

Reports of the Kansas State Board of Agriculture

Section 47, Pages 1381 - 1410

These reports by the State Board of Agriculture include the proceedings of the board, reports for the previous year, maps of counties, abstracts of counties, miscellaneous articles, and reports of agricultural societies, the state fair, state and county statistics, agricultural industries and products, the agricultural college, and the Kansas Academy of Science. The annual reports began in 1872 and were succeeded by biennial reports beginning in 1877-78. Volume numbers were discontinued with the 1953-1956 report; the last being volume 44. From 1953 to 1976 the reports drop "biennial" from the title. Annual reports begin again from 1976 to 1984, except 1982-1983 which is biennial. The dates for each report reflects the reporting year and not the publication date, which was usually a year later. The title of each report reflects the form given on the title page. Only volumes 1 (1872), 2 (1873), 3 (1874), 4 (1875), the centennial edition (1875), 5 (1876), 6 (1877-1878), 7 (1879-1880), 10 (1885-1886), 11 (1887-1888), 13 (1891-1892), and 14 (1893-1894) are currently available.

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Below, I show a comparative statement of the sales made in each year since the commencement of business, March 23, 1871, to date, giving the number of acres sold in each year, the amount for which they were sold, the average price per acre, the number of sales, and the average number of acres to each sale. (I would here state that the low average price per acre in 1874 is caused by the reductions made from our appraised prices on sales made to Mennonites, in consideration of their purchasing in such large quantities.)

When sold.	Acres sold.....	Amount.....	Average price per acre.	No. of sales.....	Average No. acres to each sale..
From March 23d to December 31st, 1871.....	71,901.51	\$425,013 75	\$5 91	472	152.38
From January 1st to December 31st, 1872.....	45,648.81	271,624 66	5 97	277	164.79
From January 1st to December 31st, 1873.....	133,501.14	748,977 25	5 61	830	160.84
From January 1st to November 30th, 1874.....	196,601.85	888,517 44	4 51	1,229	159.96

The following table shows the number of acres of railroad land belonging to this company in each county along the line, the number of acres sold in each county, the number remaining for sale, and the range of prices:

Counties.	Whole No. of acres.	No. of acres sold.	Acres remaining unsold.	Range of prices.	
				From	To
Osage	894.34	520.28	374.06	\$4 00	\$8 00
Wabaunsee	13,127.94	2,442.66	10,685.28	2 50	8 00
Lyon	426.86	270.99	155.87	.....	6 50
Greenwood	640.00	.....	640.00	.....	3 75
Morris	32,549.81	3,921.88	28,627.93	2 25	7 75
Chase	131,331.42	11,707.55	119,623.87	2 25	9 00
Marion	211,130.80	113,414.46	97,716.34	3 50	9 00
Butler	52,258.95	16,322.98	35,935.97	3 75	9 00
Harvey	169,691.46	104,342.31	64,749.15	2 75	10 00
Sedgwick	82,880.74	19,335.69	63,545.05	3 75	12 00
McPherson	97,569.18	37,890.46	59,678.72	2 75	8 00
Reno	314,024.83	52,783.32	261,241.51	1 75	10 00
Rice	165,009.91	24,265.28	140,744.63	2 75	9 00
Barton	187,391.82	35,282.71	152,109.11	1 75	10 00
Rush	61,400.00	240.00	61,160.00	4 50	10 00
Pawnee	220,558.88	13,421.44	207,137.44	4 50	9 00
Edwards	135,000.00	2,344.06	132,655.94	4 50	9 00
Stafford	90,000.00	.....	90,000.00	1 50	8 00
Kiowa	46,000.00	.....	46,000.00	1 50	8 00
Hodgeman	120,000.00	.....	120,000.00	3 00	8 50
Ford	115,907.44	640.00	115,267.44	3 00	8 50
Unorganized counties.....	752,805.62	4,480.00	748,325.62	.....	.....
Total	3,000,000.00	443,626.07	2,556,373.93	.....	.....

PRICES OF LAND.

Our lands range in price from \$1.75 to \$15 an acre, the latter price being for a few tracts of valuable land immediately adjoining thriving towns. The average price is about \$5 an acre.

Although a fair proportion of our lands are sold for cash, and on short credit, a large majority of the sales are made on our long-time terms of eleven years' credit, with seven per cent. interest. On these terms, while it is not obligatory on the part of the purchaser to improve the land, yet we make a liberal reduction from payments for improvements, and also make a discount from deferred payments, of from eighteen to ten per cent., if paid up in full in one to four years from time of purchase. For instance, if paid in one year, eighteen per cent.; in two years, fifteen per cent.; in three years, twelve per cent.; and in four years, ten per cent.

On our short-credit sales of three years, and on cash sales, we make a discount of twenty per cent. from appraised prices.

When payment in full is made, we make a warranty deed, conveying the land free from all incumbrances.



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REPORT OF S. T. KELSEY, FORESTER OF THE ATCHISON, TOPEKA & SANTA FE RAILROAD COMPANY.

SIR: In answer to your request, I submit the following statement of my success in tree planting and experimenting in southwestern Kansas, on lands of A. T. & S. F. R.R. Co., in 1874:

The following-named trees, standing in open ground, without protection, wintered without injury from climatic effects: Ash, Austrian Pine, Black Locust, Black Walnut, Box Elder, Cottonwood, Catalpa transplanted two years old, Honey Locust, Kentucky Coffee, Peach, Scotch Pine, Silver Maple, White Elm.

Slightly injured by the winter: Apple, Golden Willow, Norway Spruce, Osage Orange. Killed back more or less by the winter, but grew well again this year: Ailantus, Catalpa one-year seedlings, Sapindus.

Killed altogether: China tree and a few seedling Ailantus and Catalpa.

The following-named trees were not gnawed by the rabbits: Ash, Box Elder, Black Walnut, Cottonwood, Kentucky Coffee, Silver Maple.

Slightly damaged by the rabbits: Ailantus, Golden Willow, Peach, Silver Poplar.

Badly gnawed by the rabbits, where not protected: Apple, Austrian Pine, Black Locust, Catalpa, Norway Spruce, Scotch Pine.

During the spring of 1874, I planted some 60 acres more of trees, on ground re-plowed from last summer's breaking. I gave no artificial watering to anything on these grounds during the season. The trees and seeds started much better than last year, and notwithstanding the unusual drouth, the most of them grew well through the season, except where damaged by the grasshoppers. On the 27th of July, the grasshoppers came into the county, and stripped the foliage from the trees wherever it suited their taste.

The following-named trees were entirely exempt from their ravages: Hackberry, Honey Locust, Kentucky Coffee, Sapindus, Native Gray Willow.

Slightly defoliated by grasshoppers: Austrian Pine, Black Walnut, Black Locust, Box Elder, Cottonwood, White Elm.

Badly defoliated by grasshoppers: Apple, Ailantus, Ash, Catalpa, European Larch, Golden Willow, Lombardy Poplar, Norway Spruce, Peach, Scotch Pine, Silver Poplar, White Willow.

But little damage was done to the trees of last year's planting, even where they were entirely stripped of their foliage, but a large proportion of the seedlings and cuttings and some of the transplanted trees of this year's planting were entirely killed or badly damaged.

The following tables show the growth of the principal varieties at the places named:

HUTCHINSON—180 miles west from east line of State; 1,500 feet above sea level; soil, light sandy loam.

Name.	When planted.	Age at planting.	Height Dec. 1, 1874.
Ailantus	Spring of 1873	1 year	4 to 6 feet.
Ailantus	Spring of 1873	Seed	3 to 5 feet.
Ash	Spring of 1873	Seed	1 to 2 feet.
Austrian Pine	Spring of 1873	3 years	1½ to 2 feet.
Box Elder	Spring of 1873	1 year	3 to 4 feet.
Box Elder	Spring of 1873	Seed	3 to 4 feet.
Black Walnut	Spring of 1873	Seed	2 to 3 feet.
Catalpa	Spring of 1873	1 year	3 to 4 feet.
Catalpa	Spring of 1873	Seed	2 to 3½ feet.
Cottonwood	Spring of 1873	Cuttings	7 to 10 feet.
Honey Locust	Spring of 1873	1 year	3 to 5 feet.
Kentucky Coffee	Spring of 1873	Seed	6 to 18 inches.
Osage Orange	Spring of 1873	1 year	3 to 4 feet.
Peach	Spring of 1873	1 year buds	4 to 5 feet.
Peach	Spring of 1873	Seed	3½ to 5 feet.
Silver Maple	Spring of 1873	1 year	3 to 4 feet.
White Elm	Spring of 1873	1 year	2 to 5 feet.
Ailantus	Spring of 1874	1 year	1½ to 3 feet.
Ailantus	Spring of 1874	Seed	1½ to 3 feet.
Ash	Spring of 1874	1 year	1 foot.
Box Elder	Spring of 1874	1 year	2 to 3 feet.
Box Elder	Spring of 1874	Seed	6 to 18 inches.
Black Walnut	Spring of 1874	Seed	10 to 15 inches.
Catalpa	Spring of 1874	1 year	1 to 2 feet.
Cottonwood	Spring of 1874	Cuttings	2 to 4 feet.

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ELLENWOOD—215 miles west of the east line of the State, 1,760 feet above the sea level. Soil, a stiff, black loam, a little sandy.

Name.	When planted.	Age at planting.	Height Dec. 1, 1874.
Ailantus.....	Spring of 1873.....	Seed	2 to 4 feet.
Ash.....	Spring of 1873.....	Seed	6 to 18 inches.
Austrian Pine.....	Spring of 1873.....	3 years.....	1½ to 2 feet.
Box Elder.....	Spring of 1873.....	1 year.....	3 to 5 feet.
Box Elder.....	Spring of 1873.....	Seed	3 to 5 feet.
Black Walnut.....	Spring of 1873.....	Seed	1½ to 2½ feet.
Catalpa.....	Spring of 1873.....	1 year.....	3 to 4 feet.
Cottonwood.....	Spring of 1873.....	Cuttings.....	5 to 6 feet.
Honey Locust.....	Spring of 1873.....	1 year.....	3 to 5 feet.
Sapindus.....	Spring of 1873.....	Seed	4 to 18 inches.
Silver Maple.....	Spring of 1873.....	1 year.....	4 to 6 feet.
White Elm.....	Spring of 1873.....	1 year.....	1½ to 3 feet.
Ailantus.....	Spring of 1874.....	1 year.....	1½ to 2 feet.
Ailantus.....	Spring of 1874.....	Seed	1 to 2 feet.
Ash.....	Spring of 1874.....	1 year.....	1 foot.
Black Walnut.....	Spring of 1874.....	Seed	1 foot.
Cottonwood.....	Spring of 1874.....	Cuttings.....	2 to 3 feet.
Hackberry.....	Spring of 1874.....	Seed	6 to 9 inches.
Osage Orange.....	Spring of 1874.....	Seed	9 to 12 inches.

SPEARVILLE—283 miles west of the east line of the State, 2,478 feet above the sea level. Dry upland prairie. Soil, a dark loam, with stiff clay subsoil.

Name.	When planted.	Age at planting.	Height Dec. 1, 1874.
Ailantus.....	Spring of 1873.....	1 year.....	2 to 3 feet.
Ailantus.....	Spring of 1873.....	Seed	2 to 3 feet.
Black Walnut.....	Spring of 1873.....	Seed	1 to 1½ feet.
Black Locust.....	Spring of 1873.....	Seed	2½ to 3½ feet.
Box Elder.....	Spring of 1873.....	1 year.....	2 to 2½ feet.
Catalpa.....	Spring of 1873.....	1 year.....	2½ to 3½ feet.
Catalpa.....	Spring of 1873.....	Seed	1½ to 2½ feet.
Honey Locust.....	Spring of 1873.....	1 year.....	2 to 3 feet.
Peach.....	Spring of 1873.....	Seed	2½ to 3½ feet.
Silver Maple.....	Spring of 1873.....	1 year.....	2 to 3 feet.
Ailantus.....	Spring of 1874.....	1 year.....	1 to 2 feet.
Black Walnut.....	Spring of 1874.....	Seed	6 inches.
Box Elder.....	Spring of 1874.....	Seed	6 to 12 inches.
Box Elder.....	Spring of 1874.....	1 year.....	12 to 18 inches.
Peach.....	Spring of 1874.....	Seed	6 to 18 inches.
Peach.....	Spring of 1874.....	1 year.....	12 to 18 inches.
Osage Orange.....	Spring of 1874.....	Seed	6 to 9 inches.

Wheat and rye sown at Spearville September 20th, 1873, made a very healthy, vigorous growth, and though there was only a small field, and it was preyed upon by rabbits and insects from the surrounding prairies, it produced 10 bushels of wheat and 12 bushels of rye per acre.

Several varieties of tame grass and clover seeds were sown at each of the gardens. Most of it came up and grew well until eaten down by the grasshoppers, but being young and not well established, it was all killed except the Lucerne and Alsike clover. The Lucerne appeared to be better rooted than the other, and was but little injured, and after the grasshoppers left it, grew strong and thrifty as before. It seems to be well suited to the soil and climate, and may prove to be of great value to the plains of western Kansas. The Alsike clover was partly killed, but some that was left grew well this fall.

Sorghum grew well wherever planted, was not injured by drouth or grasshoppers, and would make three to four tons of dry fodder per acre. Castor beans and broom-corn were grown successfully at all the gardens as far west as Spearville, and were not injured by the grasshoppers.

The season has been very unfavorable for the growth of trees and farm crops, yet many things have done as well as could be expected anywhere. A few trees were killed by the winter and some by gophers, rabbits and grasshoppers; but most of the trees of last year's planting have lived through, and made a good healthy growth; none have been seriously



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injured by drouth or heat of summer; and I am satisfied that it only needs a better knowledge of the soil and climate, and the proper management of the different trees, to make tree-growing a success to the west line of the State.

Wheat and other small grains have succeeded well as far as they have had a fair trial.

Cattle have done well as usual in Southwestern Kansas, and many thousands have been kept in fine condition through the entire year without any feed but the prairie pasture. With such facilities for feeding stock, and an abundant supply of pure water, which is everywhere found in the Arkansas valley only a few feet below the surface, it must be one of the best stock-growing and dairying districts in America. But a few years will be needed to grow a supply of trees for fruit, shade, ornament, wind-breaks and fences; and with such improvements, and the attractions of a pure and healthful climate, southwestern Kansas and the upper Arkansas valley will be as desirable a location as any portion of the Western States. But people with small means should not go far beyond the settlements and depend upon general farming; for though the country may be ever so good, the requirements are so different from what has been learned in the East, that the single-handed man with a family to support will likely come to want before he learns how to master the situation. Yours,

S. T. KELSEY, Forester A. T. & S. F. Railroad.

LAND DEPARTMENT OF THE KANSAS PACIFIC RAILWAY COMPANY.*

By JNO. P. DEVEREUX, LAND COMMISSIONER.

The total land sales in Kansas up to November 1st, 1874, by this company, cover 876,196.96 acres. The quantity of land remaining unsold in each county on November 1st, 1874, was as follows:

	Acres.		Acres.
Wyandotte county.....	120.00	Rice county.....	51,549.63
Johnson county.....	378.09	Osborne county.....	23,327.72
Douglas county.....	4.00	Russell county.....	234,015.41
Franklin county.....	411.78	Barton county.....	92,831.24
Jackson county.....	707.13	Rooks county.....	38,516.88
Shawnee county.....	200.00	Ellis county.....	224,788.44
Osage county.....	80.00	Rush county.....	77,409.05
Wabash county.....	41,345.09	Graham county.....	125,520.92
Pottawatomie county.....	10,091.22	Trego county.....	211,227.30
Morris county.....	7,258.92	Ness county.....	8,247.64
Davis county.....	41,704.38	Sheridan county.....	176,105.03
Riley county.....	27,945.39	Gove county.....	215,441.28
Marion county.....	314.12	Wallace county.....	608,903.05
Dickinson county.....	39,673.11	Thomas county.....	202,614.73
Clay county.....	2,791.09	Sherman county.....	68,867.28
Ottawa county.....	42,158.59	Wichita county.....	16,010.20
Saline county.....	46,757.05	Greeley county.....	60,081.34
McPherson county.....	23,486.87		
Lincoln county.....	51,045.56	Total.....	2,589,200.94
Ellsworth county.....	153,742.90		

These lands are for sale at prices ranging from two to six dollars per acre, seldom higher, and on terms of eleven years' credit, six years' credit, or for cash. If purchased on six years' credit, a discount of ten per cent. is allowed on the price per acre. If the sale be one for all cash, a discount of 25 per cent. is made from the price per acre.

Under the eleven years' contract terms, a discount of 10 per cent is allowed to those who cultivate, in good farmer-like manner, one-tenth of the land within the first four years; and under the six years' contract, 10 per cent is allowed, if one-tenth of the land be cultivated within the first three years. When payment in full has been made a deed of general warranty is executed to the purchaser, conveying the land in fee simple, and free of all incumbrances. Over fifteen hundred deeds have been issued, and at the present time the average is about forty deeds per month.

* An effort was made to obtain other railroad statistics, especially those showing exports and imports; but owing to the circumstance that the information was requested before the close of the year, it could not be furnished in time, except in the case of the Kansas Pacific. The Auditor of that road, S. T. Smith, Esq., furnished a valuable detailed statement, but as the purpose was to show the imports and exports for the entire State, and there being no reports of these items from the other roads, this one statement has been omitted.

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LAND DEPARTMENT OF THE MISSOURI, KANSAS & TEXAS RAILWAY.

BY ISAAC T. GOODNOW, LAND COMMISSIONER.

I respectfully submit the following statement, which, if you deem of interest, you can incorporate in your coming Annual Report:

The total number acres of land granted to this company is about 1,300,000. After settling disputes heretofore existing with other railroads, whose grants conflict with ours, leaves 940,684.63 acres, situated in the following counties:

Counties.	Acres.	Counties.	Acres.
Cloud.....	7,438.04	Anderson.....	13,447.77
Clay.....	2,720.00	Wilson.....	309.75
Dickinson.....	64,120.25	Labette.....	106,141.03
Davis.....	35,264.95	Neosho.....	54,276.29
Morris.....	155,553.14	Montgomery.....	6,043.59
Chase.....	58,107.10	Allen.....	40,466.64
Wabaunsee.....	76,615.10	Crawford.....	5,851.31
Lyon.....	50,210.95	Butler.....	8,341.84
Greenwood.....	77,289.63	Riley.....	35,274.62
Coffey.....	34,641.99		
Woodson.....	108,570.63	Total.....	940,684.63

The total number of acres sold, from November, 1869, to November 1, 1874, 355,026.44; deduct therefrom the number of canceled sales, 10,875.71, leaving 344,150.73 acres sold. This amount, from the total number of acres falling to us, leaves unsold 596,533.90. The total number of acres sold, from January 1, 1874, to November 1, 1874, 59,486.73, leaving an average of 4,951.23 acres per month. The average price per acre, about \$4.30. The selling price of our land runs from \$2.00 to \$6.00 per acre, very few tracts being appraised at more than \$6.00. We have no lands appraised at less than \$2.00 per acre, but the inducements we are now offering purchasers for cash at time of sale, viz., 33½ per cent. discount, reduce our cheap lands to \$1.33½ per acre. We advertise this discount only to January 1, 1875.

Statement giving the number of acres of land for sale by the M., K. & T. R. W. Co.

Counties.	Acres.	Counties.	Acres.
Riley.....	17,502	Anderson.....	7,200
Davis.....	21,326	Allen.....	6,720
Cloud.....	2,958	Woodson.....	51,040
Clay.....	1,760	Neosho.....	50,000
Wabaunsee.....	65,730	Labette.....	100,000
Chase.....	44,375	Montgomery.....	6,000
Dickinson.....	17,780	Crawford.....	5,000
Morris.....	53,471	Butler.....	7,000
Greenwood.....	67,040	Marion.....	7,320
Coffey.....	20,480	Lyon.....	47,000

The prices of these lands will vary usually from \$2 to \$6 per acre, on ten years' time, interest 7 per cent., or a discount of 33½ per cent. for all cash at time of sale.

LAND DEPARTMENT OF LEAVENWORTH, LAWRENCE & GALVESTON RAILROAD LINE.

BY JOHN W. SCOTT, LAND COMMISSIONER.

The whole amount of land granted to this company was about 500,000 acres, located as follows:

Where located.	Acres owned.	Acres sold.	Where located.	Acres owned.	Acres sold.
Franklin county.....	2,000	500	Montgomery county.....	20,000	1,000
Anderson county.....	60,000	15,000	Wilson county.....	12,000	1,500
Allen county.....	125,000	25,000	Woodson county.....	6,000	700
Neosho county.....	125,000	10,000	Coffey county.....	5,000	700
Labette county.....	125,000	8,000			

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The balance is scattered in different counties off the line of the road.

The maximum price of lands heretofore sold is \$20 per acre, the minimum \$4, and the average \$7.62. On account of the depression of prices everywhere, of real estate, a considerable reduction has been made in the price of our lands, the maximum now being, except in rare cases, about \$7, the minimum \$4, and the average above \$5.50. This applies equally to all the counties. It is proper to say that the lands located in Neosho, Labette, Montgomery and Wilson counties, and comprising what is known as the Osage ceded tract, are involved in litigation.*

KANSAS TRUST AND DIMINISHED RESERVE LANDS.

AN ACT providing for the sale of the Kansas Indian lands in Kansas to actual settlers, and for the disposition of the proceeds of the sale.

WHEREAS, The Secretary of the Interior, in pursuance of an act approved May eighth, eighteen hundred and seventy-two, has caused to be appraised the lands heretofore owned by the Kansas tribe of Indians, in the State of Kansas, which by the terms of the treaty made by the United States and said Indians, and proclaimed November seventeenth, eighteen hundred and sixty, were to be sold for the benefit of said Indians; which appraisement also includes all improvements on the same, and the value of said improvements, distinguishing between improvements made by members of said Indian tribe, the United States, and white settlers; and whereas, the appraisement thus made was so high that neither settlers nor purchasers were able to pay the same, and the said land has remained unsold from the passage of the act: therefore,

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That each *bona fide* settler on any of the trust lands embraced in said act, heretofore reported as such by the commissioners appointed to make said appraisement, and the rejected claimants as *bona fide* settlers, who were recommended as such by Andrew C. Williams, acting under instructions to Superintendent Hoag, from the Indian Office, dated October twenty-fourth, eighteen hundred and seventy-two, be permitted to make payment of the appraised value of their lands to the local land office of Topeka, Kansas, under such rules as the Commissioner of the General Land Office may adopt, in six equal annual installments; the first installment payable on the first of January, eighteen hundred and seventy-five, and the remaining installments payable annually from that time, and drawing interest at six per centum per annum until paid: *Provided*, That where there is timber on any of the lands to be sold, under the provisions of this act, the Secretary of the Interior shall require the purchaser to enter into bond, with approved security, that he shall commit no waste on the timber, or otherwise, on said land until the last payment is made, and give his notes to secure the purchase money thereof on the terms aforesaid.

SEC. 2. That all the remainder of the trust-lands and of the undisposed portion of the diminished reserve shall be subject to entry at the local land office at Topeka, Kansas, in tracts not exceeding one hundred and sixty acres, unless a legal subdivision of a section shall be fractional and found to contain a greater number of acres, by actual settlers, under such rules and regulations as the Commissioner of the General Land Office may prescribe. And the parties making such entries shall be required to make payment of the appraised value of the land entered and occupied by each in the following manner: One-fourth at the time that the entry is made, and the remainder in three equal annual payments, drawing interest at six per centum per annum, which payments shall be secured by notes payable to the United States, and the Secretary of the Interior shall withhold title until

*SEE note, p. 158.

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the last payment is made; and the Secretary of the Interior, where there is timber on the lands, shall, in addition, compel the purchaser to enter bond, with approved security, to commit no waste by the destruction of timber or otherwise on the premises, until final payment has been made; and the Secretary of the Interior shall cause patents in fee simple to be issued to all parties who shall complete purchases under the provisions of this act: *Provided*, That if any person or persons applying to purchase lands under the provisions of this act shall fail to make payment, or to perform any other conditions required by the provisions of this act, or by rules or regulations that may be prescribed in the execution hereof, within ninety days after such payment shall become due, or performance be required by the terms hereof, or by the rules and regulations which may be prescribed in execution hereof, such person or persons shall forfeit all rights under the provisions of this act, and all claim or right to reimbursement or compensation for previous action or payment by said person or persons under the provisions hereof; and the land proposed to be purchased by such person or persons shall again be subject to sale, as though no action had been had in regard to the same: *And provided*, That all of the lands not taken within twelve months after the passage of this act may be sold in amounts not to exceed one hundred and sixty acres to any one person, at the appraised price in the land district in which they are situated.

SEC. 3. That in preparing or giving their testimony, all settlers or purchasers of land under the provisions of this act may have such testimony taken, after due and legal notice to the opposing party in interest, before any notary public or person qualified to administer an oath, and may forward such testimony with their application to the land offices or parties authorized to dispose of said lands, which testimony shall be received as if taken before the officers of such land office.

SEC. 4. That the net proceeds arising from such sales, after defraying the expenses of appraisal and sale, which have heretofore or may hereafter be incurred, and also the outstanding indebtedness, principal and interest, of said Kansas tribe of Indians, which has heretofore been incurred under treaty stipulations, shall belong to said tribe in common, and the residue not so required shall be placed to their credit on the books of the treasury, and bear interest at the rate of five per centum per annum, and be held as a fund for their civilization, the interest of which and the principal, when deemed necessary by the President of the United States, may be used for such purpose.

Approved June 23, 1874.

Location and valuation of Indian trust lands, as appraised in the year 1873.

Town.	Range	No. of acres.	Value of improvements.	Total value.	Town.	Range	No. of acres.	Value of improvements.	Total value.
14	8	6,193.95	\$1,881 00	\$19,413 60	16	9	9,557.59	\$3,285 00	\$25,295 42
14	9	5,411.67	2,894 00	13,908 36	16	10	18,200.83	3,653 00	37,817 04
14	10	5,423.86	2,145 00	15,861 41	16	11	5,899.68	1,115 00	16,000 28
14	11	1,727.02	398 00	3,729 61	17	10	11,996.45	5,305 00	46,988 65
15	8	*16,694.02	5,568 00	42,343 87	17	11	2,337.44	1,079 00	10,246 75
15	9	21,043.61	4,409 00	48,524 27	18	11	47.55	.....	166 42
15	10	18,960.07	6,882 00	45,193 64	Total.		137,808.13	\$45,363 00	\$361,424 50
15	11	6,271.46	312 00	10,206 78					
16	8	8,042.93	6,437 00	25,727 84					

*Tp. 15, range 8, footing in field-book reads 18,336.84; true amount, 16,694.02; an error of 1,642.82.

On the 14th of December, 1874, Hon. Wm. A. Phillips, in the House of Representatives, introduced a bill to reduce the appraisement of the above lands 50 per cent., which was read twice and referred to Committee on Public Lands.



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STATE BOARD OF AGRICULTURE.

TIMBER CULTURE—ACT OF MARCH 13, 1873.

AN ACT to amend the act entitled "An act to encourage the growth of timber on Western prairies."

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the act entitled "An act to encourage the growth of timber on Western prairies," approved March third, eighteen hundred and seventy-three, be, and the same is hereby, amended so as to read as follows: That any person who is the head of a family or who has arrived at the age of twenty-one years, and is a citizen of the United States, or who shall have filed his declaration of intention to become such, as required by the naturalization laws of the United States, who shall plant, protect, and keep in a healthy, growing condition for eight years, forty acres of timber, the trees thereon not being more than twelve feet apart each way, on any quarter-section of any of the public lands of the United States, or twenty acres on any legal subdivision of eighty acres, or ten acres on any legal subdivision of forty acres, or one-fourth part of any fractional subdivision of land less than forty acres, shall be entitled to a patent for the whole of said quarter-section, or of such legal subdivision of eighty or forty acres, or fractional subdivision of less than forty acres, as the case may be, at the expiration of said eight years, on making proof of such fact by not less than two credible witnesses: *Provided,* That not more than one quarter of any section shall be thus granted, and that no person shall make more than one entry under the provisions of this act, unless fractional subdivisions of less than forty acres are entered which, in the aggregate, shall not exceed one quarter-section.

SEC. 2. That the person applying for the benefit of this act shall, upon application to the register of the land district, in which he or she is about to make such entry, make affidavit before the register, or the receiver, or some other officer authorized to administer oaths in the district where the land is situated, who is required by law to use an official seal, that said entry is made for the cultivation of timber, and upon filing said affidavit with said register and said receiver, and on payment of ten dollars, he or she shall thereupon be permitted to enter the quantity of land specified; and the party making an entry of a quarter-section, under the provisions of this act, shall be required to break ten acres of the land, covered thereby, the first year, ten acres the second year, and twenty acres the third year after date of entry, and to plant ten acres of timber the second year, ten acres the third year, and twenty acres the fourth year after date of entry. A party making an entry of eighty acres shall break and plant, at the times hereinbefore prescribed, one-half of the quantity required of a party who enters a quarter-section; and a party entering forty acres shall break and plant, at the times hereinbefore prescribed, one-quarter of the quantity required of a party who enters a quarter-section, or a proportionate quantity of any smaller fractional subdivision: *Provided, however,* That no final certificate shall be given or patent issued for the land so entered until the expiration of eight years from the date of such entry; and if, at the expiration of such time, or at any time within five years thereafter, the person making such entry, or, if he or she be dead, his or her heirs or legal representatives, shall prove, by two credible witnesses, that he, or she, or they have planted, and for not less than eight years, have cultivated and protected, such quantity and character of timber as aforesaid, they shall receive a patent for such quarter-section or legal subdivision of eighty or forty acres of land, or for any fractional quantity of less than forty acres, as herein provided. And in case of the death of a person who has complied with the provisions of this act for the period of three years, his heirs or legal representatives shall have the option to comply with the provisions of this act, and receive, at the expiration of eight years, a patent for one hundred and sixty acres, or receive, without delay, a patent for forty acres, relinquishing all claim to the remainder.

SEC. 3. That if at any time after the filing of said affidavit, and prior to the issuing of the patent for said land, the claimant shall abandon the land, or fail to do the breaking and planting required by this act, or any part thereof, or shall fail to cultivate, protect

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and keep in good condition such timber, then, and in that event, such land shall be subject to entry under the homestead laws, or by some other person under the provisions of this act: *Provided*, That the party making claim to said land, either as a homestead settler or under this act, shall give, at the time of filing his application, such notice to the original claimant as shall be prescribed by the rules established by the Commissioner of the General Land Office, and the rights of the parties shall be determined as in other contested cases.

SEC. 4. That each and every person who, under the provisions of the act entitled "An act to secure homesteads to actual settlers on the public domain," approved May twentieth, eighteen hundred and sixty-two, or any amendment thereto, having a homestead on said public domain, who, at any time after the end of the third year of his or residence thereon, shall, in addition to the settlement and improvements now required by law, have had under cultivation, for two years, one acre of timber, the trees thereon not being more than twelve feet apart each way, and in good, thrifty condition, for each and every sixteen acres of said homestead, shall, upon due proof of such fact by two credible witnesses, receive his or her patent for said homestead.

SEC. 5. That no land acquired under the provisions of this act shall in any event become liable to the satisfaction of any debt or debts contracted prior to the issuing of certificate therefor.

SEC. 6. That the Commissioner of the General Land Office is hereby required to prepare and issue such rules and regulations, consistent with this act, as shall be necessary and proper to carry its provisions into effect; and that the registers and the receivers of the several land offices shall each be entitled to receive two dollars at the time of entry, and the same sum when the claim is finally established and the final certificate issued.

SEC. 7. That the fifth section of the act entitled "An act in addition to an act to punish crimes against the United States, and for other purposes," approved March third, eighteen hundred and fifty-seven, shall extend to all oaths, affirmations, and affidavits required or authorized by this act.

SEC. 8. That parties who have already made entries under the act approved March third, eighteen hundred and seventy-three, of which this is amendatory, shall be permitted to complete the same upon full compliance with the provisions of this act.

Approved March 13, 1874.

STATE AGRICULTURAL COLLEGE LANDS.

List of lands in Clay, Dickinson, Marshall, Riley and Washington counties, with average price per acre, belonging to the Kansas State Agricultural College:

Clay, 480 acres.....	\$7 10	Riley, 5,600 acres.....	\$7 09
Dickinson, 14,360 acres.....	7 10	Washington, 11,840.....	5 88
Marshall, 4,160 acres.....	5 63		

These lands have just been restored to market, after having been withdrawn for several years. They were selected in 1863 from the great mass of unoccupied Kansas lands, and the commissioners who made the selection reported that "every quarter-section would make a good farm." While they have been out of market their value has been much increased by the construction of railroads, the opening of farms on adjacent lands, and the building of churches and school houses. These lands all lie near railroads, and constitute some of the choicest tracts now offered to the public. In view of their surroundings, and the fact that *they are not subject to taxation till patents are due*, the prices asked are by no means high.

TERMS OF PURCHASE.

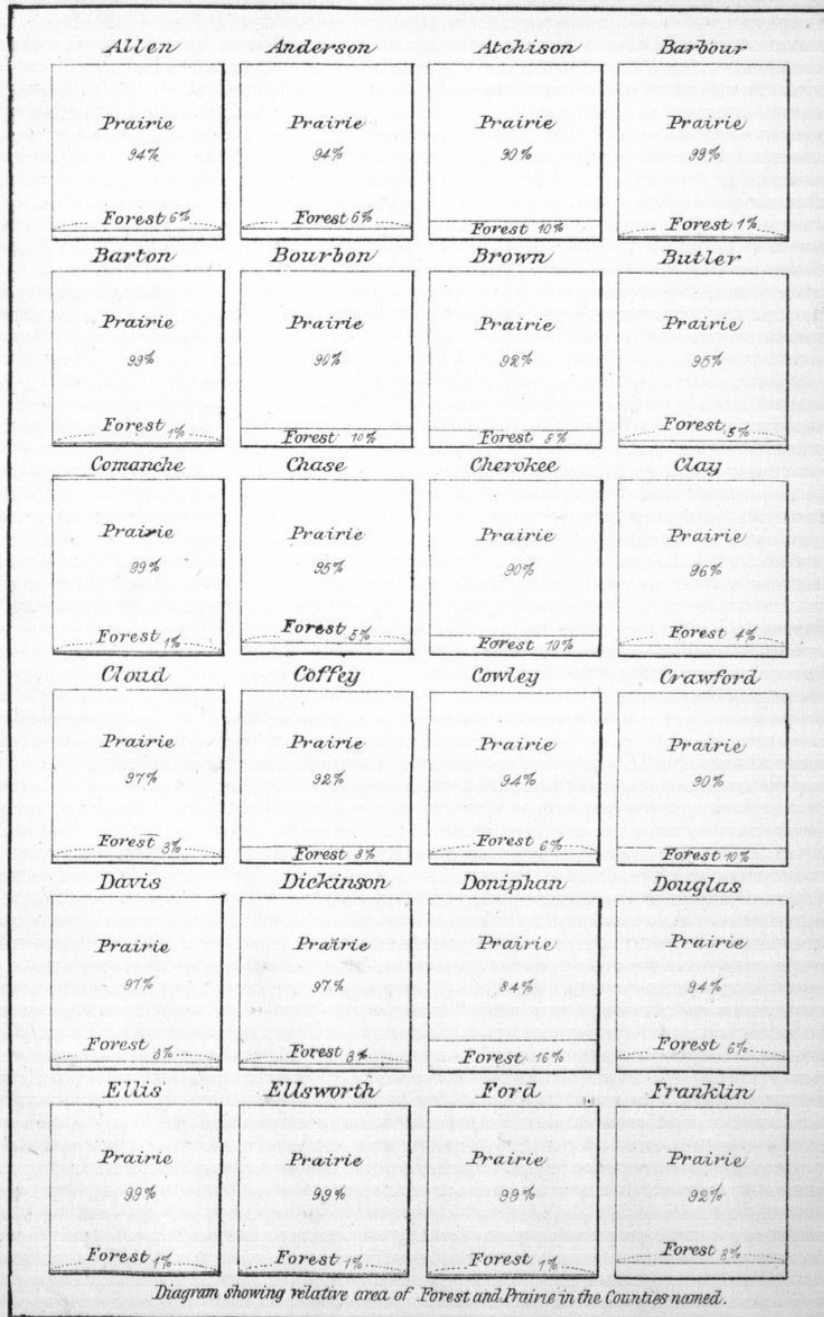
One-eighth cash at time of purchase; balance in seven equal annual installments, with annual interest at ten per cent.

BOTTOM AND UPLAND, TIMBER AND PRAIRIE.

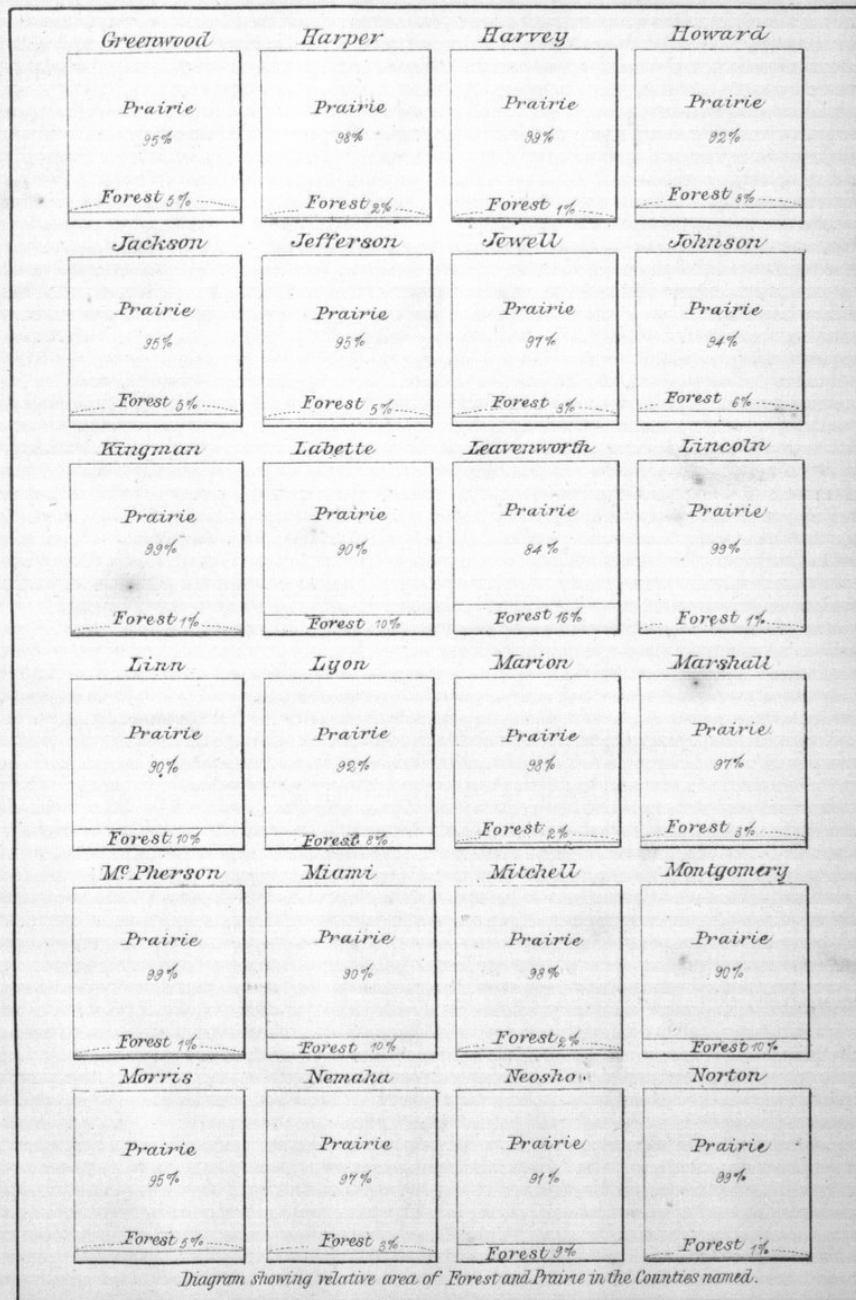
RELATIVE AMOUNT OF, BY COUNTIES.

The following diagrams of upland and bottom land, and prairie and timber land, have been prepared with great care. In the first place, reports were obtained from county surveyors of the respective counties. Estimates were also obtained from leading citizens in the respective townships of the State. Then the data thus obtained of timber and non-timber land were carefully corrected from the field-notes obtained at the office of Surveyor General Babcock, by Mr. A. L. Thornton, the draughtsman of the maps and charts. They are believed to be as near an approximation to accuracy as could have been made. Those who have given less thought to the matter, may discover supposed inaccuracies which will appear differently upon careful investigation. The *Emporia News* criticises the relative amount of bottom land credited to Lyon and Shawnee counties, respectively. While the *News* admits that the amount of bottom land (15 per cent.), for Lyon county, is about right, 31 per cent. for Shawnee county, is too much; claiming that Lyon county has as much bottom land as Shawnee. When the surveyor of Shawnee county was asked for a report, he replied that he could give an *estimate*, but if we could give him a couple of days' time he would give the *exact number of acres* of bottom land, as the respective township plats had every quarter-section of bottom land designated on them. He gave the number of acres from which we made the computation of per cent. of each.

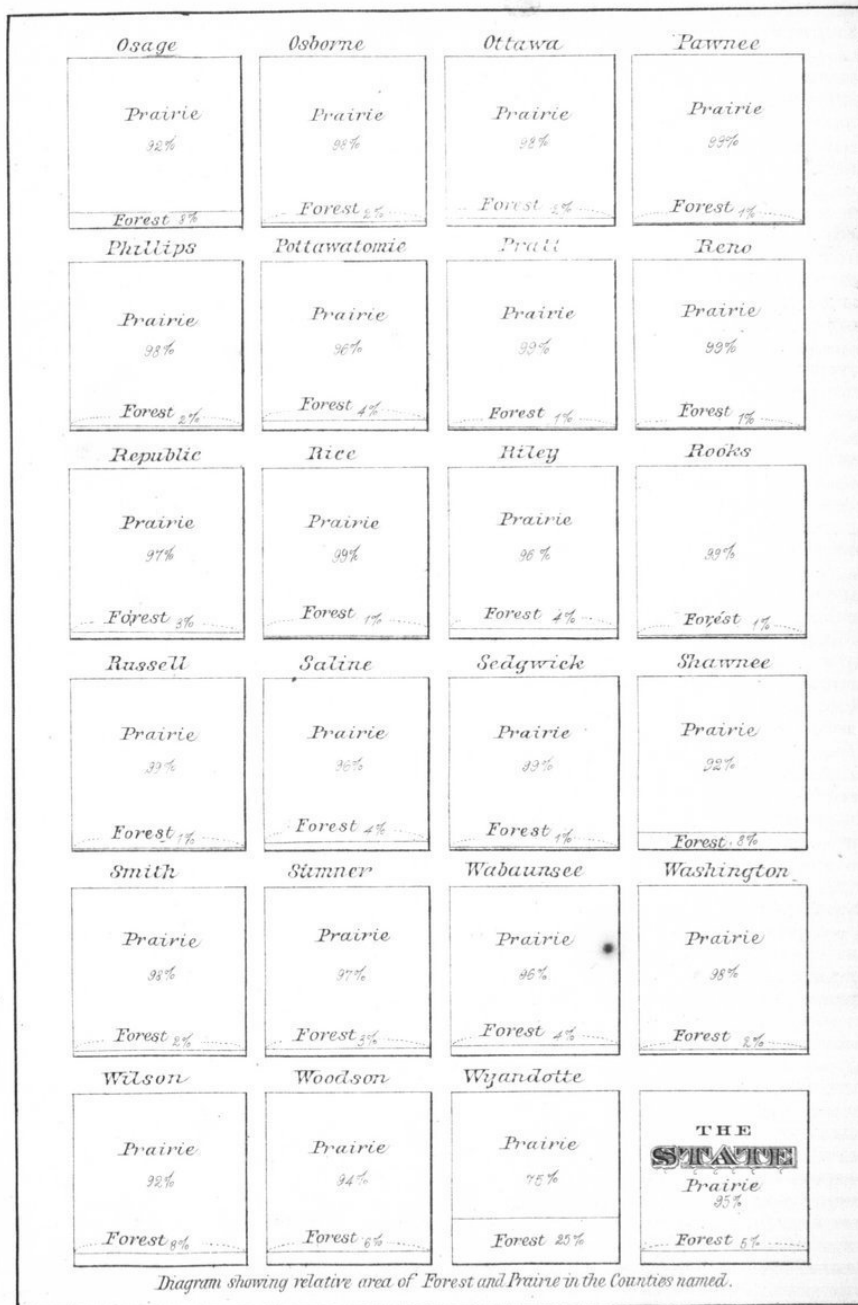
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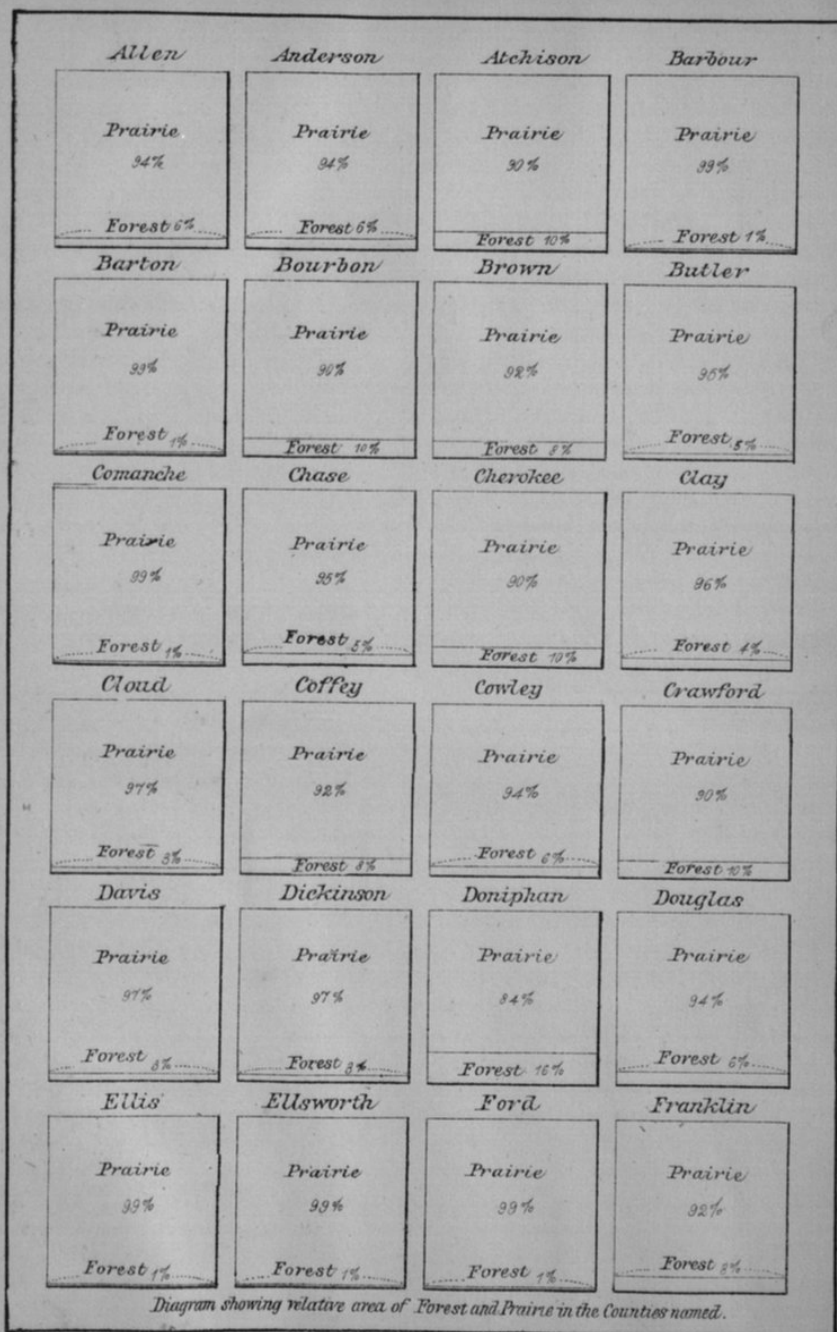
Reports of the Kansas State Board of Agriculture



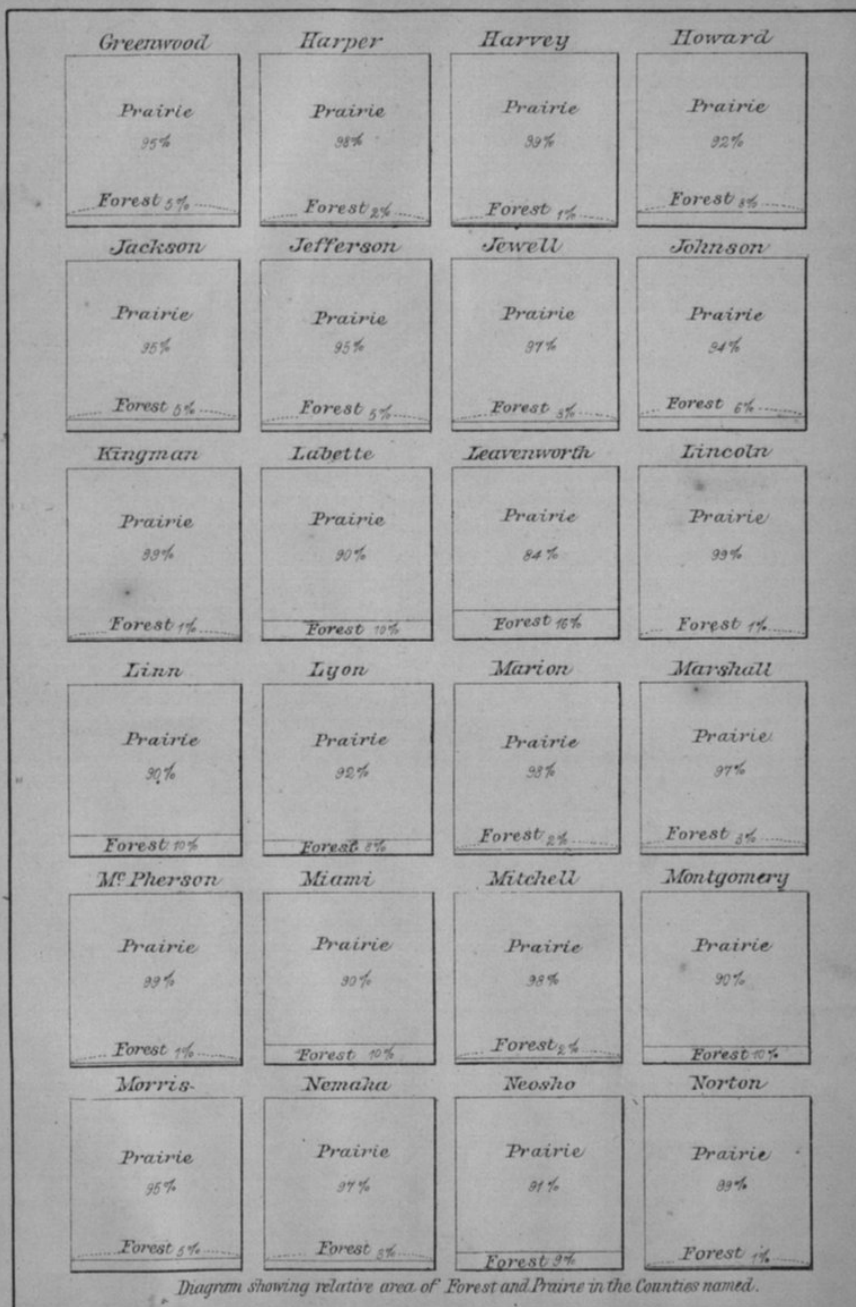
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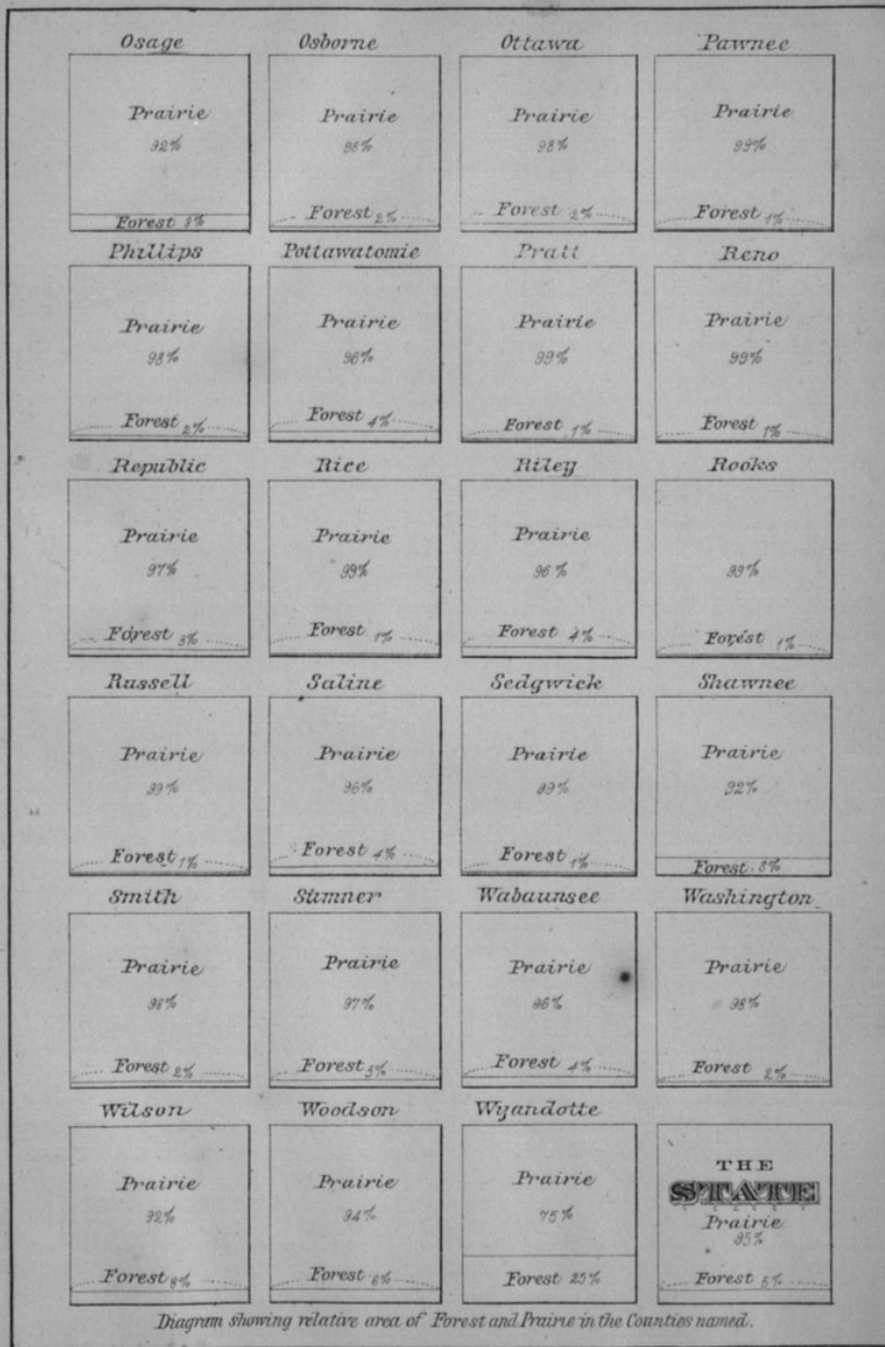
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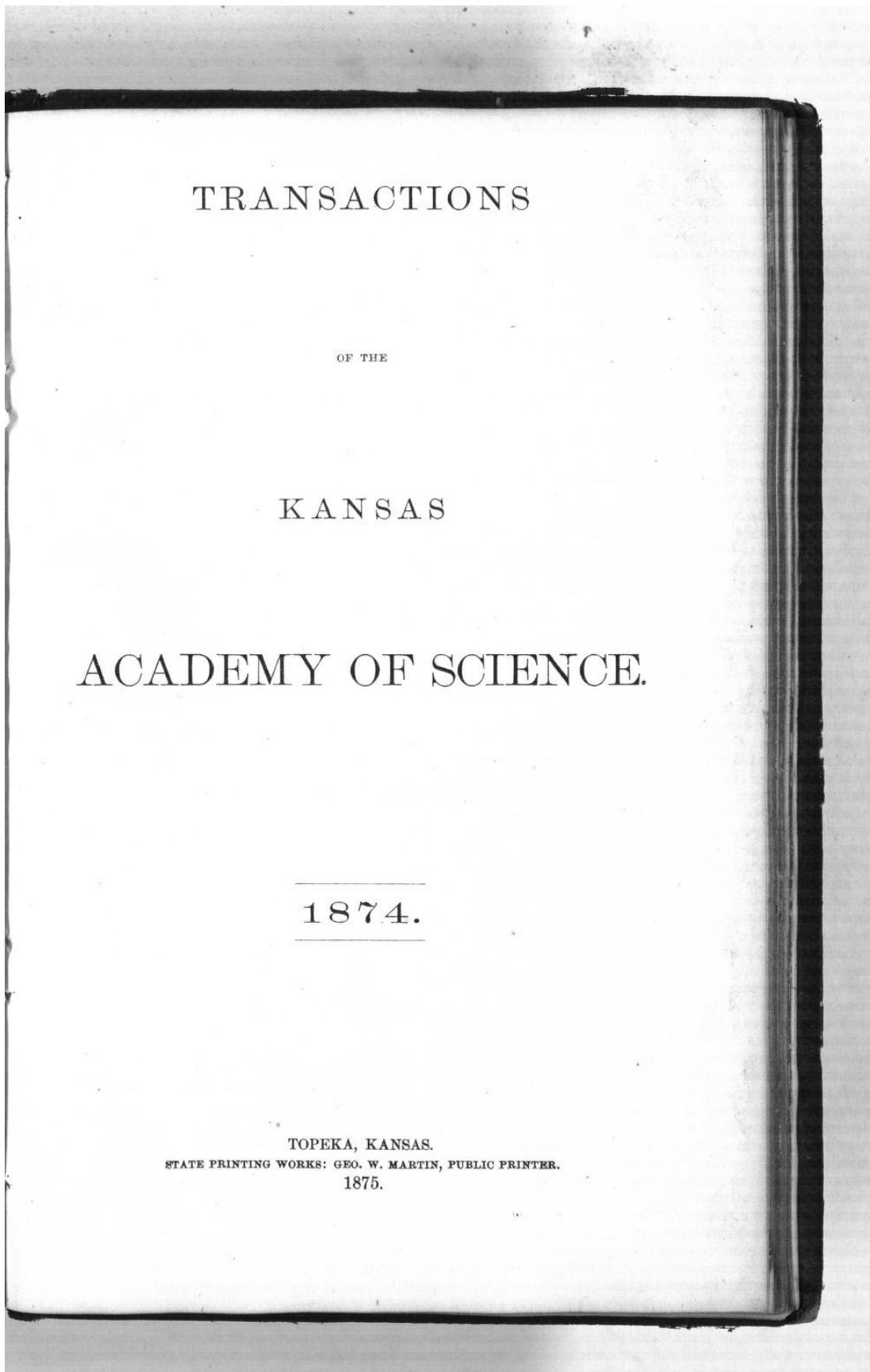


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REPORT OF THE KANSAS ACADEMY OF SCIENCE.

The Kansas Academy of Science was made a co-ordinate branch of the State Board of Agriculture by the laws of 1873.

Nearly all of the members of the Society have contributed something in the interests of science.

Prof. B. F. Mudge, who has been collecting for Prof. Marsh, of Yale, has found many new and rare specimens, which have not yet been determined.

Prof. J. H. Carruth has added to his catalogue plants. He has been greatly assisted by Lieut. Wilcox of Fort Leavenworth, Miss Wright of Irving, Mr. Watson of Ellis, Mr. Popenoe, and others, who have contributed many new and important specimens.

Prof. Frank H. Snow, of the State University, has continued his observations on the "Birds of Kansas;" and Mr. E. A. Popenoe presents for the first time a list of the Coleoptera of Kansas.

PROCEEDINGS OF THE SOCIETY.

The seventh annual meeting of the Society was held in the House of Representatives, at Topeka, on October 5th and 6th. The attendance was larger, and the interest greater than at any previous meeting.

Among the transactions of the Society the following are of public interest:

A committee, consisting of A. Gray, B. F. Mudge, and E. A. Popenoe, were appointed "to secure such a modification of the game laws of Kansas, as shall allow the killing of any birds at any time by authorized parties for scientific purposes."

Prof. Frank H. Snow was appointed to make a report on the ravages and extent of the locust, its means of extermination, together with any other information which may be considered of value to the citizens of the State.

The following papers were read:

Brachiospongia, by Prof. W. C. Hovey.

Tin and Tin Salts, by Prof. W. K. Kedzie.

Elementary Sounds of the English Language, by Prof. J. H. Carruth.

On the Priestly Centennial, by Prof. W. K. Kedzie.

Catalogue of the Lepidoptera of Kansas (continued from last year), by Prof. Frank H. Snow.

The Pliocene Formation of Kansas, by Prof. B. F. Mudge.

Artificial Organic Compounds, by Miss Jennie M. Detmers.

The Water Supply of Kansas, by W. Tweeddale.

Additions to the Catalogue of Kansas Birds, with remarks on the fertility of the Hybrid Woodpecker (*Colaptes hybridus*), by Prof. Frank H. Snow.

New and Rare Forms of Fossil Fish from Kansas, by Prof. B. F. Mudge.

Analysis of Clays from different parts of Kansas, by Dr. Wm. H. Saunders.

Additions to the Catalogue of Kansas Plants (continued from last year), by Prof. J. H. Carruth.



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Notes from the Zoological Laboratory of the University of Kansas, by Prof. F. H. Snow.

A Mad Stone in Kansas City, by Prof. John D. Parker.

A Preliminary List of the Coleoptera of Kansas, by Edwin A. Popenoe.

Observations on the use of the Antennæ of *Polyphylla variolosa* (Harris), by Prof. F. H. Snow.

The Study of Natural History as a Disciplinary Power, by Prof. W. Wheeler.

The Importance of a Geological Survey of Kansas, by Prof. B. F. Mudge.

Geological Features of the Lower Neosho Valley in Kansas, by W. S. Newlon.

On Determining the Solubilities of Metallic Salts, by Prof. G. E. Patrick.

Disappearance of the Prairie Dog from Kansas, by Prof. B. F. Mudge.

Suggestions on the True Theory of Number, by Prof. F. W. Bardwell.

OFFICERS.

The following officers were elected for the current year:

President—Frank H. Snow, Lawrence.

Vice Presidents—B. F. Mudge, Manhattan; John D. Parker, Wyandotte.

Secretary—John Wherrell, Leavenworth.

Treasurer—Robert J. Brown, Leavenworth.

Curators—Frank H. Snow, Lawrence; Edwin A. Popenoe, Topeka; W. K. Kedzie, Manhattan.

COMMISSIONS.

Geology—H. C. Hovey, Kansas City; B. F. Mudge, Manhattan.

Entomology—Frank H. Snow, Lawrence; Edwin A. Popenoe, Topeka.

Language—D. H. Robinson, Lawrence; J. H. Lee, Manhattan.

Ethnology—H. B. Norton, Emporia.

Engineering—F. W. Bardwell, Lawrence.

Meteorology—John D. Parker, Wyandotte.

Botany—J. H. Carruth, Lawrence; John Wherrell, Leavenworth.

Mineralogy—W. K. Kedzie, Manhattan.

Chemistry—G. E. Patrick, Lawrence.

Mammalia—M. V. B. Knox, Baldwin City.

COMMITTEE OF LOCAL ARRANGEMENTS.

P. McVicar, Topeka; Edwin A. Popenoe, Topeka; A. H. Thompson, Topeka.

The Society adjourned to meet at Topeka;—the time of meeting to announce.

SUGGESTIONS ON THE TRUE THEORY OF NUMBER.

BY F. W. BARDWELL.

No one will question the importance of a correct theory of number, though many may be surprised at the suggestion that the current theories are imperfect in any important feature.

It is however true that there is a widespread dissatisfaction with the books which treat of the elements of number; that there are frequent changes in the text-books used in the schools; and that educators, and the friends of education, often complain of the small results of the great amount of time and effort expended in the department of mathematics, and especially given to arithmetic.

These facts justify at least an inquiry in regard to the fundamental theory of number on which methods of instruction properly rest.

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WHAT, THEN, IS NUMBER?

If, as some allege, no formal and perfect definition can be given, yet by means of careful study we should be able to talk intelligently about it, and be able to say confidently, "*this*" is number, or "*that*" is not number.

Mill says in his *System of Logic*: "The fact asserted in the definition of number is a physical fact. Each of the numbers two, three, four, etc., denotes physical phenomena and connotes a physical property of those phenomena. Two, for instance, denotes all pairs of things, twelve all dozens of things, connoting what makes them pairs or dozens; and that which makes them so is something physical, since it cannot be denied that two apples are physically distinguishable from three apples, two horses from one horse, and so forth; that they are a different, visible, and tangible phenomena."

NUMBER USED TO DESIGNATE HOW MANY.

Perhaps it will be admitted that one of the first and most obvious uses of number is to distinguish or define *how many* things are thought of. It may or may not be in answer to a question. In either case, the term called *number*, completely fulfills the function of telling *how many*.

Does number do anything more than tell how many? It appears not. If not, let number be defined as *that which expresses how many things are thought of*, and let this definition be accepted until some defect be found, or until some better definition be invented.

TWO CLASSES OF NUMBERS.

If there be a group of oranges, consisting of three whole ones and a half of one, that is, one of two equal parts of a whole one, then to describe how many are in this group one would say *three-and-a-half*, and this term obviously performs the same kind of office which in other instances is performed by the term *three*, or by *four*; in other words, it completely fulfills the office of number, and should be included under the name. The same may evidently be affirmed of *one-half* or *three-fourths*. Either may be used to express how many, as one may say "I have ten dollars," while another states "I have *three-fourths* of a dollar," or still another says "I have *one-half* a dollar." It appears then that number may be affirmed of *whole things* or *parts of things*, and this suggests two classes of numbers, one denoting whole things, the other denoting parts of things, called respectively integral and fractional numbers.

To many, no doubt much of the foregoing seems so obvious as scarcely to merit a statement, yet recently an advanced college class in mathematics were puzzled by the question, "is one-half a number?" and the opinions were divided, though a majority thought *not*. The same question propounded to a large convention of teachers, caused a nearly equal division in the opinions expressed, while afterwards an able mathematician, widely known and admitted to be such, expressed serious doubt in regard to the matter, though finally admitting the view here expressed.

The facts just stated, indicate not so much a superficial acquaintance with the subject, as the imperfection of the current methods of presenting the elements of numbers, which should leave such confused notions in the mind, even after subsequent progress had made the problems of the higher mathematics quite familiar. One objected to the existence of fractional number, because "there cannot be such things as three-and-a-half men, or four-and-one-fourth sheep." To this it may be answered, that fact simply indicates a feature in the constitution of men and of living beings, which does not permit the existence of life in fractional parts, but in no wise does it impair the flexibility of number which is applicable either to wholes or parts.

In this connection, a practical suggestion occurs, which seems worthy of consideration. Since integral and fractional numbers are two classes of number in general, the exposition of the elementary operations should be applicable alike to both these classes: for instance, the definitions of multiplication and of division should be such as to apply to either integral or fractional numbers. By such means it is believed that the subject of



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fractional numbers may be divested of much of the difficulty usually encountered by the teacher as well as the pupil.

DISTINCTION BETWEEN NUMBER AND QUANTITY.

Much confusion seems to exist in the minds of many in regard to the notions of number and quantity. This is partly due to the intimate relation of the things, and partly due to the failure of mathematical authors and writers to make the proper discrimination.

The definition of number is often stated to be "the ratio of two magnitudes or quantities," or, it is said, "number is a unit or collection of units of which one is any magnitude assumed as a standard of measure." In making such statements, authors appear to make number depend upon quantity for its existence, and indeed it is sometimes said, quantity includes both *space and number*; from which it would follow that number is simply one of the kinds of quantity. Professor Olney says "quantity is the amount or extent of that which may be measured." It seems, however, a better statement to say, quantity expresses the limit of magnitude or extent; in other words, *quantity expresses "how much."*

The difference between number and quantity is precisely of the same kind as that between the notions of *much* and *many*.

It is noticeable that in the form of words, the comparatives of much and many are identical. Thus we say *much, more, most*, and we say, too, *many, more, most*; but the notions of more and most in one case differ from those in the other case in the same way that much differs from many; that is, in the first case more and most relate to quantity, while in the second case they relate to number.

This use of one word to express two ideas or notions, which though related are yet distinct, indicates some confusion in the minds of those whose use of words has given form to our language; but this fact scarcely excuses at the present day any failure on the part of authors and instructors to make the proper discrimination.

In the French and German languages the distinction is less marked than in the English; and so in the Latin, *multus* and *multi* (much and many) differ only in singular and plural forms of the same word. The same is true of the Greek.

NUMBER USED IN THE MEASURE OF QUANTITY.

It follows from the foregoing that it is incorrect to say "number is quantity," though number is often used in *measuring* quantity. It is, in fact, seldom that a quantity is measured in any other way than by meaning the *number* of standard units of quantity contained in the quantity to be measured. For instance, four feet, twelve bushels, twenty acres, illustrate this statement. Yet this fact, though it indicates an important use of number, still does not constitute the basis of a definition, and should not be so misused.

IS MATHEMATICS THE "SCIENCE OF QUANTITY?"

This statement, which has become stereotyped, fails to perform well the office of a definition, even if it does not fail to express the literal truth. The vague use of the term "*quantity*" unfits it to appear as the essential part of a definition. In algebra the current use of this term makes it almost equivalent to the term number, or *symbol of number*. It should be remembered that all algebraic operations are upon number. Thus there can be no multiplication of quantity by quantity: strictly speaking, all multiplication is *purely* by number; and it would seem better in a science, one of whose chief excellences is *precision*, to call things by their right names. It is believed that a careful consideration will convince any one that all the symbols of algebra are either the symbols of number or of the relations of and operation upon number. In the application of algebraic principles to problems of quantity, we deal only with the *measure* of quantity in the guise of number. In the elements of geometry, the symbols of magnitude are presented for direct consideration; but in the higher geometry the investigations are made chiefly by algebraic methods; that is, by using the symbols of number to represent the measures of quantities. The statement that mathematics is the science of quantity seems then to be an incomplete definition, if in any true sense it can be called a definition.

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ABSTRACT AND CONCRETE NUMBERS.

Perhaps the frequent occurrence of these terms forms a sufficient reason for noticing them in this connection. Number in its very nature is abstract, and it is an obvious misnomer to call it *concrete* in any case. Two means *two things*, and though the kind of things is not explicitly named, the essential character of number is not affected. The statement "two and three are five," means merely "two things and three things counted together, are five things." It may be mentioned in passing, that since the office of number is exclusively that of fixing a limit of "how many," the greater or less extent of "how many," does not at all affect the character of the number applicable to the particular case. Thus the number two or three, possesses as completely the character of number as a *thousand* or a *million*. It follows then that *zero* or *naught*, when used, as it often is, to designate the limit of "how many," is properly included under the name number. It is believed that this consideration is not only logically consistent, but that it simplifies the use of *naught*, as well in arithmetic as in algebra, where it often appears as the root of an equation, and in many instances performs as conspicuous and important services as are assigned to any number.

The necessarily brief limits of the present paper do not permit a further examination of these questions at this time; but it is believed enough has been said to show that a thorough revision of the fundamental theory of number is required in order that this branch of instruction should not fall behind in the developments of the day.

ANALYSIS OF CLAYS.

The following brief notes of qualitative and quantitative analyses, taken from my laboratory record, will be of interest to some, and give a general idea of the chemical composition of some of the clays found in so great abundance in this State.

In this form of mineral wealth, Kansas is rich, the list embracing every variety in inexhaustible quantities, from pure white porcelain clay to common marl, and in time it must develop a large and varied manufacturing industry.

Many of you have heard of the Osage City ochre, which is found in an immense bed, varying from twelve to twenty-four feet in thickness. Its composition is—

Silicate of Alumina.....	Nearly 98 per cent	Silicate of Magnesia.....	Trace
Silicate of Lime.....	Small amount	Sesqui-oxide of Iron.....	Small amount

In that portion of the bed worked at the present time, the percentage of oxide of iron is a little larger than the sample gave from which the analysis was made.

At Council Grove is found an ochre with the same constituents:

Silicate of Alumina.....	Large amount	Silicate of Magnesia.....	Trace
Silicate of Lime.....	Small amount	Sesqui-oxide of Iron.....	Moderate amount

This ochre has exactly the shade of the *Spanish brown* largely used as a mineral paint, and is in every way equal to it.

The extent of the deposit, its geological position, and its physical characters, I do not know.

Over the eastern half of the State are distributed strata of a light, bluish clay, varying from one to two feet in thickness, lying immediately over or under the coal, commonly called fire clay, but none that I know of are sufficiently pure to furnish first-class refractory fire brick, suitable for furnace linings. Some sufficiently pure, however, will, I believe, eventually be found. Clays sufficiently pure for the manufacture of stone-ware, and other articles that are not required to resist an intense and prolonged heat, are known.

A so-called fire clay found at Council Grove, contains—

Silicates of Alumina and Iron.	Carbonate of Lime.	Sulphate of Lime.	Chloride of Calcium.
	Carbonate of Magnesia.		



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The two following are found at Carbondale, No. 1 above a coal bed, No. 2 beneath it:

	No. 1.	No. 2.
Water, given off at 212° F.....	8.50	3.00
Organic matter.....	2.00	2.00
Silica.....	27.50	48.60
Alumina.....	39.50	21.85
Protoxide of Iron.....	18.05	16.70
Sulphate of Lime.....	3.90	6.80
Sulphate of Magnesia.....	0.55	1.05
	100.00	100.00

These last from Carbondale are good average samples of the so-called fire clays of Eastern Kansas.

Recently there has been discovered on the line of the K. P. R. W. a beautiful pure white porcelain clay, that remains perfectly white after being subjected to a strong heat. It is apparently pure enough for the manufacture of a fine quality of porcelain, and for many other uses in the arts. The deposit is said to be extensive, uniformly pure and easily worked, characters which, if true, make its great value fully assured. Its composition is—

Silicate of Alumina. | Silicate of Lime (a trace). | Peroxide of Iron (a trace).

A very pure sample of native rock salt was brought me from the southwestern part of the State, consisting of—

Chloride of Sodium.....	92.20	Sulphate of Soda.....	4.91
Chloride of Magnesium.....	0.81	Silica.....	2.08
			100.00

The locality from which it was taken, and the extent of the deposit, are unknown to me.

The following analysis will be of general interest, as it shows how powerful diaphoresis can remove from the body by perspiration, mineral compounds that are not ordinarily eliminated through the skin. A gentleman who had been suffering for three years from general debility, decided to try the effects of the Turkish bath. After a few trials finding his condition improved, he desired to know whether any noxious mineral matter was being eliminated by the sweating process, and brought me a sample of perspiration for analysis. After standing a few hours, a residue settled, which was examined separately. The result was as follows:

FILTRATE.			
Reaction neutral.	Water.	Organic matter.	Chloride of Sodium.
	Sulphates of Soda and Potassa.	Phosphate of Lime.	
RESIDUE.			
Organic matter.	Alumina.	Sesqui-oxide of Iron.	Phosphate of Lime.

Attention is called to the presence of alumina, sesqui-oxide of iron, and phosphate of lime, substances that we would not expect to find in perspiration, and which ought not to be eliminated from the system faster than they are naturally excreted. This case must be an exceptional one, I think, as the Turkish bath, for properly-selected cases, is a valuable tonic and remedial agent, that invigorates the system, not a debilitating agent that abstracts the sources of its vitality.

WM. H. SAUNDERS, M. D.

LAWRENCE, October, 1874.

A GEOLOGICAL SURVEY OF KANSAS.

We have an area of territory ten times as large as Massachusetts (78,000 square miles) much of it only yet visited by the hunter, and the geological character of even the settled portions but little understood.

Enough coal exists, at least for a home supply for ordinary domestic heating purposes. But even when valuable for generating heat, how much is known in relation to its worth for making gas, smelting iron ore, or for the common uses of blacksmithing?

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We have, if we believe the newspapers, plenty of magnesian limestone in all parts of the State; but who knows how much or how little of it has any magnesia in it, or whether it has any of those properties which make true magnesian limestone available for hydraulic or Roman cement? We have, on the same authority, plenty of slate; but how many know if it is the genuine article? We might go on asking the same questions about a dozen other products found, or said to be found, in our State.

Much time and money are being expended in the useless search for metals, when only two—iron and lead—can by any possibility be found in the State, and those in a narrow area, where the chances are very strongly against us. We have coal in half the counties of the State, but a considerable portion is utterly worthless. Much is frequently worked and carried to some adjoining market, only to disappoint both the miner and purchaser. At the same time our best coal seam, which would be counted good in Pennsylvania, is little worked and less known, than the inferior article. We hear of constant expenditures in boring and digging for coal, where a geologist could easily decide that no coal could be found. Enough has been spent in half a dozen Kansas cities, ignorantly and uselessly searching for coal, to pay for a full, economical and scientific survey of the State. We cite one example for illustration: A city with more enterprise than confidence in geology, though frequently advised by me that no paying coal lay within one thousand feet of the surface, commenced the search, boasting through the press that the proceeding was "contrary to all principles of science," and "against the advice of one of the best geologists in Kansas," adding, "but we have got the coal." After boring three hundred feet, and striking dark shale, a shaft was opened at an expense of over \$25,000, only to find a black, worthless substance, which was not coal, and would not burn. Council Grove is not the only place in Kansas that has spent capital to bore for coal "contrary to all the principles of geological science." A few such expenditures as the above would be all the most extravagant geologist would require for a full, scientific survey of the entire State.

Other articles beside coal, require investigation. Our gypsum is abundant and valuable, but almost unknown to our citizens. Salt is found in large quantities, but only the small deposits of weakest brines are yet worked, while this valuable article is brought a thousand miles to our market. We should, instead, be sending our very superior salt to all the neighboring States.

Nor should the scientific aspect of the survey be overlooked. We have a flora in many respects unlike the more easterly portions of our country. We want a knowledge of our insects as well for science as the farmers. The chemical analysis of our soils and building materials and few minerals, is equally important to all. Our fauna is peculiar, and some of it rapidly disappearing. We have some geological formations (Permian, for instance) little represented in the United States; and others so rich in new forms of ancient life, that Eastern colleges and institutions are procuring them by tons, and we, in future, may be obliged for our collections to glean from their leavings. Kansas has probably presented to science, during the past eight years, more new species of fossils than any other State in the Union. And this only by the unaided labors of private enterprise. Much more could be done by a little State aid, and the specimens and credit preserved for Kansas. We should not be behind other States in this respect. Not only are Missouri and Iowa leading us in this matter, but many of the Southern States have organized, or are organizing, their geological surveys. We should not be less enterprising. We cannot promise the discovery of any precious metals as the result, yet a knowledge of the mineral contents of our strata will richly repay the small cost necessary. No better advertisement can be made to draw emigration, than a geological report. A true knowledge of the geological character of Kansas should be sent abroad. While writing this article, an official document from the National Land Department at Washington comes to me with a most gross misstatement of our coal fields. Such errors should be corrected by official reports from home. Nothing would so economically prevent the useless waste of

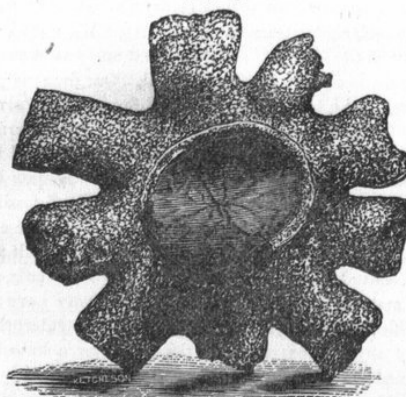
time and money in search of possible products of the soil. The saving to the people at large would, in this respect, be ten-fold, and from the pockets of those who can ill afford the expense.

BRACHIOSPONGIA.

BY REV. HORACE C. HOVEY, M. A.

During a geological trip in 1855, I discovered a new genus of fossil sponge, which, although extra-limital, may be worthy of a brief notice. My first specimen was exhibited to Prof. L. P. Yardell, of Louisville, Kentucky, and while in his hands it was seen and described by Prof. D. D. Owen. (Second Report of Geology of Kentucky, p. 111.) He styled it an amorphozoon, and suggested the name of "*Scyphia digitata*." I doubt if he ever saw the fossil in place, though he correctly refers it to the Bridseye group of the Lower Silurian. It was again described and imperfectly figured by Prof. R. Owen. (Indiana Geological Survey, 1859-60, pp. 362, 363.) He changed the name to *Syphonia digitata*, and he recognized it as a sponge. The specimen thus described, having nine arms, I claim as my discovery, and it should be acknowledged as typical of the genus. Prof. S. S. Lyon afterward found one with eleven arms, of which casts have been widely distributed. In 1867 I placed my original specimen in the hands of that accomplished naturalist, Prof. O. C. Marsh, of Yale College, for a more careful examination. The result was the rejection of the former unsuitable names and the substitution of *Brachiospongia* (the arm-bearing sponge), with the specific name of *Romerana*, in honor of Prof. F. Roemer, the leading authority on paleozoic sponges. Over fifty additional specimens, complete or fragmentary, were obtained by me on a subsequent visit to Franklin county, Kentucky, and a map of the sponge region was prepared. Specimens have also been found in the same geological horizon in Tennessee. Allied forms were likewise found, but they were so highly silicified and distorted as to make an accurate description impracticable. Prof. Marsh's notice appeared in the *American Journal of Science and Arts*, vol. 44, p. 88; and it was afterward corrected and elaborated in the form of a paper read before the American Science Association in 1868. Figure 1 represents *B. Roemerana*.

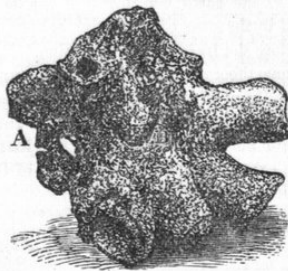
[Fig. 1.]



The general appearance of the *Brachiospongia* is vasiform; a central cup, oval, with a rim one or two inches high, being surrounded by tubular arms or fingers, hollow at the base, and closed at the extremity. These arms vary in number, from five to twelve; and on this variation specific distinctions are founded. The smallest sponge of this kind thus

far found is three inches in diameter, and the largest, twelve inches. Frequently the fingers were found detached from the body; and in one case two large ones were found near each other, having so grotesque a resemblance to a pair of diminutive human feet that for a time my assistants positively refused to aid me further! The exterior of the *Brachiospongia* is silicified, while through the interior characteristic silicious spicules are distributed. Near the center of the base, and opposite the mouth of the cup, is a small papilliform cone, which others have regarded as the point by which the sponge was attached to its support. But, in my opinion, this is a hasty conclusion; and I think it can be shown that this basal protuberance is the remnant of a partially absorbed arm. In a specimen of *B. Hoveyii* (Marsh), having twelve arms, only six of which appear in the figure (see fig. 2), there is evidence that the sponge arms, though constant in their specific numbers, were at intervals liable to alternate absorption and reproduction. The arm, marked A, seems to be the youngest in a series of which the basal cone, marked B, is the retiring member. A more careful study of these curious and highly interesting fossils may serve to throw light upon the mysterious laws of spongoidal growth.

[Fig. 2.]



DISCREPANCIES BETWEEN THEORY AND OBSERVATION OF THE MOON'S MOTION.

BY F. W. BARDWELL.

In studying recently the question of the moon's irregularities, I discovered an apparent source of error affecting lunar computations, whose explanation will probably interest many scientists, though of more special value to the astronomer.

The problem of the moon's motion has been one of the most interesting, though troublesome, in the series which astronomers have attacked with such success, as one by one the difficulties have been overcome, and the victors received their well-earned honors. Yet it is well known that the differences between the predicted and observed places of the moon are greater than in the case of any other heavenly body, and that these discrepancies have excited the special efforts of investigators.

Thus a comparison of the Washington observations with the American Ephemeris for 1870, indicates errors in the predicted right ascension of the moon, extending from $\frac{1}{7}$ 0.°4 to -0.°7.

Among the interesting phenomena dependent upon the motions of the moon, lunar and solar eclipses are conspicuous, and observations of these have naturally been used in the determination of elements or in the verification of theories, and any error pertaining to such observations would serve to introduce error into lunar tables.

An eclipse of the moon occurs when she passes into the earth's shadow, and the axis or central line of the earth's shadow is usually reckoned as the prolongation of the line



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connecting the center of the sun with the center of the earth. But this supposition contains an appreciable error. For since light requires an appreciable extent of time to pass from the earth to the moon, the earth advances in her orbit during that small interval, so that the part of the shadow found at any distance from the earth, say at the moon, lags a little behind the corresponding place of the earth.

It may easily be shown that the axis of the earth's shadow thus lags by an angle of about $20''$ —equal to the angle of aberration—and as the entire cone of shadow tends to lag equally in angular measurement, it will follow that the eclipse will begin and end earlier than if the earth's shadow were projected directly behind itself.

In other words, the central moment of a lunar eclipse does not coincide with the instant of the moon's opposition, but differs by the time required for the moon to gain about $20''$ relatively to the earth's position in her orbit, which may be 40 or 50 seconds of time or more.

In the case of a solar eclipse, some of these relations are reversed, though the result is nearly the same. Considering the motions of the earth and moon with reference to the sun, the moon is first in advance of the earth, while the earth is gaining upon her, but as the moon's shadow lags also, so the earth encounters it earlier, and by nearly the same interval of time, as happened in the case of the lunar eclipse, and the central moment of the solar eclipse occurs before the instant of conjunction.

It follows, then, that a lunar theory which includes the supposition that the central moments of lunar and solar eclipses indicate the instants of opposition and conjunction must involve an appreciable error, which would affect the tables based upon it.

It is noticeable that the error here pointed out— $20''$ in longitude—corresponding to about 1.93 in right ascension, expresses so nearly the range of the discrepancies between the lunar tables and the results of observation.

Whether the elimination of the effects of this error would serve to reconcile completely theory and observation, can only be decided by actual experiment, but it seems reasonable to expect much from such an elimination.

The lagging of the shadows suggests other curious deductions, which may be mentioned:

When the transit of Venus occurs, she will not, in the ordinary sense of the word, be seen upon the disc of the sun, but she will intercept certain rays of light, while only the place of the intercepted rays is perceived. But the place of these rays, or the shadow, lags, and, since the velocity of Venus is greater than that of the earth, the angle of lagging is greater than in the case of the earth's shadow. It will happen, then, that Venus will be in a line with a tangent to the sun and earth several minutes before an observer on the earth can perceive the indications.

If Venus were able to shine and make her light perceptible while passing in front of the sun, she would be perceived sooner than will actually be the case, and all the circumstances of the transit will appear later on this account.

The angle of aberration due to the velocity of Venus is about $24''$, and, since this measures the angle of lagging, the shadow will not overtake the earth until Venus shall have advanced about $24''$ past the line of tangency. The hourly motions being respectively $+ 10.980$ and 6.267 in right ascension, it will require about five minutes to accomplish the passage, and this interval indicates the apparent delay that may be expected.

Again, in the case of the solar eclipse, the absolute velocity of the moon is less than that of the earth, by a difference due to the velocity of the moon about the earth, which may be determined with a good degree of accuracy. The angle of lagging will, therefore, be less, and the time occupied by the earth in gaining it will also be less, so that the change in the angle of aberration, due to the velocity of the moon about the earth, will be indicated on a magnified scale.

The ratio of this change to the entire angle of aberration would again indicate the

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absolute velocity of light, knowing which, and the time occupied by light in coming to us from the sun, the distance of the sun becomes determinable.

The value of this method of determining the solar parallax will depend upon the precision of the lunar tables, but, with the elimination of the effects of the error above explained, it is possible such precision may be attained as shall make the method valuable.

The comparative frequency of eclipses would enable astronomers to accumulate observations rapidly, and the more rapidly reduce the degree of error.

POSTSCRIPT.

The foregoing remains the same as originally prepared, though from further inquiry it appears that in the case of the lunar and solar eclipses *apparent* instead of *true* geocentric opposition and conjunction are understood in the elements given in the Nautical Almanac for those computations, so that no error in the moon's place could thus occur. A similar remark applies in the case of the transit of Venus.

The fact of the lagging of planetary shadows, seems, however, to deserve recognition, though it furnishes no aid in the attempt to diminish the discrepancies between lunar theory and observation. And though these discrepancies are still so great as to indicate a specific cause which has so far eluded discovery, it is yet reasonable to believe that the true cause lies within the operations of known law; that this cause will ultimately be found out, when the moon will appear to move completely subject to the law of gravitation, and will conform gracefully to the predictions of astronomers.

LAWRENCE, KANSAS, December 7, 1874.

ON TIN "SALTING" ENTERPRISES IN THE UNITED STATES.

BY PROF. WM. K. KEDZIE.

Among the many elements which enter into, and add to the completeness of what we in egotistic phraseology term "our modern civilization," there are many most vitally important in their relations to the wants and necessities of civilized life, for which modern civilization is in no way responsible. They are the product, not of modern enterprise or industry: on the contrary, they are an inheritance, handed down to us from a remote and barbaric past.

Not the least important in its multitudinous and vital relations to the usages of civilized life, and for which we here to-day are mutually debtors to *pre-civilized* enterprise, may be mentioned the metal, TIN. The mere mention of the metal calls up before us the thousand-and-one uses and purposes which it subserves in every-day life. Whether in the form of block-tin, or as a coating to inferior but more durable metals, such as iron or copper, or in the beautifully semi-crystallized condition known as *moirée metallique*, or in the form of foil of one one-thousandth of an inch in thickness—so indispensable in the manufacture of mirrors; its brightness and beauty, almost equaling that of silver; its durability in air at ordinary temperatures—all conspire to render it a metal of incalculable value in the manufacture of articles of ornament and of every-day use.

And yet indispensable as we in this age and country have learned to regard this metal, it is interesting and instructive to note how little actual progress in the mining and metallurgy of tin has been made in the last three thousand years. For by this you will see that I place the discovery and first manufacture of tin from its ores, at a point far antedating the birth of the Christian era. No learned savant in the old world of alchemy has been able to hand his name down to posterity, linked with so all-important a discovery.



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To give the exact date of the introduction of tin would be quite as impossible and as difficult as to name the discoverer of gunpowder, or of the manufacture of glass. In the books of Moses we are told at one point of the "gold and the silver, the brass and the tin." Under the cabalistic sobriquet of *Kassiteros*, Homer sings of it in the Iliad, as that which gave strength and splendor to the battle-shields of Trojan warriors. By the writings of Pliny and others, we know that as early as between the years 1030 and 1040 before the birth of Christ, the Phoenicians had begun to avail themselves of the immense tin deposits of Cornwall, in the British Isles. And strange as it may appear, these same old mines of Cornwall, after 3,000 years of hard usage, are still the great tin producers of the world, giving us annually from their apparently inexhaustible resources 140,000 hundred-weight of the pure metal. Since the time when the Phoenicians began the transportation of this metal across the English Channel, how comparatively little has been accomplished in the new discovery and development of tin deposits. To be sure, we now have the mines of Banca and Malacca, yielding their annual 100,000 hundred-weight. Then, too, there are the remarkable mines of Bolivia, the reported yield of which has however, in all probability, been greatly exaggerated. Then may be enumerated the lesser deposits of Bohemia, Saxony, and Australia, and associated with the mineral Cryolite ($\text{Al}_2\text{F}_3 \cdot 3\text{NaF}$) to some considerable extent in Greenland. The Australian tin ore contains also so large a percentage of gold that it may be extracted with profit. Within the past year also a new deposit of most promising character has been discovered upon the MacIntyre river in Australia, which bids fair to rival either Cornwall or Banca in its wealth.

The remarkable absence of anything approaching the character of tin deposits in the United States has been a most unwelcome fact which has long perplexed mineralogists. Not that the mineral *Cassiterite* or *Tin Stone* is entirely absent; for very slight deposits may be found near the town of Chesterfield, Pa.—associated with albite and tourmaline—also near Jackson, N. H., Paris, Maine, in the gold fields of Virginia, in Idaho, and in California. But in all these localities the metal exists only in such quantities as to be purely of mineralogical, never of metallurgical importance. It is but proper to remark, however, that the supposition is entertained by some that the deposits of San Bernardino county, California, may yet prove of commercial interest, when more fully examined.

Now in a territory so richly endowed as is that of the United States, with all the mineralogical wealth that the needs of a high civilization could demand, this lamentable poverty in the matter of tin deposits evinces an unwarrantable short-sightedness on the part of nature. To be compelled to resort to our more favored English brethren on the other side of the Atlantic for a requisite supply of the needed metal has long been a subject of national chagrin. This impoverished condition of our tin resources has plainly been long felt by American patriotism as a great and a national reproach upon the character of a progressive commonwealth! At least upon no other adequate basis can we explain the efforts to supply this deficiency by the innumerable *tin-salting enterprises* which the last twenty years have witnessed in this country, some of which have been conceived and carried out upon a stupendous scale and with unfaltering energy. It is among these undertakings that the recent "tin mountain" excitement in Missouri may be classified; in some respects one of the most laughable instances in the whole calendar of tin frauds, closing with a grand railroad excursion, in which a credulous public is said to have stood gaping around two chemists, who were supposed to have produced the metal from a rock about as destitute of true cassiterite (tin stone) as a specimen of Jura limestone!

It is among these instances that these isolated "tin discoveries" are, even in our midst in Kansas, constantly taking place. I am in constant receipt, at my laboratory, of packages of ore from various parts of the State, supposed to abound in tin. Not infrequently a neat little ingot of the pure metal, said to have been found in close proximity to the ore, accompanies each package—the discoverer evidently forgetting that pure tin is one of the rarest elements in the whole realm of mineralogy. But it is to one of these enter-

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prises in particular, even now in progress, and which can hardly be considered other than a case of "salting," that I desire to-day to call your attention, having been myself an amused spectator of the undertaking. I refer to the "Otter Head Consolidated Tin Land Pool" of the region north of Lake Superior. The marvelous accounts of this territory report it as furnishing not only the sulphide of tin, (Sn S_2 generally combined with sulphides of iron and copper,) which has hitherto been known only in Cornwall, England, where it passes under the name of bell-metal ore, but in addition also an abundance of the genuine Cassiterite—tin-stone (Sn O_2)—in all its forms of hard, brown-black, glittering octahedral crystals: before the blowpipe alone infusible, but readily yielding globules of metallic tin when fused upon charcoal with a flux. The modifications of Cassiterite are also said to be here afforded in their various botryoidal forms known as "wood-tin" and "toad's eye," from its peculiarly concentric and radiated structure; and last but not most incredible part of the whole account, *native* or *metallic tin*, which heretofore has been known only as an exceedingly rare native metal, found occasionally in the gold washings of Boliva and in Siberia. Early in the past year an elaborate article appeared in the New York *Herald*, giving an account of the supposed discovery of these mines. It seems that some years ago, off the entrance to Thunder Bay, on Lake Superior, the famous Silver Islet was discovered, which now, under the direction of a large company, is yielding an immense profit. Stimulated by this discovery, the whole north shore of the lake was soon covered by earnest explorers. As a portion of the fruit of their investigations, gold in quartzose rock was said to have been found in the region about Shenandowan Lake, though in consequence of an unsettled dispute between the provinces of Manitoba and Ontario as to the right and title of the land, the discovery was maintained a profound secret. A portion of this same party of discoverers, operating in other directions toward the south and east, reported themselves as finding, in the immediate vicinity of Otter Head, on the Canada shore, extensive veins of dark-colored ore of a high specific gravity, specimens of which they brought with them on returning. These specimens are filled with well-defined crystals of Cassiterite, which may readily be detected with a glass of low magnifying power. Upon assay they yield an abundance of metallic tin. It is said that the discoverers first supposed them to be iron ores, on account of their dark color, but the assay failed to yield metallic iron in sufficient quantity to account for their high specific gravity. A white metal was also produced as a part product of the assay, and was at first taken to be silver, as silver was the metal they were seeking. A more critical examination, however, proved this product to be metallic tin.

This valuable metal being heretofore supposed to be an utter stranger upon this continent, this supposed discovery created, as might have been expected, much comment and an unusual degree of interest. No more propitious a locality for such a venture, supposing it to be a fraudulent one, could have been possibly conceived. Around the exact point of the so-called discovery, at Otter Head, about midway between the canal of Sault Ste. Marie and Thunder bay, the country is eminently wild, solitary and romantic. Heavy granite cliffs rise from the shore of the lake to the height of a thousand feet. A few wandering Chippewa Indians may be found in the district, but not a white man can be seen within fifty miles of this point. From the extremely precipitous character of the territory, extensive inland travel is an utter impossibility; hence, much of the exploration must be confined to the lake shore. Early in May, 1873, I received from the secretary of the "Otter Head Tin Pool" a considerable quantity of the ore, accompanied by a printed pamphlet embodying the report of the trustees of the company. The ore was certainly of an unexceptionable character, dark-gray in color, and heavily charged with crystals of Cassiterite. Much of it was in the condition called stream tin—a rich, fine ore, produced by the washing action of running water. It yielded on assay from fifteen to thirty-five per cent. of clean metal. This ore was also remarkably free from the inju-