

## EDITORIALS

### THE RESEARCH CORPORATION, AN EXPERIMENT IN PUBLIC ADMINISTRATION OF PATENT RIGHTS.

Some seven years ago while working in the University of California on a set of problems in sulphuric acid manufacture, the author came upon certain phenomena which promised to lead to important improvements in the electrostatic collection of smoke and fumes from chemical and metallurgical plants. He was at once confronted by the old dilemma of adjustment between academic and commercial activities, as only through direct construction and study of installations on a commercial scale did it seem possible to develop into full usefulness the inventions involved.

Finally with the personal and financial help of Prof. Edmond O'Neill, of the Chemistry Department, and Dr. Harry East Miller and Mr. E. S. Heller, both alumni of this Department of the University, the commercial development of the project was undertaken and patents secured. The understanding among those thus actively concerned was that when the receipts from the business should have repaid the initial investment with reasonable interest at least, a considerable portion of the patent rights should be turned over to the University of California, or some other public institution, to be administered as the nucleus of a fund for the promotion of research; it was also hoped that this might set a precedent and stimulate similar contributions from others.

The business and technical development of the project struggled through and over many difficulties and disappointments for the first few years but with a constantly growing scale of operation; it was not until the fifth year of the work that the latter repaid what the organizers had spent upon it.

It is not the purpose here to enter upon the technical details of the inventions involved as the early history of these has already been published in *THIS JOURNAL* and quite fully abstracted elsewhere. ("The Electrical Precipitation of Suspended Particles," *THIS JOURNAL*, **3**, 542. *Engineering News*, Oct. 26, 1911, pp. 495-498. *The Engineering and Mining Journal*, Oct. 14, 1911, **92**, 763-764. *Mining and Scientific Press*, Aug. 26 and Sept. 2, 1911, **103**, 255-258, 286-289. *Rauch und Staub*, Apr., 1912, **2**, 187-195.) A further supplementary account and discussion was also given at the annual meeting of the American Institute of Mining Engineers last February.

Merely as an index to the practical significance which the work has already attained, suffice it to say that installations made under these patents have now been in commercial operation for over five years and the largest of these have been on a scale representing a construction cost of over \$100,000 each. The first were in the far West but several are now in operation or under construction in and about New York City (see article by Schmidt, *THIS JOURNAL*, **4**, 719 and by Bradley, p. 908 of this issue, for instances).

By the time the work had thus reached a self-supporting basis, its significance was felt to have broadened to a degree which made its control by a local institution such as a single University inexpedient; the fullest success of such a movement is inevitably conditioned upon its being most broadly representative of the common interest of those whose coöperation and support it aspires to secure. Through Director J. A. Holmes, of the U. S. Bureau of Mines, who had taken a very helpful interest in the work, it was brought to the attention of the Smithsonian Institution nearly two years ago; the informal discussion which followed resulted last October in a formal offer of the patent rights to the Institution. The only condition qualifying this offer was that these patent rights should be given an adequate business administration and the proceeds be devoted to furthering scientific research.

In December last, after careful consideration and discussion with the prospective donors and under their hearty indorsement, the Board of Regents of the Smithsonian Institution adopted the following resolutions:

RESOLVED: That the Board of Regents of the Smithsonian Institution do not deem it expedient for the institution to become the direct owner of the proposed gift of royalty-bearing patents;

RESOLVED FURTHER: That the Board of Regents of the Smithsonian Institution decide that the Institution may properly accept a declaration of trust from the owners of the patents to hold and operate the same in the interests of the Institution, and to pay over to the said Institution the net profits therefrom.

The Board further authorized its Executive Committee and its Secretary, Dr. Charles D. Walcott, to coöperate with those from whom the offer had come in the organization of either a subsidiary or an independent board of trustees or directors to conduct the business side of the project.

In elaborating this plan, the organizers have tried to study carefully both the economic and academic needs which it was intended to subserve. The following are among the considerations which have perhaps had most to do in determining the form and policy of the new organization as finally constituted.

During the last few years, the rapid growth of engineering and technical education, coupled with a general awakening to the commercial importance of research in the industries, has brought about a persistent demand the world over for closer and more effective coöperation between the universities and technical schools on the one hand and the actual industrial plants on the other.

The value to both sides from such coöperation is to-day generally conceded, but as to the most expedient methods of its accomplishment opinions differ, and we are still in the experimental stage of working out the problem.

One solution which has been extensively applied

consists in universities and schools permitting and even encouraging the members of their teaching staffs to go into private consulting practice. Another form of coöperation is seen in the Industrial Fellowships recently established at several universities, through which their laboratories undertake the investigation of certain problems for individual commercial firms or organizations; the latter bear the expenses and receive the first fruits of the investigations, but under restrictions as regards final publication and use intended to justify the universities or technical schools in taking their part in the work.

While these and similar methods now in use bring about the desired coöperation, it has been felt by some that they are open to the objection of introducing too direct business relations between the academic institutions or the members of their faculties and individual financial interests. As still another alternative, intended particularly to meet to some degree at least this last objection, the Research Corporation has been organized.

Briefly stated, the Research Corporation is a board of administration, whose work is to guide the development of such patents as may be turned over to it, and finally market them, the net profits from all such business being devoted to scientific research "by contributing the net earnings of the corporation . . . . . to the Smithsonian Institution and such other scientific and educational institutions and societies as the Board of Directors may from time to time select, in order to enable such institutions and societies to conduct such investigations, research and experimentation." Under this system, it will be noticed, a part at least of the financial returns of the scientific investigations of our academic laboratories automatically goes back to them for aiding further investigations.

But this represents only one side of the good which the plan aims to accomplish. Conservation has of late become a word to conjure with, and all manner of economic wastes are very properly receiving a too-long delayed attention. The men in our universities and colleges have been among the first and most effective in promoting the general conservation movement, yet there is what we may term an intellectual by-product of immense importance, a product of their own activities still largely going to waste. This is the mass of scientific facts and principles developed in the course of investigation and instruction, which through lack of the necessary commercial guidance and supervision never, or only after unnecessary delay, reaches the public-at-large in the form of useful inventions, and then often through such channels that the original discoverers are quite forgotten.

The Research Corporation was primarily intended to serve the ever-growing number of men in academic positions who evolve useful and patentable inventions from time to time in connection with their regular work and without looking personally for any financial reward would gladly see these further developed for the public good, but are disinclined either to under-

take such developments themselves or to place the control in the hands of any private interest.

During the process of organization, however, it became evident that the class of donors of patents to the cause would by no means be limited to men in academic positions, but rapidly extended not only to private individuals outside the colleges, but even to large business corporations who often find themselves incidentally developing patents which overrun their own field of activities. Such patents are very apt to get pigeon-holed and come to actually stand in the way of true industrial progress, even though their owners may realize that development and use by others would indirectly benefit themselves. As an official of one of the large electrical companies put it—"Any extension of the use of electricity, or even power in general, is pretty sure eventually to mean more business for us through one department or another."

A procedure adopted by many men in academic and public positions in an attempt to bring various inventions before the public and at the same time prevent private monopoly has been to secure patents as a matter of record and then throw them open gratis to public use. This procedure received official recognition in the U. S. Patent Act of March 3, 1883, which authorizes the remission of all Patent Office fees to Government officials on patents bearing on their face permission for everyone in the country to use the invention without the payment of any royalty.

Practice has shown, however, that this does not accomplish all that had been hoped for it. A certain minimum amount of protection is usually felt necessary by any manufacturing concern before it will invest in the machinery or other equipment, to say nothing of the advertising necessary to put a new invention on the market. Thus a number of meritorious patents given to the public absolutely freely by their inventors have never come upon the market chiefly because, "what is everybody's business is nobody's business."

If some of these patents, on the other hand, were placed in the hands of such an organization as the Research Corporation, it could study the situation and arrange licenses under fair terms, so as to justify individual manufacturers undertaking the introduction of the inventions and at the same time it would be accumulating from the royalties funds for further investigations.

As to the details of organization, the Research Corporation was incorporated February 26, 1912 as a stock company under the laws of the state of New York, with its office at 63 Wall St., New York City, its declared purposes being:

(a) To receive by gift and to acquire by purchase or otherwise, inventions, patent rights and letters patent either of the United States or foreign countries, and to hold, manage, use, develop, manufacture, install and operate the same, and to conduct commercial operations under or in connection with the development of such inventions, patent rights and letters patent and to sell license or otherwise dispose of the

same, and to collect royalties thereon, and to experiment with and test the validity and value thereof, and to render the same more available and effective in the useful arts and manufactures and for scientific purposes and otherwise.

(b) To provide means for the advancement and extension of technical and scientific investigation, research and experimentation by contributing the net earnings of the corporation, over and above such sum or sums as may be reserved or retained and held as an endowment fund or working capital, and also such other moneys and property belonging to the Corporation as the Board of Directors shall from time to time deem proper, to the Smithsonian Institution, and such other scientific and educational institutions and societies as the Board of Directors may from time to time select in order to enable such institutions and societies to conduct such investigation, research and experimentation.

(c) To receive, hold and manage, and dispose of such other moneys and property, including the stock of this and of any other corporations, as may, from time to time, be given to or acquired by this Corporation in the furtherance of its corporate purposes, and to apply the same, and the proceeds or income thereof, to the objects specified in the preceding paragraph.

As practically all technical work under the Corporation's supervision will be done in coöperation with either industrial works on the one side, or school and college laboratories on the other, its expenses will be chiefly administrative, and were estimated for the first year at \$10,000, the expectation being that after this it would be self-supporting. As a margin for unforeseen contingencies, the capital was placed at \$20,000, divided in 200 shares, of a par value of \$100 each, and issued under the condition that "no dividends shall be declared or paid thereon, and the entire net profits earned by said capital stock shall be applied to or expended for the aforesaid purposes." All stock issued is also under an option to the Corporation by which the latter may, at any time, through its Board of Directors, repurchase it at par, and the stock cannot be otherwise sold, without first notifying the Board and allowing the latter an opportunity to exercise this option.

Of the total 200 shares, 101 have thus far been issued and their par value paid into the Corporation's treasury as working capital. This stock is held in lots of from three to ten shares by the following list of stockholders:

Edward D. Adams, of the Deutsches Bank, New York.  
 Cleveland H. Dodge, of the National Bank and Farmers Loan and Trust Company, New York.  
 James Douglass, President of Phelps, Dodge & Co., President of El Paso & S. W. R. R., New York.  
 T. Coleman du Pont, formerly President of the du Pont Powder Co., Wilmington, Del.  
 Frederick A. Goetze, Dean of the Faculty of Applied Science, Columbia University, New York.  
 Elon Huntington Hooker, President of the Development & Funding Co., New York.  
 Hennen Jennings, of the Sea Board Air Line.  
 Charles Kirchoff, Past President American Institute of Mining Engineers, New York.  
 Benjamin B. Lawrence, Consulting Mining Engineer, New York.

Arthur D. Little, President American Chemical Society, Boston.  
 Thomas C. Meadows, Vice-President International Agricultural Corporation, New York.  
 H. C. Perkins, President Oriental Consolidating Mining Co., New York.  
 Charles A. Stone, of Stone & Webster, Boston.  
 James J. Storrow, of Lee, Higginson & Co., Bankers, Boston.  
 Elihu Thomson, of the General Electric Co., Lynn, Mass.  
 Henry R. Towne, of Yale & Towne, President of the Merchants' Association, New York.  
 Charles D. Walcott, Secretary of the Smithsonian Institute, Washington, D. C.

The Directors, who need not be stockholders, are 15 in number, seven constituting a quorum, and are elected for a period of three years, one-third going out each year. They in turn elect each year an executive committee of five, of which three constitute a quorum. The present personnel of the administration is as follows:

## OFFICERS:

Vice-President,	Charles D. Walcott
Secretary,	Lloyd N. Scott
Treasurer,	Benjamin B. Lawrence
Assistant Treasurer,	Columbia Trust Co.

## DIRECTORS:

To serve until 1913.

T. Coleman duPont	Charles A. Stone
Arthur D. Little	Elihu Thomson

M. B. Philip

To serve until 1914

Frederick A. Goetze	John B. Pine
Benjamin B. Lawrence	Lloyd N. Scott

Charles D. Walcott

To serve until 1915

Thomas C. Meadows	Hennen Jennings
Elon H. Hooker	Charles Kirchoff
	James J. Storrow

## EXECUTIVE COMMITTEE:

Frederick A. Goetze, <i>Chairman</i>	
Benjamin B. Lawrence	Elon H. Hooker
Charles D. Walcott	Arthur D. Little
John B. Pine, <i>Counsel</i>	
Linn Bradley, <i>Engineer</i>	

It is not proposed to fill the offices of President and Manager until the work of the Corporation is well under way and the permanent demands and responsibilities on these officers can be better estimated, their duties devolving in the meantime upon the Vice-President, Chairman of the Executive Committee and Engineer.

The present organization is not considered as necessarily permanent in all its details but was deemed the most simple and generally expedient for carrying out the initial stages of this experiment in economics, at least until it should have earned a safe working surplus of its own and demonstrated its ability to produce a substantial permanent revenue. It will then devolve upon the Board of Directors to decide upon a definite policy for the ultimate control of the Corporation. This may be done by exercising the option to repurchase all outstanding stock at par and then proceed to redistribute the same, as for example, by turning the whole over to the Smithsonian Institution, or perhaps better still by dividing it among a number of universities and similar institutions. This, of course, does not mean that the particular institutions so selected would thereby acquire any more direct claim on the profits of the corporation than others, since the stock is non-dividend bearing,

but merely that they would become trustees responsible for the election of Directors who would give the Corporation a business administration, thoroughly practical but conforming to the ideals implied by its objects and associations.

The terms under which each new patent shall be acquired by the Corporation are entirely in the hands of the Board of Directors, but at least for some time to come it is probable that only such patent rights will be primarily considered as are offered freely, without restrictions as to mode of administration or obligation of any financial return from the Corporation, as present indications are that the latter will find itself well occupied even by these offers alone.

The Board has authority to purchase patents where this may appear as good business policy, which may quite conceivably occur from time to time in rounding out fields in which it has already embarked. Contracts with owners of patents for administering the same on a profit-sharing basis will probably not be considered, chiefly owing to the unforeseen complications which it is easily possible, not to say certain, that such agreements would eventually lead into as the further developments of different interests began to overlap.

A much simpler, safer and more expedient procedure appears to be for the patentee to retain if he so chooses complete title and control of his patent in certain geographical territory, while assigning the same in other territory entirely unencumbered to the Corporation. Any development which the latter can give it will then automatically enhance the value to both.

This procedure is well illustrated in the case of the first patents to come into the possession of the Corporation, *viz.*, those referred to above as initially offered to the Smithsonian Institution itself. The owners of these at the time of their original offer had already spent considerable time and money in their development, but from the outright sale of their foreign

rights and the rights of six western states (California, Oregon, Washington, Idaho, Nevada, and Arizona), together with a license for the one industry of Portland Cement manufacture throughout the whole United States, they felt adequately remunerated for their work and financial risks, and were willing to turn over all remaining United States patent rights as a nucleus for the experiment in economics which the Research Corporation represents. Together with this there came to the Corporation a 10 per cent. interest in the net profits of the parties who purchased the rights for the Western States and for the cement industry, while incidentally growing out of the negotiations on the foreign rights, another set of valuable patents has come to the Corporation from Mr. Erwin Moeller, of Germany, which emphasizes in a most practical way the fact that academic organizations, and particularly the Smithsonian Institution, are international in spirit, and so recognized by scientific men the world over, presenting at once a nucleus from which may well be developed many activities leading toward world consciousness, coöperation and peace.

The present movement, as stated, had its inception on the far western edge of this continent in very unpretentious beginnings, but has already overrun national borders both in the character of its work and the personnel of its supporters. It is a question which should peculiarly interest this Congress as to how far and in what way international coöperation can best be assured in such activities which, from their very nature and aims, should from the outset transcend political boundaries and national pride and be treated by one and all from a standpoint as broad as humanity itself. It was with this in mind that the present paper has been presented, not so much as a record of present achievement, as to stimulate discussion and coöperative effort toward ever wider and more effective activities in this most promising field.

F. G. COTTRELL.<sup>1</sup>

## ORIGINAL PAPERS

### A STUDY OF THE VARIATIONS OF THE PHYSICAL AND CHEMICAL PROPERTIES OF RED LEAD.

By O. W. BROWN AND A. R. NEES.

Received Aug. 2, 1912.

Red lead is an oxide having the empirical formula  $Pb_3O_4$ . The chemical composition and physical properties vary within wide limits, depending upon the method of manufacture and the nature of the material from which it is made. Two distinct modifications of this oxide are known in commerce: ordinary red lead or minium, and orange mineral. The exact difference between these two modifications is not clearly understood. It is not our purpose, however, to enter into a discussion of this. What we do want to do, is to point out some of the variations in chemical and physical properties of ordinary red lead and the factors which control these variations.

In order to make the subsequent discussion clear,

a brief résumé of the various processes employed for the manufacture of red lead will be given. Companies which make white lead burn their "off color" white lead or minium. In a second process molten lead is rabbled in a reverberatory furnace. The greenish yellow oxide, or massicot as it is called, thus obtained is ground and separated from the particles of metal by air or by levigation. This oxide is then burned to red lead. In some processes the levigation is dispensed with and the massicot is alternately ground and heated until conversion to red lead is complete.<sup>2</sup>

In another method<sup>3</sup> litharge is first made from the metal, and tapped from the furnace in a fused condition. After being allowed to cool it is ground and

<sup>1</sup> The substance of this article was presented in an address before the Eighth International Congress of Applied Chemistry, New York, September, 1912.

<sup>2</sup> W. Eckford, Brit. Pat. 25,256, Dec. 4, 1908, and 15,423, July 1, 1909. *J. S. C. I.*, **29**, 166.

<sup>3</sup> Hoffman's "Metallurgy of Lead," 4th Ed., pp. 15 and 16.