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DIVISION OF THE  
STATE GEOLOGICAL SURVEY  
M. M. LEIGHTON, *Chief*  
URBANA

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CIRCULAR NO. 48

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CORRELATION OF MINABLE COALS OF ILLINOIS,  
INDIANA, AND WESTERN KENTUCKY

BY

J. MARVIN WELLER AND HAROLD R. WANLESS

REPRINTED FROM THE BULLETIN OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS,  
VOL. 23, No. 9 (SEPTEMBER, 1939), PP. 1374-1392.



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## CORRELATION OF MINABLE COALS OF ILLINOIS, INDIANA, AND WESTERN KENTUCKY<sup>1</sup>

J. MARVIN WELLER<sup>2</sup> AND HAROLD R. WANLESS<sup>3</sup>  
Urbana, Illinois

### ABSTRACT

The numbers by which the principal coals of Illinois, Indiana, and western Kentucky are commonly known are a result of independent work by the geological surveys of these three states and for the most part do not correspond. Certain interstate correlations have been made during the last 75 or more years and much attention has been directed toward the correlation of coals within the individual states but no attempt has previously been made to effect a comprehensive correlation of the coals of the Eastern Interior basin as a whole.

Of the 50-odd seams present 13 are mined, 6 in Illinois, 5 in western Kentucky, and 8 in Indiana. The most important coal is Harrisburg No. 5 of Illinois (= Kentucky No. 9=Indiana V). The Herrin coal No. 6 of Illinois (= Kentucky No. 11) is second in importance. Less important widespread seams are Rock Island coal No. 1 of Illinois (= Minshall of Indiana) with which is tentatively correlated Murphysboro coal "No. 2" of Illinois (= Mannington of Kentucky), Colchester coal No. 2 of Illinois, and Danville coal No. 7 of Illinois (=Indiana VII). Coals important only in restricted areas are lower and upper Brazil blocks of Indiana, Coals III, IV, and VI of Indiana, Grape Creek coal of Illinois, and coals No. 12 and 14 of Kentucky.

### INTRODUCTION

The political boundaries which separate the states of Illinois, Indiana, and Kentucky divide the great Eastern Interior coal basin into three unequal parts. Although the strata, including the coal beds, pass without interruption from one state into another, each part possesses its own individual system of nomenclature, long ago adopted and still in general use.

### KENTUCKY NOMENCLATURE

The first generalized section of the Coal Measures in the Eastern Interior basin was worked out in western Kentucky and was published by D. D. Owen in 1857.<sup>4</sup> In this section the coals were numbered from the base upward from 1 to 18. The numbers 9 to 12 have been widely and generally correctly applied throughout western Kentucky and this part of the section includes the most important commercial coals of the area. Numbers used by later workers for higher seams are commonly of only local significance and Owen's numbers 1 to 8 have

<sup>1</sup> Published by permission of the chief, Illinois State Geological Survey, but representing the authors' individual opinions. Manuscript received, June, 1939.

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<sup>4</sup> D. D. Owen, *Third Report of the Geological Survey of Kentucky* (1857), pp. 18-24.

not generally been employed outside of his typical area in Union County. His No. 5 coal is now known as No. 6 and his No. 6 as No. 7.

#### ILLINOIS NOMENCLATURE

A. H. Worthen, with the aid of Leo Lesquereux who had assisted Owen in Kentucky, attempted to apply the Kentucky numbers in Illinois but unsatisfactory results caused him to abandon this system and develop a system of his own based mainly on the outcrops in the Illinois valley. His stratigraphic section in which the coals were numbered from 1 to 8 was published in 1868<sup>5</sup> and these numbers were later applied with varying success throughout the state. Worthen's coals 2 and 3 are the same bed and were mistakenly separated because of different roof conditions. Several of the coals in southern Illinois were miscorrelated by Worthen and it is only very recently that data necessitating revision of his correlation of these beds have been obtained.

#### INDIANA NOMENCLATURE

Lesquereux introduced the numbering system of the western Kentucky coals into Indiana but he was not followed by other geologists. E. T. Cox lettered the seams from the base upwards and this system was used in the Indiana reports for many years. In G. H. Ashley's report of 1899<sup>6</sup> successive Roman numerals were assigned to the more important seams and intermediate thinner coals were designated by adding a letter to the number of the next lower important seam. This system has persisted in Indiana to the present.

Ashley's original standard section was based on observations in Vigo and Clay counties but because of the early recognition of some of the intricate and confusing miscorrelations of his report a supplement was published in the thirty-third annual report of 1908 in which these were partially corrected and the section in Sullivan and Greene counties was adopted as standard.

#### STATE BOUNDARIES

The development of three different systems of nomenclature for the coals of the Eastern Interior basin has resulted from the working out of the stratigraphic succession of the beds by State agencies in its three political subdivisions with little or no regard for each other's work. A state line is not a natural boundary between areas of different

<sup>5</sup> A. H. Worthen, *Geol. Survey of Illinois Vol. 3* (1868), pp. 5, 6.

<sup>6</sup> G. H. Ashley, *Indiana Department of Geology and Natural Resources Annual Report 23* (1899), pp. 89-91.

geologic development and it may be much easier to correlate beds from one state into adjacent parts of another than it is to correlate these same beds between certain areas within a single state. For example, the relations of the coal beds of the Danville district of Illinois to the Indiana coal fields are much clearer than are their relations to the coals in any other part of Illinois, and the coals of southern Illinois are much more easily correlated with those of western Kentucky than with those of western Illinois.

#### CORRELATION OF COALS

Where outcrops, mine workings, or bore holes are abundant and closely spaced it may be possible actually to trace a single coal seam for long distances and thus establish the identity of coals at more or less widely separated localities. Where such information is unavailable, however, or where a seam decreases below workable thickness or entirely disappears other means of recognition must be employed. Those which have been generally relied upon include the character of the coal, the nature of floor and roof, the position and type of partings, the kinds of fossils included in associated beds, and the intervals below or above conspicuous coals or other types of strata such as limestones or thick sandstones. The fact that none of these criteria, singly or in combination, is infallible is amply demonstrated by the numerous miscorrelations that have been made. With increasing distance between the areas correlated the reliability of these criteria rapidly decreases.

#### SEDIMENTARY CYCLES

The recognition by members of the Illinois State Geological Survey that the different types of strata which make up the Coal Measures in the Eastern Interior basin normally occur in sequence with certain definite relations to each other has served to furnish a new means of coal correlation (Fig. 1). These sequences occur in cyclic repetition<sup>7</sup> and each cyclothem (strata formed during an individual cycle of sedimentation) may be traced and correlated as a unit regardless of the variations of its constituent members. Thus it is possible to trace for long distances the horizon of a coal, even though the coal be entirely absent, and to recognize it as the same seam if it again be developed in some other area.

<sup>7</sup> J. M. Weller, "Cyclical Sedimentation of the Pennsylvanian Period and Its Significance," *Jour. Geology*, Vol. 38 (1930), pp. 97-135.

H. R. Wanless and J. M. Weller, "Correlation and Extent of Pennsylvanian Cyclothem," *Bull. Geol. Soc. America*, Vol. 43 (1932), pp. 1003-16.

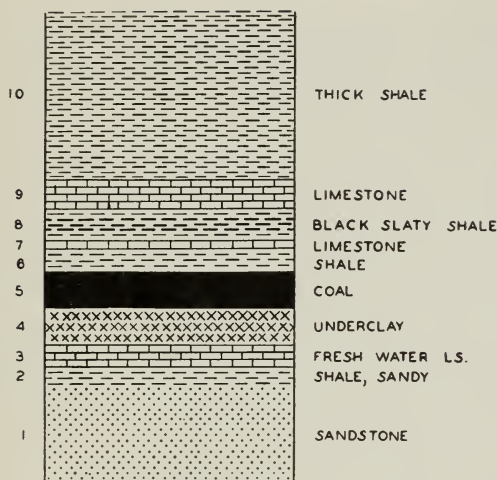


FIG. 1.—Diagram showing succession of members in ideally developed cyclothem. In actual occurrence all members are discontinuous and where present may vary greatly in thickness, and most of them show different lithological characters from place to place. With very rare exceptions cyclothems are incomplete and lack one or several of these members. Basal sandstone (No. 1) locally rests unconformably on lower beds and in some places occupies channels cut beneath horizons of other coals. Fresh-water limestone (No. 3) is lacking in many cyclothems. Underclay (No. 4) is commonly more extensive than associated coal although some coals occur without underclay. Shale and marine limestone (Nos. 6 and 7) are erratically developed and rarely occur associated with workable coals. Black slaty shale, marine limestone, and upper shale (Nos. 8, 9 and 10) are commonly more persistent and more uniform lithologically than most other members.

#### VARIATIONS IN SECTION

The succession of Coal Measures strata is very different in the northwestern and southeastern parts of the Eastern Interior basin. The sediments were apparently derived from a mountainous area on the southeast and in the southeastern part of the basin the geological section is much thicker and more sandy than it is on the northwest. But most important of all, the southeastern section consists of a greater number of cyclothems than are present farther northwest. The additional cyclothems of the southeastern section more or less gradually lose their identity northwestward, pass into almost unrecognizable rudiments that may be present here and there, or disappear entirely. This situation introduces the greatest difficulty that is encountered in cyclothem correlation and some of the problems so raised have not yet been satisfactorily solved.

#### SOUTHERN VERSUS WESTERN ILLINOIS

The Coal Measures succession is greatly reduced both in thickness and in number of members present throughout a large area in western

Illinois near East St. Louis and on the north. Many of the beds below coal No. 6 are entirely absent or are only discontinuously developed in this area and the intervals separating several coals or their horizons are very small. Also there is extremely pronounced thickening, within short distances, of the section east of the Duquoin anticline, which extends north and south in the southern part of the basin near the third principal meridian, and this is accompanied by the introduction of a number of new cyclothems. As a result of these conditions the well known sections of southern and western Illinois are very different and correlation is unusually difficult because in the intervening area of much thinned section where some of the cyclothems are very similar and discontinuous it is possible unwittingly to jump from one coal or its horizon to another only a few feet above or below.

#### STATUS OF COAL CORRELATIONS

A state-wide investigation of the Coal Measures stratigraphy of Illinois by the Illinois State Geological Survey has been in progress for more than ten years and is rapidly nearing completion. During the course of these studies, as time and opportunity have permitted, numerous observations have been made in Indiana and western Kentucky in order to obtain data bearing upon stratigraphic problems encountered in Illinois. In addition grants from the National Research Council to J. M. Weller in 1930 and from the Geological Society of America to H. R. Wanless in 1935 and 1936 have helped to finance observations outside of Illinois that would not otherwise have been possible.

At the present time the principal unsolved problems of correlation within the Eastern Interior basin concern the highest and lowest parts of the Coal Measures. The correlations of the principal minable coals are for the most part clear and any uncertainties which still exist are indicated in the following discussions.

#### COALS OF EASTERN INTERIOR BASIN

Some fifty or more different coal seams are present in the Eastern Interior basin. Most of them are thin and no single seam is everywhere developed. Almost every one of these coals, however, thickens in one or more areas so that it becomes locally important and has been dug at least on a small scale for local fuel requirements. Some of the thinner coals, where favorably situated, particularly in Indiana, have been stripped on a fairly large scale and stripping operations will doubtless be extended on such beds in the near future. Most of these seams can be excluded from the present consideration, however,

and attention mainly concentrated on those beds which do at present, or have in the past, supported large-scale underground mining activity.

## MINABLE COALS

In Illinois six coals are of minable thickness and quality, in Indiana there are eight, in western Kentucky five. Listed in a single sequence from the bottom up these are as follows: (1) lower Brazil Block coal, Indiana; (2) upper Brazil Block coal, Indiana; (3) Rock Island No. 1 coal, Illinois; (4) Staunton Coal III, Indiana; (5) Colchester No. 2 coal, Illinois; (6) Linton Block Coal IV, Indiana; (7) Springfield No. 5 coal, Illinois; (8) Grape Creek coal, Illinois; (9) Coal VI, Indiana; (10) Herrin No. 6 coal, Illinois; (11) Coal No. 12, Kentucky; (12) Danville No. 7 coal, Illinois; (13) Coal No. 14, Kentucky. The following table shows the principal correlations and the general areas of importance of these coals.

<i>Northern and Western Illinois</i>	<i>Southern and Eastern Illinois</i>	<i>Western Kentucky</i>	<i>Indiana</i>
Coal No. 7	Danville No. 7	Coal No. 14	Coal VII
Coal No. 6	Herrin No. 6	Coal No. 12 Coal No. 11	Coal VI
Springfield No. 5?	Grape Creek Harrisburg No. 5	Coal No. 9	Petersberg V Linton Block IV
Colchester No. 2			Staunton III Minshall
Rock Island No. 1	Murphysboro No. 2	Mannington	U. Brazil Block L. Brazil Block

## COLUMNAR SECTIONS

The accompanying graphic columnar sections (Figs. 3-6) show on a uniform scale the relations of all the coals present in different parts of Illinois, Indiana, and western Kentucky between the top of the conglomeratic Caseyville (Mansfield, Makanda, Babylon) sandstone and the higher marine Lonsdale (Cutler, Madisonville, West Franklin, Somerville) limestone. The more important limestones and sandstones are shown in their proper positions and recognizable coal horizons without coal are indicated by dashed lines. The important minable coals are correlated from column to column and are briefly discussed later. Figure 2 shows the geographic locations of the columnar sections.

Columns 1 to 4 (Fig. 3) show the development of the most important part of the Coal Measures in the northwestern part of the Eastern

Interior basin where a number of cyclothem present to the southeast are absent or represented by only sporadically occurring rudiments. The cyclothem from coal No. 2 upward, which constitute the principal parts of these sections, are persistent throughout this area and are recognizable in southern Illinois.

1. *Northern Illinois*.—The Coal Measures succession of La Salle County and vicinity differs considerably from the sections present in all other parts of the Eastern Interior basin but careful study has

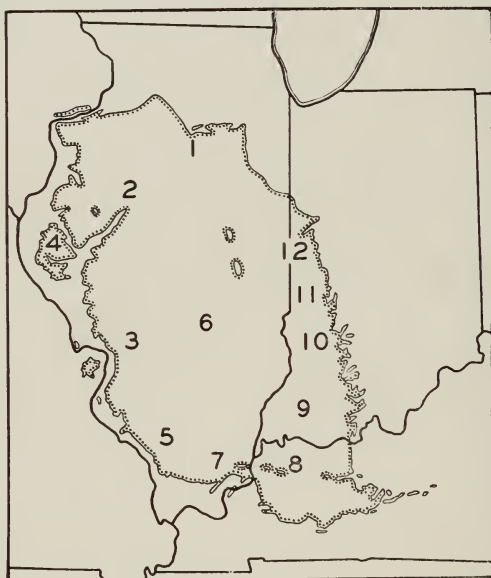


FIG. 2.—Outline map showing extent of Coal Measures in Eastern Interior basin, and locations of graphic columnar sections presented on Figures 3-6. Width of area mapped, approximately 375 miles.

served to identify most of the beds with the more characteristic development of this part of the section in the Illinois valley.

Three coals have been mined in this district. The first is coal No. 7, the second is believed to be coal No. 6, and the third is coal No. 2. The "2nd vein" is lenticular and occurs at varying distances below the Brereton limestone which is a thin but fairly persistent bed. Thin coals, which are at least approximately equivalent to Coal IV of Indiana and the Grape Creek seam of eastern Illinois, are present above coal No. 2 and above the horizon of coal No. 5 but elsewhere in the northwestern part of the basin they are very rarely and only locally developed. Along the La Salle anticline the strata below coal

No. 2 are represented by thick fireclay similar and equivalent to the Cheltenham clay of the St. Louis district.

2. *Illinois valley*.—The Coal Measures section has been worked out in greater detail along the Illinois valley and vicinity than any-

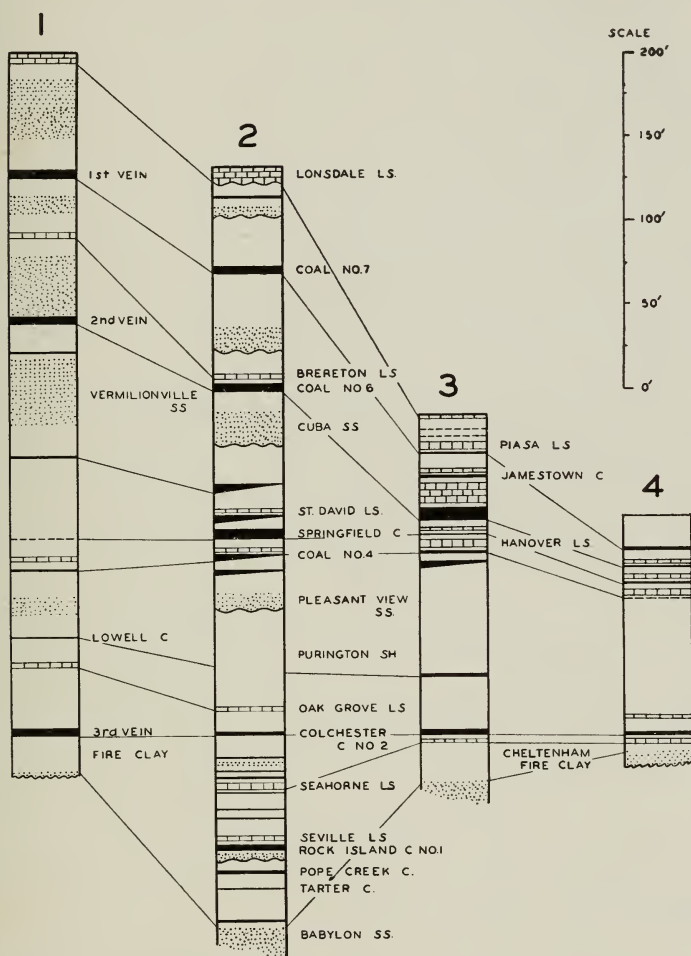


FIG. 3.—Columnar sections 1-4. Vertical scale shown in feet, here and in Figures 4, 5, and 6.

where else in the Eastern Interior basin. It consists of a well developed succession of cyclothem that have been identified in almost all parts of the basin and many of the most useful stratigraphic key beds are present here.

Coal No. 5 is the principal seam mined in this part of Illinois

although coal No. 1 was formerly important near Rock Island and coal No. 2 has been extensively worked in small local mines. In a few very restricted areas other coals achieve respectable thicknesses but are too limited to be of appreciable importance.

3. *Madison and Macoupin counties, Illinois.*—The entire Coal Measures thins progressively down the Illinois valley toward St. Louis. Below coal No. 2 the section passes into the thick Cheltenham fireclay except for the basal Babylon sandstone and the Seahorne limestone which extends for some distance as a persistent bed, then gradually becomes discontinuous and finally disappears. Above coal No. 2 the sandstones become thinner and wedge out, and most of the shales decrease in thickness. Only coal No. 6 is workable. Several of the limestones, however, reach their maximum development here and the thin Jamestown coal makes its appearance, becomes more notable farther southeast, and finally becomes workable in parts of western Kentucky.

4. *Western Illinois.*—The thinnest development of the Coal Measures in the Eastern Interior basin occurs in Adams and Brown counties of western Illinois. Many members have disappeared entirely from the section and only the Purington shale and coal No. 2 are present with unreduced thicknesses. The section here does not continue quite high enough to reach the Lonsdale limestone or its horizon.

Columns 5 to 8 (Figs. 4 and 5) show the development of the middle part of the Coal Measures in central and southern Illinois and western Kentucky. The stratigraphic section has thickened so greatly in part of this area, as the result of the greater development of sandstones and the introduction of new members, that it has been necessary to divide these columns into upper and lower parts at Illinois No. 2 coal and these are presented separately on Figures 4 and 5, respectively. Correlations with Figure 3 are indicated by the introduction of western Illinois names and coal numbers in parentheses opposite the appropriate members.

5. *Southwestern Illinois.*—This section is constructed mainly from data obtained in Perry and Jackson counties. It is noteworthy because it shows the beginning of the expansion that is most important below coal No. 2 and which becomes progressively greater across southern Illinois and western Kentucky. Except for thicker coals, this section is very similar to the development of corresponding strata between coal No. 2 and the Curlew (Seville) limestone, in parts of the northwestern portion of the Illinois coal field. In the areas of columns 3 and 4 many of these beds are absent and thus the Perry-

Jackson County section constitutes a connecting link between western and southern Illinois.

The important coals of this area are the Murphysboro seam, a double benched coal now largely mined out, and coal No. 6. The

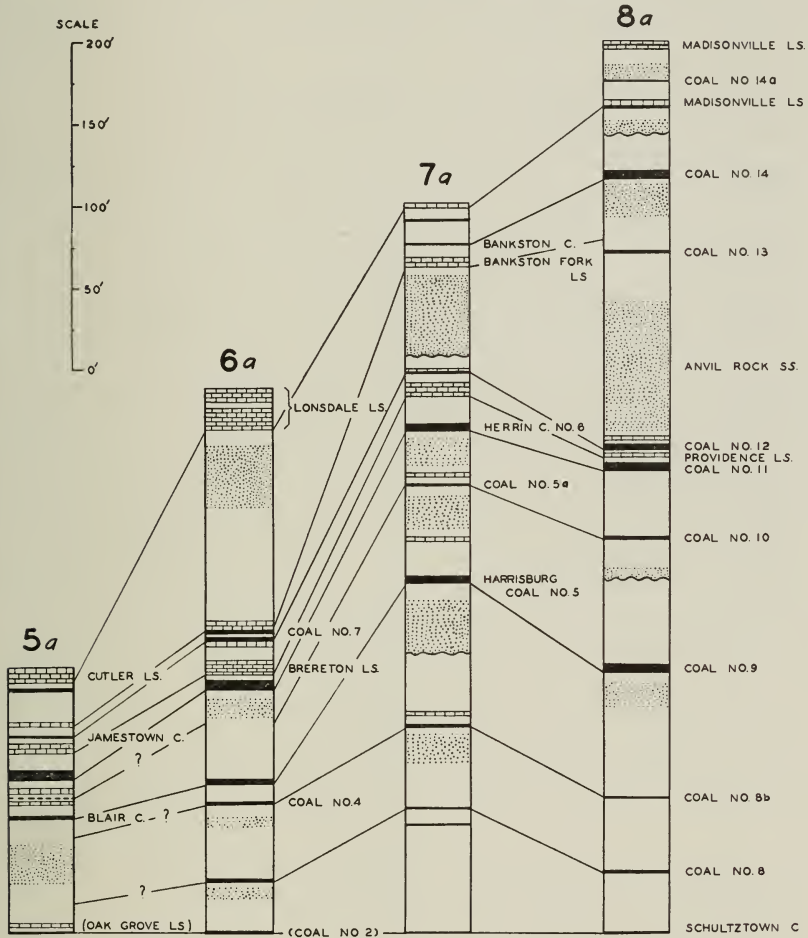


FIG. 4.—Columnar sections 5a, 6a, 7a, and 8a.

Blair coal, probably equivalent to the Harrisburg seam, is of minor importance.

6. *Central Illinois*.—The main coal-bearing strata in central Illinois are everywhere buried beneath a thick covering of younger beds and this column is, therefore, based on a study of deep borings and mine shafts. That part above coal No. 2 is comparable in thickness to

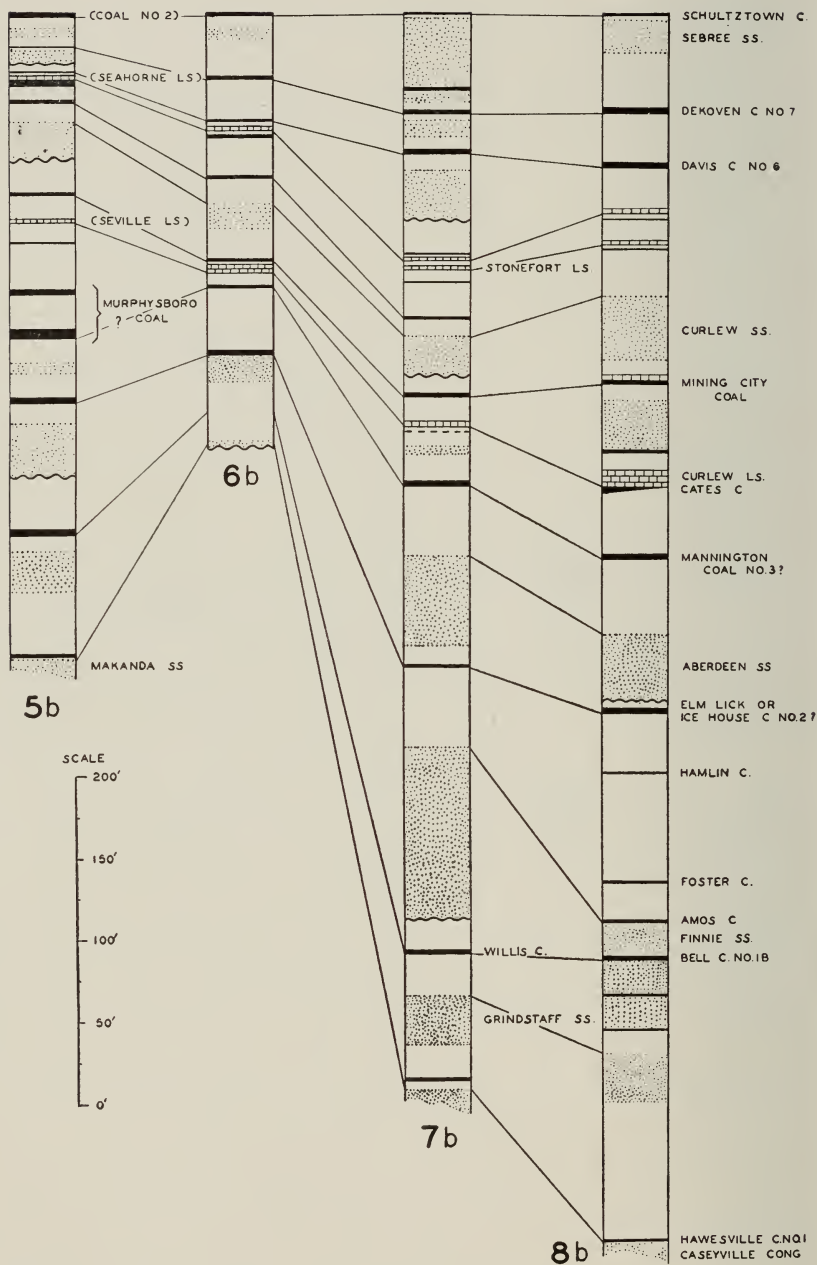


FIG. 5.—Columnar sections 5b, 6b, 7b, and 8b.

corresponding beds in the Illinois valley area as shown in column 2. Below coal No. 2, however, the section is similar but considerably thicker than that of column 2 and reflects the remarkable thickening of these lower beds that occurs southeastward across the basin. Coal No. 6 is the only important seam in this area although coal No. 1 (Murphysboro?) was formerly mined in Christian County from the deepest shaft in Illinois.

7. *Southern Illinois*.—This column illustrates the approximate maximum development of the middle part of the Coal Measures in Illinois. The entire section has expanded and numerous members absent or poorly developed in other parts of the state are here more or less persistently present. Among the more important of these are the Bankston and No. 5a coals and the Stonefort limestone which extend far into western Kentucky. Both the Herrin and Harrisburg coals are actively mined in this district and the DeKoven and Davis coals give promise of considerable future importance.

8. *Western Kentucky*.—This column illustrates the further expansion of the section that occurs eastward in western Kentucky. It is based mainly on observations in the western part of this field. It is not characteristic, therefore, of all of western Kentucky and probably does not indicate the maximum expansion occurring in that state.

By far the most important coal of western Kentucky is No. 9. The Mannington and No. 11 seams, whose equivalents are mined in Illinois, are important in certain areas. Coals No. 12 and No. 14, thin or absent in other parts of the basin, locally achieve minable thickness and considerable local importance.

Columns 9 to 12 (Fig. 6) show the development of the middle part of the Coal Measures along the eastern border of the Eastern Interior basin in southwestern Indiana and eastern Illinois. Correlation of the most important members is indicated by the introduction of Illinois names and coal numbers opposite them.

9. *Southern Indiana*.—This column is based upon outcrops and drill records in Gibson, Pike, and Dubois counties and is much thinner than that presented for western Kentucky. In this area the lower part of the section is thinning notably toward the north and several more coals are present between the Holland (Minshall) limestone and the Mansfield sandstone than occur farther north. The only important seam in this area is the Petersburg Coal V although years ago the much thinner Cannelton coal was extensively mined adjacent to the Ohio River.

10. *Sullivan and Greene counties, Indiana*.—This is the present standard section for Indiana. Coal V, known here as the Alum Cave

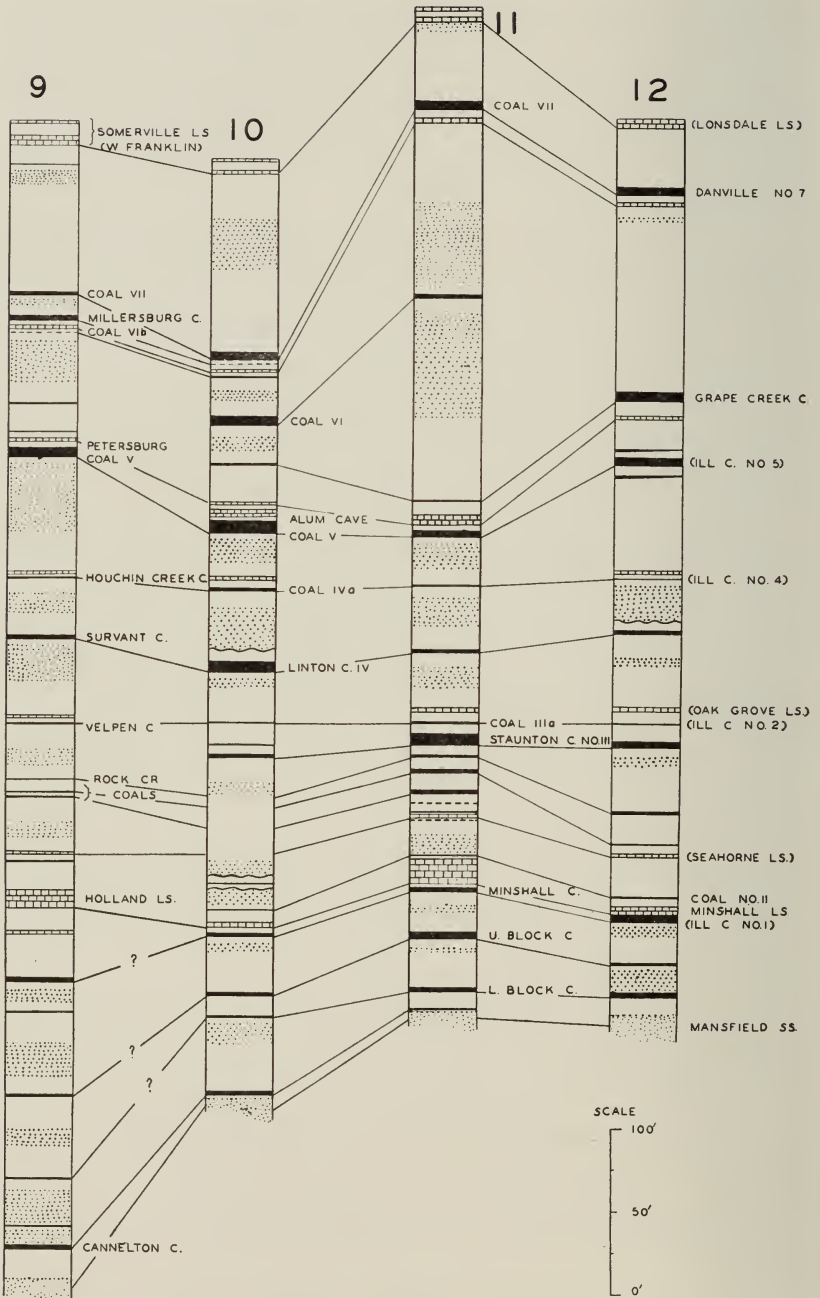


FIG. 6.—Columnar sections 9–12.

seam, persists as a thick coal across these counties and Coal VII has thickened from the south so as to be of some importance. These counties, however, are particularly noteworthy for the great development of Coals IV and VI which make this area one of the richest coal-bearing regions of the entire Eastern Interior basin.

11. *Vigo and Clay counties, Indiana.*—This is Ashley's original type section for the Indiana coal fields and the only area in which Coal III is of noteworthy commercial importance. Here also the coals beneath the Minshall limestone achieve their greatest development along the eastern border of the basin. Coals V and VII are present and minable in this area.

12. *Vermilion County, Illinois and Indiana.*—In this area the entire Coal Measures is thinning notably toward the north and many of the coals shown in this column disappear. The persistent Coals V and VII extend into this area but as Coal VII reaches its maximum development Coal V pinches out completely. This district also appears to possess the only minable body of the Grape Creek coal or its equivalents. The Minshall coal also achieves minable thickness in this area.

#### DESCRIPTIONS OF MINABLE COALS

*Lower Brazil Block coal.*—The lower Block coal is at present the first important coal overlying the Mansfield sandstone in Indiana and it achieves its greatest importance in Clay County where it is a splint coal and is extensively mined. It is correlated with the Bell coal, No. 1B of western Kentucky, the Willis coal of southern Illinois, and the Tarter coal of western Illinois. In Indiana and western Illinois this seam is irregular in development, being present with good thickness in more or less small areas from which it thins in all directions and is locally absent. In southern Illinois and western Kentucky, however, it is a more persistent but thin seam.

*Upper Brazil Block coal.*—The upper Block coal lies close above the lower Block in Clay County, Indiana, where it is likewise mined. It is also a splint coal. Farther south the interval between these seams expands and it is known as the Ice House coal, No. 2 of the western counties of Kentucky from which it has been traced into southern Illinois. Farther east in the western Kentucky coal field it is the Elm Lick coal. It is correlated with the Pope Creek coal of western Illinois. Like the lower Block it is irregularly developed in Indiana and western Illinois whereas farther south it is a more persistent but thin seam.

*Rock Island No. 1 coal.*—The Rock Island coal was formerly of much importance in the northwestern corner of the Illinois coal fields

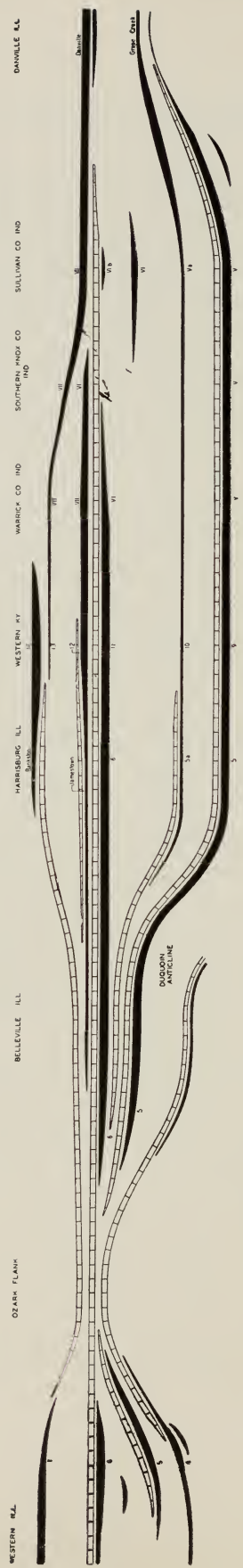


FIG. 7.—Cross section (not drawn to scale) around western, southern and eastern margins of Eastern Interior coal field showing relations of principal coal seams and their associated limestones.

but it is now largely mined out. Like the Block coals of Indiana it is irregularly distributed and lies in discontinuous areas separated by barren territory. It is correlated with the Minshall coal (Coal V of 1899) of Indiana and is probably equivalent to the Murphysboro No. 2 coal of southern Illinois, now mined out, and the Mannington coal of Christian County, Kentucky, which is locally an important seam. The Minshall coal has been stripped extensively and worked from many local shafts and entries but has nowhere been subjected to large-scale underground mining. Its thickness, which in some areas exceeds 6 feet, requires, however, that this seam be included among the minable coals of Indiana.

Both in the Rock Island district and in Indiana this coal is overlain by a conspicuous marine limestone of irregular development known by the names Seville and Minshall limestones respectively. This bed is also extensively developed in southern Illinois and western Kentucky as the Curlew limestone. In this southern area the limestone is believed to have risen in the section above the coal as the result of the introduction of members including a thin coal not present farther north. There is, however, some doubt regarding the correlation of the Murphysboro and Mannington with the Rock Island coal and they may actually belong at a slightly lower horizon.

*Davis and Dekoven coals.*—The Davis and Dekoven coals of southern Illinois and the adjacent part of western Kentucky are not at present commercial coals but their thicknesses of 4 feet or more throughout a considerable area and their good quality appear to guarantee their future importance. Outside of this area the Davis is a thin but persistent seam. The Dekoven coal is not quite so extensively developed but these two seams or their horizons have been recognized in outcrop almost completely around the basin.

*Stanton Coal III.*—Indiana Coal III is important only in a comparatively limited area in Clay and adjacent counties. Its barren horizon is believed to have been recognized a short distance below the Colchester No. 2 coal in western Illinois and a thin coal at this horizon is probably present in southern Illinois and western Kentucky.

*Colchester No. 2 coal.*—The Colchester coal is probably the most uniformly developed seam in the entire Eastern Interior basin. It has been opened at innumerable places in western Illinois but its thickness, which varies little from 30 inches, prevents it from being an important commercial coal at the present time. In northern Illinois it was formerly worked extensively from shafts where it is known as the La Salle "third vein" coal and reaches a thickness of  $3\frac{1}{2}$  feet or

more. At present it is the basis of an enormous stripping operation. Southward it thins and is of little or no economic importance. It is known as Coal IIIa in the revised Indiana nomenclature and has been named Velpen in the area of the Ditney folio of the United States Geological Survey's geologic atlas. In western Kentucky this seam is known as the Schultztown coal.

This coal is overlain by a persistent black slaty shale above which occurs a very characteristic series of impure limestone bands bearing marine fossils and separated by shale. These limestone bands, black shale, and coal constitute one of the most readily recognized and stratigraphically important key horizons of the entire Coal Measures.

*Linton Block Coal IV.*—The Linton Block coal is important only in a comparatively restricted area embracing parts of Greene and adjacent counties in Indiana. South of this area it is somewhat thinner and is known as the Survant coal. In western Illinois near Alton and in northern Illinois near La Salle thin local coals occur that are at least approximately equivalent to this seam. It is probably equivalent to Coal No. 8 of western Kentucky.

Coal IVa, a thin seam next above the Linton Block in Indiana, is a very persistent bed that is known in western Illinois as coal No. 4. It is commonly overlain by black and locally slaty shale, and in western Illinois this is succeeded by marine limestone and the coal or its horizon has been widely identified. In Indiana the black shale is associated with a layer of dense black impure limestone and constitutes an easily recognized horizon; it is the Houchin Creek coal of the Ditney folio and Coal No. 8B of western Kentucky.

*Harrisburg No. 5 coal.*—The Harrisburg No. 5 coal is equivalent to western Kentucky Coal No. 9 and the Petersburg or Alum Cave Coal V of Indiana. According to most recent observations it is probably likewise equivalent to the Springfield No. 5 coal of western Illinois.<sup>8</sup> This seam is, therefore, the most important coal of the Eastern Interior basin. It is the principal coal mined in Indiana and western Kentucky and is second only to coal No. 6 in Illinois.

Coal No. 5, like coals No. 2 and No. 4 of Illinois and their equiva-

<sup>8</sup> The Springfield seam is the true No. 5 coal of the type section built up by Worthen in western Illinois. In the discussion of the geology of Saline County, published in volume 6 of the Worthen survey reports, the Harrisburg coal was identified as No. 5 and this number was consistently applied to it for more than 50 years. Later, stratigraphic studies in the area between the Springfield and southern Illinois mining districts appeared to show that the Harrisburg coal is equivalent to No. 4 rather than No. 5 and this correlation was published by the writers in 1932 (*Bull. Geol. Soc. America*, Vol. 43, pp. 1007, 1008). Recent work which has resulted in a better understanding of the Indiana section suggests that the 1932 correlation is incorrect and that the Springfield and Harrisburg coals are actually the same. This problem is not yet satisfactorily solved.

lents elsewhere, is generally overlain by black slaty shale and marine beds including persistent limestone. It or its horizon has been recognized almost continuously around the borders of the basin but is locally entirely absent in the area of much reduced section in west central Illinois and it is very inconspicuous in the Danville district.

*Grape Creek coal.*—The Grape Creek coal is important only in a very limited area south of Danville, Illinois. It continues southward through Indiana as a thin but persistent seam (Vb) and is equivalent to Coal No. 10 of western Kentucky and No. 5a of southern Illinois. It is unknown in western or northern Illinois<sup>9</sup> except as possible local developments principally of cannel coal in Stark and La Salle counties.

*Coal VI.*—Like Coals III and IV of Indiana, Coal VI is limited in development and is important only in part of Sullivan and adjacent counties in Indiana. Three rather persistent partings in this seam suggest that it is equivalent to Illinois coal No. 6 although such correlation is not made at this time because of the important interval separating it from the limestone cap rock of the latter seam and the intervention of another thin coal. This interpretation may not be correct because somewhat similar relations between a coal believed to be Herrin No. 6 and its cap limestone locally occurs in La Salle County, Illinois.

*Herrin No. 6 coal.*—The Herrin seam is the most important coal of southern and central Illinois and it attains the extraordinary thickness of 14 feet east of the Duquoin anticline in Franklin County. It thins out and disappears toward the northwest and becomes discontinuous at the north where it is known as the Streator or La Salle "second vein" coal but achieves minable thickness in certain small areas. It is equivalent to Kentucky No. 11 coal which in the western part of that state is second in importance only to Coal No. 9. It is probably Coal VIb of Indiana.

The Herrin coal is characterized throughout practically its entire extent by three persistent clay partings one of which is widely known as the "blue band." These partings are more extensive than the coal itself and may be recognized, separated by thin streaks of smut, at many places where no actual coal is present. This seam is overlain by dark shale and a marine limestone which persists far beyond the limits of the coal.

*Coal No. 12.*—This coal is important only in western Kentucky where it is mined in Hopkins and Muhlenberg counties. It continues,

<sup>9</sup> In 1932 (*op. cit.*) the writers correlated the Grape Creek and Springfield No. 5 coals. The Grape Creek coal, however, definitely overlies the Harrisburg coal and the present correlation of the latter bed with the Springfield seam forces the conclusion the previous correlation is incorrect.

however, as a thin seam which is persistent throughout southern and central Illinois where it is known as the Jamestown coal and in the southern half of the Indiana coal fields where it is termed the Millersburg seam which has been incorrectly correlated with Coal VII. This seam lies close above the Herrin coal and at many places they are separated by little more than the limestone cap rock of coal No. 6.

*Danville No. 7 coal.*—The Danville coal, Illinois No. 7 coal, Indiana Coal VII, is at present principally worked in the Danville district in large strip mines. It thins out both toward the northwest and south and is absent in southern Illinois and parts of western Kentucky. In the latter area, however, it may be the seam that is locally known as No. 13. It was formerly worked by shaft at a few places in northern Illinois where it was known as the La Salle "first vein." This, like several of the lower seams, is overlain by black shale above which marine limestone may or may not be present. In general the limestone is best developed where the coal is thin or absent.

*Coal No. 14.*—This seam is important only in western Kentucky where it is worked in large mines principally in Hopkins County. It is apparently discontinuous and there is some uncertainty regarding the equivalence of coals in different parts of this district that are known as Baker, Nebo, and No. 14. It is tentatively correlated with the Bankston coal of southern Illinois, a thin seam that is undeveloped in other parts of that state.

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