Altitude Level Lines Will Be Hooked Up.

Gazette 3-3-31

G. C. Branner, state geologist, announced yesterday that a plan has been worked out through co-operation of the state Geological Survey, the state Highway Department and the United States Coast Geodetic Survey to hook up altitude level lines established by the Highway Department on various state highways with levels established by the Geodetic Survey in such a way that the number of established bench marks in the state will be increased approximately 75 per cent during the next 15 months.

Most of the levels established by highway engineers in surveying routes for state roads have no relation to sea level, but are based on their relation to other given points. While Mr. Branner was in Washington recently, he took up the matter with the director of the Geodetic Survey and that department agreed to run several basic lines across the state to tie up all established level points on the basis of sea level.

The federal survey now is completing level lines from Seligman, Mo., along the M. & N. A. railroad to Kensett, from Kensett northeastward along the Missouri Pacific railroad to an established line at Hoxie and southward to Little Rock, and another line from Fort Smith to Mena, Texarkana and Lewisville. Establishment of these lines will complete the government's "first order" of levels, which are established with the highest precision, Mr. Branner said. When these lines are completed, the first order of levels will be tied in with the second order, which will include those established by the Highway Department, and the entire system will be recognized as official U. S. Geodetic Survey levels.

The state Geological Survey will publish a bulletin and maps within the next two years giving details concerning the system, which Mr. Branner said will be as extensive as that in any other state.

Knowledge of the altitude of various points in the state, with relation to sea level, will facilitate surveys for flood control and water power projects, topographic mapping, construction of highways, railroads, etc.

Federal Survey Work Extends Into Arkansas.

11-8-32

G. C. Branner, state geologist, was notified yesterday by R. S. Patton, director of the United States Coast and Geodetic Survey at Washington, that field work has been started on lines of control leveling beginning at Cape Girardeau and Seligman, Mo., and extending southward into Arkansas. The Cape Girardeau line will pass through Poplar Bluff, Pocahontas and Hoxie. The other line will pass through Rogers, Fayetteville, Winslow and Van Buren to Fort Smith. A third line will begin at Van Buren and extend through Ozark and Clarksville to Russellville. The new lines will form a part of the government's projected net of control leveling of high precision, which is intended to space lines so that no point will be more than 25 miles from a leveling line. The information made available through the establishment of such lines is essential to irrigation, drainage, highway and railroad construction and similar construction projects. Bench marks established along the lines form the starting point for additional leveling by other government bureaus.

GEOLOGIST HEADS GEODETIC SURVEY

George C. Branner to Supervise Work for Which $98,352 Allotted Arkansas.s

Gazette Nov. 8. 1933

George C Branner, state geologist, has been designated by R. S. Patton, director of the United States Coast and Geodetic Survey, to supervise geodetic survey work to be done in Arkansas with an allotment of $98,352 in federal funds.

The program contemplates that $88,000 from the federal Emergency Relief Administration will be used to pay surveying crews. This sum will be supplemented by an allotment of $10,352 from the Coast and Geodetic Survey.

Positions and elevations determined on traverse and level lines which would be run through the state are of basic importance to engineering works, such as flood control, power projects, power and pipe line extensions, irrigation, regional planning and the perpetuation of public and private boundaries, Mr. Branner said.

Tentative plans call for 25 field parties to run traverse and level lines throughout the state, so that no point in the state would be more than 12 miles from one of the lines. The maximum distance now to such lines is about 25 miles.

The major portion of the traverse and level work in Arkansas was completed by the Coast and Geodetic Survey during the past three years with funds which former Congressman Heartsill Ragon and Mr. Branner were instrumental in having allotted to Arkansas.

The federal Public Works Administration already has allotted $82,000 to Arkansas for Geological Survey work; $69,000 for topographic surveys, $8,000 for stream gauging, and $5,000 for underground water surveys in the rice belt.

The Coast and Geodetic Survey has allotted $13,720 of public works funds to the state for triangulation, levels, etc., making a total of $95,720 allotted to the state.

GEODETIC SURVEY TO AID ENGINEERS

Nov 12, 1933

Supervisor in Arkansas Says Many Will Receive Employment.

George C. Branner, state geologist spoke to members of the Little Rock Engineers Club at the Hotel Ben McGehee yesterday on proposed work to be done in the state by the United States Coast and Geodetic Survey with the recent allocation of public works funds amounting to $98,320. Mr. Branner has been designated to supervise the work.

He said that it would furnish employment of many engineers who will receive salaries of $1,700 a year, plus $ a day for expenses. Mr. Branner said that the Federal Emergency Relief Administration has been asked for $88,00 for geodetic work, supplemented with grant of $10,320 from the Geodetic Survey.

A difficulty arose, however, in the wage scale to be paid junior engineers because rules of the relief administration forbid such a high scale. Harry L. Hopkins, relief administrator, has been asked for a special ruling to raise wages for engineers.

Allotments of $69,000 for work in the Ouachita and Ozarks regions; $82,000 for Geological Survey work; $8,000 for stream gauging and $5,000 for an underground water survey in the rice belt of eastern Arkansas already have been made by the Public Works Administration.

Mr. Branner said that he is acting as the proceeding agent in supplying engineers for the work in the state under C. L. Sadler of Joplin, Mo., who has charge of the work in Oklahoma, Kansas, Nebraska and Arkansas.

Mr. Branner said that allocations from relief sources for geological and geodetic surveys in Arkansas total $194,000.

The zero milepost for the state has been placed on the capitol grounds, at 334.799 feet above mean sea level, Mr. Branner reported.

Audit Board Head Speaks.

Col. John R. Fordyce, chairman of the state Highway Audit Commission explained the work done by the commission in establishing claims by engineering companies. He said that the commission is trying to get information and not "to dig up dirt on our former highway friends."

Fifty claims have been sent up to the commission for review, Colonel Fordyce said. Circulars have been sent out showing information sought by the commission and asking claimants to have their own engineering work done.

Colonel Fordyce said that the commission establishes a legal method of settling claims against the state without expensive court trials. He said that one of the most difficult before the commission is the claim of the Missouri Bridge Company for work done on the bridge at Garland City, dynamited in 1930. The bridge spans the Red river at that point.

U. S. Geodetic Survey Nearly Completed.

Dec 26, 1934

(Science Service.)

Cleveland.—You will soon be able to know exactly where you are, at any place in the United States. The U. S. Coast and Geodetic Survey has nearly completed its great double survey of this country. This comprises both triangulation, which gives highly accurate information on north-south, east-west location, and leveling, which tells with like accuracy where you are in an up-and-down sense.

Progress in these surveys was reported by Dr. William Bowie, chief of the division of geodesy, U. S. Coast and Geodetic Survey, in a paper presented before the autumn meeting of the National Academy of Sciences here today.

The lines laid down by the survey cover the country as with a huge net. The field workers, with their precision instruments, have already woven 172,000 miles of the levels net, leaving only 28,000 miles yet to be finished. Of the triangulation net 55,000 miles have been completed, with 61,000 miles yet to be done.

GEODETIC SURVEY PARTY IN ARKANSAS

65 Men Will Run 3,000 Miles of Levels in Next Few Months.

Dec 2, 1934

Headquarters have been established in Little Rock by the United States Coast and Geodetic Survey for a precise level party composed of 65 men, who will run about 5,000 miles of levels in Arkansas, eastern Oklahoma and southern Missouri, Dr. George C. Branner, state geologist, said yesterday.

Lieut. A. C. Thorson is in charge of the party, which is composed of the following units: One casting party that operates in advance of other units and casts concrete monuments and distributes them along the proposed lines; four bench mark parties which set these monuments and describe their locations, and eight leveling parties which determine the precise sea level elevations of the monuments.

Approximately 3,000 miles of levels will be run in Arkansas, and, weather permitting, the work will be completed in about four months. When the work is completed, Lieutenant Thorson said, Arkansas will have a complete level network which will be valuable to state, county and local engineers.

Provide Exact Data.

The surveys furnish accurate latitudes, longtitudes, distances, true bearings and elevations, Lieutenant Thorson said, and while they are made primarily for mapping and charting, the network will supply essential information for highway and railroad location, hydro-electric development, flood control, power and pipe transmission lines, reclamation and drainage projects, state and city planning.

With the leveling, the party will determine the exact elevations above mean sea level of lines of points. The lines usually follow roads and railroads, because the points are easily accessible to both the surveying party and those who require the elevations.

Instruments Used.

The instruments used are the spirit level and a level rod graduated in meters, centimeters and millimeters.

The first order leveling in Arkansas has been completed, and the first order level loops will be divided by second order lines by the party now operating. The level network eventually may be completed to such an extent that no point within the state will be more than 15 miles from a monument for which precise sea level elevations has been determined.

All level lines are tied together to form a series of large loops or circuits, some of which are hundreds of miles in length. The progress in first order leveling is usually about 90 miles per month and in second order leveling about 150 miles per month.

With both first and second order levels, brass or aluminum elevation plates are set in some relatively permanent foundation such as pavemnet, bridge ends, buildings, or in special concrete posts set for the purpose. The elevation of these markers, which are called bench marks, is stamped on the metal plates. These marks are established in every town on the line of levels and also at about 2-mile intervals along railroads and highways.

ROPER ADVOCATES MAPPING PROGRAM

Dec 24 1934

Would Aid Development of Natural Resources, Secretary Contends.

Washington, Dec. 23.—(AP)—Although business generally improved during the year, Secretary Roper today reported to the president that lack of consumer demand had caused the initial splurge of manufacturing induced by the NRA to wane for a time.

The recovery drive, he said, jumped manufacturing from 56 per cent of normal in March, 1933 to 101 in July but by June, 1934 this was down to 86.

The secretary made no general recommendations for legislation at the next session. He did, however, urge an appropriation for a high voltage electrical laboratory at the National Bureau of Standards; aid for the Coast and Geodetic Survey in completing typographic maps of the country; a national survey of pollution of streams by the Bureau of Fisheries and early Senate ratification of the international convention on safety of life at sea.

Of the 1933 increase in manufactures, the secretary said this "probably" was part of a natural cyclical upturn, but that this was "greatly augmented by the increase in confidence which was engendered by the advent of the new administration together with the belief that inflationary policies would be followed" and a desire to manufacture as much as possible before the NRA increased costs.

The emphasis being laid on development of national resources, the secretary said, pointed to the need of an accurate map of the country.

"Only about 25 per cent of this country is adequately mapped at the present time; less in proportion than most of the other nations," he reported "This situation is a direct result of the individualistic policy under which our nation developed.

"It is now the national will that there be a saner and wiser use of the heritage of wealth latent in our soil, our streams and our forests, and our mineral resources."

In his general business review, the secretary reported an improvement in profits of industry, but found the capital goods industries depressed and private construction low. Farm income increased, he said.

Suggests Further Surveys in State

Democrat 3-3-36

A WPA project to provide workers to re-run 122 miles of level lines in Arkansas to complete the level survey in this state was suggested yesterday to Dr. George C. Branner, state geologist, in a letter from J. H. Hawley, acting director of the United States Coast and Geodetic Survey:

Dr. Branner said that he had no immediate plans for such a project but that it would be given consideration since a project already is under way for compilation of data gathered in previous surveys.

Mr. Hawley called attention to triangulation and leveling surveys as of January 1, 1936, and showed that 122 miles should be re-run in Lafayette, Columbia, Craighead, Poinsett, Cross and Jackson counties.

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Benefits of Accurate Boundaries

Through the Use of Triangulation, the Need for Astronomical Observations Along State Boundaries Is Eliminated. Several Arcs of Triangulation Have Been Located in and Near Arkansas.

By WILLIAM BOWIE

Chief of the Division of Geodesy of the United States Coast and Geode tic Survey.

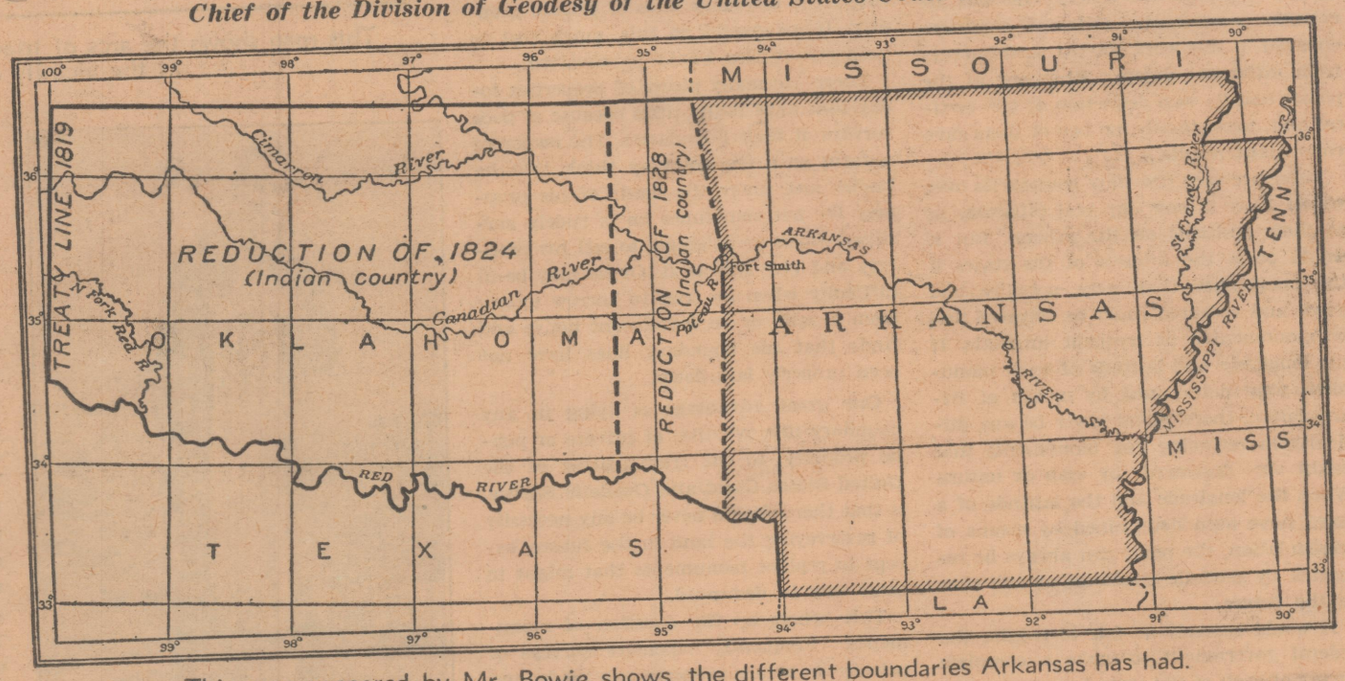
Arkansas was admitted to the Union as a state in 1836. The enabling act of Congress described the boundaries of the new state as follows:

"Beginning in the middle of the main channel of the Mississippi river, on the parallel of 36 degrees north latitude, running from thence west, with the said parallel of latitude, to the Saint Francis river; thence up the middle of the main channel of said river to the parallel of 36 degrees, 30 minutes, north; from thence west to the southwest corner of the state of Missouri; and from thence to be bounded on the west, to the north bank of Red river, by the lines described in the first article of the treaty between the United States and the Cherokee Nation of Indians, west of the Mississippi, made and concluded at the city of Washington, on the 26th day of May, in the year of our Lord one thousand eight hundred and twenty-eight; and to be bounded on the south side of Red river by the Mexican boundary line, to the northwest corner of the state of Louisiana; thence east with the Louisiana state line, to the middle of the main channel of the Mississippi river; thence up the middle of the main channel of the said river, to the thirty-sixth degree of north latitude, the point of beginning."

In the state constitutions of 1836, 1854, 1868 and 1874, the boundaries of Arkansas were described, but there were no material changes from the description given in the enabling act of Congress. However, by an act of Congress, approved in 1905, the western boundary of the state near Fort Smith was changed to include a portion of the Indian Territory. This involved only about one-fifth of a square mile.

In 1920, commissioners surveyed and marked a portion of the Arkansas-Mississippi state line which involved some land that was in dispute along the river. The Mississippi, which was considered to be the boundary between Arkansas and the state of Mississippi, is not really a very good boundary. It changes its course from time to time as the river cuts across country during high water. Every time such a change in the channel occurs, the question comes up of who owns the land that has been shifted from one side of the river to the other.

The north boundary of Arkansas was surveyed in 1823 and was resurveyed by a joint commission of this state and Missouri between 1843 and 1846. The later survey was started at a point near the Mississippi river, whose latitude from sextant observation was determined at 36 degrees. The marks along this boundary consisted of tree blazes, wooden posts, and mounds of earth and stone. This so-called 1843 line, which differed materially from the previously located northern boundary, was accepted by the legislatures of the two states and ratified by congressional act of February 15, 1848.



This map prepared by Mr. Bowie shows the different boundaries Arkansas has had.

The part of the west boundary south of the Arkansas river was surveyed and marked in 1825, and that from old Fort Smith to the southwest corner of Missouri was surveyed and marked in 1831. A resurvey of the west boundary was begun in 1857, but after the surveyors had done only a small amount of work, they were directed to return to Fort Smith and retrace the line of the previous survey which had been found to diverge to the west.

A resurvey and remarking of the entire west boundary of the state was authorized in 1875. This work, which was completed in 1877, showed that the old lines from old Fort Smith, both southward and northward, diverged to the west, thereby adding more than 200 square miles to the area of Arkansas. The Cherokee and Choctaw Indians were paid for the land of which they had been wrongfully deprived.

The southern boundary of Arkansas, which is the northern boundary of Louisiana, was surveyed in 1806, shortly after the Louisiana Purchase. The survey was presumably along the thirty-third parallel of latitude from the west bank of the Mississippi river to the east bank of the Red river. Most of the marks made by the surveyors were blazed trees. This location of the line was accepted in 1841 as the boundary between Louisiana and Arkansas. A part of this line was resurveyed and remarked in 1841. Other parts of the line have been resurveyed as a part of the regular work of the General Land Office. West of the Red river, the line was surveyed in 1839. The western six miles of the boundary was resurveyed in 1895 and a stone post was placed on the Texas line to mark the northwest corner of Arkansas. The United States Geological Survey has located certain points on this southern boundary of Arkansas.

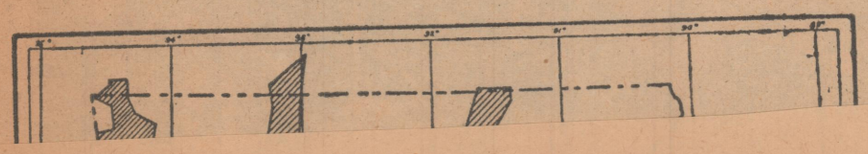
It will be seen from the foregoing that some of the boundary lines of Arkansas have not been substantially monumented. It would be to the interest of the state to have new surveys made in order that the limits of the state might be well laid down on the ground and monumented in such a way that any one could tell when he steps from the state to any of the adjoining states.

In making a map of a state, the most important thing is to have the boundaries accurate as to locations. Then the state map will be true in form and area. There are many ways of surveying the boundaries of a state. In the early days of this country, before the telegraph, longitudes had to be determined by observations of the moon or by transporting chronometers from a point whose longitude was known to the meridian designated as the state boundary. Such methods of determining longtitude were crude and many meridian boundaries were quite inaccurately laid down. The boundary, however, remains as marked on the ground after it has been accepted by the legislatures of the two

A most notable case occurred in the Island of Puerto Rico. The old Spanish chart was based upon astronomically determined latitudes at Ponce on the south coast, and at San Juan on the north coast. These two cities are only 33 miles apart in the north and south direction. Yet the distance between them determined from these astronomical latitudes was just one mile in error. At the south station the plumb line had been deflected towards the north by the mass of the island and the deficiency of mass in the water of the Caribbean sea, and at the north station it had been deflected to the north by the mass of the island and the deficiency of mass in the waters of the Atlantic ocean.

In Turkestan there is a broad valley running east and west flanked by high mountain ranges. The width of that valley determined by astronomical observations, was found later to be in error by a mile and a half. At the southern station the plumb line had been deflected towards the south and at the northern station it had been deflected to the north.

There have been cases in our state boundary surveys where more than one astronomically - determined latitude or longitude has been used in locating the boundary. It has been found that a north and south line run from one of the astronomical stations would not join another part of the boundary extended north and south from a second astronomical station. Even the boundary along the forty-ninth parallel between Canada and the



TO COMPILE SURVEY DATA.

Charles W. Clark of Washington, junior engineer for the United States Coast and Geodetic Survey, arrived yesterday to serve as technical adviser for a WPA project sponsored by Dr. George C. Branner, state geologist, to complete tabulation of data on a survey of several areas in western and northwestern Arkansas. Level lines were run and other field work completed seevral years ago. The project will continue until July 1 or later with eight or more WPA workers assigned to the project.