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CONTENTS

AREAS FOR FURTHER PROSPECTING NEAR THE MARTINSVILLE POOL, CLARK COUNTY

By Gail F. Moulton

Introductory Statement

Areas deserving further prospecting in the vicinity of the Martinsville pool, Clark County, were determined as a result of a field investigation by the Illinois State Geological Survey during 1925 and 1926. The present preliminary report is issued so that the operators interested in the field may benefit at once from the results of the work. A report to be published later will present further details regarding geologic conditions and production.

Development of the Martinsville Pool

Prior to 1922 the production in the Martinsville pool had been obtained from a pay in the Mississippian limestone at a depth of about 500 feet. Late in 1923 drilling was undertaken to test the oil possibilities of the "Trenton." The Trenton Rock Oil and Gas Company found such a good showing of oil at about 1,400 feet in their first well on the John Carper farm in sec. 30, T. 10 N., R. 13 W., Martinsville Township, that drilling was suspended and a producing well obtained in the newly discovered pay.

Development of the Carper sand production was active during the period 1923-1925. During that time a deepened well discovered a new producing horizon at a depth of 1,550 feet in the "Niagaran" lime and within the past year, many wells have been deepened to this new pay. The present practice is to drill both the Carper and "Niagaran" horizons at once, leaving about 200 feet of hole without casing which is protected by a liner in most cases set on a shoulder at the top of the lime above the lower pay.

Producing Horizons

CARPER SAND

The Carper sand is a fine grained sandstone which occurs in lenticular bodies of considerable areal extent in the black shale underlying the Mississippian limestone. The general relations are indicated in the typical section in figure 1. Commonly the sandstone occurs in two or more beds which are separated by 10 to 15 feet of shale. In a few places as many as four separate beds of sandstone are found. Usually the top sand is barren of oil, but in one or two wells it has been reported to make a showing. The second sand is generally the principal producing member of the Carper sand zone.

The oil accumulation in the Carper sand is determined by a combination of folding and sand conditions. The Carper sand is consistently productive where found on the higher parts of the dome, but in some places it is so dense that the wells are small. Good wells have been obtained at some little distance down the dip from the highest portions of the structure below tighter places in the Carper sand, but the presence of a larger amount of gas in the highest parts of the fold has generally resulted in securing the best production there.

"NIAGARAN" LIME

The "Niagaran" is a porous, weathered zone in the upper part of the Devonian-Silurian limestone. The best production has been found from 10 to 30 feet below the top of the limestone. In general a large amount of water is produced with the oil from this horizon. The proportion of oil is considerably greater on the higher parts of the fold than it is down the dip. The producing area is bounded by territory in which the proportion of oil is very small, and is insufficient to pay for the cost of pumping.

Relation of Production to Geologic Structure

It appears that predictions as to production can be made from a knowledge of structural conditions more confidently for the "Niagaran" than for the Carper sand. It is easily understood that an entire lack of the Carper sand could cause a dry hole on a favorable part of the structure. In addition, structural features which are not pronounced enough to cause oil accumulation in the "Niagaran" have resulted in production from the Carper sand when combined with favorable sand conditions. A recent example of this type is W. C. McBride Rush No. 24 in sec. 26, T. 10 N., R. 14 W. It is thus apparent that pronounced folding should be deemed necessary for . luction from the "Niagaran" but that prospecting for Carper sand pro- on should be guided both by a consideration of structure and by the

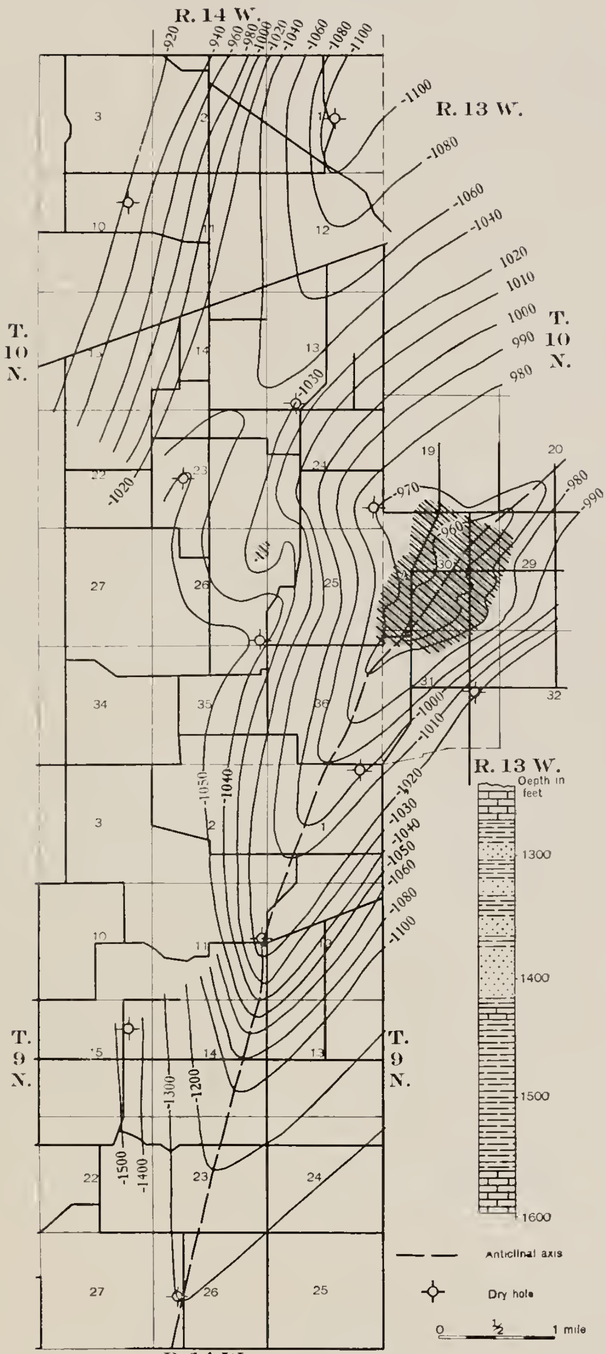


FIG. 1.

Fig. 1. Structure map of the Martinsville area with contours drawn on the base of the Sweetland Creek shale. The shaded portions represent producing areas. (Drawn by G. F. Moulton, Illinois State Geological Survey.)

best available information on sand conditions. The recommendations in this report are primarily intended for prospecting for production from the "Niagaran", and are based on the interpretation of the structural conditions shown in figure 1.

Structure

The structure of the area as determined from deep well data is shown in figure 1 by contour lines drawn on the base of the Sweetland Creek shale. The present producing area lies on a high part of a dome which is distinctly elongated in a northeast-southwest direction, and which seems to represent a local high structure superimposed on an anticline of considerable extent having the same trend. This axis of folding was pointed out in an earlier report[1] and an interpretation of more complete recent data now shows that, in the producing area at least, it lies almost precisely as therein located.

It appears that the principal fold continues beyond the limits of present production, both to the northeast and to the southwest. Although the data away from the producing area are not abundant, what information is available justifies the interpretation given on the map. Wells which reach the "Niagaran" give no direct evidence of local highs along the axis of this fold, but the alignment of shallow sand pools to the west suggests that a high might be found along the axis where the principal producing area for the shallow sand in Johnson Township crosses it (approximately in sec. 34, T. 9 N., R. 14 W.). It is further possible that local doming may occur on the axis of folding to the northeast of the producing area. This possibility is also worth testing out.

The question of the presence of other axes of folding parallel to the one through the Martinsville pool is also of considerable importance to the prospector. In the 1923 report,[2] a second axis is shown a short distance northwest of the Martinsville pool, and a third is indicated connecting the North Casey and York pools. Both of these axes trend parallel to the axis through the Martinsville pool.

More recent data seem to indicate that there is only a very slight fold in the position indicated for the first axis northwest of the Martinsville axis, but that there is a considerable probability that the axis connecting the North Casey and York pools represents a pronounced fold.

Areas for Further Prospecting

Several areas for further prospecting can be indicated at this time. It seems probable that the producing area will be found to extend from the

[1] Mylius, L. A., Oil and gas development and possibilities in parts of eastern Illinois: Illinois State Geol. Survey Bull. 44C, 1923.

[2] Mylius, L. A., op. cit.

central part of the field along the axis of the fold beyond the tested portion. Drilling in parts of sec. 20, T. 10 N., R. 13 W., and sec. 36, T. 10 N., R. 14 W., near the anticlinal axis as shown on the map and a short distance from the present productive area, is worth while. These two areas are suitable for testing by the operator who plans on only one test well.

Drilling along the axis about two miles southwest of the Martinsville pool, as well as a short distance northeast of the deep well in sec. 26, T. 9 N., R. 14 W., might result in the discovery of other domes along the Martinsville axis. Each well drilled to prospect this area should be used to obtain full information in regard to sub-surface conditions. The geological information thus secured should in turn be used to modify the plan of prospecting in accordance with the most complete data available at the time that each location is made. It is only by following such a plan that thorough testing can be accomplished economically.

Similar drilling should be done a mile or two northeast of the Martinsville pool along the Martinsville axis in order to determine conditions there.

The prospecting recommended should be undertaken by a group who can lease a substantial block of acreage to safeguard their interests, and who can drill three or four wells in each area tested before abandoning the project.

The area between the North Casey and York pools appears to merit testing by a similar comprehensive program of drilling along the anticlinal axis indicated in that area. Three or four wells might be necessary to verify the existence of the anticlinal fold and probably three more would be sufficient to determine whether local structural highs may be expected along the axis if one is found.

Present data on this interesting area do not permit the extension of the structure map to include it, but it has been determined that the strata rise rapidly to the northwest from a point about two miles northwest of the Martinsville axis. It is also known that there is a pronounced west dip a mile or two farther west; so the presence of a strong fold seems assured. For that reason prospecting in this area should yield profitable results to a group having sufficient acreage to cover any pool which might be found if a prospecting program calling for the drilling of seven or eight wells could be undertaken.

Summary

The investigation of the geology of the Martinsville area has determined conditions which (1) suggest the possibility of extending the area of "Niagaran" production both to the northeast and southwest, (2) indicate areas along the Martinsville axis in which other domes may exist, and (3) strongly suggest the advisability of drilling to locate a parallel axis of folding connecting the North Casey and York pools.

OIL INVESTIGATIONS IN THE CENTRALIA AREA—PRELIMINARY REPORT

By Alfred H. Bell

Introduction

Several small oil fields are located in the Centralia area, some of them notable for long duration of production. The probable extension of geological conditions favorable for oil accumulation to other localities in this area, as well as the possibility of finding deeper production in the developed fields, has rendered desirable a more detailed investigation of the sub-surface geology of the area than has heretofore been made. Under the direction of the Illinois State Geological Survey this work was begun by the writer in the summer of 1926. The following is a brief preliminary report which, since the data obtained are not yet complete, should not be taken as final.

Former Work in the Area

The most complete study of the geology of the Centralia area yet made is that by E. W. Shaw[1] in 1911. At various other times the area has been visited by members of the Illinois State Geological Survey and their results have been published.[2]

General Geology

The region is almost wholly covered with glacial deposits. Outcrops of older rocks are few and inadequate to give much indication of the sub-surface structure. In making inferences with respect to sub-surface conditions one is therefore limited almost wholly to well and mine records.

Stratigraphy

A brief reference to the succession of strata encountered in drilling is in order; for a fuller account of the stratigraphy the reader is referred to the Carlyle-Centralia folio.[3] The strata which occur between the base of the glacial drift and the top of the Herrin (No. 6) coal, roughly 500 to 550 feet in thickness, consist mainly of shale with a little interbedded limestone and sandstone and some thin beds of coal. They are classified as the Mc-

[1] Shaw, E. W., U. S. Geol. Survey Geol. Atlas, Carlyle-Centralia folio (No. 216), 1923.

[2] Blatchley, R. S., Illinois oil resources: Illinois State Geol. Survey Bull. 16, pp. 130-146, 1910.

St. Clair, Stuart, The Centralia area: Illinois State Geol. Survey Bull. 35, pp. 67-73, 1917.

Kay, Fred H., Coal resources of District VII: Illinois Coal Min. Inv. Bull. 11, pp. 115-138, 1915.

[3] Shaw, E. W., op. cit.

Leansboro formation of the Pennsylvanian system. For the next 300 feet, approximately, shale belonging to the Carbondale formation is predominant. Next below is about 175 feet of sandstone of the Pottsville formation. An unconformity separates it from the underlying rocks of the Chester group which belong in the Mississippian system. These rocks consist of limestone, sandstone, and shale in about equal amounts. None of the wells in the area described in this report appear to have been drilled below the base of the Chester rocks into the underlying Ste. Genevieve and St. Louis limestones, and the Chester group in this area is known to have a thickness of at least 500 feet.

Structure

Structural conditions in parts of the Centralia area are indicated on the accompanying contour maps as follows: (1) An area east and northeast of Centralia, with contours drawn on the top of Herrin (No. 6) coal and on the top of the producing sand (fig. 2). (2) An area just south of Centralia with contours drawn on the base of Herrin (No. 6) coal (fig. 3). This area includes the Wamac field.

Area East and Northeast of Centralia

The map in figure 2 shows an anticlinal nose whose axis trends northeast and southwest. It has a relatively steep dip to the northwest and gentler dips in other directions. An interesting relation is here shown between the productive area and the structure. The producing wells are not found on the highest part of the structure but on the slopes.

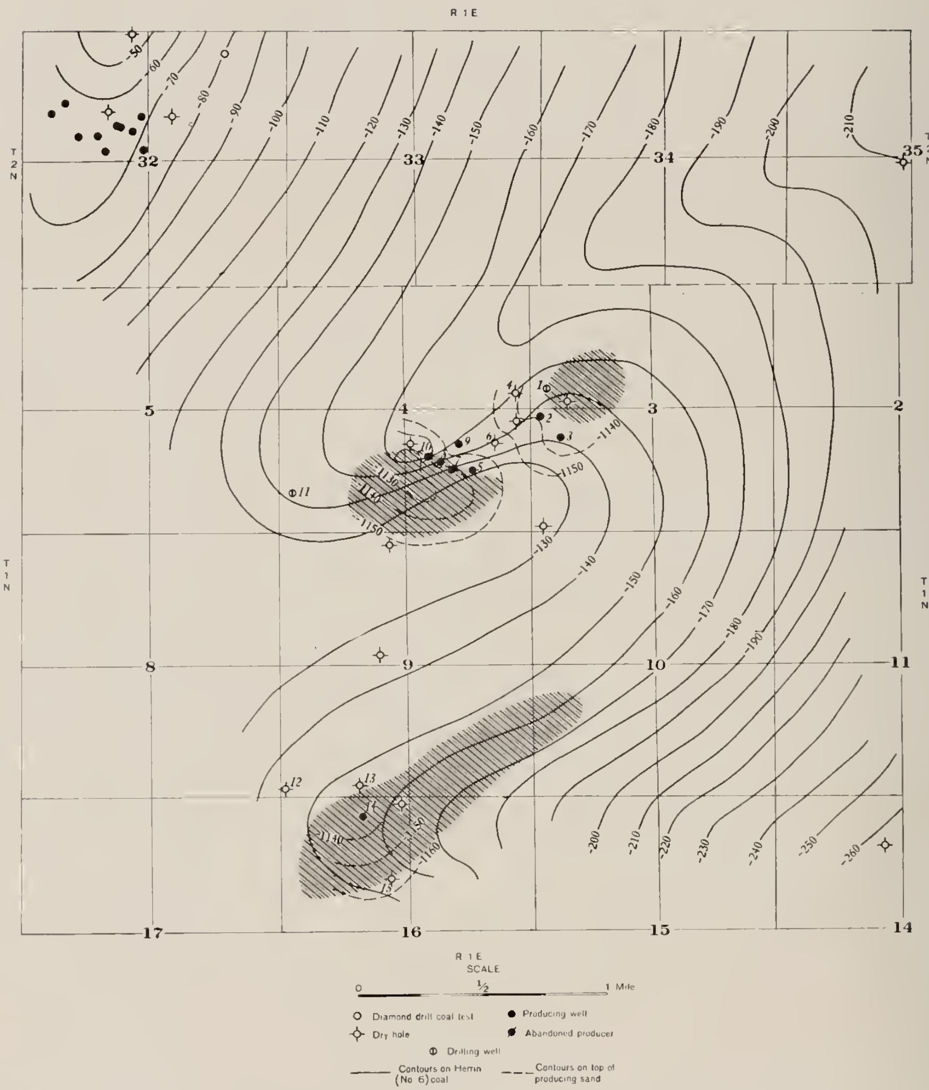
The producing sand on which are drawn the dashed contours in figure 2 is in the lower part of the Chester beds and is about 1,000 feet below the Herrin (No. 6) coal. It probably corresponds with the Stein sand of the Sandoval field. A comparison of the contours shown on the map brings out the notable difference between the structure on the top of the sand and that on the Herrin (No. 6) coal. This difference may be explained on the basis of (1) the unconformity between the Mississippian and Pennsylvanian systems and (2) irregularities in the deposition of the sand.

DEVELOPMENT

Three small areas of production are shown in figure 2.

(1) *The Ohio Oil Company.* Kuester wells 1 and 2, NW. ¼ SW. ¼ sec. 3, T. 1 N., R. 1 E. These two wells have been pumped for 15 years and are at present producing about 7 barrels per day of which 6 barrels are from No. 1.

This company has recently drilled a north offset to Kuester No. 1 on the Adams lease in the SW. ¼ NW. ¼ sec. 3, T. 1 N., R. 1 E. It had a



1. Adams No. 1
2. Kuester No. 1
3. Kuester No. 2
4. McLellan No. 1
5. McIntosh No. 1
6. McIntosh No. 2
7. Langewisch No. 1
8. Langewisch No. 2
9. Langewisch No. 3
10. Old Langewisch No. 1
11. Higgins well
12. Baker well
13. Stater well
14. Brown well
15. Stater No. 1

FIG. 2. Structure map of area northeast of Centralia, Marion County. Shaded areas are considered to have fair to good possibilities for oil production. (Drawn by A. H. Bell, Illinois State Geological Survey.)

showing of oil in the producing sand of the Kuester which was topped at 1,601 feet but the well was drilled down to 1,779; it is being plugged back to 1,625.

(2) *The James Oil Company.*—Langewisch wells 1, 2, and 3, and McIntosh wells 1 and 2, SE. ¼ sec. 4, T. 1 N., R. 1 E. The production here from 4 wells is about 30 barrels of which Langewisch No. 1 makes 13 barrels. This well was drilled in 1919. It filled up with oil and made 82 barrels natural the first 24 hours. By August, 1925, it was making only one-fourth barrel. It was then drilled 10 feet deeper to 1,632½ and shot with 40 quarts. Langewisch No. 2 was also shot about the same time with a resulting increase in production. Langewisch No. 3 and McIntosh Nos. 1 and 2 have been drilled during the past year. The first two of these are now being pumped; McIntosh No. 2, completed in July, 1926, had a showing of oil estimated at 8 barrels but the well has been abandoned. These data were supplied by Mr. George Timberlake.

"Old No. 1 Langewisch" was drilled by the Sayer Oil and Gas Company in 1910. At first it made considerable quantities of gas and oil; it was then shot with 80 quarts and salt water came in, so that it had to be abandoned.

Another well about 300 feet northwest of "Old No. 1" had water in the sand.

An interesting test is being made by Higgins and Timberlake on the Higgins lease in the SW. ¼ sec. 4, T. 1 N., R. 1 E., half a mile west of the Langewisch wells. On August 10 they were drilling at 1,440 and should have been at the top of the sand in two or three days. If this well is a producer from the same sand as the Langewisch and Kuester wells it will "prove up" the intervening territory.

(3) The Brown well in the NE. ¼ NW. ¼ sec. 16, T. 1 N., R. 1 E., has been pumped for 15 years and is now making 5½ barrels per day.

Attempts have been made to extend production outwards from this well but so far without success. The well about a quarter of a mile to the southeast, Stater No. 1, is reported to have made 8 barrels natural. It was shot with 40 quarts and then made water. The dry hole in the NE. corner NW. ¼ of the same section was shallow, with a total depth of 810 feet, so that the deep sand was not tested. The north offset to the Brown well, on the Stater land, had a showing of oil.

The Baker well to the west, SW. corner sec. 9, had water in the sand.

RECOMMENDATIONS

On the basis of the structure shown by the contours drawn on the Herrin (No. 6) coal and on the producing sand there appears to be a good opportunity for extending the producing areas northeast from the Kuester and Adams wells in sec. 3 and southwest from the Langewisch wells in sec. 4.

There appear still to be good possibilities of extending the Brown production in sec. 16. The territory between the Brown well and the Stater well to the south is practically "proven" for small production. Although the structural data are meager, the contours in figure 2 suggest a possible extension of production to the northeast through the SE. ¼ sec. 9 and into the SW. ¼ sec. 10. It is also possible that the oil pool may extend southwest of the Brown well.

The shaded areas in figure 2 are considered to have fair to good prospects for oil production.

Not enough is known concerning the structure in the remaining parts of the area mapped to form the basis for definite recommendations concerning the locations of wildcat tests. No other very favorable localities can be pointed to in this area. It may be, however, that, as future drilling progresses, structural conditions will be found to differ from those shown in figure 2, and small domes or terraces may exist whose presence is at this time unsuspected and which may have influenced the accumulation of oil in commercial quantities.

The fact that little or nothing can be learned about sub-surface structure from surface studies in this area makes it all the more imperative to keep careful logs of all wells that are drilled in the future. If we had such logs for all the wells that have been drilled in the past our knowledge of the sub-surface geology would be much fuller than it is, and more accurate predictions could be made concerning the locations of oil pools in advance of drilling. The preservation of numerous samples of well cuttings, especially in the vicinity of oil sands, is also of great importance for a thorough geological study. These samples should be carefully labelled as to depth and location of well. The Survey will gladly supply sample sacks for well cuttings to anyone engaged in drilling.

The Wamac Field

The Wamac field south of Centralia was opened early in 1922; the first oil was discovered late in 1921. The maximum flush production for the field was about 1,200 barrels per day; the present production is approximately 125 barrels of 32° Baumé oil from 100 wells. All the oil is obtained from a sand about 230 feet below Herrin (No. 6) coal known locally as the "Petro" oil sand. It has a thickness of about 30 feet.

Structural conditions are shown in figure 3. The data for the map were obtained from large scale maps of No. 2 and No. 5 mines owned by

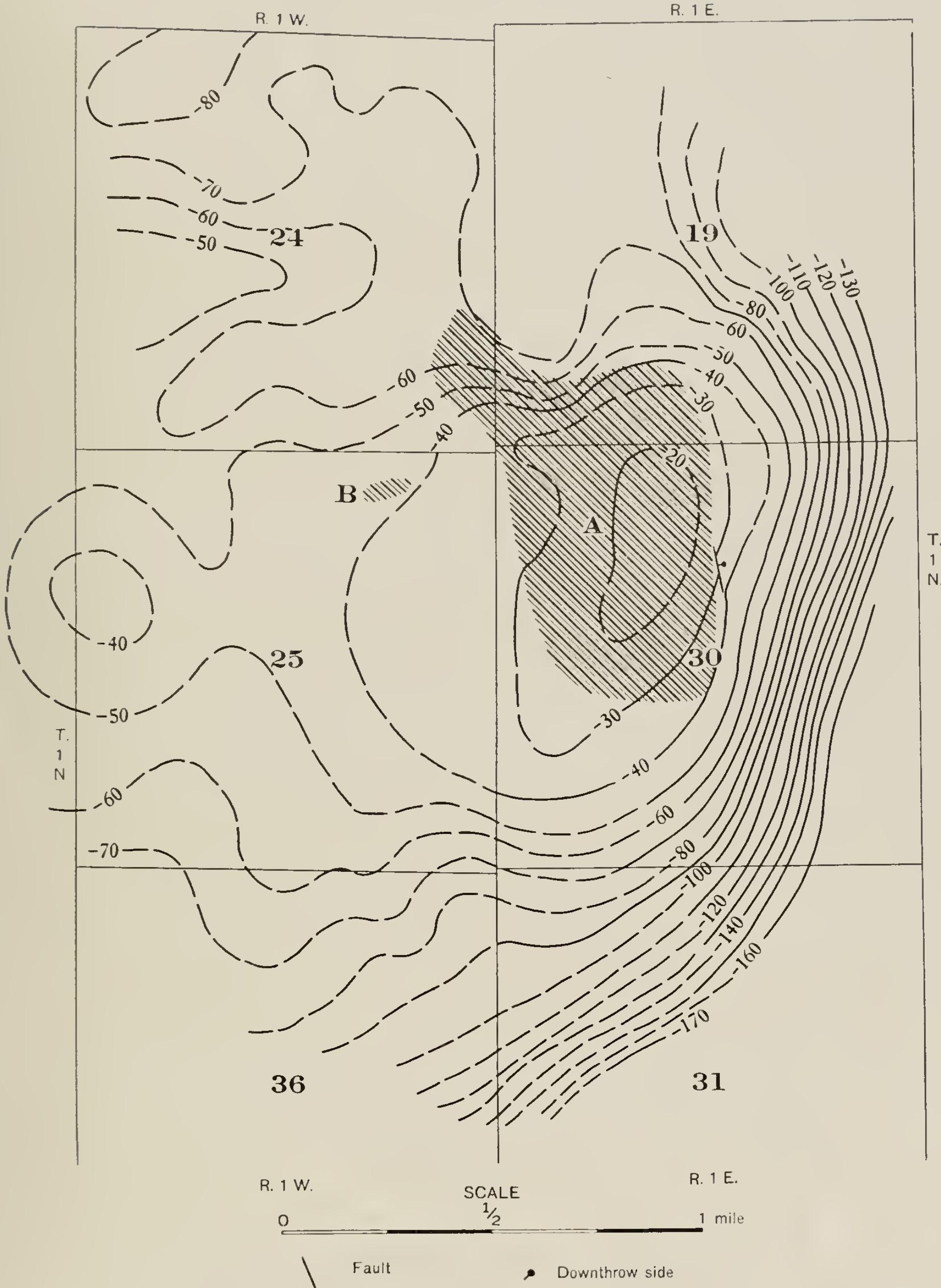


FIG. 3. Structure contours drawn on the base of Herrin (No. 6) coal in area just south of Centralia. Shaded area A shows extent of Wamac pool. The wells drilled in shaded area B were formerly pumped but are now abandoned. (Drawn by A. H. Bell, Illinois State Geological Survey.)

the Centralia Coal Company. Precise levels were determined by the mine engineers through most of the main tunnels and, as their results are embodied in the accompanying contour map, a higher degree of accuracy has been attained in this map than is possible for most structure maps.

The important features are the steep east and southeast dip, 140 feet in a little over half a mile, and the relatively gentle dip in other directions, especially to the west. The mine map shows one fault trending a little west of north and east of south, situated about 1200 feet north and 250 feet east of the center of sec. 30, T. 1 N., R. 1 E. The fault plane dips 75° to the east. The displacement is 3 feet, and the downthrow side is on the east. The fault is just outside and to the east of the productive area of the Wamac oil field.

The present productive area of the Wamac field is indicated by shaded area A in figure 3. In all but the extreme northern part production is limited to the highest part of the structure. The boundary is known fairly definitely from the positions of dry holes. One deep test has been drilled, namely Petro Oil and Gas Company's Frazier No. 1 (250 feet south of north line and 730 feet east of west line of SW. ¼ sec. 30) to a depth of 1,484 feet. A dry sand was encountered from 1,454 to 1,460 and a salt water sand from 1,460 to 1,480 which was believed to be the Benoist sand. Since this test was drilled fairly high on the structure it appears to condemn the structure for possibilities of production in deeper sands, at least as far as the Benoist.

The results of a more detailed study of the Wamac field will be presented later.

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