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SOME INSOLUBLE RESIDUE CORRELATIONS OF MISSOURI AND VIRGIL STRATA IN IOWA

E. H. Wenberg

Iowa geologists have long experienced great difficulty in isolating good key beds in the younger Pennsylvanian strata. This difficulty is due to the cyclothemic nature (see fig. 2) of the sediments. The marked success of the Missouri Geological Survey in distinguishing southward extensions of these strata in Missouri on the basis of their insoluble residues has led to a similar attempt in Iowa.

Spot and channel samples were gathered from surface exposures and from mines. (See fig. 1). Although these samples tended to have weathered characteristics unless they were collected with great care, they were better than well samples in that they were uncontaminated from material above and they were more truly representative of the rock unit sampled. In the laboratory the rocks were crushed and sieved to a uniform size and digested with dilute cold hydrochloric acid. By subsidation the coarse residue portion was separated from the fine residue and was subsequently studied under a binocular microscope for mineral and fossil content. The fine residue was described only on the basis of color. In order to show the relationships of the residues to one another

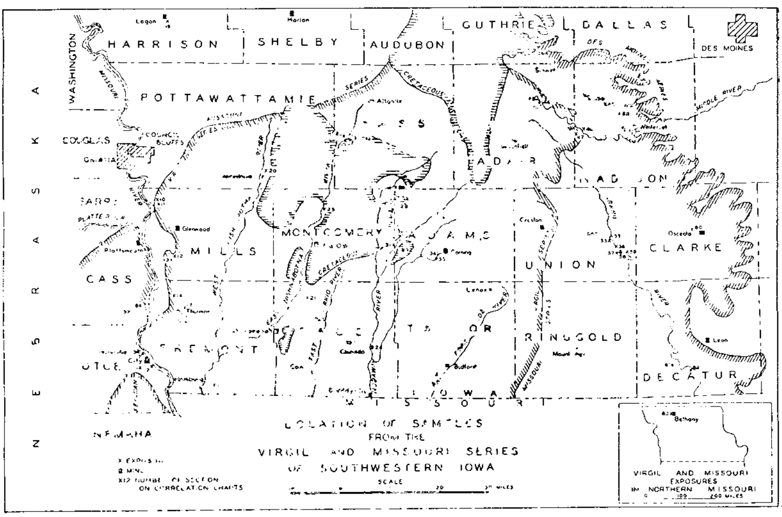

Fig. 1. Location of samples collected.

use was made of graphs or logs in which the ordinates represent the thickness of the strata sampled, the abscissae reveal the percentage by weight of the coarse residue, the fine residue, and the soluble material, and the patterns represent the types of residue present.

An examination of the residue logs (figures 3 to 12) and a reference to the map showing the origin of the samples (fig. 2) leads to the following conclusions. Both the percentage of residue and the type of residue are quite similar in nearby exposures of the same rocks; but with an increase in distance between exposures there is a corresponding decrease in similarity between either type or percentage of residue.

One of the best examples of long distance insoluble residue correlations is that of the Grandhaven limestone in the upper part of the Wabaunsee group. Lithologically the Grandhaven resembles other Wabaunsee limestones, but in four out of four samples examined minute dark gray tourmaline crystals were found. This is remarkable because tourmaline crystals are quite rare in these strata.

Both the Nyman and the Nodaway coals are good horizon markers and are easily recognized in the residues in Iowa. However, in Nebraska both coals thin out and disappear toward the west.

The Elmont limestone is frequently confused with the Reading. As a general rule the residues of the Elmont consist of foraminifera and gray clay. In contrast the residues of the Reading contain large amounts of glauconite and of brown clay. Glauconite is not found in the Elmont. The presence of glauconite in the residues of a building stone widely quarried in the Tarkio River valley has led to the correlation of that stone with the Reading limestone exposed in the Missouri River valley. However, the underlying Wakarusa limestone, also, contains glauconite and may be correlated with at least some of the Tarkio valley limestones.

The Soldier Creek is mostly sandstone and is easily recognized even in the field.

Frequently the Nodaway coal and the overlying Howard limestone contain pyrite replacements of fossils and white gypsiferous internal molds of ostracodes.

Below the Severy shale are the massive limestones and well-developed cyclothems of the Shawnee group. Chert, especially the dark variety, is common in the Coal Creek limestone. The underlying Holt shale has a persistent black fissile phase and overlies a persistent thin limestone. The black chert and the underlying black fissile shale have led to the recognition of the Coal Creek limestone as far northeast as Adair county. In each cyclothem there is a black fissile shale overlying a thin limestone and overlain by a thick cherty limestone. The thick limestones frequently carry silicified foraminifera. The Sheldon limestone foraminifera are fragile and perforate whereas most of those found in the Curzen, the Ervine Creek, the Spring Branch, the Kereford, and the Plattsmouth are fusulinids. The Rakes Creek shale, although not well exposed, seems to be largely made up of sand and silt. Blocky, sandy shales are common in these cyclothems. The Shawnee group seems to have begun with shore or near shore deposits for red beds and sand are common in the Snyderville and the Weston.

Similar near shore deposits seem to have closed the period of Missouri deposition. They are represented by the maroon shales of the Vilas and the Bonner Springs formations. Beneath these red shales lie the well-developed cyclothems of the Missouri series. Four massive thick limestones,—the Argentine, the Drum, the Winterset, and the Bethany Falls,—are especially thick and persistent. Their close resemblance to one another has led to much miscorrelation. However, the residues differ slightly. The Argentine is quite cherty and contains few other residues. In all of the Drum limestone samples examined there were white spines; many of the spines are fragile hexactons and are beautifully preserved in the residues. The Winterset is cherty, often forms a fine brown residue, and in many cases contains bundles of hollow ferruginous spines. This latter residue found in the limestone exposed at Logan, Harrison county, strengthens the previous correlation of that limestone with the Winterset limestone in Madison county. The Bethany Falls is usually divided into three massive limestones by two thin shaly layers. In contrast to the fine brown residues of the Winterset limestone the Bethany Falls residues are generally gray. An interesting lateral variation in type of residues is afforded by the Middle Creek limestone. In Decatur and in southern Madison counties the Middle Creek is a nearly pure limestone of constant thinness. However, as it extends to the northeast part of Madison county there is a decided thickening and a large amount of sand is included.

As in the case of the Virgil series, the Missouri series is based on extensive sandstones and red beds.

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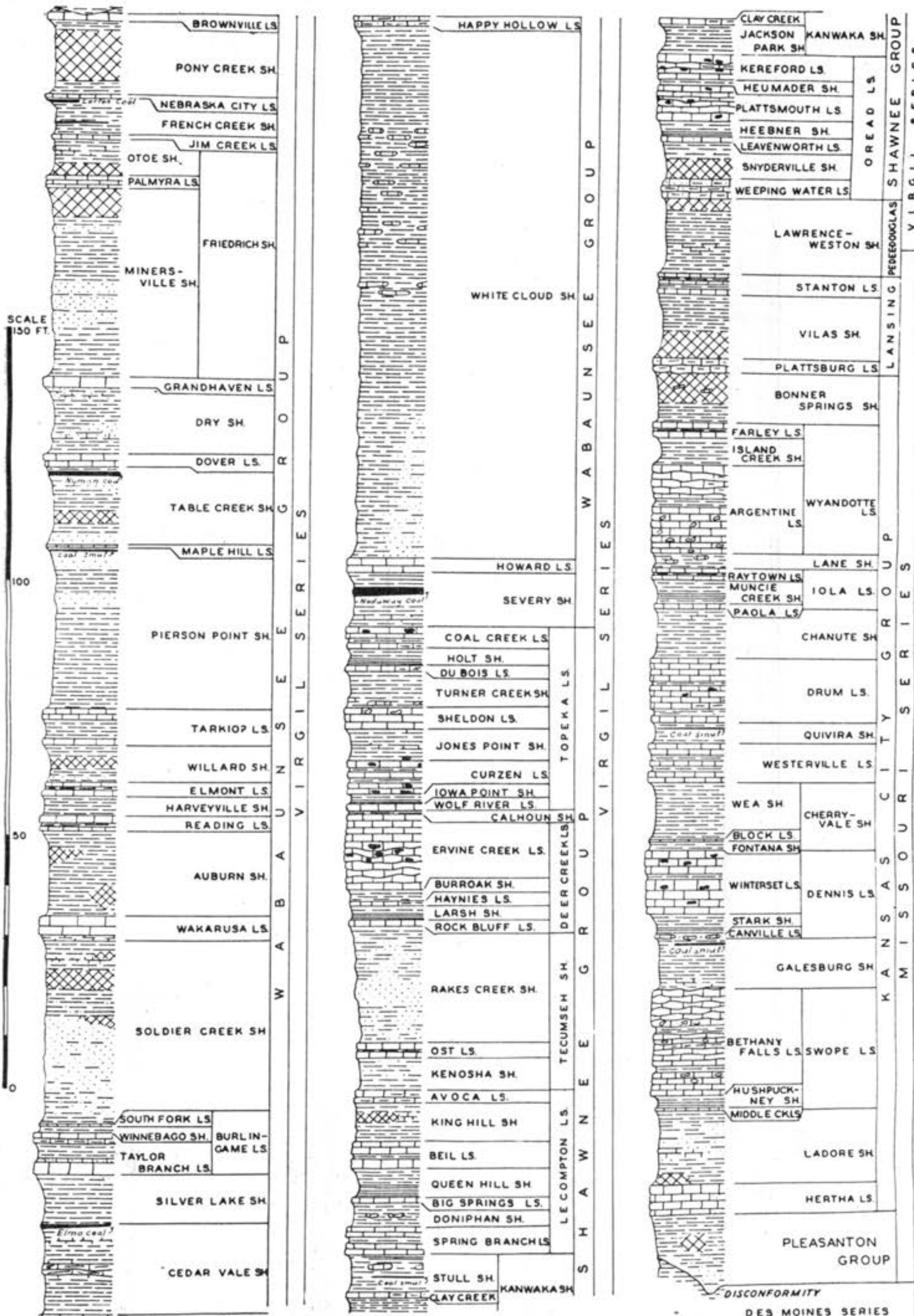

GENERALIZED SECTION OF THE VIRGIL AND MISSOURI SERIES IN IOWA

FIG. 2.

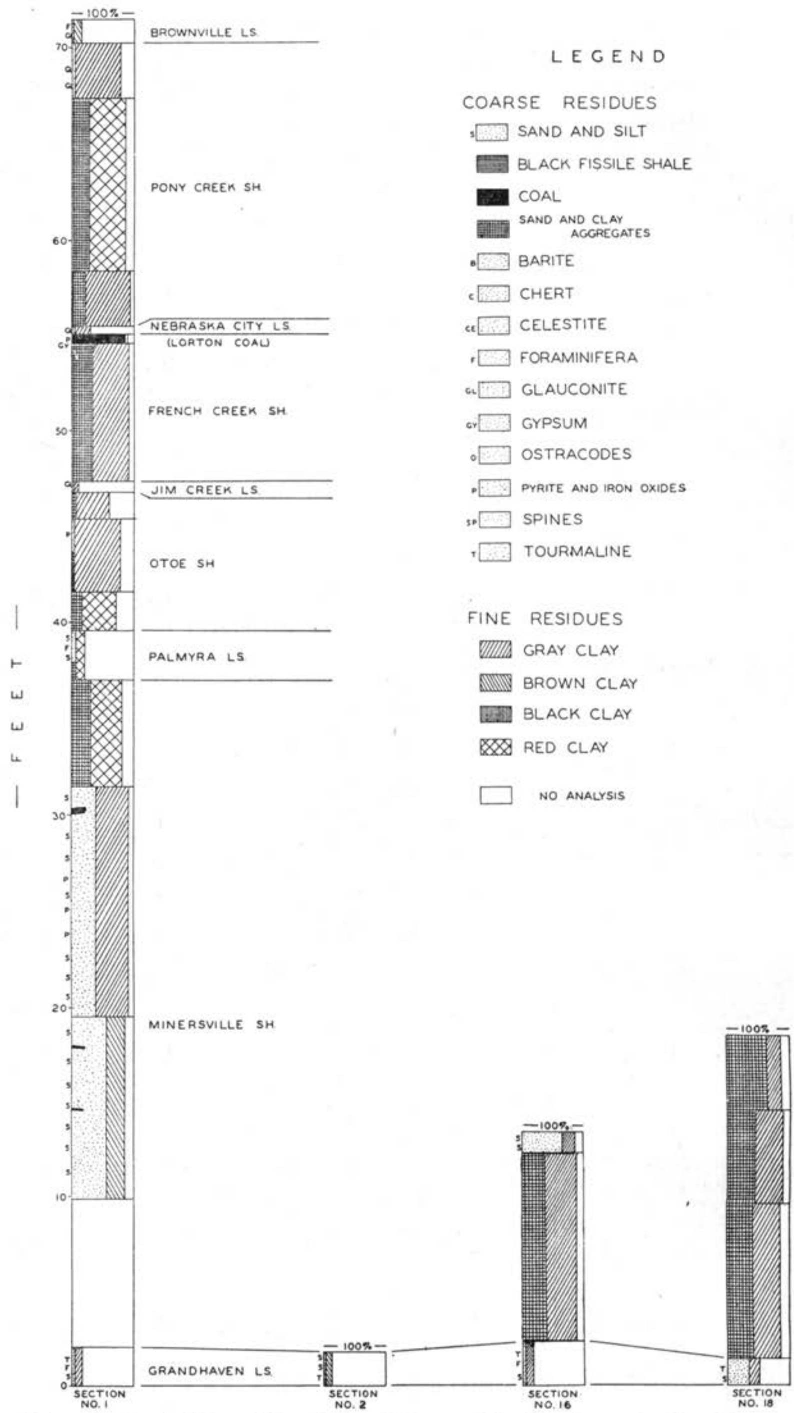

Fig. 3. Insoluble residue logs of Brownville limestone to Grandhaven limestone.

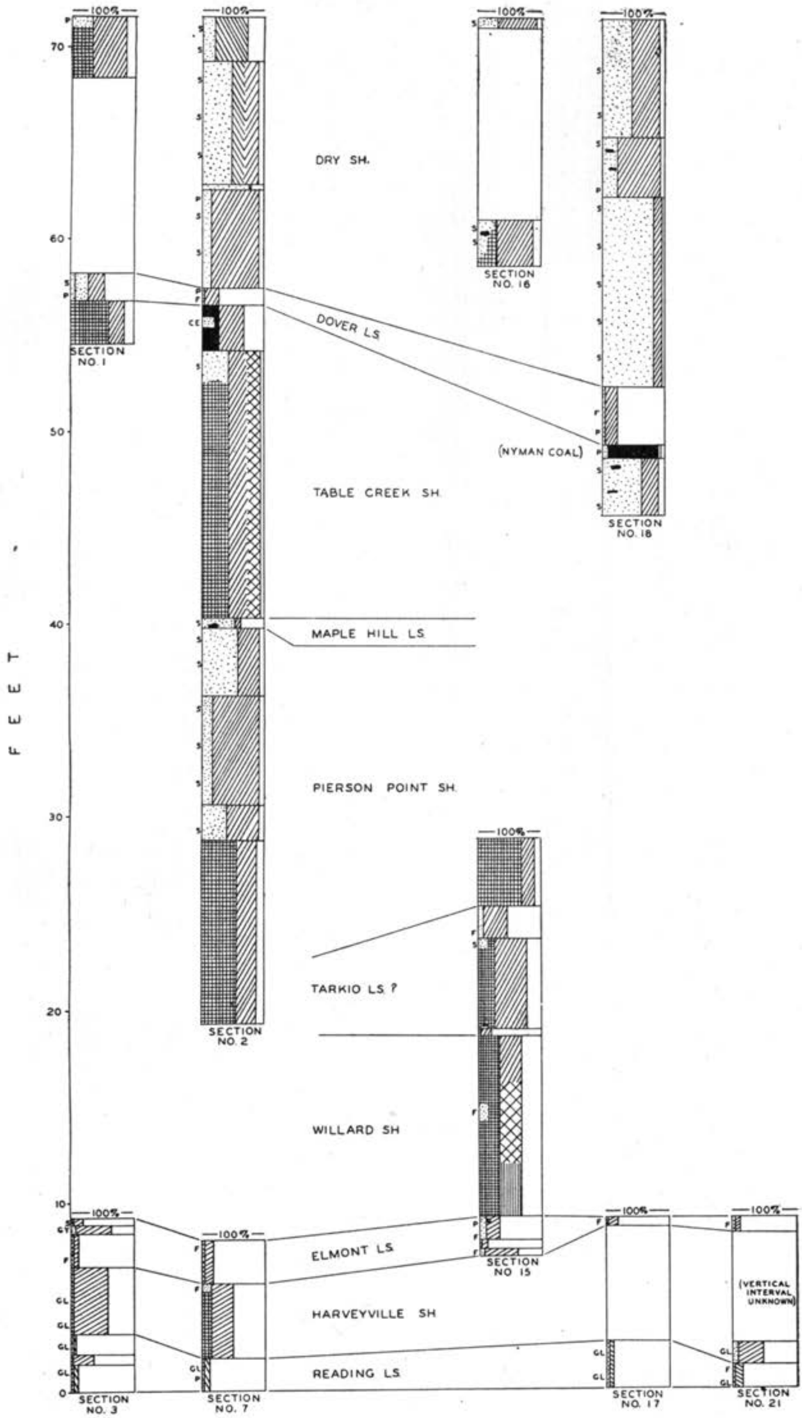

FIG. 4. Insoluble residue logs of Dry shale to Reading limestone.

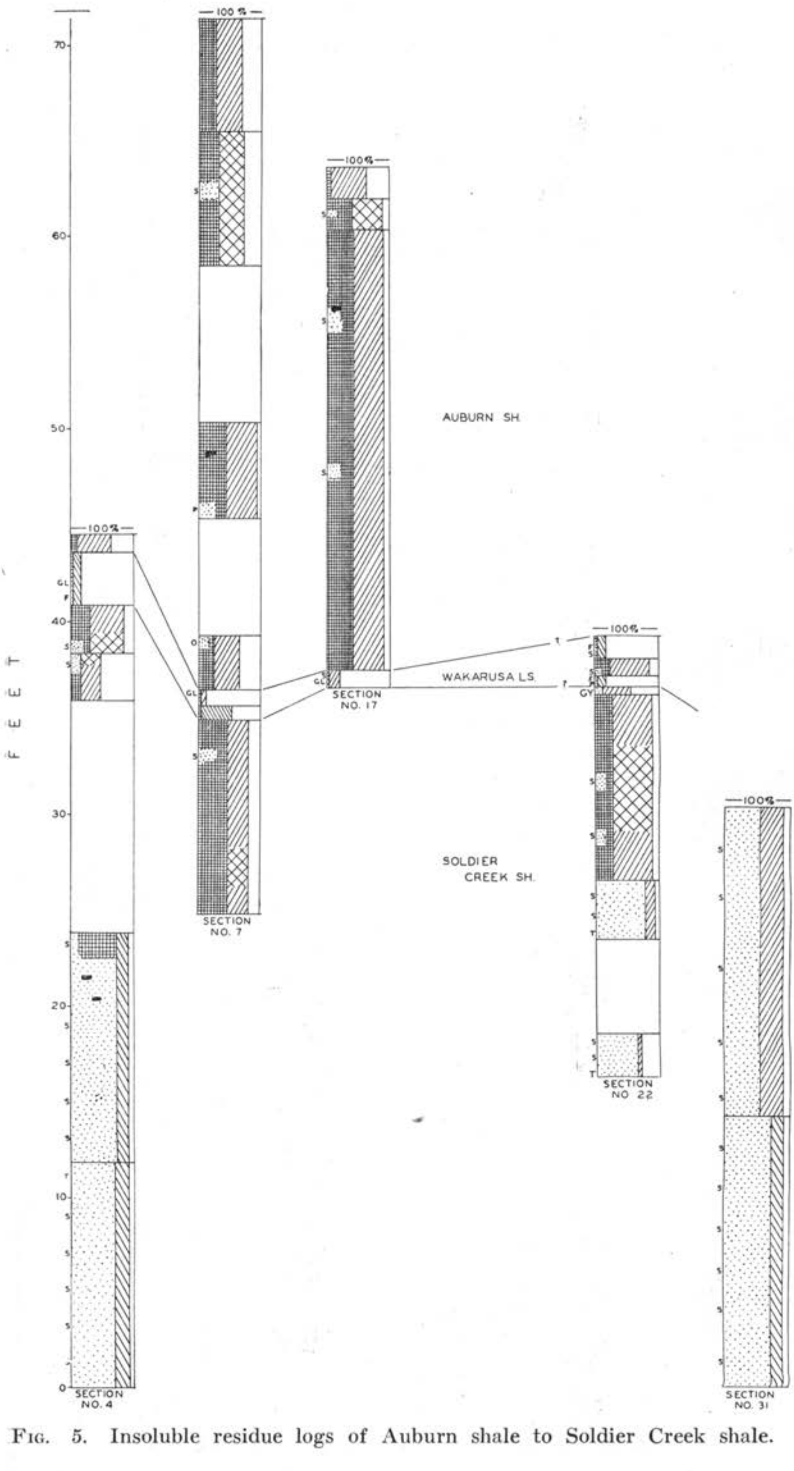

FIG. 5. Insoluble residue logs of Auburn shale to Soldier Creek shale.

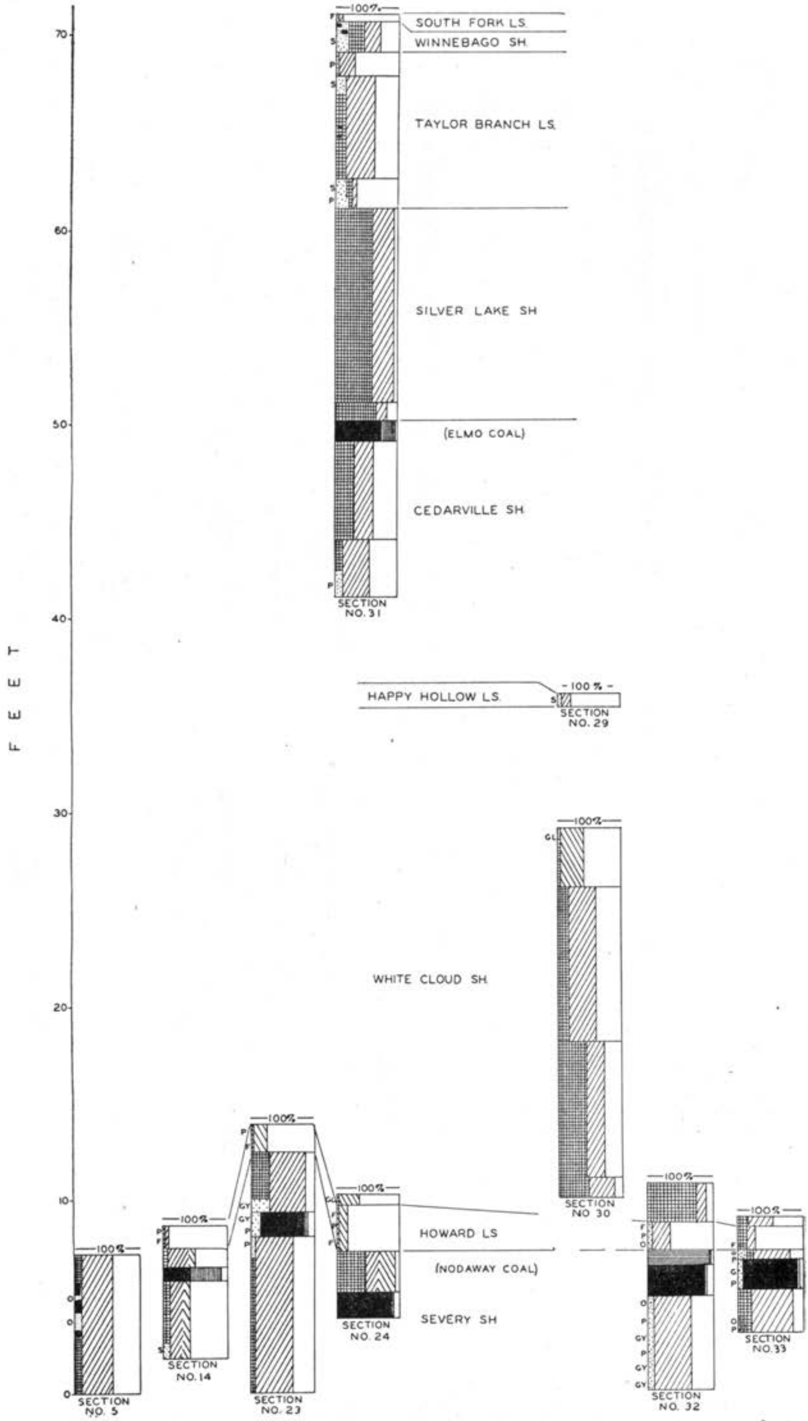

FIG. 6. Insoluble residue logs of South Fork limestone to Severy shale.

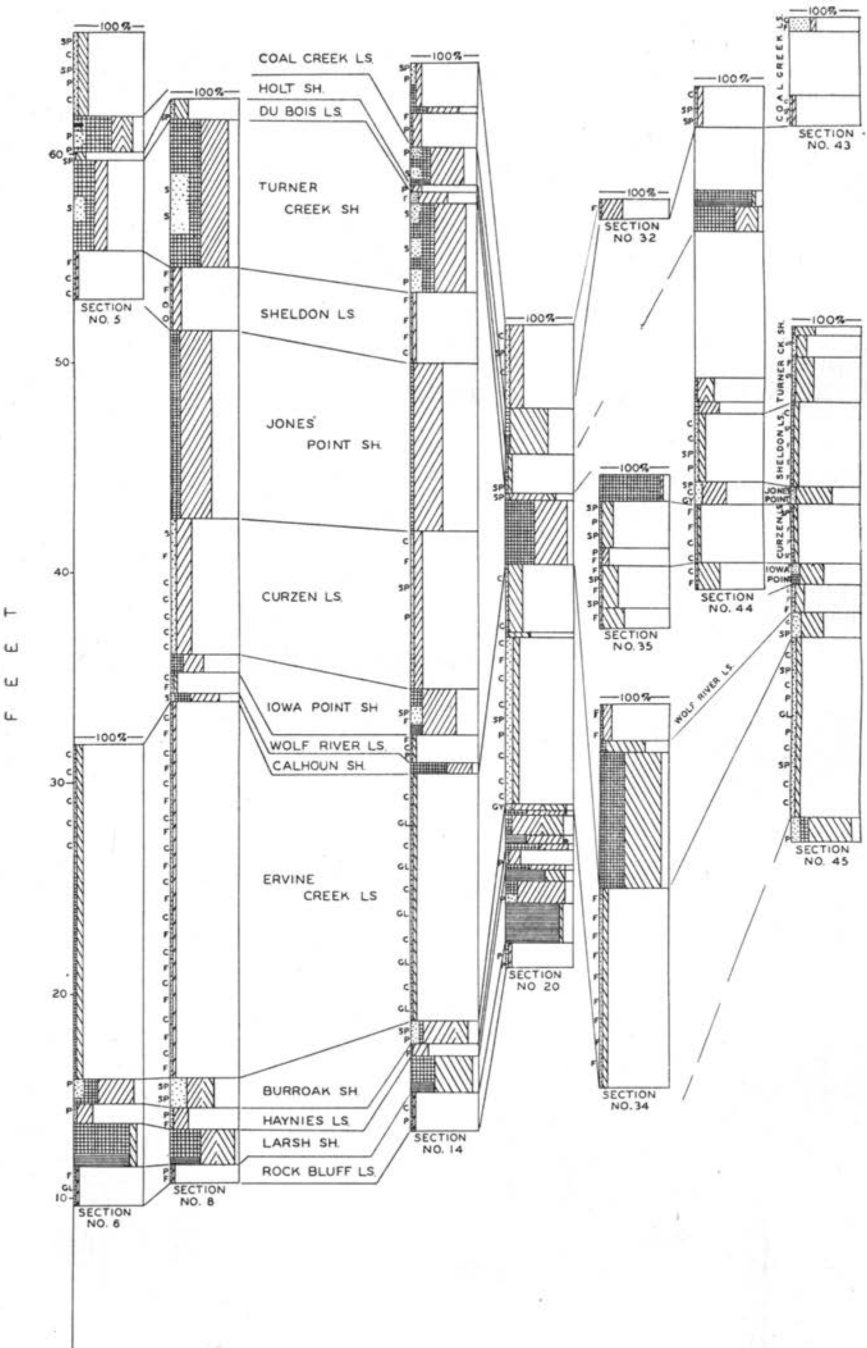

Fig. 7. Insoluble residue logs of Coal Creek limestone to Rock Bluff limestone.

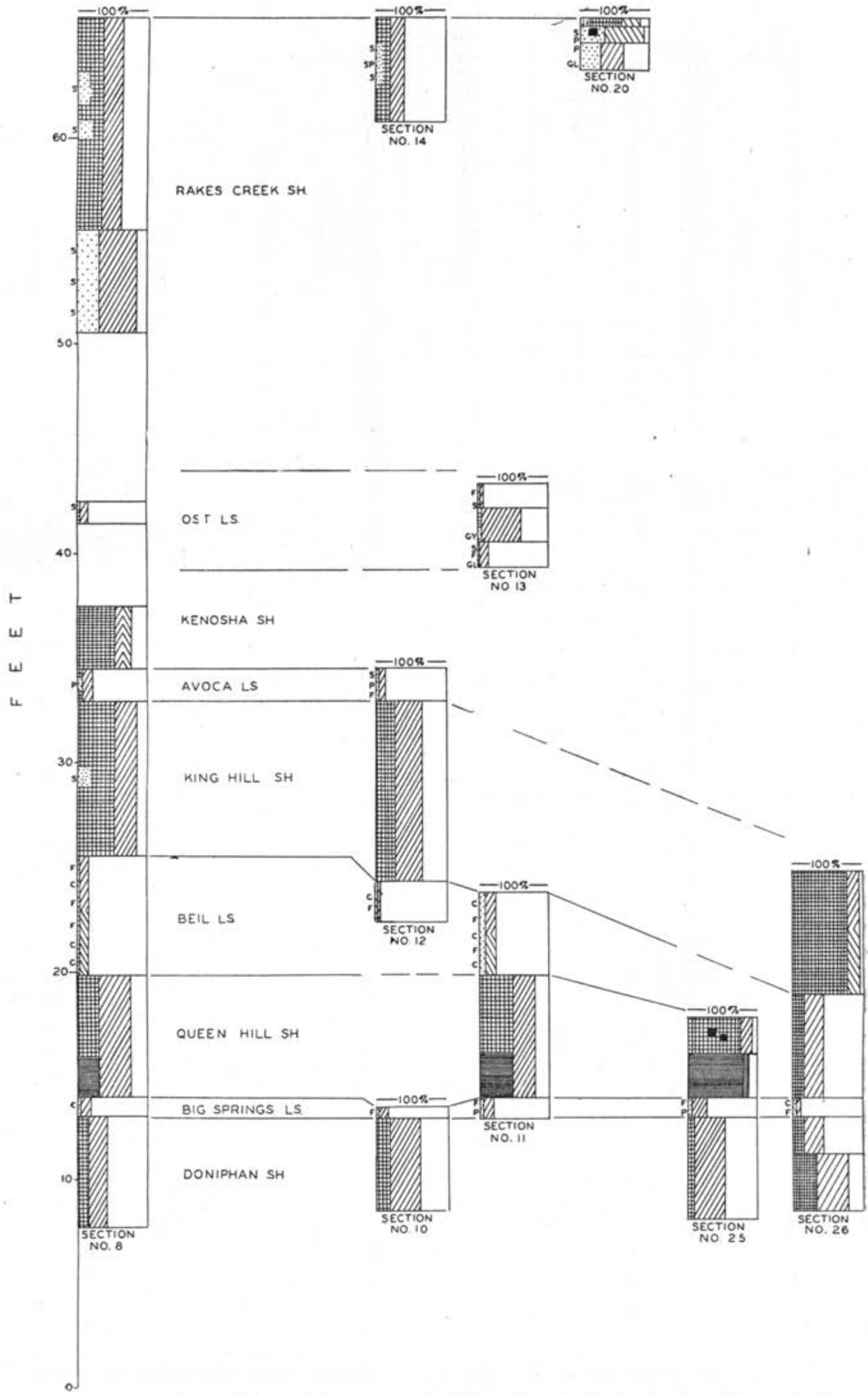

FIG. 8. Insoluble residue logs of Rakes Creek shale to Doniphan shale.

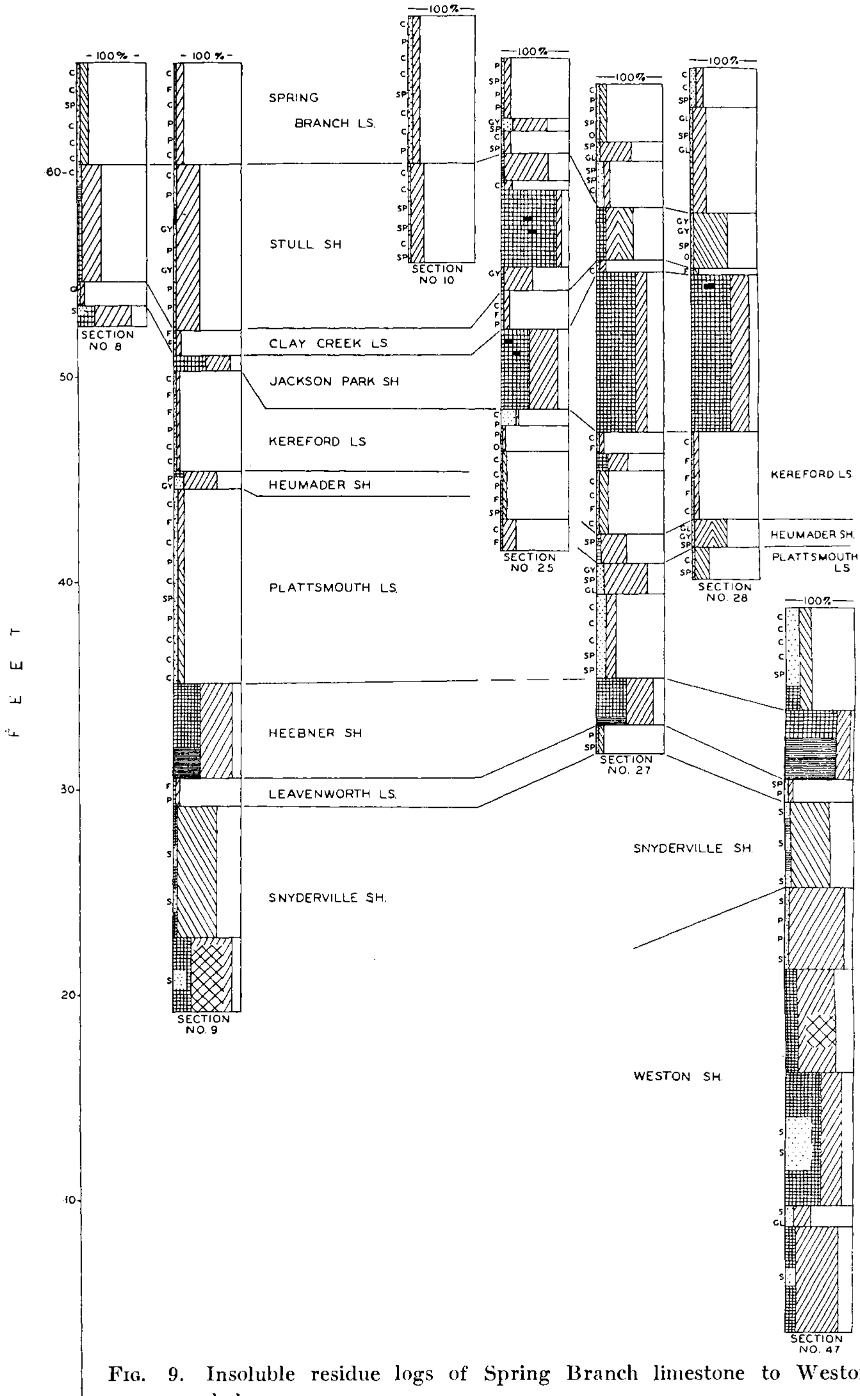

FIG. 9. Insoluble residue logs of Spring Branch limestone to Weston shale.

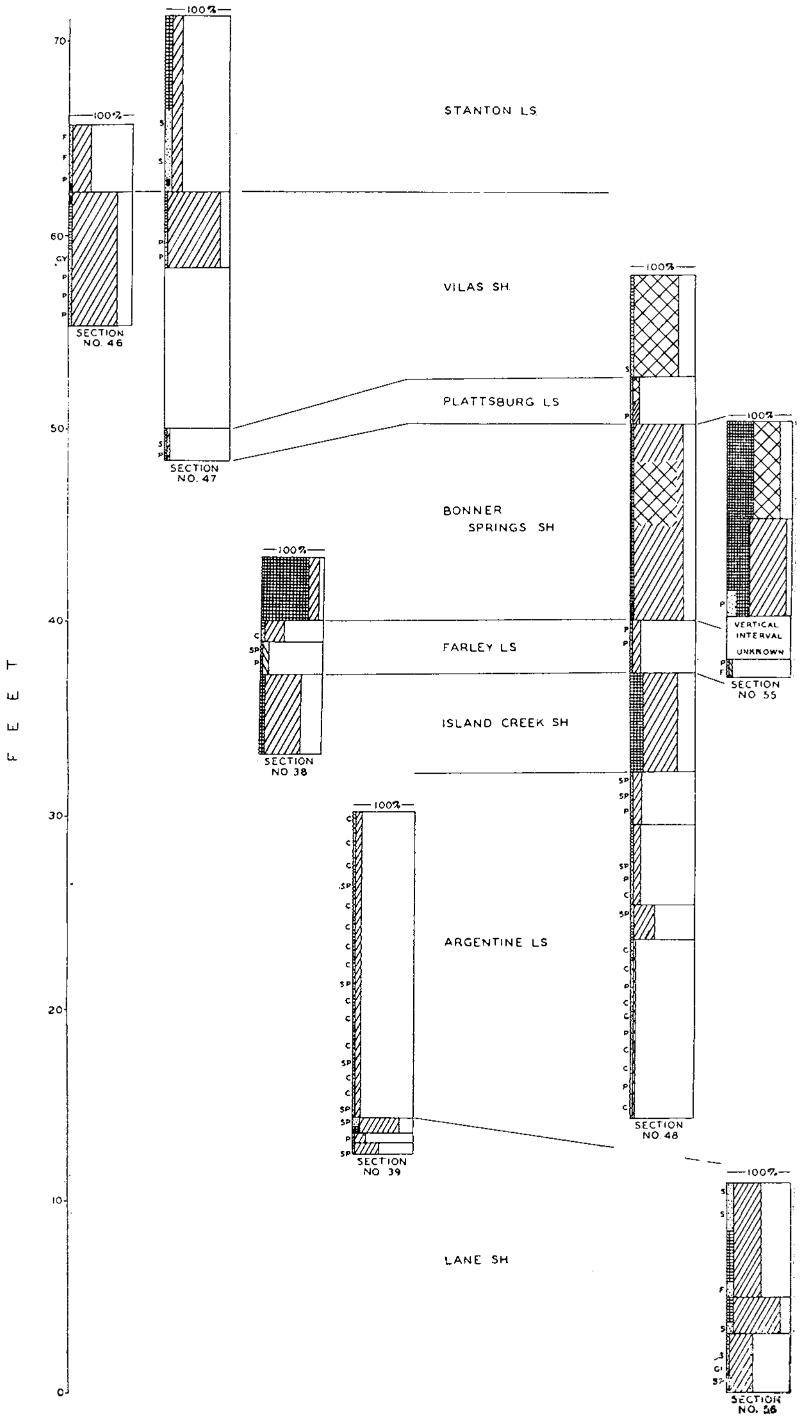

Fig. 10. Insoluble residue logs of Stanton limestone to Lane shale.

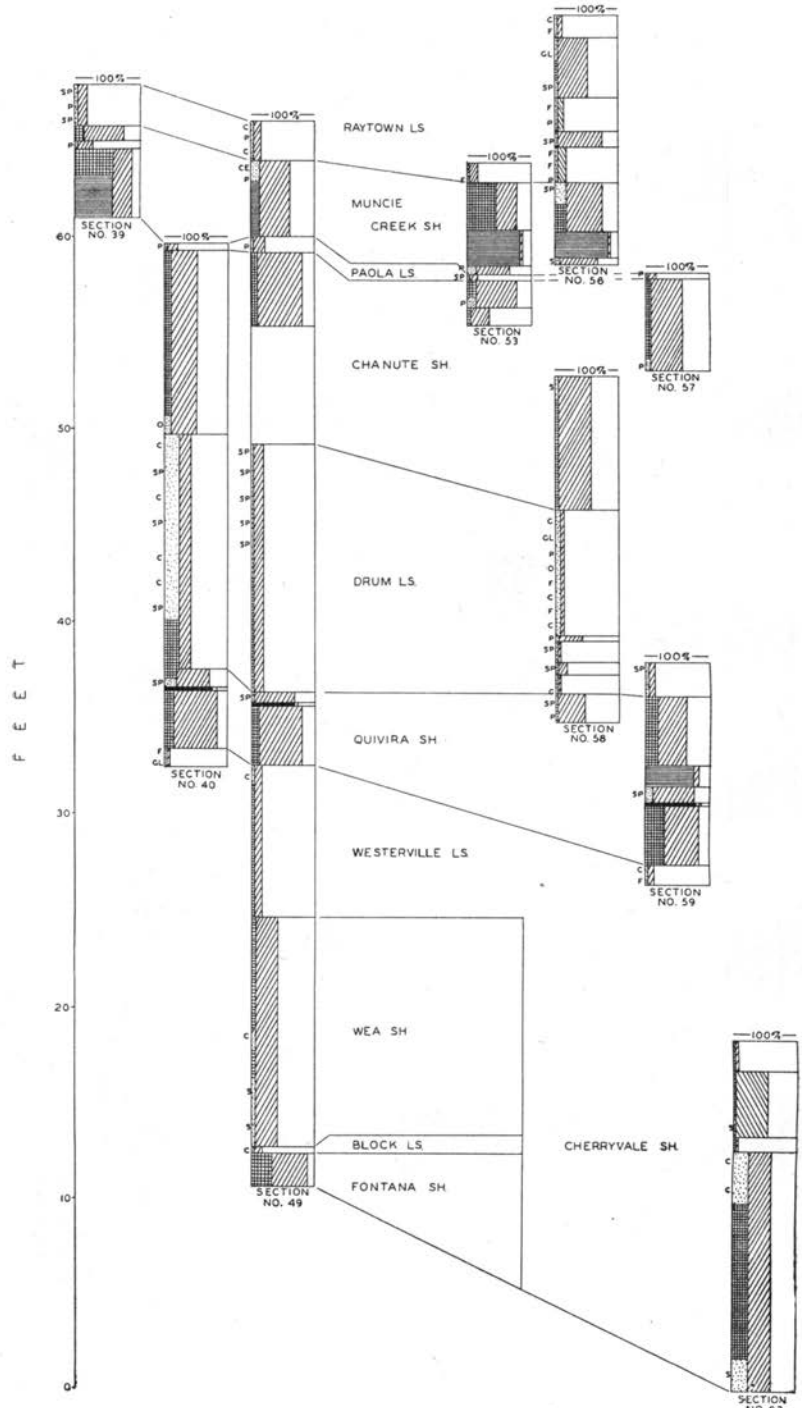

Fig. 11. Insoluble residue logs of Raytown limestone to Fontana shale.

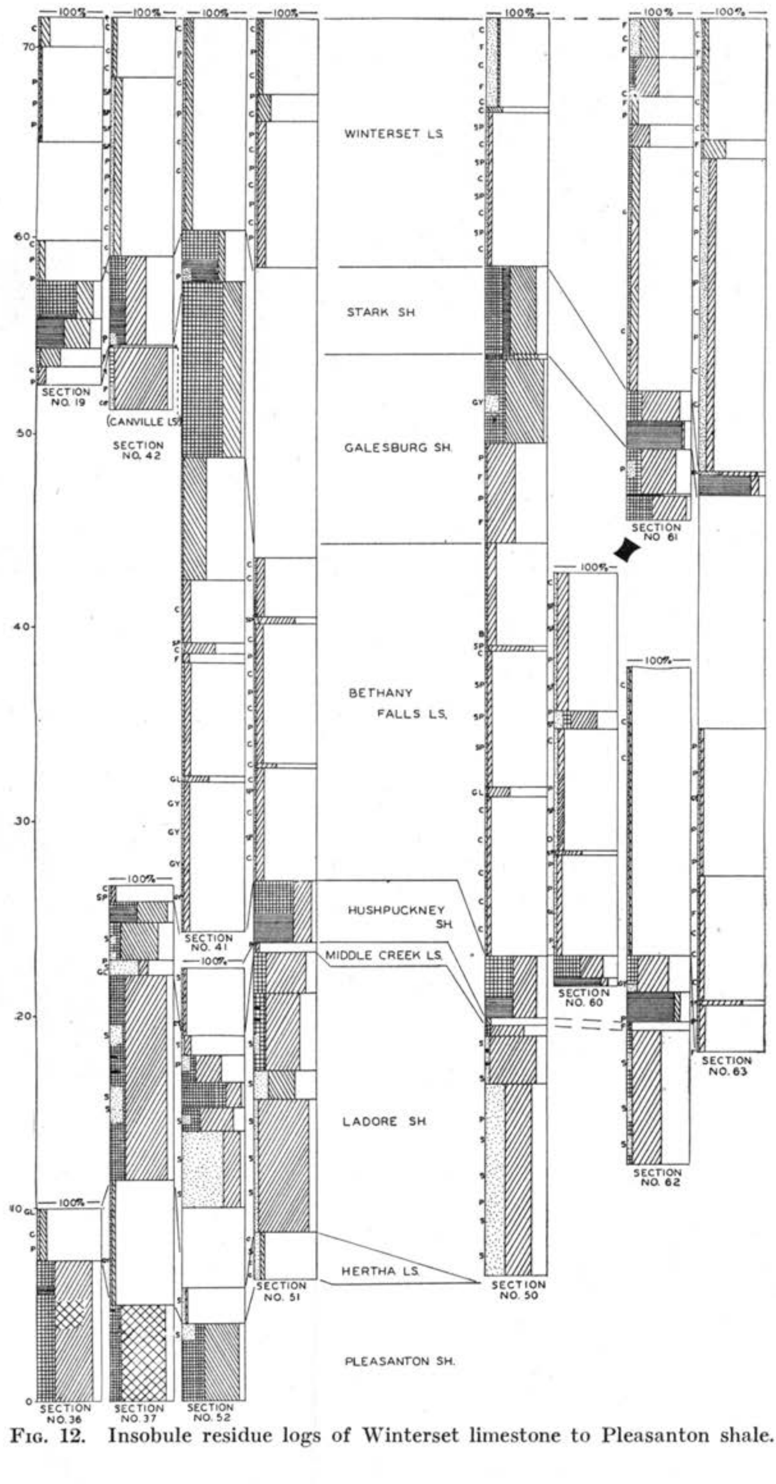

FIG. 12. Insobule residue logs of Winterset limestone to Pleasanton shale.