BENTONITE IN WYOMING.

Since there appears to be a fairly general misconception as to methods and ways and means for developing this industry and since the present status of the industry is pretty generally misunderstood, it seems pertinent, at this time, to give you briefly something of the history of this non-metallic mineral, and outline some of the methods which suggest themselves as proper ones to follow in the attempt to place the bentonite industry on a stable footing.

Bentonite was first described by the late Professor W. C. Knight of the University of Wyoming, who investigated samples of the clay from the Taylor property at old Rock Creek Station, about forty miles northwest of Laramie. Since then it has been described by various government geologists, namely: Fisher, Darton, Wherry and others, during the earlier years, and, more recently, by Ladoo of the Bureau of Mines, and, more comprehensively, by Hugh Spence of the Canadian Department of Mines.

In reviewing the older literature one finds little attempt by these writers to do more than describe the geological conditions in which bentonite is found, and to speculate about the probable origin of the clay. While these matters doubtless are important in their own way, they do not much concern the man who is trying to build a business of marketing the mineral.

Neither are we particularly concerned with the more recent speculations of the laboratory geologists who have departed from the older idea of confining the name "bentonite" to that class of clay as occurs in the Benton formation in the Western States, which possesses the peculiar properties first noted and described. For our purpose today, we must be content with bentonite as it occurs in Wyoming, and pass with a mere mention the California montmorillonite and the shales of Tennessee and Virginia which some writers have forced into the bentonite classification on the questionable basis of chemical composition alone.

These older writers, in coming to the conclusion that bentonite is derived from the alteration of volcanic ash, have caused much misunderstanding of the facts by newspaper writers and the non-technical public. Many of the latter

have become excited over a deposit of pumicite and have distributed samples of that material as being bentonite.

The bulletin entitled "Bentonite" by Hugh S. Spence, issued by the Canadian Department of Mines in 1924 is perhaps the most complete statement of the general subject that has yet been published. However, this is somewhat technical in part, and I would hesitate to recommend it to the non-technical man who seeks information, lest he misconstrue the meaning of the many excellent statements of fact it contains. It may seem somewhat strange to you that I make a point of the above. It would seem less strange could you listen, as I have done, to the frequent, entirely inaccurate statements of those who, having endeavored to post themselves about the material by reading the available literature, have drawn conclusions directly opposite to the facts as stated therein. Unfortunately this cannot be prevented. There is a paucity of literature on the subject available to the "man on the street" who wants to know.

Perhaps the earliest use of bentonite is one that cannot be considered a commercial one. Oldtimers from the early day train operating crews on this division of the Union Pacific have told me they frequently made use of it, mixed to a paste with water, to lubricate hot boxes. They all assured me that it filled the bill.

Some commercial use was made of bentonite as early as 1888, one or two cars per year having been marketed at that time. Some of this production was used as a filler for candy. Doctor Wiley and his colleagues put a stop to that, and the present generation is fortunate in that the tonnage so consumed was small.

During the early 90's a small paper mill at Denver, Colorado, consumed a considerable tonnage from the Taylor and Linscott properties at Rock Creek. On the closing of this mill, this market was shut off, and the productionof bentonite from that time until 1920 did not greatly exceed three or four cars per year.

Now, during all these years the material was known to exist, but attempts to find or develop a market were few. Some spasmodic effort was made, it is true, but no consistent or long continued work was done along this line.

In the year 1920 the Owyhee Chemical Products Company, with bentonite holdings at Medicine Bow and elsewhere, began the first systematic effort to develop a real market that had ever been made. Prior to this time the small amount of the clay marketed had been shipped in the crude form. Believing as we did, that no real progress could be

made in this way we equipped to furnish the material fully prepared for use, and broadcasted samples and information about the material to every likely industry. During the first year alone of this work, samples of the clay and information regarding it were introduced into some 1500 industrial laboratories and plants. In this connection, if you will permit a brief digression, the following statement by Raymond B. Ladoo, formerly of the Bureau of mines, in his " Reports of Investigations", Serial No. 2289, published in October, 1921, is perhaps significant. He says, "During the years 1920 and 1921 interest in bentonite greatly increased". I mention this here to point out the outstanding fact that it is entirely insufficient to discover a deposit of non-metallic mineral such as this and tell the world we have it. We must go further and demonstrate to the prospective consumer that he can use it, and what advantage its use will be to him. Without this constructive work, backed up by the research which enables it to be done, the industrial world, which offers the potential market, will never care whether the resource exists or not.

Since that time the Wyoming production has steadily increased until in 1927, some 10,000 tons were marketed. During that year some additional deposits were opened and a number of supply houses in the Eastern industrial sections commenced to handle the clay in one form or another, as middlemen, between the Wyoming producers and the consumers. Prior to 1928, however, the principal production was from two sources, namely: our deposits at Medicine Bow and that of Ex-Representative Mondell at Clay Spur near Newcastle. During the year 1928, two new deposits were equipped with plants for the production of bentonite in the finished form, in Weston County, and a number of small deposits were opened up for "gophering" production.

Bentonite of the Wyoming type occurs in strata of varying thickness in many parts of Wyoming. The marketable strata so far discovered are confined to the Mowry or Pierre shales and outcrop in a number of districts where uplifts have exposed these formations. Bentonite beds vary considerably in thickness, even in the same locality, and may be found from an inch or two up to about 12 feet. The thicker beds are, as a rule, of low quality and even the beds of moderate size are frequently so impure as to render them useless in the present state of the industry. That this is so is not generally known. Unless it is known and appreciated, it is more than probable that attempts to develop such beds will be made and result in financial loss and attendant discredit to the industry.

Can bentonite and its production be developed into a stable and secure industry? No doubt it can and should. Bentonite is a clay, just one among many. Manifestly it cannot enter into competition with Eastern clays in Eastern markets on a pound for pound basis merely as an alternative constituent in a mixture or as a strictly filler clay. The freight handicap makes this out of the question. If it has a place in industry at all it must take that place because of some different quality or properties it possesses, which other clays, occuring nearer the point of consumption, do not possess.

Wyoming has few present or immediately prospective industrial plants in which bentonite of the Wyoming type can be used. Therefore, like many of the other non-metallic resources of the State, it must seek a market afar. Contrary to the majority of the non-metallic minerals of the State there is no adequate marketfor bentonite at the present time at all commensurate with its potential production. The marketing of bentonite is not now and probably will not be for a good many years an economic problem which can be solved by entering existing markets heretofore supplied from other sources, on a competitive basis. There are no pre-existing markets. Whatever market there is, has been, and broader ones will have to be, developed.

There is grave overproduction of bentonite in Wyoming now. It does not need more plants for its production, but it does urgently need wider markets if its production is to progress to a worth-while point, and permit the development of new deposits. I can assure you that plants now equipped for the production of bentonite in this State are capable of supplying at leastthree and, more probably, five times the annual tonnage taht all the consuming industries together now can use.

How, then, can this condition be remedied? There is only one way. Forget, for a time the question of production and develop the potential market.

Technical research, the development of new uses for the material, and the discovery of new products that can be made from or by the use of bentonite are urgently needed now.

A considerable number of uses already have been worked out, Some of these are well known, and some are in secret processes known to but few.

As I stated befoe, there is little use considering replacing other clays, more cheaply obtainable in the industrial East, with bentonite, bulk for bulk or pound for pound. Bentonite must either satisfy a want not met by the use of the commoner

varieties of clay, or it must impart more desirable qualities to the finished product.

Before we can make much progress in working out these new methods for utilizing bentonite, we must become thoroughly familiar with its properties and with its behaavior under all conditions concomitant with each suggested use. The difference between bentonite and the commoner clays is a difference of degree. I am speaking now in the popular, and not the technical sense. All clays are hydrous aluminum silicates of varying degrees of purity or rather of impurity. Clays owe their plastic properties, for the most part, to the finer particles, the colloidal portion. The percentage of this colloidal portion is much higher in the bentonites than in the ordinary clays of commerce. Hence, the properties of a bentonite of good quality are the properties of the colloidal or plastic portion, modified by the non-plastic constituents. Theproperties of the ordinary clay are the properties of the non-plastic constituents modified to a certain degree by the plastic portion.

This, in every brief, is the distinctive property of bentonite which will determine its industrial application. It is neither proper nor advisable, on this occasion, to dwell at any considerable length on this phase of the question, nor to enter into any technical discussions or explanations. I intend merely to point out the general direction in which research should tend. I wish to emphasize, strongly, the fact that this natural resource of the State of Wyoming cannot be developed properly by locating, uncovering and equipping deposits for production; it must be developed from the point of its final utilization.

This is going to require research, and still more research. The possibilities for the material are great. New uses can and will be found for bentonite but its utilization cannot be forced by over-production, fostered by ill- advised promotions, and the premature exploitation of the known deposits.