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Some Features of the Fort Dodge Gypsum

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SOME FEATURES OF THE FORT DODGE GYPSUM.[1]

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A New Basal Conglomerate.—During the prosecution of field study of the gypsum for the Iowa Geological Survey the writer found immediately beneath the gypsum in several places a basal conglomerate which has not heretofore been described in reports on the region. The locality where this conglomerate is best developed is in a ravine on the west side of Des Moines river op-

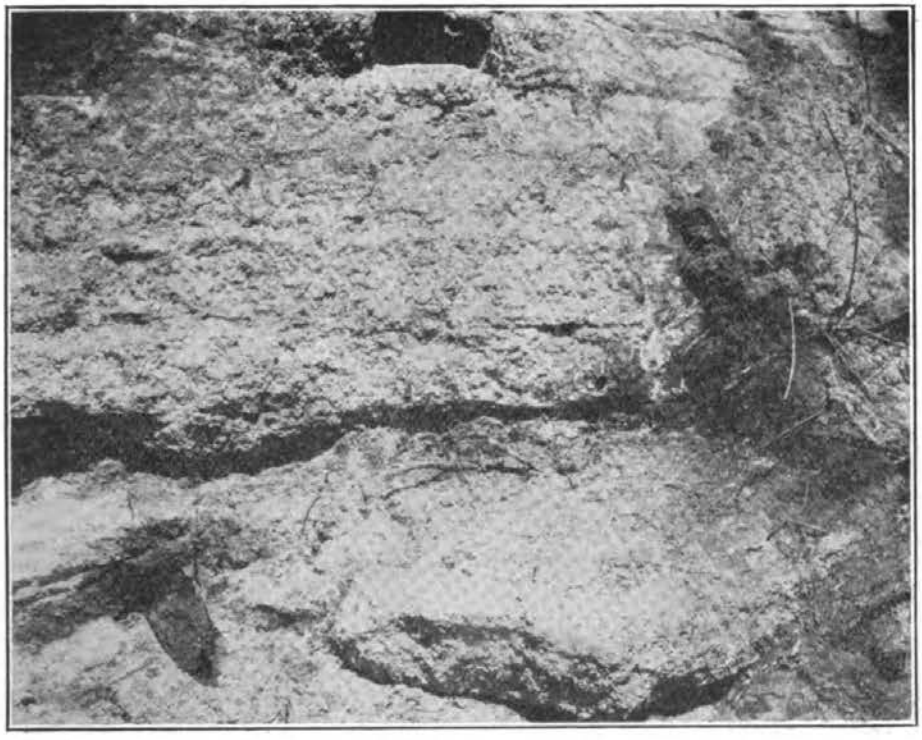

Fig. 194.—Conglomerate beneath gypsum in the ravine opposite Two Mile creek, Webster county. The dark shadow across the middle of the picture divides the gypsum from the conglomerate.

posite Two Mile creek about three miles south of Fort Dodge. The Fort Dodge, Des Moines and Southern railway extends along this ravine and has exposed the conglomerate in some of its cuttings. In the lower part of the ravine the gypsum is seen to lie on the black or dark colored Coal Measures shales. In places the contact is direct while in other places about six inches of clay, evidently residual, intervenes. Perhaps one-half mile up the ravine there is exposed beneath the gypsum a reddish or

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grayish conglomerate one to two feet thick, figure 194. The pebbles are mostly limestone, fairly well smoothed by attrition, and are rather small, the larger ones being not much over half an inch in diameter. Under the conglomerate lie the shales of the Des Moines stage locally colored red or lighter shades. At other places near by the conglomerate outcrops immediately beneath the drift, figure 195. The gypsum either has been removed by erosion or solution or was not deposited. The significant feature about this conglomerate, however, is its fossil content, and this it

Fig. 195.—The conglomerate which lies immediately under the gypsum in the ravine opposite Two Mile creek, below Fort Dodge. The conglomerate is fossiliferous here.

is which makes it of peculiar value in relation to the gypsum. Professor A. O. Thomas of the Department of Geology of the State University visited the gypsum region with the writer on a later trip and a number of fossils were collected from the conglomerate. Mr. Thomas after studying this collection and comparing it with type forms wrote as follows: "The basal conglomerate fauna is very evidently of Missouri age although I am not ready to say so unequivocally since so many Pennsylvanian forms have a habit of continuing on into the Permian. I have

compared the unquestionably identified species with Pennsylvanian and with Permian lists and all point to the former rather than to the latter. Not a trace of anything Mesozoic occurs in the material. Some of the specimens show evidence of wear as from rolling but they do not seem to have been transported far. Here is the list:

Fusulina secalica Say=*F. cylindrica* Fischer.
Zaphrentis (species unidentified).
Stem segments (and plates?) of unknown crinoids.
Rhombopora lepidodendroides Meek.
Productus cf. *longispinus* Sowerby.
Pugnax osagensis (Swallow).
Squamularia perplexa (McChesney).

Fig. 196.—The general even top of the gypsum in the Vincent clay pit, Fort Dodge. Note the channel down the center of the view.

The Rhombopora has suffered from wear so that the characteristic markings, if they were ever present, are rubbed off. There is no question about the Fusulina. I sectioned a few, they are as good specimens as one could wish for.''

The nearest known rocks of Missouri age are in Carroll, Crawford and Monona counties. In former times the northward extent undoubtedly was greater. Cretaceous rocks are present only a few miles to the west of Fort Dodge in Calhoun and Poca-

hontas counties. In spite of the softness of the Cretaceous rocks fossils certainly could be transported as far as the gypsum region and in fact they are found in the drift at considerable distances from the original strata. There are no known strata in northwestern Iowa west of Webster county intermediate in age between the Missouri and the Cretaceous. The presence of Missouri life forms in the conglomerate of the gypsum region proves it to be of post-Missouri age, while the entire absence of fossils of Cretaceous or later age argues strongly for a post-Missouri-pre-Cretaceous age for the conglomerate and for the associated

Fig. 197.—A view from the opposite end of the pit, Vincent pit, showing the uneven surface.

gypsum and the shales and sandstones which in some localities overlie it. The possibility of the Miocene age of these beds, which has recently been advanced,[2] seems to be definitely excluded by the evidence.

Doctor Sidney L. Galpin of the Department of Geology of Iowa State College informs the writer that a similar fossiliferous conglomerate underlies the gypsum beds of Kansas, which are well known to be of Permian age.

[2]Keyes, Chas., Iowa Acad. Sci., Vol. XXI, p. 186. Eng. & Min. Jour., Vol. 100, p. 466, 1915.

The other locality where this conglomerate was found is at the pit of the Vincent Clay Products Company at Shady Oaks station on the Fort Dodge, Des Moines and Southern Railway. This is at the mouth of Two Mile creek on the east bank of Des Moines river directly opposite the ravine in which the previously described outcrops occur. Here the conglomerate is absent from some places while at others it is a foot or a foot and a half thick. It is red and gray and most of the pebbles are less than one-half inch in diameter. Parts of the conglomerate are really a coarse

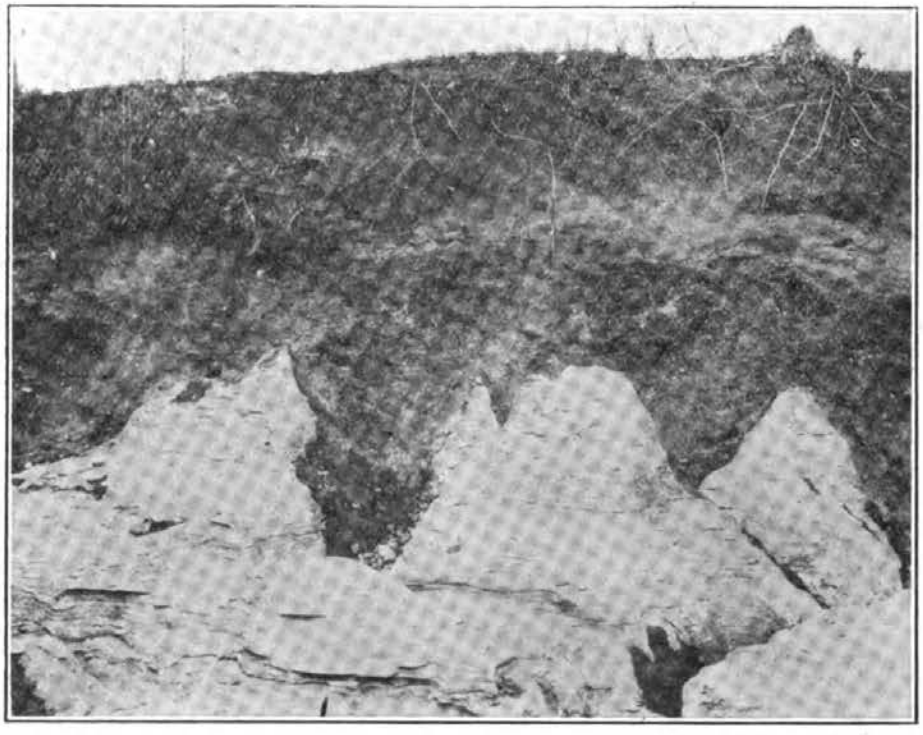

Fig. 198—The irregular surface of the gypsum buried in drift, Vincent clay pit, Fort Dodge.

sandstone. Fossils were found in streaks and pockets of the coarser materials.

A noteworthy feature in this pit as well as in several others is the fact that the upper few feet of the Coal Measures shales just under the gypsum is highly colored, red, blues, purples and light grays predominating. These lighter colors grade into black below. Whether this lighter coloration is inherent in the shales or is due to the chemical action of the dissolved gypsum as it percolates downward is not clear.

An Irregular Solution Surface on the Gypsum.—The overburden of glacial drift at the Vincent clay pit is removed by hydraulicking. The gypsum, which here has a maximum thickness of about seven feet, is then broken up and removed. In the fall of 1917 quite a large area had been cleared of drift and a remarkably irregular surface of the gypsum was revealed. From its nature it is evident that the irregularity was caused by aqueous solution or erosion rather than by ice erosion. Sinuous winding channels have been cut almost through the gypsum bed as the

Fig. 199.—A detail of the irregular surface in the gypsum. The banding is well shown. Vincent pit.

accompanying views show. What was apparently a larger channel extended almost the entire length of the stripping (see figure 196). Pinnacles and towers and walls of fantastic design have been carved in the solid rock and a most picturesque miniature topography has been formed. Potholes or pothole-like cavities have been dissolved out where we may imagine that the tiny torrents dashed and swirled or the slowly percolating waters of a bygone day seeped among the rocks and clays that formed the surface of that time.

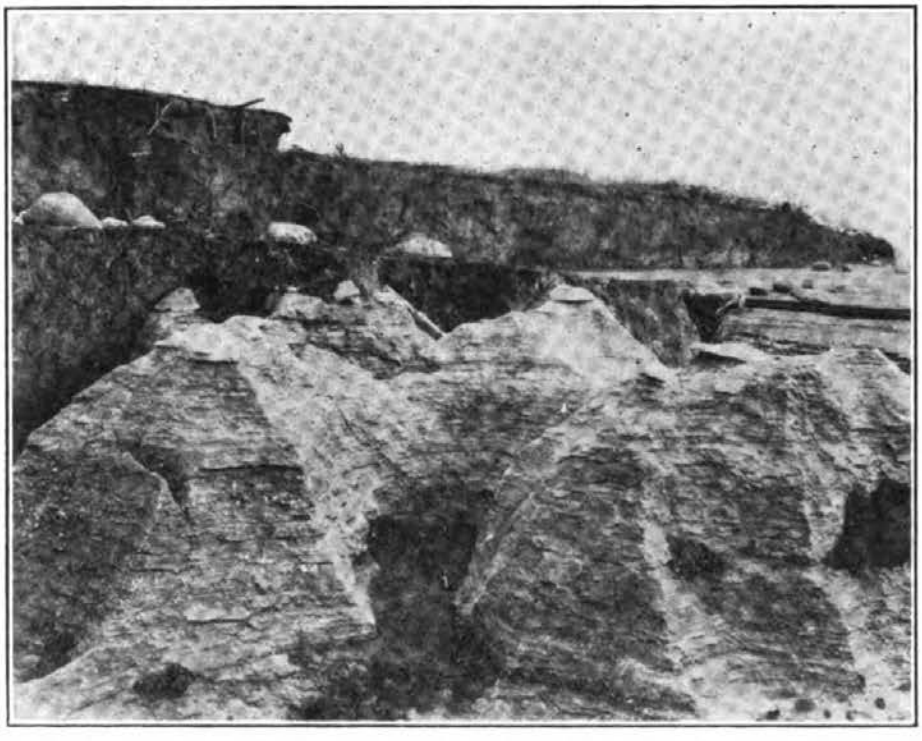

Fig. 200.—A potholelike cavity in the gypsum, Vincent clay pit.

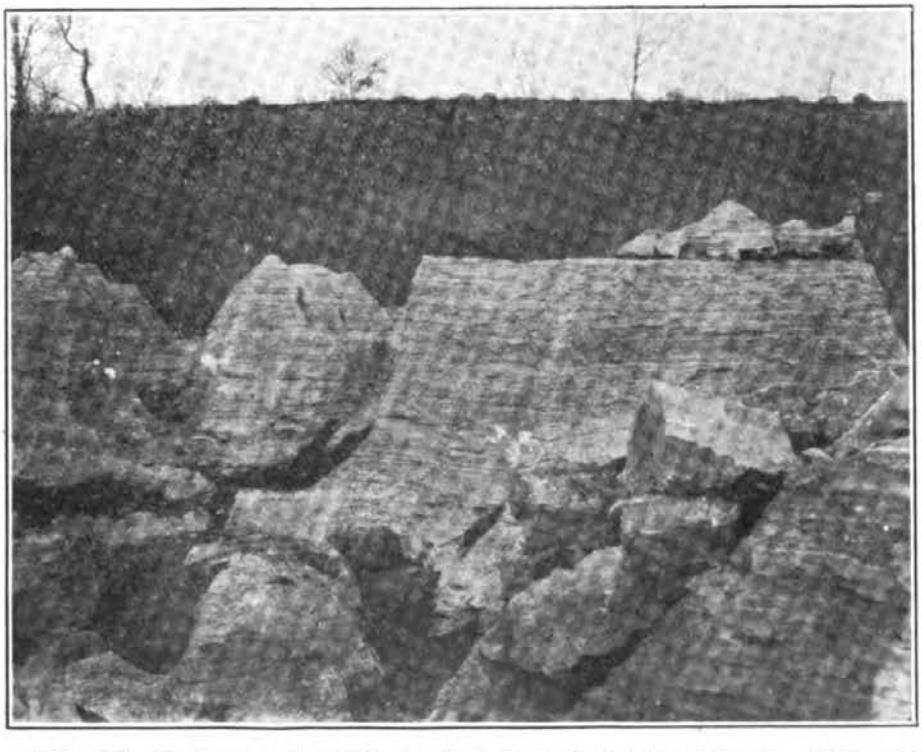

Fig. 201.—Valleys and small erosion channels in the gypsum. Note the small hole at the extreme right. Vincent pit.

There is little evidence to show the age of this solution surface. In some places gray drift fills the hollows in the gypsum while yellow oxidized till extends across hollows and eminences alike, without curving down at any point. In one place an oxidized band bends up over the gypsum mound. There is no indication of slumping or settling of drift into the hollows as the gypsum was dissolved away. If all of the drift here is Wisconsin, as it seems to be, its condition and position would seem to indicate that the solution was accomplished mostly in pre-Wis-

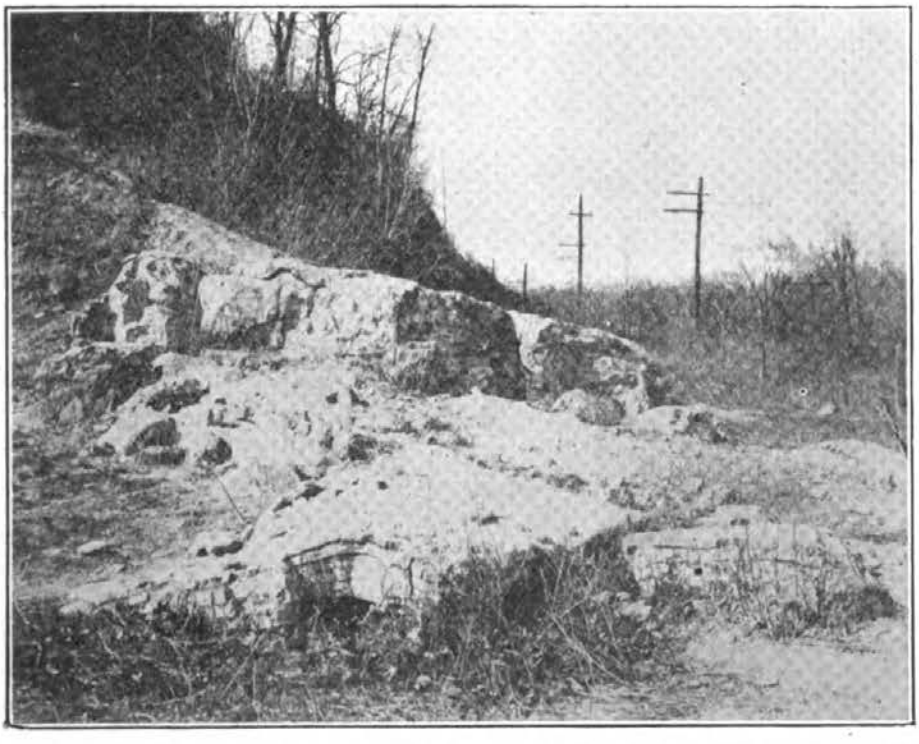

Fig. 202.—Domes in the gypsum on an exposed surface up Two Mile creek. Three feet of red shale overlies the gypsum.

consin (Peorian) time at least, and it might, of course, be earlier than that. The illustrations show that the pebble band and the humus zone extend, for the most part, in uniformly straight lines parallel with the surface of the ground. The fact that this locality is on the upper slope of the valley wall makes escape of the ground water easy and would permit of relatively rapid passage of these waters through and over the rock. This condition might point to a more recent date for the formation of this surface. At the same time similar topographic conditions have prevailed since the valley was formed in post-Kansan (Yarmouth)

times, so that similar opportunities for solution have been offered for a long period of time.

Gypsum Domes.—About a mile up Two Mile valley there is an exposure of gypsum just above the track level of the Interurban railway. It is the last exposure to be seen in ascending the valley and it lies at the end of a point between the main valley and a tributary ravine. Evidently the overburden was cleared away in order to obtain the gypsum. About three feet of red sandy shale lies between the drift and the gypsum. Some of the upper

Fig. 203.—Domes and flexures in the gypsum up Two Mile creek valley.

layers of gypsum on the floor of the exposure have been arched up until they have formed a number of hollow domes of circular or elliptical outlines. The walls of these domes are six inches to a foot in thickness and are cracked and checkered in a very irregular manner. The writer has not seen anywhere else the gypsum so weathered as it is at this place. At several places the rocks give forth a hollow sound as one walks over them. Solution channels similar to those seen in the Vincent clay pit are present here also and show the same intricate arrangement as well as revealing the weathering which the gypsum has undergone.

Professor Thomas suggests that the domes have been caused by the crystals of gypsum in the upper layers absorbing an excess of water with a consequent expansion and a heaving up of the layers into domes. In some cases, as is shown in the center background of figures 202 and 203, the expansion has resulted in a buckling of the layers.

As to the age of these phenomena, the first and natural assumption would be that they were very recent, later than the un-

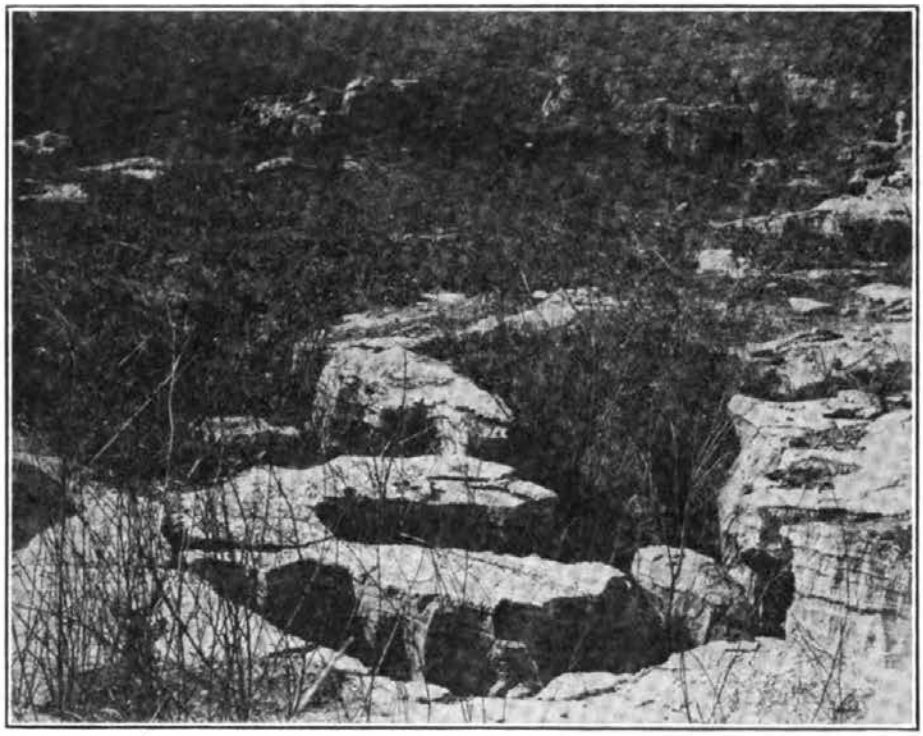

Fig. 204.—Channels of solution in the gypsum in Two Mile creek valley, at the same locality as the last two views.

covering of the beds. This may indeed be the case but the general condition of the beds—their buckling and tilting, their solution channels and extreme weathering—seem to the writer to point rather to a greater age. There are so many possibilities for the time of formation of these features—postglacial, interglacial and preglacial—that it does not seem possible to decide upon any one of them.

IOWA GEOLOGICAL SURVEY,
DES MOINES.