

South Dakota  
Geological and Natural History Survey

Freeman Ward, State Geologist

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CIRCULAR 6

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**CHALK**

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BY

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## INTRODUCTORY NOTE

One of the many effects of the war was the restriction placed on the importation of the English and French chalk. To meet this situation an attempt was made to utilize the domestic chalk.

Early in the fall of 1918, through the courtesy of the Yankton Commercial Association, the State Survey was supplied with a quantity of chalk rock for experimental purposes and the work was started. The termination of the war removed the necessity for an immediate solution of the problem, so little has been done since. Although the investigation is by no means complete, yet the facts so far determined are considered to be of sufficient interest to be published in the hopes of stimulating further investigation and perhaps of starting a new industry in the state.

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## USES

Chalk rock has been used in this state for building stone, for making lime, and, when mixed with shale, in the manufacture of cement.

Chalk may also be used, directly or indirectly, in the manufacture of whiting, paint, kalsomine, putty, rubber, leather, picture frame molding, gunpowder, oil cloth, roofing cement, and possibly other things. It is this second set of uses for which the English and French chalk has been imported.

Whiting is the basis of the manufacture of most of the other things listed. It is of several grades. It may be merely the finely powdered chalk. The better grades receive additional treatment for the purpose of improving the texture, removing grit, etc., and have special trade names.

## OCCURRENCE

The chalk rock is technically known as the Niobrara Chalk and is of Cretaceous Age. It rests upon the Benton Group and is overlain by the Pierre Shale. It outcrops extensively along the Missouri River from Yankton up to and beyond Chamberlain, being a prominent member of the bluffs bordering that stream. It is found as scattering outcrops east of the river, and also as a more or less continuous band nearly encircling the Black Hills to the west. It has been struck in digging many of the wells in widely separated parts of the state. Presumably, then, it may be considered as an essentially flat or gently undulating bed (averaging 150 feet in thickness) underlying nearly the whole of South Dakota, and outcropping at the surface at many localities, the chief ones of which have been indicated.

For the most part it is heavy bedded. But it may be thin bedded and locally has shaly members present. This shaly character is more common in the western than in the central and eastern part of the state.

## THE INVESTIGATION

Since the South Dakota chalk occurs in practically unlimited quantities and since it is readily accessible at many points in the state, the in-

vestigation was concerned primarily with the problem as to whether the chalk was of the proper quality to serve as a substitute for the foreign chalk.

The specifications as to quality apparently have never been clearly defined. While the composition of the chalk is important, a chemical analysis alone will hardly be an adequate criterion of quality. Chemically the South Dakota chalk while not quite as pure is not vastly different from the foreign chalk.

But the physical qualities, color, texture, etc., seem to be more important in controlling the value and usefulness of the material. A few of these physical qualities may be told on inspection, but most of them cannot be determined without special equipment, or can be ascertained only by actual trial of the material in manufacture.

To this end a number of manufacturers were approached and were found willing to experiment with our material. Their desire to help in the problem was very gratifying and the matter was progressing very satisfactorily at first. But as soon as the war pressure was removed they lost interest. As a result, a number who had promised to experiment with our chalk dropped the matter at once. The investigation was further hindered because some of the manufacturers could not experiment with our chalk rock directly but needed the whiting made from the chalk. Our lack of equipment prevented us from preparing the grades of whiting desired and necessitated us again turning to outside aid for the manufacture of the whiting.

## THE RESULTS

There is no doubt at all that a good grade of putty can be made from the South Dakota chalk. Putty made in the Survey laboratory has proven suitable for ordinary uses. Two manufacturers report that a satisfactory putty can be made. The color is darker than ordinary putty and this is the one drawback to a perfect article. The color of the chalk prevents its manufacture into White Glazing Putty, but (to quote from a manufacturer) "otherwise it possesses the same qualities as the whiting made from imported chalk." And since so much putty work is covered by paint this color would not prevent its very general use. Nor would the color interfere in the making of oil cloth, picture molding, roofing cement, which articles require putty for their manufacture. Putty may be made from crude whiting (finely pulverized chalk). A better grade lighter in color can be made from the refined (treated) whiting. But none of it is white.

While the crude whiting seems to be unsuited for the manufacture of rubber because it is somewhat gritty, the refined (treated) whiting is quite suitable. It has no substances injurious to rubber and is so reported by two manufacturers. A prominent Rubber Company says, "I believe we could use this material in rubber goods without difficulty but that it would command a lower price than the ordinary whiting because of its appearance." The color again is objectionable, not because it in any way injures the quality or interferes with the particular manufactur-

ing process involved, but because the trade is used to a particular color and has some prejudice against a different shade.

Refined whiting could be used in the manufacture of the darker tints of kalsomine, but its color would prevent its general acceptance by the trade.

No experiments were run to test the value of our chalk in the manufacture of leather or gunpowder.

In conclusion—It seems clear that the South Dakota chalk is a raw material suitable for the manufacture of both putty (and things made from putty) and rubber. But we must recognize that there is a color drawback which in competition may have to be met by a lower price.

At present, the industries using the bulk of the whiting are located in the eastern part of the United States. It is possible that the freight rates between South Dakota and the Atlantic seaboard may be a determining factor in the exploitation of the chalk.

Whether factories should be established in the state and the manufactured articles themselves, rather than the raw material, shipped to compete with the eastern products is a matter that should be decided by the various commercial organizations of the state.

#### FUTURE INVESTIGATIONS

The Survey expects to continue the investigation—partly in the field searching for white and better beds of chalk, and partly in the laboratory to see if the color defect can be overcome, and to find other uses for the material. This investigation will be continued as soon as opportunity and funds become available, both of which are lacking at present. Further efforts will be made also to secure the co-operative help of the manufacturers.

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Address all inquiries to the State Geologist