

education through the means of these schools, and he is heartily in accord with the work they do in training our young men. On the point of the degree, he is in favor of dropping the C. E., and giving some other degree, as, for instance, in Applied Science, leaving the C. E. to be obtained from the Society after the graduate has fulfilled conditions to be laid down by the Society.

He would recognize the standing of an engineer who belonged to any of the leading well-known societies, and admit him to membership and right to practise on complying with some light formality. He would advocate reciprocity, rather than restriction; he admits that one consequence of the proposed new condition would be that an engineer could only practise as long as he paid his annual fees or dues to the Society; the rule obtains in other professions, there is no reason why it should not be successful in engineering. The writer fails to comprehend the difficulty which appears to have arisen in the minds of many members, that engineering cannot be so designated as to be called a profession; it seems to him that there is no more difficulty in defining Civil Engineering than there is in defining Law, Medicine or Theology.

With reference to the present position of the Society, the object and purpose, as set forth in the charter, is "to facilitate the acquirement and interchange of professional knowledge among its members, and more particularly to promote the acquisition of that species of knowledge which has special reference to the profession of Civil Engineering, and, further, to encourage investigation in connection with all branches and departments of knowledge connected with the profession." Under this charter we are, perhaps, unable to assume the more extended duties of controlling professional practice by licensing our practitioners.

"THE DIAMOND PROSPECTING DRILL IN MINING CANADIAN PHOSPHATE AND OTHER IRREGULAR DEPOSITS."

BY J. BURLEY SMITH, M.E.

It is generally held that the diamond drill is not of the same utility in prospecting and determining the position of irregular deposits as it is in minerals of more regular occurrence. This is more from the fact of the great results achieved in determining accurately the areas, extent, and depth of regular deposits scientifically located, than failure to discover the position of acknowledged uncertain deposits. However great the service rendered with regard to regular deposits, it will be remembered that the value of the diamond drill as a prospecting tool became first properly appreciated from the remarkable discoveries, made through its use, in the great hematite deposits of North Lancashire and Cumberland, England — deposits which from their apparent fitfulness and irregularity had been worked only on a small scale and as mere surface pockets occurring here and there over a considerable area of ground, and abandoned when apparently exhausted, until the boring operations of a few enterprising proprietors taught the lesson that, although the character of the ore seemed irregular, similar deposits occurred at much greater depths and of much greater magnitude, the irregularity, scientifically considered, being but another form of regularity, and the peculiar order in which these deposits were to be looked for. Subsequently, and chiefly owing to the use of the prospecting drill, these mines have been worked to a very great depth, and much more extensively, turning out, annu-

ally, many hundreds of thousands of tons. And the great number of successful results of recent years in such deposits in all parts of the world appears to indicate that the diamond drill is of even greater utility in prospecting these than in the more regular minerals referred to.

The very irregularity which makes some kinds of mining so uncertain shows the necessity of traversing and searching the zone of occurrence in many directions by some method much more rapid and less costly than by shafts and tunnels, and a tool like the diamond drill, capable of drilling from 20 to 40 feet per day, and bringing out cores of the material passed through, seems to fulfil, in a great measure, these required conditions. Through its use prospecting of a mineral property can be exhaustively and reliably carried out in a few months, and cross sections delineated, showing the number and size of the deposits, from the plotted profiles of which the quantity of ore contained may be approximately calculated, showing if the quantity discovered is large and near enough to bear the greater expense of sinking a shaft or driving tunnels to reach it.

Thus, by the expenditure of a few thousand dollars in the prospecting machinery, and the cost of the necessary boring operations, the owner of a property is able, figuratively, to cut his property into slices and see what is inside, the accuracy of which depends of course on the number of cuts made. And instead of risking a large sum in the purchase of a costly permanent plant and machinery to begin active mining operations for a mineral only doubtfully believed to exist, it may be ascertained by a properly arranged system of borings [practically constituting an approximately accurate underground survey showing the extent and location of detached and irregular deposits] whether it is advisable to lay out money in plant at all, or how much, and even if it is desirable to mine a property or not. If valuable, the very best machinery can be laid down without hesitation or risk, for the most economic method of sinking or driving to, and mining the mineral when reached.

At the same time an approximate knowledge of the quantity, making it feasible to determine, in advance, all the questions of transport and annual yield; the laying down of tramways and transport generally; and the use of available water, or other gratuitous power, to the best advantage.

Negotiations for sale or purchase would also be much simplified from the fact of the real value of the mining estate being established, the cores of mineral and country rock, with the accompanying chart and sections, being the best evidence of the character of the property.

In mining phosphate of lime in Canada the prospecting drill is certain to prove of the greatest possible service.

It is now pretty clearly demonstrated by those eminent Canadian geologists who have earnestly investigated the phenomenon of occurrence of this peculiar mineral, that it is found, with rare exceptions, in detached masses or pockets, sometimes resembling veins, in masses of pyrotene, which, originally considered as interbedded portions of the structure of the Laurentian rocks, are now generally acknowledged to be intrusive dykes, probably connected with the basic eruptions of Archæan date.

Very recent observations made in the actual mining of phosphate corroborate in a remarkable way these conclusions, and give at once a basis from which to start in searching for the mineral.