Biographical Notes on Jonathan Knight (1787-1858)

This is an account of the life and achievements of one of the unknown and unsung builders of America, a rugged individualist (in the best meaning of this somewhat overworked appellation) and a practical man, but one whose intellectual curiosity was so marked that his avocation was solving problems in one of the purest branches of pure mathematics—the Theory of Numbers.

Some months ago a 500-page mathematical manuscript, written by Jonathan Knight (1787—1858), was given to the Historical Collections of Washington and Jefferson College by his great-granddaughter, Mrs. Irene Patton, to whose care the manuscript had been entrusted by her father, who in turn had received it from his father. The manuscript turned out to be a collection of problems from many sources, together with their solutions. Some of the problems were ones that had occupied the attention of famous mathematicians, and the solutions given by Mr. Knight are of considerable interest. In at least one case, Knight had found a particular solution of a well-known problem (Diophantus V, 19) that was not published by a mathematician until twenty years later. However, it is not the purpose of this article to discuss the manuscript; that has been done in a more appropriate place. But even a casual reading of the manuscript indicates that the writer was a most unusual person, and that a few notes on his life are timely.

1 Charles M. Ewing of Washington, Pa., is Director of these Collections.
3 There appear to have been a number of Jonathan Knights (usually without any middle name or initial) in early American history, but only two of them achieved anything approaching national fame. A Jonathan Knight who was born in Norwalk, Connecticut, in 1789, was graduated from Yale, became a physician, and was one of the founders of the American Medical Association and of the Yale Medical School. He died in 1864, thus being a contemporary but not a relative (at least not a close relative) of the writer of the mathematical manuscript.
I

Included with the gift of the manuscript was a collection of letters and papers, one of which was the original of an autobiographical sketch of Jonathan Knight written in 1858, about two months before his death, for the Biographical Directory of the American Congress. Since this was later published in a somewhat abridged form, the original is reproduced here.

I was born of poor but respectable parents in Bucks County Pennsylvania on the 22nd November 1787 and with them removed in 1801 to East Bethlehem, Washington County, in the same state where I yet reside engaged in agriculture. In 1809 I married Ann Heston in a meeting of the religious society of Friends, in accordance with their good order, and we still remain in religious fellowship with that society.

The limited means at command did not permit of my education at any College nor in any Seminary of learning above the ordinary primary school then in the country. Nevertheless an unquenchable thirst for knowledge impelled me to read and study at home mostly of nights, by which means I acquired a pretty good American education and a competent store of mathematical learning, and became a teacher in schools and a surveyor of land and of roads. About the year 1816, I was appointed by the state government of Pennsylvania to make and report a Map of Washington County in order to facilitate the forming of Melish's Map of the State. This duty involved much field labor—the instrumental surveys requiring an hundred days work in their performance. That service having been satisfactorily performed I served three years as County Commissioner to which office I was elected by the people. Soon I entered upon Civil Engineering and after assisting in a subordinate station in the preliminary surveys for the Chesapeake and Ohio Canal and in those of the National or Cumberland Road, between Cumberland and Wheeling, I was appointed in 1825 by the Federal Government, a Commissioner, to extend the road and accordingly did extend its location from Wheeling through the states of Ohio and Indiana, to the eastern line of the State of Illinois. In 1822 I was elected a member of the legislature of Pennsylvania and served in the House of Representatives and in the Senate six sessions. In 1828 I resigned my seat in that senate and entered the service of the Baltimore and Ohio Railroad Company, and visited England to acquire knowledge in that then new department of civil engineering. Returning I accepted the office of chief engineer for that company in 1830, which I held until 1842. Retiring then to the farm I continued the pursuit of agriculture for which I was always partial with only occasional times of absence from home on professional or other calls, until 1854 when I was elected to the 34th Congress in the 20th district of Pennsylvania, composed of Fayette, Greene and Washington Counties. Having served through the three sessions of that Congress, and failing of a re-election in 1856 I again retired to a rural and private life, on the Farm at East Bethlehem.

Knight's career after the period of his early training falls into several fairly well defined categories: he was a surveyor and commis-

For this sketch, see Biographical Directory of the American Congress (Washington, D. C., 1928), 1192.
sioner for the National Road, a state legislator, a civil engineer for the Baltimore and Ohio Railroad, a Congressman, and finally a retired farmer and amateur mathematician. Typical incidents, anecdotes, and other relevant information from each of these periods illustrate the wide capacities of Jonathan Knight.

II

A book entitled *Lives and Works of Civil and Military Engineers of America*, written by Charles B. Stuart in 1871, contains a twenty-page chapter on Jonathan Knight. Concerning Knight’s early life, Stuart states:

He early showed a peculiar talent for the exact sciences and mathematics, and at the age of twelve years he had worked Dilworth’s Arithmetic through, and set the result down in a blank book. Soon after commencing with this Arithmetic, he was looking forward in the book, and discovered the process of extracting the square root, and so told his father, who hesitated to believe it, but he satisfied him by immediately working a number of examples. After this he needed but little instruction as he advanced in the science of numbers.

He studied surveying with his father and when he was eighteen years of age he obtained Bonnycastle’s Algebra, and studied it successfully into quadratic equations. At this time he had never seen a person that understood algebra. During the next year, being informed of a teacher who was teaching algebra in a neighboring town he went there, and received instruction in this branch for three or four months, which was the extent of his schooling in mathematics. About this time he cultivated the habit of solving questions or problems mentally, when engaged in working on his father’s farm, or in drawing firewood home in the winter. Upon starting to the woods for a load he would read a question and when he returned and unloaded his sled, he would go into the house to warm, and while there set the solution down, and read another question, then start to the woods again, and continue. He was in the habit, at an early age, upon entering a building that was being erected, of obtaining its dimensions, and then proceeding to estimate the quantity of materials used in the construction, if brick, the number of them, and even the number of nails and shingles used.⁵

Among the papers in the Knight collection at Washington and Jefferson College is a letter written in 1882 by William Knight, a son of Jonathan, stating that he had furnished the material for the first part of the Stuart sketch quoted above, and calling attention to an error. He writes: “An important mistake occurs in Stuart’s book in relation to the time he [Jonathan Knight] received instruction in

algebra, it is stated as three or four months: I am certain it was just three weeks, this is the statement in the copy of the manuscript I retained.”

III

After the completion of the survey of Washington County for the Melish Map of Pennsylvania mentioned in the autobiography, it is not surprising that we should find young Knight in the employ of the federal government as a surveyor. However, the story (as told in the Baltimore and Ohio Employees Magazine in 1917) of how Knight became a government surveyor is worth repeating, even if the story may be apocryphal.

During the year 1818 Government surveyors were locating the National turnpike, a highway to be built from Washington, D. C. to St. Louis, Missouri. While passing the Knight farm one of the engineers remarked that they needed a man to help carry the chain. Thinking this would be a source of practical education, the farmer-surveyor applied for the job conditional that he be allowed free access to the engineers' books and the privilege of looking over the work. The proposition was accepted.

While nearing Washington, [Pennsylvania], the county-seat [of Washington County], the party came to a high hill which required heavy grading. This place has since been known as “Eggnog Hill,” for while there they made this concoction and all partook freely except Mr. Knight, who neither drank intoxicating liquor nor used tobacco. Here he detected a mistake in the work of one of the engineers. In recognition of his ability the commissioners commended him to the authorities at Washington, D. C., which resulted in his appointment as surveyor to finish the line.

He took up the work at Wheeling, West Virginia, and continued it westward to Terre Haute, Indiana, closing the season there November 15, 1820. In a letter written to his wife while making the journey (the letter was mailed at Terre Haute and the postage cost was fifty cents) he gave a minute description of the country through which his party passed. It being heavily timbered and thinly settled, they made their way with difficulty. In the letter he named the rivers they crossed, told of their width and of the very trying experience they had in replacing a broken axle on one of their wagons. They depended for meat mostly on wild game. Knightstown, Indiana, being on the line of survey, was named in his honor.

One of the Reports drawn up by Knight as Commissioner is printed in the House Documents of the 19th Congress, 2nd Session, as a part of a “Letter from the Secretary of War Relative to the National Road.” Knight was probably under considerable pressure from communities and politicians during the location of the road. After commenting on various possible routes for a certain portion of the road, Knight gives six conditions under which the Commissioner might legally deviate from a straight line, and then lists four condi-
tions under which he could not so deviate. He concludes by stating, “I have, under a conviction of imperious duty, located and reported the direct route, leaving the final determination of the question to the government.”

IV

Now let us go to the Hall of the House of Representatives at Harrisburg on the evening of January 26, 1824. Jonathan Knight is writing to his wife, Ann, whom he calls Nancy.⁶ (He has evidently just received a letter from her.)

Dear Nancy:

This is my eleventh letter to thee. It gave me unspeakable satisfaction to find that you were in good health and wanted for nothing except my presence.

He then goes on to express surprise and annoyance that Nancy has not been receiving his recent letters—each of which had been carefully numbered. After describing some of the steps he has taken to avoid such an occurrence in the future, he writes:

I also directed a letter to Headquarters, to the Postmaster General at the City of Washington informing him of the reports and requesting him to apply the corrective if anything wrong had taken place, with a request that he would do me the favor also to inform me upon the matter.

The relation in which I stand to one whom I love, and to my constituents who have sent me here, is such that I cannot, nor will not, silently suffer an imposition of this sort from any part of the immense machinery of the Post Office Department. They must either perform, or quit it altogether. . . .

It may be, however, notwithstanding all this, that the mail has only been partially deranged, or impeded for a time by high waters as the winter has been uncommonly open and wet. If so, I hope all will yet be right. . . . If, after all my care, these letters should not arrive, I hope I have given thee such evidence of attachment and regard as to be worthy of thy praise and the continuance of that love and affection which I have heretofore experienced, even when perhaps too little merited, and which, like charity, divine charity, is calculated to hide a multitude of faults.

I could wish to write much more at this time but have nothing more, having written two days ago.

I had to write three or four letters yesterday and as many today, this too much breaks in upon my time but I cannot get rid of it. I must answer people, and especially those whom I am here to serve.

So excuse me my love

And believe me as heretofore

Thine affectionately

J. Knight

P.S.

I am well in health.

⁶ Jonathan Knight to Ann Heston Knight, Jan. 26, 1824, Washington and Jefferson Collections.
A small notebook that belonged to Jonathan Knight is marked "4 mo., 1824," and contains "Solutions of Questions from Jno. Capp's Manuscript." One of these reads:

It is required to find what yearly rents any real estate must yield beyond all reprisals, to be sufficient within the space of seven years, to satisfy any certain debt or lien, in order to save the same from condemnation under the Laws of Pennsylvania.

Following the solution of this problem is the following note:

The last Theorem is precisely the same as that given in Rees's Cyclopedia [Abraham Rees, editor, 1810] for a similar purpose; and which I had access to in the State Library in the Session of 1823–24 to determine the questions relative to the Far. and Mechs. Bank of Philadelphia. And on the result of that Theorem, the Charter was granted for $70,000 for 20 years, Capitol $1,250,000.

While a member of the state Senate, Knight was one of five members of the Inland Navigation and Internal Improvement Committee. In 1825 he is listed as voting in favor of legislation for the "Pennsylvania Canal," to connect the Susquehanna with the Ohio River. Agitation for this action followed the good economic effects for New York State of the completion of the Erie Canal.

V

One is faced with a formidable task in attempting to show in a few pages the importance of Jonathan Knight's services to the Baltimore and Ohio Railroad and of the Baltimore and Ohio Railroad's value to the struggling country in the 1830's.

According to Dunbar in his History of Travel in America (1937), of the ninety-five early railroads, only "two of them—the Baltimore and Ohio and the Erie—were enterprises born of broad vision. They were the only instances in which early American railways on the verge of construction were conceived and planned, from the first, as important arteries of general commerce designed to connect separate sections of the country."8

The Baltimore and Ohio, chartered in 1827, was the first railroad in the United States "operated for public use." The Quincy Railroad,

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7 This notebook may be found in the Washington and Jefferson Collections.
8 Seymour Dunbar, History of Travel in America (New York, 1937), 1379.
four miles long, was constructed in 1826 by Gridley Bryant for the specific purpose of moving stones for the Bunker Hill monument. During the struggle to obtain a charter for this earlier railroad, such questions as the following were asked in the House. "What do we know about railroads? Who ever heard of such a thing? Is it right to take people's land for a project that no one knows anything about?" And there was even the comment, "We have corporations enough already!" According to Stuart, "onerous restrictions were imposed, but it [the charter] finally passed by a small majority only."

The question of what a railroad actually was did not receive an answer for some time. Some people argued that "it was merely an improved turnpike, a semipublic way over which, by the payment of a fee, any man might operate his steam engine and carriages. If this contention seems odd today, it did not seem odd to a people who were familiar with turnpikes but had never seen a steam railroad." A committee was appointed in Pennsylvania to study the matter and make a report.

No, said the committee, a railroad was not to be a turnpike. It must be managed by one company. And to bolster its opinion the committee called for support from Jonathan Knight, Esq., first chief engineer of the Baltimore and Ohio Railroad and one of the giants of the early days of the rails. Knight was a man of positive opinions and direct speech, and what he said about the place of the railroad in American life must have settled the matter. With his usual vigor he vowed that "... locomotive engines and their trains, managed and ordered by different companies, cannot be successfully run upon the same rail-way; and whoever shall attempt it will assume a fearful responsibility, as jeopardizing, in an imminent degree, and without necessity or the prospect of corresponding benefit, the lives and effects of passengers and others. The great speed and irresistible momentum of these machines and their trains render any other than a unity of management in the highest degree dangerous, if not absolutely impracticable. . . ."

The man who set down these positive opinions was one of the most notable in the primeval days of railroading. His location work for the Baltimore and Ohio had been particularly remarkable in that he laid out an excellent route at a time when there were no rules to go by, and when it was not even known how steep a grade or how sharp a curve a locomotive engine and its trains could handle. Knight, like Allen, the operating head of the Charleston road [another early railroad] had to work pretty much on the trial-and-error system, and both men appear to have made few errors. Hence, when J. Knight said that a railroad was to be operated by one concern, he was listened to. There seems to have been little if any more public discussion as to what form a railroad should take.11

9 Stuart, 122.
11 Ibid., 26.
By 1853, William Prescott Smith, the "Citizen of Baltimore" who that year published a *History and Description of the Baltimore and Ohio Rail Road*, could say:

The adaptation of the Rail Road system to general traffic—that point so long disputed—was thus fully and forever set at rest by the Baltimore and Ohio Rail Road Company, which, although surrounded by numerous and complicated difficulties, presented one of the very few undertakings of public works by private means, at that period in which no reasonable hope had been disappointed, and every expectation realized. All species of agricultural productions, lime, timber, lumber, fire-wood, and even paving stones which were before valueless to their owners, were daily brought to Baltimore, with profit to those using the road as a means of transportation for articles so bulky and so cheap; and in return, at an enhanced toll, but with equally profitable results, plaister of Paris, coal, boards, bricks, and scrap iron were sent into the interior.\(^\text{12}\)

But this was a far cry from the early days. "In the beginning, no one dreamed of steam upon the road. Horses were to do the work; and even after the line was completed to Frederick [having been started at Baltimore], relays of horses trotted the cars from place to place."\(^\text{13}\) There were even experiments with treadmill and sailing cars.

In 1830 the B. and O. attracted many visitors. "Among these . . . was Baron de Krudener, Envoy from the Emperor of Russia, who made an excursion in the sailing car [called the Æolus], managing the sail himself."\(^\text{14}\) The Baron is reported to have held a conversation shortly after this with President Philip E. Thomas of the B. and O., in which Mr. Thomas observed that "should the Emperor introduce Rail Roads into Russia, it would not be many years before a Railway would be constructed between the Baltic and the Black Sea, . . . such a road would enable Russia to encircle in her arms, not only the entire Northern, but also the Eastern frontier of Europe, and thus greatly extend her power and influence."\(^\text{15}\)

Reporting this conversation in his 1853 *History*, Smith says (the italics and exclamation points are Smith's): "To this the minister naively replied, 'My Dear Sir, you cannot suppose that Russia has any ambition, and that she desires either to increase her power or influence! On these points, she will remain content with her present position!'"\(^\text{16}\)

\(^{12}\) William Prescott Smith, *History and Description of the Baltimore and Ohio Rail Road* (Baltimore, 1853), 34.
\(^{13}\) Stuart, 229.
\(^{14}\) Smith, 26.
\(^{15}\) *Ibid.*, 27 (note).
\(^{16}\) *Ibid.*
By the end of the summer of 1830, the first miniature steam engine had pushed a car containing twenty-four passengers over the first thirteen miles of the road at an average speed of about six miles an hour. One might think that this development would have attracted wide attention. On the contrary, only one New York newspaper mentioned the event, about a month later, in a brief paragraph at the bottom of the second page with no headline.17

The use of steam on American railroads was possible largely because of an invention of Jonathan Knight. We read in Smith:

In the 4th Annual Report of the President and Directors to the Stockholders, (in 1831), it is remarked that “by the many improvements made in the application of moving power, an immense reduction in the cost of transportation and velocity have been effected.”

Amongst the most valuable of these, the Report states that “the combined cylindrical and conical car wheels, invented by the Chief Engineer of the Company (Mr. Knight), have been found of the utmost importance by the facilities they afford in turning curves.” It is stated, that, “by the aid of this highly valuable improvement, every doubt is removed of our being able to employ locomotive engines upon the Baltimore and Ohio Road. . . . This discovery is the more important to us,”—the Report continues,—“inasmuch as from the surface of the country over which our route must be conducted, numerous curves in the tracks will be unavoidable; and the great advantage of this form of wheels consists in their so readily accommodating themselves to the degree of curvature upon the road, that there scarcely appears to be any perceptible obstacle to the passage of the cars over them, greater than on a straight line.” Until this discovery it was regarded as a settled principle that no Railway car would travel safely on a curve of much less radius than one thousand feet, while with these wheels, they traversed curves of four hundred feet radius at a high speed. It was afterwards found that this wheel wore the inner edges of the rails very rapidly, and it has since been modified to prevent that result.18

Two other important inventions of this period, the so-called “friction wheel” and the adaptation of the eight-wheel carriage for use in high-speed trains, are generally credited to one Ross Winans, a horse trader who came to Baltimore to sell horses to the B. and O., but who remained to serve the road in many ways. Winans, incidentally, made a lot of money, but apparently just missed winning “several millions of dollars” by claiming a little too much in his lengthy lawsuits against railroad companies using the eight-wheel carriage. The courts decided that Gridley Bryant was the inventor, but sad to relate, Bryant apparently never received proper compen-

17 Dunbar, 953.
18 Smith, 31 (note).
sation for his invention nor even for his help to the railroad companies.

After his [Gridley Bryant’s] invaluable services to the several Railroad Corporations, in the “Ross Winans Suit,” his health and spirits were impaired by the oft-repeated promises made to him of ample compensation. . . . After waiting long in expectation of the promised remuneration (being several times assured that his claims would eventually be considered), he was at length forced to the conclusion that he had wasted his time and strength in vain, and that their obligations to him were wholly ignored. With the uncomplaining spirit of a proud and reticent man, he bore his disappointments in silence, and gave up this last hope of his old age.19

Reizenstein credits Ross Winans and Jonathan Knight with having a part in the following railroad development:

. . . When locomotives took the place of horse-power, the light coach wheels were replaced by cast-iron wheels, to the perfection of which Ross Winans, John Elgar, Jonathan Knight and Phineas Davis all contributed.20

And in describing the construction of one of the spur tracks, Hungerford states:

Knight suggested that the track should be laid with sleepers—of wood, by this time—three feet apart, instead of four, as on the Main Stem, and that stringers be placed below, as well as above the crossties; this last a considerable variation from established practice. On the upper stringers, he proposed to lay a continuous flat iron rail, each rail about fifteen feet long, with a base three and a half inches wide and standing about two inches in height. It would weigh about thirty-two pounds per running yard, or about fifty tons for each mile of single track.

This rail, when finally laid down in accordance with the chief engineer’s recommendations, was the first form of “T” rail ever used upon the Baltimore and Ohio—and probably anywhere within the United States. It represented a distinct advance in one of the most important phases of railroad construction.21

The American Rail Road Journal in 1835 had this to say about the B. and O.:

We acknowledge the favor by the President of the Company, of a copy of the Ninth Annual Report of the Baltimore and Ohio Rail Road Company, and cannot refrain from here expressing our own, and we believe the thanks of the whole Rail Road community, as well in Europe as in America, for the candid, businesslike, liberal manner, in which they annually lay before the world the result of their experience.

19 Stuart, 129–130.
20 Milton Reizenstein, The Economic History of the Baltimore and Ohio Railroad, 1827–1853 (Baltimore, 1897), 34.
It will not be saying too much, we are sure, to denominate them the Rail Road University of the United States. They have labored long, at great cost, and with a diligence which is worthy of all praise in the cause, and what is equally to their credit, they have published annually the results of their experiments, and distributed their reports with a liberal hand that the world might be cautioned by their errors and instructed by their discoveries. Their reports have in truth gone forth as a textbook, and their road and work-shops have been a lecture-room to thousands who are now practising and improving upon their experience. This country owes to the enterprise, public spirit and perseverance of the citizens of Baltimore, a debt of gratitude of no ordinary magnitude, as will be seen from the President's report in relation to their improvements upon and performances with their locomotive engines, when compared with the performances of the most powerful engines in Europe, or rather in imagination, in 1829, only six years ago.

Much of the technical material in these reports was prepared by Jonathan Knight. "The able reports and elaborate analytical papers which he prepared during a series of years, . . . do him great credit as a scientific investigator," is Stuart's comment.

Hungerford, in recording the resignation on September 30, 1842 of Jonathan Knight as chief engineer of the Baltimore and Ohio, summarizes his services as follows:

For sixteen hard years, perhaps as hard years as might possibly come to the lot of any railroader, Mr. Knight had served the road. He had been with it from the beginning. He was one of the last of its pioneers to depart from its official ranks.

Mr. Knight served the property faithfully and well. But he seems to have had a rare faculty for engaging in bitter disputes, in acrimonious word battles, long drawn out. . . . Despite these things, however, Jonathan Knight to this day remains one of the commanding figures of the early days of Baltimore and Ohio. His Quaker sincerity and honesty and his undoubted ability rendered him of vast help when help was most needed—at the very outset of the road's career.

Jonathan Knight was elected to the 34th Congress of the United States as a Whig. The records of this Congress (First Session, 1855) are preserved in the Congressional Globe, the forerunner of the Congressional Record. Repeatedly during the First Session, Mr. Knight requested unanimous consent for the introduction of a resolution "inquiring into the expediency of a scientific and instrumental survey of the Ohio River by the U. S. Engineers or other Commission to report on the construction of a dam. . . ." Each time the request

22 Smith, 33 (note).
23 Stuart, 238-239.
24 Hungerford, I, 211.
was made, however, a Representative of one of the southern states objected. Knight's resolution concerned a project of Colonel Charles Ellett, Jr.

He [Colonel Ellett] spent the winter of eighteen hundred and fifty-fifty-one, in a close examination of the Lower Mississippi, its channels and deltas, and made many original observations upon the formation of the bars at the mouth of the river. He gave the results of his labors in a report to the War Department. This report he afterwards incorporated with his "Memoir on the Ohio River," printed by the Smithsonian Institute, . . . This work presents, with its author's beauty of style, and originality of thought, the plan which was, in his estimation, the crowning conception of his professional career, that on which he rested his hopes of future fame. It was to this plan of improving the navigation of the great rivers of the country, by means of vast reservoirs erected at their headwaters, by which surplus water of the seasons of floods might be stored up, to be set free in the droughts of summer, that he devoted most of his earnest thought, until his interest was diverted from every subject connected with his profession, by the political difficulties of the country. It was certain that one feature of this comprehensive plan, which rendered it so captivating to Colonel Ellet's mind and heart, was its general utility to the whole country, tending by its wide-spread benefits, to draw more closely the bonds between the North and South.25

Ellet endeavored to get a bill through Congress for an appropriation to enable him to demonstrate, on a small scale, the practicability of his Reservoir plan for the improvement of the Mississippi River. He had, at the opening of the session, every hope of success; but Congress soon became so absorbed in the political questions of the day, that he found it impossible to accomplish his purpose. The bill passed the Senate, as before, and was lost in the House.26

No attempt will be made here to discuss "the political questions of the day" for this complex pre-Civil War period. It may be of interest to note, however, that on January 2, 1856, Knight tried to get the House to take the eighty-fifth ballot for the selection of a Speaker, and that on January 9, he stated to the House, "I have understood that our Democratic friends wish to make a continuous session until we shall have elected a Speaker. In this matter I think I shall vote with them."

A letter written in 1908 by a granddaughter of Knight contains the following27:

Grandfather's work on Internal Improvements attracted the attention of Henry Clay and he and Grandfather became great friends in Congress and Grandfather

25 Stuart, 277-278.
26 Ibid., 280.
27 Julia Knight to Irene Knight Patton, 1908, Washington and Jefferson Collections.
visited Mr. Clay at his home. When we were in Brownsville [Pa.], Father was talking with the Ironmaster at Bridgeport who cast the iron bridge. He told a story about Mr. Clay's being on the stage on the way to Washington at the time the bridge was being built. The approaches were narrow, only wide enough to allow the stage to go on. The horses shied, upset the stage and the passengers were flung into the ditch at the side. Some wag remarked that the bridge was a very expensive one as they "had sent all the way to Kentucky for Clay to fill the approach."\(^{28}\)

The same letter indicates some of the Quaker beliefs and customs of that day.

 Father is very fond of music and we used to love to hear him play on his flute. He says he always wanted to play, but of course it wouldn't do for a Quaker to allow it, so he had to keep his flute in a barrel in the barn and play away from the house. He said Grandmother liked to listen to it. I always had the impression they went to singing school but he tells me it was a Geography Class conducted by Isaac Cleaver. The young folks, fifty to a hundred, met at the school-house in the evenings and sang their lessons. For instance, all the capes, all the islands, all the rivers and their tributaries. They always began with the four divisions of the earth. When they took a river, they would name the tributaries on one side of the river then go down the other. Mr. Cleaver beat time and Father said it was quite exciting.

. . . the silver service the B. and O. wanted to present to Grandfather and the Quakers wouldn't let him take it! Grandmother felt so badly about it, however, that he accepted a dozen silver cups. . . . Then about his inventions of the conical wheels and car trucks. You know he never would take patents, for his principles in some way interfered. . . .

VII

During the years immediately preceding his election to Congress, and during the remainder of his life, Jonathan Knight spent most of his time on his farm in Washington County. He was the Secretary of the first Agricultural Society organized in that county. It was during this period, too, that he wrote most of the mathematical manuscript mentioned at the beginning of this article.

When Knight retired from the B. and O. he was succeeded by Benjamin H. Latrobe, who had been his assistant for a number of years. It is interesting to note that although B. H. Latrobe had been trained to be a lawyer, he became a civil engineer, whereas his brother, John H. B. Latrobe, had received an education in engineer-

\(^{28}\) A similar anecdote is reported in Thomas B. Searight, *The Old Pike: A History of The National Road* (Uniontown, Pa., 1894), 16. In Searight's version the location was given as Uniontown, Pa., and the comment was: "This is mixing the Clay of Kentucky with the limestone of Pennsylvania."
ing, but later became the legal counsellor for the B. and O. Smith has the following to say of this double-barreled training:

The knowledge of the law has, however, been of great service and value to the Company in the performance by the first, as an engineer, whilst the knowledge of engineering possessed by the other has been of equal advantage in protecting the varied interests of the Company from encroachment.29

A letter written by B. H. Latrobe not only tells of Knight's last illness and death, but also provides a summary of his distinguishing traits.

... The leading characteristics of Mr. Knight, as a professional man, were strongly marked, and entitled him to a high rank in the roll of American Civil Engineers. His natural aptitude for the acquisition of knowledge in the exact sciences, and especially those which depended upon the skilful use of algebraic analysis, was unsurpassed. The habit of close thinking, into which he was led by the natural tendencies of his mind to mathematical investigation, made him reason rigidly on all subjects, and gave a philosophical cast to his conversation, upon almost every topic that he touched. Yet his remarks were not a series of dry abstractions, but were practical in their bearings, and enriched by illustration and anecdote. In political economy he was well versed, and expressed enlightened and comprehensive views upon the subjects of banking, trade, manufactures and agriculture, of the last of which he possessed much practical knowledge, derived from experience and careful observation. Politics, also, was a favorite theme with him, and upon public measures he always expressed broad and national views. He discussed the characters of our public men with great spirit, and often with a sarcastic humor which marked his conversation on most subjects. The character of Henry Clay appeared to be his ideal of a statesman and orator.

In private life, he was distinguished by many excellent qualities. He reared a large family—ten children—fulfilling his domestic duties in the most exemplary manner, bringing up his children in the fear of God, providing for them with a judicious regard to their several capacities and dispositions. He left a comfortable estate, after having settled all his children during his own lifetime; and among his neighbors and many friends, a character of unsullied probity and consistent Christian kindness.

Mr. Knight was taken suddenly ill with bilious colic, in a very severe form, at his home, on the thirteenth day of November, eighteen hundred and fifty-eight. In a few hours inflammation had set in, causing a severe pain and a continued oppressive sensation in the chest. He died on the ninth day of his illness, being the seventy-first anniversary of his birthday. During his last illness he was very patient and calm, conversed little, but always spoke pleasantly to those about him, recognizing them until the last moment, and with his last words expressed his belief "that he had made his peace with God and had no matter to make up with any man; and that he believed he was entering upon a state of rest and happiness in the life to come."30

29 Smith, 86.
30 Stuart, 240-242.
The following tribute was written by Stuart for another of the early American civil engineers.\textsuperscript{31} As one thinks back over the life of Jonathan Knight, it appears that these words might also be applied to him.

There are some men who never directly sought for power or place, who never sought their own glory, who never ceased from useful labors and never devoted their honest gains to vanity or vice; the men who have been good sons, good husbands, good fathers and good neighbors; the men who in all their ends and labors have been real benefactors to mankind. . . .

\textit{Trinity College} \\
Harold L. Dorwart

\textsuperscript{31} Benjamin Wright. Stuart, 72–73.

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\textbf{Certificate of Excellence}
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The American Institute of Graphic Arts conducted a competition during the past year in which the artistic merit of 562 magazines was judged. Of these, fifty-three were selected for exhibition in the 1950 Magazine Show and were awarded Certificates of Excellence. Among them were such publications as \textit{Life, Vogue, Fortune, Holiday} and \textit{Reader's Digest}. Journals of learned societies were not prominent on the list of those periodicals which competed successfully, and it is therefore a matter of special satisfaction to this Society that its quarterly, \textit{The Pennsylvania Magazine of History and Biography}, was one of the magazines singled out for the Institute's award and exhibit.