

Missouri Vs. Iowa

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SooperKanoon Citation : sooperkanoon.com/88421

Court : US Supreme Court

Decided On : 1897

Appeal No. : 165 U.S. 118

Appellant : Missouri

Respondent : Iowa

Judgement :

Missouri v. Iowa - 165 U.S. 118 (1897)

U.S. Supreme Court Missouri v. Iowa, 165 U.S. 118 (1897)

Missouri v. Iowa

No. 6, Original

Report filed December 14, 1896

Decree entered January 18, 1897

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ORIGINAL

SYLLABUS

The report of the commissioners appointed February 3, 1896, [160 U. S. 160](#) U.S. 688, to find and remark the boundary line between the states of Missouri and Iowa, is confirmed, and it is ordered that that boundary line be as delineated and set forth in said report.

MR. CHIEF JUSTICE FULLER announced the decree of the Court.

This cause coming on to be heard on the application of the State of Missouri, the State of Iowa consenting thereto, for decree on the report of James Harding, Peter A. Dey, and Dwight C. Morgan, commissioners appointed by decretal order herein on February 3, 1896, to find and remark with proper and durable monuments such portions of the proper boundary line between the States of Missouri and Iowa as run, marked, and located by Hendershott and Minor, commissioners of this Court, under the orders and decrees of this Court of February 13, 1849, and January 3, 1851, as have become obliterated, especially between the fiftieth and fifty-fifth mile posts on the same, and it appearing that a difference of opinion has arisen in respect of certain allowances to be included in the expenses incurred in remarking said boundary line, it is ordered by the Court that Commissioner Morgan be allowed his *per diem* for 46 days' services, and that the account of expenses attached to said report be completed by the addition of that *per diem* in favor of said commissioner, and that said report as so completed in that particular be, and the same is hereby, in all things confirmed, as follows:

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"To the Honorable the Supreme Court of the United States:"

"The undersigned commissioners, appointed by the decree of your honorable Court dated February 3, 1896, to find and remark with proper and durable monuments such portions of the boundary line between the States of Missouri and Iowa run, marked, and located by Hendershott and Minor in accordance with decree of your honorable Court dated January 3, 1851, as have become obliterated, especially between the fiftieth and fifty-fifth mile posts on said line, etc., respectfully submit the following report:"

"On the 27th day of February last, the commissioners met in the City of Chicago, and fully discussed matters pertinent to the proper performance of the duties imposed upon them. Construing the decree as applying to all portions of the boundary line in question, the commissioners decided to advertise in newspapers published in counties in Missouri and Iowa adjacent to the boundary for information regarding such parts of said line as were in dispute, or had become obliterated. This was done, and considerable information elicited, but as the officials of one of the states interested declined to authorize the work necessary in retracing the line, excepting where directed in the decree, nothing was done beyond the finding and remarking 'with proper and durable monuments' such portions of the line as was necessary for its proper relocation between the 40th and 60th mile points, as shown hereinafter."

"After careful consideration, it was decided to apply to Gen'l W. W. Duffield, Superintendent U.S. Coast and Geodetic survey, for a detail from his corps of assistants to perform all field work necessary in carrying out the instructions of the Court. It was decided that the employment of expert officers of the Geodetic Survey Corps for the services required would result more satisfactorily to the states concerned than would the selection of any private parties, as the high professional attainments of these officers, and their freedom from any possible bias regarding the boundary line to be established, were ample guaranties for the entire reliability and impartiality of any work done by them."

"Correspondence was accordingly had with Gen'l Duffield,

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who consented to detail two of his assistants and also to supply them with a complete outfit of all instruments and appliances necessary in the prosecution of the proposed work. This offer was at once accepted. A meeting was afterwards had in St. Louis, March 11th ult., when it was decided to meet at Lineville, Iowa, a point immediately upon the boundary line between Missouri and Iowa, for the purpose of personal investigation as to the proper point or points at which to commence operations. Two of the commissioners accordingly met at Lineville on

March 18th ult., and spent three days in the examination of the boundary line and of points on said line claimed to have been established by Hendershott and Minor in 1850. The first step taken was to decide regarding the proper points between which our work of relocation of that part of the line designated in the decree of your honorable Court, namely, from the 50th to the 55th mile points on the Hendershott and Minor line, should be commenced. It appeared to us that the cast-iron monuments placed by Hendershott and Minor at intervals of ten miles would naturally be more reliable than any traditional points, and the first investigations were made as regarding the 40th, 50th, and 60th mile points, these being originally marked by Hendershott and Minor with iron monuments, as stated. After careful examination and much inquiry, the commissioners were satisfied that the monuments marking the 40th and 60th mile points were in their original positions. As regarded the monument at the 50th mile point, whilst no positive evidence could be had as to its removal from its original position, the rumors and statements were such as to render its reliability a matter of doubt, and it was therefore determined to use the monuments at the 40th and 60th mile points as fixed points between which to relocate the boundary line."

"It was subsequently arranged for the commissioners to meet at Davis City, Iowa, a point on the Chicago, Burlington & Quincy Railroad adjacent to the 40th mile point, where it was proposed to commence work. Gen'l Duffield was accordingly notified, and on Wednesday, April 8th ult., the commissioners reached Davis City, and met Messrs. W. C. Hodgkins

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(in charge of work) and A. L. Baldwin, of the U.S. Geodetic Survey Corps, detailed as per arrangements made with Gen'l Duffield. These gentlemen brought with them a very complete outfit of instruments of the best description used in geodetic work, including all necessary equipment for astronomical observations as well as field work. We proceeded to the 40th mile point on the afternoon of April 8th ult., and arranged for the commencement of work the following day. On April 9th ult., a party for field work having been organized and the necessary teams and wagons hired, the entire party proceeded to Pleasanton, Iowa, a point situated immediately

on the boundary line just east of the 45th mile point. Pleasanton and Lineville subsequently became the bases of operation, our parties changing from one of these points to the other as the necessities of the work required."

"Work was commenced at the 40th mile point, as arranged. It soon became quite evident that the actual boundary line as indicated by points shown and satisfactorily identified differed from the line as would be established by the field notes of the Hendershott and Minor survey. In order that the relative positions of the actual mile points between the 40th and 60th mile points could be properly determined, and also their true relation to the theoretical points as found in accordance with the courses and distances shown in Hendershott's report, it was deemed necessary to establish a chord or baseline twenty miles in length between the 40th and 60th iron monuments to which all points actually found and definitely located or shown and claimed as being upon the boundary line could be referred, and from which all points finally determined could be accurately located. For the details of the actual field work and its results, we respectfully refer to the accompanying report of Mr. W. C. Hodgkins, in charge of party (Appendix A). It is proper here to state that the field work, done as it was in accordance with the precise methods of the U.S. Geodetic Surveys, was necessarily very slow and tedious; but its accuracy, in our opinion, cannot be questioned. The measurement of the twenty-mile baseline involved a very great amount of labor, whilst the computations necessary in the

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exact reduction of the measurements were also very laborious. Complete topographical notes were also taken for the entire work, but the commissioners have deemed it unnecessary to have maps prepared, as their preparations would involve a considerable expense without any corresponding benefit. The very unfavorable weather during a great portion of May and a part of June interfered seriously with the prosecution of the field work, causing a delay of from two to three weeks."

"Careful examination was made in every instance for the precise location of the original Hendershott and Minor mile points, but out of twenty-one of these points included in the survey. only nine, including three iron monuments, could be satisfactorily identified. The 42d, 43d, 44th, 49th, 54th, and 58th mile points were identified and located by evidence entirely satisfactory to the commissioners. As regards the 50th mile point (iron monument), concerning the reliability of which doubt had existed, the commissioners are satisfied that it is very little, if at all, out of its original position; its relation to the 49th mile point (which was clearly identified as Hendershott's original point), as determined by the baseline, confirming our judgment. After the work of relocation had commenced and preliminary work on the twenty-mile base well advanced, statements were made to the commissioners to the effect that the iron monument at the 60th mile point had at one time been moved from its original position. This being a matter of importance, the monument in question being considered as a fixed point in establishing the baseline, an inquiry was had regarding it, and a considerable amount of testimony heard. This testimony was very conflicting, but after its careful consideration and the prolongation of the baseline some four miles eastward of the 60th mile point, the commissioners were satisfied that the monument was occupying its original position."

"The location of the 52d mile point was more difficult, and involved a much more extended investigation than for any point established by the commissioners. It was claimed and strongly urged that the original 52d mile point as established by Hendershott and Minor was at a point witnessed by two

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trees -- an elm and an oak -- which trees, as well as a point established from them in accordance with Hendershott and Minor field notes, were shown. The field notes regarding this and also the 53d mile point are as follows:"

" (Chains.)"

" 80.00 Set 52d mile post."

" Bearings, elm, 18 inches diameter, N., 87 1/4 E., 10 1/2 links; burr oak, 12 inches diameter, S., 22 W., 28 links."

" (Continuing):"

" N., 88 47 E."

" (Chains.)"

" 0.30 A pond, 250 links wide; direction of its length, N. & S."

" 5.00 Prairie."

" 15.00 Timber."

" 30.00 Field (Stokes') fence, nearly N. & S."

" 57.50 Left field."

" 80.00 Set 53d mile post. Bearings, black oak, 8' diameter, S., 53 E., 15 links; black oak, 6' diameter, N., 53 E., 64 links."

"The trees shown and claimed as being the original witness trees for Hendershott and Minor's 52d mile point agree very well with the field notes as regards their distance from the 51st mile point, and also as to their relative positions to each other. The distances and bearings of these trees from the point shown and claimed as the original Hendershott mile point also agree with the field notes closely. Beyond these coincidences, however, there is, in our judgment, nothing whatsoever to warrant a conclusion that they were ever marked as witness by Hendershott and Minor. In their report ([51 U. S. 10](#) th Howard, pages 15 and 16) they state:"

"In timber, the number of the mile is marked on the witness trees with the letter appropriate to each state, there being one tree marked on each side of the line whenever possible. The foot of each witness tree is marked with the letters 'B L.' The oak tree shown and claimed to be a witness tree for the 52d

mile point had a large 'blaze' on its trunk, about five feet from the ground. Nothing whatever could be ascertained by the commissioners to in any manner indicate what, if any, marking had been inscribed on the blaze, nor could any information be had concerning such marking. At the foot of this tree, facing N., 45 E., is to be seen a blaze on which are plainly discernible the letters 'B X.' The blaze on the trunk of the tree faced directly east, whilst the point to which it is claimed to refer is but 22 east of north from the tree. It is the universal custom of surveyors in marking witness trees, so far as the experience of the commissioners goes, to make such marks so as to face as nearly as possible the point witnessed. The 'B X' mark faces certainly 25 east, and the blaze on trunk of tree 68 east of the point claimed to be witnessed. Measurements of the 'X' mark at base of tree are as follows, in tenths of one foot:"

image:a

"The mark inclining to the left extends above the letter 'B,' and is quite close to the upper curved line. The mark inclining to the right runs closely to the lower part of the 'B.' It would have been quite as practicable to have cut a letter 'L' as an 'X' on the blaze found at foot of this tree, and the commissioners were not prepared to accept this letter 'X' as an 'L' without stronger corroborative evidence than they could obtain. This tree, if marked by Hendershott and Minor, must have been so marked forty-six years ago. A section of the tree at a point eight feet above the ground, the tree being very uniform in size, from three feet above the ground for eight to nine feet above, was cut and sent to Prof. McBride, botanical expert at the University of Iowa, for his opinion (as expert) as to its age, etc."

"In a letter from him to Commissioner Dey, May 19th, 1896, he states: "

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" I judge that the tree, when felled, was 70 years old. Its history runs about as follows: 59 years ago, it received an injury (blaze?) of which a scar persists. The tree at the time was about 11 years (11-16) old, and not to exceed, bark included,

3 1/4 inches thick. I say about 11 years for it takes some years not recorded on the section for a tree to attain six feet in height. 25 years later, the tree had added about 2 1/2 inches to its radius. The next 17 years, a little more than one inch to the radius, making the diameter of the wood (bark not counted) about 8 1/4 to 8 1/2 inches. Since this, another inch of wood has been added to the radius. Calling this 17 years (it is more, rather than less, as the annual increment is constantly smaller), we have the total since the scar, 59 years."

"This oak tree, as shown by Prof. McBride at a point where section examined by him was cut, was 8 1/4 to 8 1/2 inches in diameter when 53 to 58 years old. Being 70 to 75 years old, it would have been 24 to 29 years old in 1850, and its diameter where blaze was found could not have exceeded 5 inches. As the blaze shows a face of fully eight inches, it is evident it could not have been cut on a tree with a diameter of only five inches. The diameter of this tree at base, where 'B X' mark was found, is now 15 inches. Applying the proportionate growth of tree as shown by Prof. McBride, and its diameter at base could not have exceeded 8.5 inches 46 years ago, and its size was not sufficient to have received the blaze now shown."

"Regarding the elm tree, also claimed to be a witness tree for the original Hendershott 52d mile point. This tree also has a large blaze, about four feet from the ground. Nothing whatever was shown to prove that it ever had any mark upon it (prior to the time of a private survey made in 1893) other than the characters 'S 28.' The letter 'S,' if it ever existed, is now totally obliterated. The figure '2' is still plainly discernible, and a part of the upper portion of a figure '8' to the right of the '2' can also be traced. Nothing was shown to prove that it was ever marked at its base with the letters 'B L,' as it should have been were it a Hendershott witness

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tree. Diligent search had evidently been made at some time for this mark, as is plainly evidenced by the chopping at its base; and, had the proper marks ever been found, it is quite certain the fact would have been in evidence before the commissioners."

"The Hendershott notes show that at 30 links eastward of the 52d mile point, the bank of a pond was reached, and that the pond itself was 250 links in width, making a distance of 280 links from the 52d mile point to the east bank of pond. The bank of this pond directly east of the 52d mile point, claimed to be witnessed by the 'elm and oak,' has evidently moved eastward to some extent since 1850, as shown by present conditions. Measurements made by the commissioners show that 280 links eastward from the point claimed as the Hendershott 52d mile point reach a point 59 links east of the present bank of the pond. Thirty chains east of their 52d mile point, as seen by their notes, the Hendershott line crossed the 'Stokes' field fence. The line of this fence is still plainly visible. A line straight from the 52d mile point, claimed to be witnessed by the 'elm and oak,' to the 54th mile point, will pass at least 70 feet south of the 'Stokes' fence line, as noted by Hendershott. For more than thirty years, and after the establishing of the boundary line by Hendershott and Minor, it is claimed a road was maintained and worked as a Missouri road between the 52d and 54th mile points, and that until within the past five years, this fact was never questioned. It is claimed that the line recognized by parties living on both sides of the boundary as being the Hendershott line since his survey, and until within the past few years, is now plainly shown for a very considerable distance between the 52d and 53d mile points by the line of what is known as the 'Fugate Fence Line.' It is claimed this fence was put up by one Fugate, the owner of land in and a resident of Iowa (and who was also a surveyor), and who, living as he did close to the line, and present when the Hendershott survey was made, probably knew where the true line was, and placed his fence on that line. This line very closely agrees with a line running directly from Sullivan's 52d mile point to the 54th mile point,

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the last named having been satisfactorily identified and located by the commissioners. It is claimed to be improbable that Fugate placed his fence north of the proper line."

"The commissioners most carefully considered all the conditions relating to the point claimed to be the Hendershott 52d mile point, and witnessed by the 'elm and

oak.' But the more the matter was weighed, the stronger became their conclusion that the trees mentioned could not have been the witness trees as claimed. Coincidences of position constitute their claim. It is proper here to state that within a short distance to the north of the 52d mile point, as established by the commissioners, are the stumps of an elm and burr oak which agree, as well as do the other elm and oak, as to distance from the 51st mile point, better as to topographical conditions, and are very similar as to the relative position required by the field notes for the witnesses to the 52d mile point. The commissioners have no idea that these stumps referred to were those of Hendershott's witness trees, but make this statement to show that coincidences such as shown by the 'elm and oak' are not impossible. To have crossed the 'Stokes' fence, in a distance of 30 chains, starting from the suppositious 52d mile point claimed to be witnessed by the elm and oak, an angle of at least 2 to the left would have been necessary, and also another angle to the right equally great in order to run directly to the 54th mile point. Hendershott's notes make no mention of any such angles. The angle recorded as having been made at the 52d mile point was 29' to the north, the course having been changed, according to the Hendershott notes, from N. 89 16' E. to N. 88 47' E. We are satisfied, from personal investigation, and from points found and referred to our baseline, that the original Sullivan line can be readily traced from his 51st mile point to his 52d mile point, and we believe it very probable that the Hendershott line between the 52d and 54th mile points is nearly identical with the Sullivan line. Whilst we did not adopt the Sullivan line between the points named, very good reasons could have been given for doing so. The Hendershott notes make no mention of Sullivan's line after leaving his 49th mile

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point until his 54th mile post was reached. they make no mention of finding Sullivan's 52d mile point or of any trees on his line, but they say in their report ([51 U. S.](#) 10th Howard Report) that they 'discovered abundant blazes and many witness tress which enabled us to find and remark the said (Sullivan) line as directed by the court.' Also, on [51 U. S.](#) same report, it is stated:"

" *But in heavy bodies of timber, no difficulty was experienced in discovering evidences of the precise location of the [Sullivan] line not only by blazes, but by line and witness trees.* "

"(Italics are ours.) And on the same page:"

"The general topography of the country, and especially the crossing of the streams, greatly facilitated us in following the line, and in some instances, when confirmed by the old blazes, enabled us to establish it with sufficient certainty."

"Commencing some ten chains east of the 51st mile point, the country through which the boundary line passes was and is heavily timbered, and, as before stated, the Sullivan line in the timber is at this time readily to be found. The inference that the Hendershott line eastward from the 51st mile was nearly identical with the Sullivan line is quite as strong as the contrary, notwithstanding no mention is made by Hendershott of the Sullivan line after leaving a point 6.20 chains east of the 49th mile point until reaching the 54th mile point"

"The Sullivan line, between the 51st and 52d mile points, as shown by his field notes, crossed the east fork of Grand River (now called Weldon) three times. This line now, by reason of changes in the bed of the stream, will cross the Weldon five times. With the exception of the 'elm and oak,' there were no traditional or apparent evidences claimed as indicating the original location of the Hendershott and Minor 52d mile point. A line run eastward with the bearings given by the Hendershott notes from their 51st mile point would pass at least 40 feet south of the point indicated by the 'elm and oak.' A line run eastward, as per the Hendershott notes, from the point claimed as the Hendershott and Minor 52d mile point would pass at least 90 feet south of their 54th mile point. The commissioners carefully considered all the comparatively authentic traces of the Hendershott line, together

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with the topographical conditions given in the notes of the survey. Between the 53d and 54th mile points were found evidences of the Hendershott line, which

were satisfactory, and the line established by us was run from the 54th mile point, which, as before stated, was identified directly to the 52d mile point and passing through the points found between the 53d and 54th mile points. The Hendershott notes show a line direct from the 52d to the 54th mile point."

"The line, as finally established and marked by us, between the 52d and 53d mile points is north of the boundary line as claimed for Iowa, and south of that line as claimed by Missouri, and, as it happens, very nearly equally divides the narrow territory in dispute, although there was no intention to compromise the difference. We are satisfied that the line, as established by us between the 53d and 54th mile points, is very nearly, if not identical with, the original Hendershott line, and in accordance with the marks of that survey. The same line was produced to the 52d mile point, notwithstanding it passes considerably south of the plainly indicated Sullivan line. The 52d mile point, as established and marked by us, was placed as nearly as possible in accordance with the notes of the Hendershott survey, evidenced by the width of the pond, and also its distance from the 'Stokes' fence line."

"The field-notes of the Hendershott and Minor survey show as follows:"

"At 6.30 chains eastward from the Hendershott 42d mile point, Sullivan's 42d mile point was found, and course changed at that point from N. 88 53' E. to N. 89 06' E."

"6.37 chains eastward of Hendershott's 43d mile point, Sullivan's 43d mile point was found, and course changed at that point from N. 89 16' E. to N. 89 47' E."

"7.00 chains eastward of Hendershott's 44th mile point, Sullivan's 44th mile point was found, and course changed at that point from N. 89 47' E. to N. 89 9' E."

"6.20 chains eastward from Hendershott's 49th mile point, Sullivan's 49th mile point was found, and course changed at that point from N. 89 9' E. to N. 89 16' E."

"4.07 chains eastward of Hendershott's 54th mile point,

Sullivan's 54th mile point was found, and course changed at that point from N. 89 16' E. to N. 89 2' E."

"2.53 chains eastward of Hendershott's 58th mile point, Sullivan's 58th mile point was found, and course changed at that point from N. 89 2' E. to N. 89 27' E."

"In each instance, it will be seen that the Hendershott courses are changed at the Sullivan mile points. The decree of your honorable Court made January 3, 1851, declared that the line should be direct between each Hendershott mile point, and it is evident that the actual courses between the points referred to above are not in accordance with the recorded courses. It was found by reference to our baseline in all cases where the field notes show a straight line between such points that, when the distance recorded as a straight line was two or more miles, the line is actually a curve. The ordinates measured from the baseline do not show any regular rate of curvature, and the curves themselves swing to the south and then to the north, the baseline crossing the boundary line three times in twenty miles. The greatest distance of baseline from boundary line is at the 55th mile point, which is about 247 feet north of base. The 46th mile point is 160 feet south, and the 60th mile point 153 feet south of base."

"It is difficult to account for the discrepancies found between the recorded line as shown in Hendershott's notes and the line actually found. It is quite possible that the irregularities either grew out of the inaccuracy of the solar compass used on the survey or an inaccurate use of the instrument itself."

"We were surprised at the facility with which the Sullivan line could at the time of our survey be traced for considerable distances along the twenty miles of line included in our operations. Of twenty-one mile points from the 40th to the 60th, inclusive, Sullivan had witness trees for fifteen. Some of these witness trees can now be found, and also well defined line trees mentioned by him. On Hendershott's line only eight mile points out of the twenty-one referred to were witnessed by trees. Had the care shown by Sullivan in marking his line been exercised by Hendershott and Minor, the line of the latter would have been much more fully

and satisfactorily defined. The hurried manner in which the work of the Hendershott survey was performed (151 miles of relocation, in addition to random lines, having been accomplished in 30 days) may in some measure account for the great lack of witness trees and other evidences necessary for an actual location of the boundary line of 1850. We are inclined to the opinion that, so far as regards the twenty miles mentioned, the Sullivan line can be as readily relocated as can the Hendershott line."

"The decree of your honorable Court requires that the line relocated by us shall be marked with durable monuments. Twenty-one mile points included in the line relocated, being from the 40th to the 60th mile, inclusive, are now marked as required. The 40th, 50th, and 60th miles are marked with the cast-iron monuments originally placed by Hendershott and Minor in 1850. Mile points intermediate are marked with stone monuments. These are of the best quality of Missouri red granite, are twelve inches square, and from 6'2' to 6'6' in length. The stones stand 2' above ground (this portion being hammer dressed), and are well finished in every particular. On the north side of each stone is plainly cut the word 'Iowa,' on the south side the word 'Missouri,' on the east side the words 'state line,' and on the west the figures denoting the number of the mile point."

"The iron monuments were reset so as to show about 18 inches above ground. The granite monuments were set with great care, their apices being exactly on the line. They were well rammed when placed in ground, and will need no witness trees. Their weight averages 1,050 pounds each, and we think they can safely be pronounced both durable and permanent. The amount paid for them includes all freight charges and expenses of delivery and setting."

"Attached hereto (Appendix B) is a statement of the expenses consequent upon the relocation and marking that portion of the boundary line between the 40th and 60th mile points, which statement is respectfully submitted for the action of your honorable body."

"Attached hereto (Appendix C) is a photograph of the

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section of the oak tree examined and reported on by Prof. McBride."

"James Harding"

" *Comm'r for Missouri* "

"Peter A. Dey"

" *Comm'r for Iowa* "

"Dwight C. Morgan"

" *Of Illinois* "

"Chicago, Ill., Sep. 18, 1896"

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" *Appendix A* "

"U.S. Coast and Geodetic Survey"

"Salina, Kansas, June 20th, 1896"

"Gen. James Harding, Hon. Peter A. Dey, Dwight C. Morgan, Esq.,
Commissioners in the Matter of the Boundary Line between the States of Missouri
and Iowa."

"Dear Sirs: I have the honor to submit the following report upon the operations
conducted under my direction for the purpose of enabling you to locate and mark
by 'durable monuments,' as required by the decree of the Supreme Court of the
United States dated February 3rd, 1896, that portion of the boundary line between
the States of Missouri and Iowa which lies between the fortieth and sixtieth mile
posts east of the old northwest corner of Missouri, as marked in 1850 by H.B.

Hendershott and W. G. Minor, commissioners."

"It appears unnecessary for me to make any mention in this report of the antecedent circumstances leading up to this survey, as you are well acquainted with them, and will no doubt take occasion to allude to them in your own report to the Supreme Court."

"I therefore pass at once to my own work."

"Your board having applied to General W. W. Duffield, superintendent of the U.S. coast and Geodetic Survey, for the detail of an officer to make the necessary surveys, I was selected for that duty, and Mr. A. L. Baldwin, also of the C. & G. Survey, was assigned to the party as assistant observer."

"In compliance with the request of your board, received through Mr. Morgan, we met you on April 8th, 1896 at Davis

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City, Iowa. A preliminary inspection of the western portion of the field of work was made on that day, and the organization of the party was completed by engaging laborers and teams."

"On the following day, the whole party was transferred to the village of Pleasanton, Iowa, that place being centrally located for the western half of the work, as it is directly on the boundary, and just east of the forty-fifth mile post."

"A partial examination of the line, as identified by more or less reliable traditions current in its neighborhood, made it evident that its course in many places deviated widely from the description given in the field notes attached to the report of the former commission. (Howard's Reports, Supreme Court U.S., vol. X.)"

"Not only do the bearings differ from those recorded in that report, but portions of the line which are there called straight were found to be curved, or composed of broken lines."

"Under these conditions, it seems inexpedient to attempt to reproduce upon the ground the courses and distances of the former survey."

"Such an attempt would undoubtedly have led to serious confusion, and would have furnished little information of real value, while the labor of making the necessary corrections would have been excessive."

"In place of that undesirable plan, I adopted, with your approval, the method of measuring a baseline straight across the country for the twenty miles to be surveyed."

"All of the old points which were recovered, and all new points which it became necessary to locate upon the ground, were directly referred to the baseline, which, from a mathematical point of view, is the axis of abscissae in a system of rectangular coordinates."

"It seems scarcely necessary to mention the advantages which this method affords in point of simplicity and accuracy of work, but it may do no harm to allude very briefly to a few of them."

"Thus, the relative positions and bearings of different portions of the boundary can be readily found with far greater precision than would otherwise be easily practicable."

"Moreover, in this system of work, each point of the

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boundary is fixed independently of every other point, all being directly referred to the baseline. This characteristic permits any desired local correction to be made at any point without necessarily affecting points on either side -- a feature which I consider very essential in work of this character. The baseline was so selected as to lie along the general direction of the boundary, which in fact crosses it three times, eleven of the twenty-one monuments being north of the base, and the other ten south of it."

"This statement well illustrates both the irregularity of the boundary and the fact that the baseline is very close to the general direction of the line."

"Another important consideration in the selection of the baseline was to make it pass through the towns of Pleasanton and Lineville without meeting obstructions and without damaging private property."

"This was successfully accomplished, and, in the whole course of the line, remarkably little tree cutting was needful. The baseline was ranged out with an eight-inch theodolite, the standards of which were high enough to permit the telescope to transit. The telescope was of excellent quality, and was provided with an eyepiece micrometer, by means of which slight deviations from the straight line could be measured and corrected."

"As the work of locating the baseline advanced eastward, the party was moved to Lineville, Iowa, which town is situated just north of the boundary line, and between the fifty-sixth and fifty-seventh mile posts, and thenceforward operations were conducted from either Lineville or Pleasanton as was found more convenient from time to time."

"As soon as the line was opened, and even before the final adjustment of its eastern terminus, the linear measurement was begun by Mr. Baldwin, with the assistance of the commissioners, working westward from the east end of the base, near the sixty-mile monument."

"When about five and one-half miles had been so measured, I was ready to take personal charge of the measurement, and began at the west end of the base, near the forty-mile monument, working thence eastward to a junction with the line above mentioned. "

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"The system of measurement employed was that ordinarily used in the coast and Geodetic Survey for direct measures not requiring the base apparatus."

"A narrow steel tape, twenty-five meters in length between end marks, was stretched under a tension of ten kilograms, as indicated by a spring balance attached to one end of the tape. The successive tape lengths were marked on stakes driven into the ground."

"As the tape necessarily follows very closely the inclination of the ground, the horizontal distance will be less than the measured distance, and the correction for slope must be computed for each tape length, the difference of height between the ends being determined by spirit level. The very irregular profile of this line made these differences of height unusually great, and correspondingly increased the amount of correction."

"A small correction for catenary is also necessary when the tape swings clear to the ground, the 'sag' of the tape slightly decreasing the distance between its ends. Further, as all metallic measures vary in length with changes of temperature, it is necessary to apply a correction for such variations, the length of the tape being known at the temperature of zero, centigrade."

"Temperatures were accordingly noted at frequent intervals, usually at every fourth tape."

"The direct measurement was completed on May 8th, although the eastern part of the line had still to be leveled."

"The computations were at once taken in hand, and the resulting distances were furnished you as rapidly as possible."

"These results, for present purposes and as compared with ordinary measures, may be considered practically exact, and they show that the chain used by the surveyors of 1850 was too long, probably from the combined effects of abrasion and of high temperature."

"The distances between such of the old points as were recovered are nearly always too great. The ratio of excess is not constant, as, indeed, would hardly be expected, but shows a tendency to increase in going from west to east."

"A marked exception to this rule of excess in distance is found in the fifty-second mile. The eastern end of this mile

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was not recovered, but was found with reasonable certainty from various considerations, while the reputed point at the western end was recovered. The mile so determined is noticeably less than a statute mile. The western part of this mile traverses a very steep, rough, and wooded country, while its eastern part crossed the Weldon River three times in 1850."

"These natural difficulties in the way of accurate measurement probably caused the shortage in this particular mile."

"In my own work, I found it desirable to avoid the direct measurement of this mile, which is even more unfavorable now than in 1850, the Weldon having changed its course sufficiently to cross the baseline five times at present."

"For this purpose, a branch base about seven-eighths of a mile in length was measured on the flat ground east of the Weldon, and the distance across the broken section was then obtained with great precision by triangulation. The distances across the Grand River and Little River were also obtained by triangulation."

"Whenever in the course of the measurement we passed a point which it was desirable to refer to the baseline, the point at which its rectangular ordinate met the baseline was noted, and the length of the ordinate itself was measured. The relative positions of these various points thus became known, including not only such of the mile points as could be identified, but also numerous objects commonly reputed to mark the boundary, as fences, trees, stones, etc."

"As far as possible in connection with the measurement, notes were made to provide material for a topographical sketch of the strip of country traversed by the boundary."

"As stated above, the measurement was completed on May 8th. As rapidly as the reductions were computed, the places for the mile stones were marked on the ground from the fortieth to the forty-ninth."

"The weather, which up to that time had been generally favorable, now became very wet. The frequent and heavy rains seriously interfered with the work, and rendered progress across the country very slow; the roads being nearly impassable, and the fords quite so. On May 18th, the exigencies of the regular work of the coast and Geodetic Survey

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compelled the detachment of Mr. A. L. Baldwin, who had rendered energetic and efficient assistance in the work."

"On the same day I moved from Pleasanton to Lineville to resume work on the eastern part of the line. In the intervals between rains, I completed the levels, and, after computing the distances, marked the places for the mile posts -- a work in regard to which further details will be given below. The topographic notes were also completed."

"In order to furnish as much information as possible in regard to this portion of the boundary line, observations for the approximate determination of the latitude and longitude and of the astronomical azimuth or bearing of the baseline were made at Pleasanton and at Lineville."

"Bad weather interfered with the observations at Pleasanton, and at Lineville the lack of time and unfavorable local conditions somewhat affected the precision of the results, which answer, however, the purpose desired. Latitude and azimuth were obtained by observations on Polaris (a Ursae Minoris) with the theodolite. Time was obtained by sextant observations of the sun, using a mercurial horizon and the method of equal altitudes. For longitude, the local time was compared with the railroad telegraphic time signals. It remains for me only to state briefly the old points which were recovered, and the conditions which, under your decisions, governed the location of those points which were not identified by local marks."

"The fortieth, the fiftieth, and the sixtieth mile points were found marked by the iron monuments placed there by Commissioners Hendershott and Minor in 1850. There was some dispute as to whether No. 60 was in its original position or not, but the weight of evidence and the continuity of the traditional line on either side of it indicated pretty conclusively that it had never been disturbed."

"The remaining points were originally marked by stakes, sometimes witnessed."

"No. 42, while not directly identified by marks, was satisfactorily recovered by means of a 'line tree' four chains W., and by topographical notes at crossing of Grand River, as shown in original record. "

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"No 44 was restored by measurement from the two witness trees, the decaying stumps of both of which were found."

"No. 49 was also identified by the stumps of both witness trees."

"No. 51 was marked by a 'mound and pit,' which have been accepted for years as the true marks."

"No. 54 was marked by a stone, and was further identified by one witness tree."

"No. 58 was recovered by traces of the stakes in addition to the remains of the witness tree, and the point established by J. C. Sullivan in 1816 was also found a little further east, and also the stump of an elm tree, noted as a 'line tree' in both Sullivan and Hendershott notes, being 4.10 chains W. of Hendershott's 58th mile point. The remaining points were located in the following manner:"

"No. 41 was placed midway on line between 40 and 42."

"No. 43 was so placed as to preserve the relations with 42 and 44 required by the field notes of 1850, and after being so located was found to agree with the stump of the witness tree on the Iowa side of the line."

"No 45 was placed in the middle of the street bounding Pleasanton on the south, which middle line is shown as the boundary on the official plat of the town on file at the county seat, and at the proper distance along the line averaging to the 49th mile."

"No. 46 was similarly located on the line passing from 45 through a stone pointed out by tradition as marking the line."

"No. 47 was placed at the proper distance on a line drawn straight from 49 westward through a witnessed section corner between 47 and 48."

"No. 48 was placed on the same line midway between 47 and 49."

"No. 52 was located at a point west of the pond or lake in the Weldon bottom agreeing with the topographic description given by the former commissioners, and on a line agreeing as closely as possible with all of the apparently authentic traces of the line surveyed in 1850."

"No. 53 was placed a mile west of 54, on the straight line between 52 and 54. "

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"No. 55 was placed a mile east of 54, on the extension of the line drawn from 54 through a witnessed stone at the corner common to Wayne and Decatur Counties, Iowa."

"Nos. 56 and 57 were placed at mile distances on the straight line drawn from 55, through an iron pin at the southwest corner of the streets surrounding the public square at Lineville, which pin was universally accepted as a point marking the boundary. Unsuccessful search was also made for the remains of a wooden post which formerly stood a little further east."

"No. 59 was placed midway between 58 and 60 in the manner required by the field notes of 1850."

"While this work was in progress, many of the inhabitants along the line asked that additional points, intermediate between the mile points, might be furnished them, and, with your approval, this was done."

"In accordance with the decree of the Supreme Court dated January 3rd, 1851, such points were always placed on the straight line between the adjacent mile posts. The final observations were made on the afternoon of June 13th, and the instruments were then packed, and on the 15th were shipped to Washington."

"I left Lineville on June 15th, also, to resume my regular duties in the coast and Geodetic Survey."

"In closing this report, permit me to express my appreciation of the uniform courtesy and consideration shown my assistant and myself by all the members of the commission, and my hope that our earnest labors in this interesting work have proved satisfactory in methods and results, and that they may be instrumental in permanently settling this controversy."

"The appended pages give in summarized form the results of the observations and measurements, as well as the mathematical formulae employed."

"Respectfully submitted."

"W. C. Hodgkins"

" *Assistant, Coast & Geodetic Survey, Chief of Party* "

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" *Appendix B* "

"The following table gives the bearings and distances between the successive mile posts of the Missouri-Iowa boundary

from the fortieth to the sixtieth mile east of the initial point, as the said mile posts were relocated and marked by James Harding, Peter A. Dey, and Dwight C. Morgan, commissioners, in 1896."

"The distances are given to the nearest tenth of a meter, and to the nearest half foot, and the bearings or azimuths to the nearest quarter minute."

"The azimuth is reckoned from the south point as zero in the direction of west, north, and east successively -- *i.e.* 90 means due west, 270 due east, etc."

"The convergence of the meridians is 44 1/2 seconds for each mile. The bearings going west, or back azimuths, are therefore in each case three-fourths of a minute greater than the eastern or direct azimuths."

image:b

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image:c

"Note on the Reduction and Results of the Astronomical Observations at Lineville, Iowa."

"For latitude, the observed altitudes of Polaris were reduced by the method and table given on page 534 of the American Ephemeris, with the result:"

"Approximate latitude = 40 34.6'."

"Comparisons of local mean time, obtained by sextant observations of the sun, with railroad time signals, gave the following result:"

"Approximate longitude (W. of Greenwich) = 93 32'."

"For azimuth the observations of Polaris were reduced by the formula"

image:d

"in which the letters have the following significations:"

image:e

"Resulting azimuth of baseline = 89 21' 49' east of north."

"These results transferred to the monuments at each end of this 20-mile section give the following: "

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Lat. Long. Azimuth

40-mile mon't 40 34.4' 93 51' 269 14' 49"

60-mile mon't 40 34.6' 93 28' 89 29' 40"

"the azimuth at each point being the bearing of the straight line joining the two points."

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Appendix C

image:f

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Appendix B

Account of Expenses Incident to the Relocation and Remarking the Boundary Line between the States of Missouri and Iowa from the 40th to the 60th Mile Point, under Decree of the Supreme Court of the United States, February 5, 1896.

Pay of engineers:

W. C. Hodgkins, U.S. geodetic

Survey Corps, 74 days at \$5.00. . . . \$370.00

A. L. Baldwin (U.S. Geodetic

Survey Corps), 41 days at \$5.00 . . . 205.00

Transportation from Washington, D.C. . 77.75

Transportation to Salina, Kansas. . . . 41.14

Freight on instruments returned

to Washington 8.32

\$ 702.21

Pay of one assistant (14 days at \$2.50) and laborers 190.50

Subsistence of parties in field 421.75

Hire of teams and drivers and feed for teams. . . . 342.25

Paid for eighteen granite monuments in place. . . . 922.00

Miscellaneous expenses paid (telegrams, township

plats, signal materials, clerical work, and

typewriting, repairs of instruments, storage

&c.; &c.;). 171.60

Advertising, Missouri and Iowa. 133.30

Commissioners:

James Harding, Comm'n for Missouri,
78 days at \$10.00 780.00

James Harding, traveling expenses. . . . 161.85

941.85

Peter A. Dey, Comm'n for Iowa,
60 days at \$10.00. 600.00

Peter A. Dey, traveling expenses 189.47

789.47

Dwight C. Morgan, Comm'n,
46 days at \$10.00. 460.00

Dwight C. Morgan, traveling expenses . . 198.63

658.63

Total \$5,273.56

And it is ordered, adjudged, and decreed that the boundary line between said States of Missouri and Iowa, in controversy herein, be, and it is hereby,

established and declared to be as delineated and set forth in said report.

It is further ordered, adjudged, and decreed that the compensation and expenses of the commissioners and the expenditures attendant upon the discharge of their duties be, and they are hereby, allowed at the sum of \$5,273.56, in accordance with their report as confirmed as aforesaid, and that said charges and expenses, with the costs of this suit, to be taxed, be equally divided between the parties hereto.

And it is further

Ordered, adjudged, and decreed that the clerk of this Court forthwith transmit to the chief magistrates of the States of Missouri and Iowa copies of this decree, duly authenticated under the seal of this Court.

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