors, for the purpose of dealing with awards, deciding as to the extent of the assistance due to the inventor's position in a Department, and determining the share of the Government in commercial profits, and the other to arrange for the exploitation of patents to the best advantage. The Board itself would fulfil the former function by acting as an Awards Committee, but for the latter, which deals with commercial matters, it would establish an independent Exploitation Committee with its secretary as intermediary.

In order to secure the full confidence of the inventor, it is recommended that the Inter-Departmental Patents Board should be a neutral and impartial body, on which are to be found neither representatives of the Departments concerned nor of the technical workers, but that it should have a permanent chairman of sound legal training and experience, and members characterised by their knowledge of the application of research and invention to industry. As this aspect of the work of the Board is judicial, it is deemed well to keep separate from the commercial aspect, which would be delegated to a committee of a different type—the Exploitation Committee—composed of nominees of the Departments, of the Treasury, and of business men with suitable experience and willing to assist in the exploitation of patents.

The Report proceeds to consider more closely the proposed mode of working of the Inter-Departmental Patents Board, this Board sitting as an Awards Committee, and of the Exploitation Committee. The Inter-Departmental Patents Board would have a permanent Chairman, and a small staff, under the Chairman's direction, would co-ordinate the work of the two Committees. Its cost would be borne by the Treasury, part of whose functions it would have delegated to it; its awards, however, would not be subject to revision by the Treasury on the ground of amount, but only on questions of principle. An inventor would, in the first place, be deemed to hold in trust on behalf of the

Government all rights relating to his invention, but would be entitled to obtain from the Board a decision defining his rights, and he would undertake to assign his patent if called upon to do so, or the Board might decide to leave the completion of the patent to the inventor for his sole benefit. All non-secret patents in which the State has an owning interest would be assigned, not as at present to a Secretary of State, or to a Departmental Trust, but to a single organisation. The Board would also consider the case of the Government servant who was not specially engaged on research or development work, but who produced an invention.

The Awards Committee would consider the rights of the inventor in the light of the principles enunciated above. Except only in respect to awards would this Committee or the Board itself deal with secret patents for which the inventor has no possibility of securing commercial rights and the use of which is limited. Decisions as to maintaining their secrecy must remain in the hands of the respective Departments, who, if they desired, could consult in private with the Board. To avoid an undue burden being thrown upon the Inter-Departmental Board, it is provided that the Departmental Awards Committee of any Department should act as a committee of the Main Board and have power to deal with minor cases, forwarding to the Main Board only such cases as appear important as involving principles, or as being likely to result in an award exceeding 1000*l.*

Indications are given in the Report as to the mode of treatment by the Awards Committee of inventions which are a result of work by a team of part-time workers, and by workers aided by grants given for the sole purpose of increasing the bounds of knowledge.

The work of the Exploitation Committee is a matter of peculiar difficulty, seeing that this Committee would have to advise as to the advantage of completing protection by patents and exploiting them commercially when patented, and arrange with their business agents for placing them in the most favourable manner. It is hoped from experience during the War that men engaged in industry and commerce would still be willing to place their services at the disposal of the State for the achievement of these national aims. It would be the duty of this Committee to secure profits from the useful application of the patents under its charge, whether from their sale or from licences for their use. It would have the power of making a final decision, as this is vital in order that business dealings may be brought to an issue quickly and satisfactorily, and would employ sales agents paid on commission. If demonstrations on the semi-industrial scale, or works trials on the large scale, appeared desirable, this Committee would be empowered to carry them out. The

Exploitation Committee would also advise on the taking out of foreign patents, to be sold outright, however, so as to avoid the inconvenience of a Government organisation having to maintain a question of validity in a foreign country.

Some other matters of interest in this Report may be briefly mentioned. Doubt is expressed as to the soundness of the practice obtaining in one Department at least, of stopping short at provisional protection in the case of inventions of value for the preservation of health or of life, or the general use of which could be enforced by a Government Department; completion of the patent is now advised on the ground that very often no commercial use can be made of an invention unless a definite monopoly is granted to a manufacturing firm. Similarly, foreign patents for such inventions should be taken out.

For the encouragement of meritorious research workers, it is recommended in the Report that the head of a department should be given the power to promote successful investigators, or to secure for them special increases of salary, within certain limits, and without promotion out of their grade. The opinion is also recorded that the remuneration of scientific workers should be adequate and that they should have reasonable security of tenure.

While the Committee states it has not found that Government Departments are more reluctant than industrial firms to allow the publication of the results of scientific investigations, it is strongly of opinion that no obstacle should be placed in the way of research workers who wish to publish such results, regard being had to the national interest, and it proceeds to point out that the Government will secure the services of men of scientific ability and reputation, only if such permission is not withheld except under exceptional circumstances.

A mode of procedure is recommended to secure for the worker the opportunity of lodging a provisional application at the Patent Office without submitting it through his superior officer, who would, however, be supplied with a copy from the perusal of which he could decide as to whether the invention should be regarded as secret. Attention is directed to the importance of advertising to all concerned the conditions in force regarding the taking out of patents.

Such are the main features of this important Report. It cannot be denied that there existed an urgent need for a detailed consideration of the whole patent question for which different Departments of State had varying provisions and regulations. The matter is one of peculiar difficulty, on account of the personal association of a worker with the idea which ultimately leads to a successful patented process, while at the same time

he is in receipt of maintenance and facilities. In spite of one phrase in this Report where the position of Government servants not specially engaged on experimental work is being discussed, in the words that "it was no part of the bargain made between them and the Government Department concerned when they entered into its employment, that they should make discoveries or inventions," it can safely be said that no such contract of service could reasonably be demanded. By maintaining a well-equipped establishment with adequate facilities and conditions for a well-chosen investigating staff, the employer has a good ground for belief that an atmosphere will be created in which at any time striking new ideas may arise, but he cannot claim to expect more than this in the way of striking developments. It is to this balance of interests that the Committee has applied itself, and in the passage quoted earlier in this notice has defined the position of research worker maintained by the Government, with regard to his claim to ownership in inventions. While laying stress on the general principles that the invention of such a worker is the property of the State, and that the reward to the inventor is contingent on the connexion of the invention with the work for which he was engaged, the Report makes clear that in settling the question all the circumstances of the case will be taken into account, having in mind, no doubt, such matters as the case when a Department desires to keep the invention secret, the merit and importance of the invention, together with any peculiarity in conditions of employment.

The tribunal suggested to adjudicate on such points, in view of its neutral character, should go far towards securing the confidence of the inventor, more especially as he should no longer be able to point to lack of uniformity in treatment by different branches of the Service. From the body of decisions of this tribunal there will, no doubt, gradually emerge sufficiently definite guiding principles to enable new applications to be dealt with expeditiously and fairly.

Much will depend on the interpretation of the principles described above in the first decisions arrived at by the Patents Board, and the extent to which encouragement to the scientific worker, one of the objects laid down in the terms of reference, is to result will be watched with interest.

Up to this point the Report is fairly clear, and there is no reason why its recommendations should not be carried out satisfactorily. It is to be hoped that it will be equally successful in the much more difficult task of exploiting inventions. Although, under the existing system in some Departments, a Government servant may be able to obtain permission to have reassigned to him the non-Governmental rights of an

invention made in the course of his work in order to exploit it commercially, he is rarely in a position adequately to carry this through, either from want of time on account of his normal duties, or from want of business ability. The inventor had the alternative in the event of a process proving an important one either to leave the Government Service and devote himself to his patent, or to remain in the Service and see the success of his invention jeopardised in its civil applications. The exploitation of Government-owned inventions by business men who have had experience in work of this kind is the only other way out of the difficulty that can readily be seen, and it is to be hoped that the confidence of the Committee will be justified by suitable public-spirited men coming forward to take up the work.

The Report bears internal evidence of much thought and consideration of diverse opinions, and thanks are due to members of the Committee for their hopeful effort to suggest an organisation which, by settling claims and disputes definitely and rapidly, will thereby remove an impediment to progress in investigation and at the same time afford the worker the opportunity of stating his case.

Principles and Problems of Aeronautics.

The Mechanical Principles of the Aeroplane. By Dr. S. Brodetsky. Pp. vii + 272. (London: J. and A. Churchill, 1921.) 21s. net.

THE entry of Dr. Brodetsky into the ranks of workers on aeronautical topics marks an important development in the higher study of aerial navigation. Why the achievements of modern aviation have not from the outset been built up on a sub-structure of purely abstract mathematical theory such as has arisen concomitantly with other branches of physics and engineering is difficult to understand. The behaviour of laminæ and other bodies moving through a medium under assumed laws of resistance, whether artificially propelled or otherwise, opens up a vast collection of problems which might well have occupied the attention of mathematicians and been illustrated by experiments with models long before the evolution of the full-sized aeroplane. Instead of this being done, flying machines have been built, flown, wrecked, and their pilots killed, by designers who have not even fully appreciated such elementary facts as that when an aeroplane is moving with uniform velocity the forces acting on it must be in equilibrium, that three forces in equilibrium must meet in a point, that an aeroplane has six degrees of freedom, that stability and equilibrium are not the same thing, and so forth. Whether the Tarrant triplane could have

been saved by a full appreciation on the part of its pilots of the validity of the equation of *initial* angular acceleration, $I d^2\theta/dt^2 = M$, or numerous aviators saved from death by a better knowledge of the forces and couples on which longitudinal and lateral stability depend, are debatable questions. Meanwhile mathematicians of repute have attacked the writer of this review for intimating that a fuller theoretical study of the problem should be undertaken.

The National Physical Laboratory and the Royal Aircraft Establishment have absorbed many of the most enlightened of our university graduates who are competent to study aeronautical problems, and they are doing excellent work there. But, unfortunately, the amount of constructional work that had been going on while the mathematicians of our universities were making and marking examination questions, with their eyes shut to the outside world, has thrust on our Government institutions vast arrears of questions arising out of the engineering and physical difficulties associated with aviation. It is therefore not surprising that scarcely any one previous to Dr. Brodetsky has started at the opposite end and tried to fathom the capabilities of pure mathematical reasoning as distinct from experiment in throwing light on the study of aeronautical problems.

A notable exception is afforded by Mr. Lanchester, whose two volumes certainly represent a genuine attempt to investigate the behaviour of aeroplanes as deduced from *a priori* reasoning. But the subject was bristling with mathematical difficulties of a cut-and-dried character quite outside the scope of Lanchester's resources, and no mathematician would take up the challenges so oft repeated in NATURE until Dr. Brodetsky came on the scene. Contrast this state of affairs with the past history of electrical engineering, in which subject mathematical tripos candidates were being worried with solutions of Laplace's equations for infinitely long charged cylinders and conditions for solenoidal and lamellar magnets long before Lord Kelvin presented Peterhouse with its electric light.

In recent years nearly every publisher has decided that there is a demand for an up-to-date book on aeronautics, and has got some one to write one. In all these books the effects of the policy of "putting the cart before the horse" is painfully evident. The mathematics is usually of a very elementary and insufficient character until we are confronted with the invariable chapter headed "Stability, Mathematical Theory." This is usually nothing more or less than a mutilated copy of part of the "Science Monograph" on "Stability in Aviation" by the present writer, accompanied by a misuse of signs and symbols and a total disregard for all the accepted doctrines