

THE MANUFACTURE OF PENCILS



"If you want the big picture stare at all the little pictures. Think small or don't think at all."
— Austin Meredith



Austin Meredith

READING

PAPER

INK

THE BOOK

THE PRESS

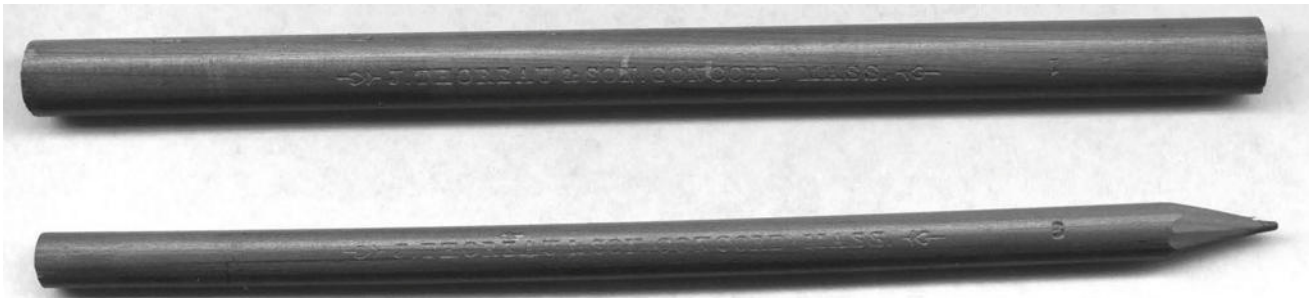
THE PENCIL


A WEEK: What, after all, does the practicalness of life amount to? The things immediate to be done are very trivial. I could postpone them all to hear this locust sing. The most glorious fact in my experience is not anything that I have done or may hope to do, but a transient thought, or vision, or dream, which I have had. I would give all the wealth of the world, and all the deeds of all the heroes, for one true vision. But how can I communicate with the gods who am a pencil-maker on the earth, and not be insane?

PENCILS

PENCILS

Be aware that the Thoreau family business was not simply the manufacture of [pencils](#).





Although they turned their hand to many things, such as the manufacture of sandpaper and glass paper, basically the manufacturing part of this family's business arose out of the processing for sale of a deposit of very pure graphite discovered by their relative [Charles Jones Dunbar](#) in New Hampshire in 1821.  They processed this graphite in any way that would prepare it for a market: for instance, they manufactured plates for the carbon batteries of the day. The grinding of the graphite was done by water power in the mills at the



waterfalls of the Assabet in Acton. Uncle Charles had filed this mineral claim for only seven years, and the family needed to get the best of the graphite out of the earth and utilized before the seven years were expired (1828?). Then, after their own source of graphite was gone, in order to continue this line of work they had learned, they would procure good quality Canadian graphite on the open market.



They produced black lead art pencils, and red and blue to complete their "line," in various hardnesses, and managed to make them the equal of those produced in Germany by Faber, and in London by Rhodes, and by Beekman & Langdon. [Henry Thoreau](#) found a way to grind the plumbago mixture much finer by allowing only the finest particles to drift upward on an air current. The powder was mixed with the finest clays of Bavaria to produce pencils that could wholesale at \$6.⁰⁰ the gross and then retail for \$0.⁷⁵ the dozen or, sometimes, \$0.²⁵ each. Various members of the family made trips around New England to solicit bulk orders.

There has been suspicion that the family's poor pulmonary health was exacerbated by this constant environment of plumbago — for guests noted that everything in their home was covered with the drift of fine black dust. The cottage manufacture of pencils became more and more competitive and, upon the invention of the high-speed rotary printing press in 1847,  Thoreau gradually shifted the family business into the grinding of the exceedingly fine [graphite](#) powders such state-of-the-art machines used in place of fluid [ink](#). He sold these powders in bulk by confidential contract and relied on industrial secrecy and on the highest standards of quality and customer service to maintain high wholesale prices (rather than trusting to patents, which in effect would merely have spread the word about his new manufacturing techniques and mix ingredients). At first he was able to get \$10.⁰⁰ per pound for his fine electrotyping powders, and was selling 600 pounds a year. As time went on he had to cut his price to \$8.⁰⁰, then to \$5.⁰⁰, then to \$2.⁰⁰ per pound, but since the size of the market kept increasing the family annual income continued to increase as well. By 1853  the family was no longer bothering to make pencils in the sheds behind the house, the sheds that eventually would burn down. Among the other things Henry was, such as “poet/naturalist,” he was an exceedingly competent industrial engineer/marketing planner/sales representative.

There may have been a relatively minor health impact to this work. The Internet supplies the following info:

Toxicological Information on graphite: Graphite dust causes benign pneumoconiosis (graphitosis). Symptoms of pneumoconiosis from graphite dust exposure are dyspnea, coughing, black sputum, bronchitis, ventricular hypertrophy and impairment of pulmonary function. X-rays will show progressive nodulation of the lungs. The threshold limit value was set in conformity with the limit for free crystalline silica, which may be present in graphite. Symptoms: Coughing, forceful expiration. Dyspnea, difficulty in breathing. Black sputum, black colored expectorate. Bronchitis, inflamed bronchial mucous membranes, pulmonary fibrosis, fibrous tissue involving lungs. Pneumoconiosis, degenerative respiratory disease.

GRAPHITE MATERIALS

Coal worker's pneumoconiosis — This form of pneumoconiosis is caused by the inhalation of carbon particles from coal, graphite, lamp black or carbon black. It most often affects those who mine, process or ship coal; graphite miners; and workers who manufacture synthetic graphite, lamp black or carbon black. Like silicosis, coal worker's pneumoconiosis can cause significant fibrosis, primarily in miners who have worked for decades without respiratory protection.

COAL PNEUMOCONIOSIS

20 BCE

Philip of Thessalonica, a poet, mentioned the use of writing tools fashioned of lead in disc shaped pieces. The small lead disc used by the [Romans](#) to rule guidelines on papyrus and to rule lines for cutting onto stone blocks may have been responsible for the error that caused to identifying our familiar core as the [pencil](#)'s “lead.”





PENCILS

PENCILS

1500

Graphite was found on the side of Seathwaite Fell in Borrowdale, near Keswick. The name given locally to the mineral was “wad.” The initial uses of “wad” were in the marking of sheep, and in the creation of molds for the casting of cannonballs. It was considered so valuable as a war material, therefore, that stealing it, or receiving it as stolen goods, was a crime punishable by hard labor, or transportation. During this century black-lead [pencils](#) would be coming into use in England. They would, however, at least during this early period, look nothing at all like this:



PENCILS

PENCILS

1564

[Conrad Gesner](#), the 1st chap to draw a picture of a [pencil](#), was in this year granted a title of nobility, and became Conrad von Gesner.¹



[Graphite](#) came to be used as a marker, when the purest deposit ever found was revealed near Borrowdale, in Cumberland in the Lake District of north-western England, when an oak fell during a storm. Shepherds found the rough chunks useful to mark their flocks, but the material was messy to handle. That problem would be addressed by cutting the material into small square-cornered sticks and wrapping them in string to make them easier to hold, and then people would begin to glue the graphite sticks into grooves cut in small wands of wood. The material would be referred to as “plumbago” (imitation lead). The first handmade [pencils](#), in the form that we know today are the “*Crayons d’Angleterre*,” would be made from Borrowdale graphite.



1. Shades of Escher! —One may suppose that Von Gesner may have used a pencil at least to create the 1st draft of this woodcut (which has above been enhanced somewhat, for purposes of clarity).

Among the users of the pencil would be a chap name of [William Shakespeare](#) who would be known on occasion to scribble quickly in order to pay the rent. In this year, we suspect, he was born. For some time he wouldn't look very much like this, if he ever looked like this at all (the representation is fanciful, and based upon approximately nothing):



We have about five hard facts about Shakespeare's life, such as that he rented his London room from a [Huguenot](#) — which means that there are only about a couple of facts left after this. But who's counting?

1565

In *DE OMNI RERUM FOSSILIIUM GENERE, GEMMIS, LAPIDIBUS, METALLIS, ET HUIUSMODI...* (TREATISE ON FOSSILS), [Conrad von Gesner](#) of [Zürich](#) provided us with the earliest surviving description of a [pencil](#), accompanied with a woodcut prepared by himself, depicting a wooden tube holding a piece of [graphite](#).



Since the object derived its name from Middle English and Middle French words meaning “brush,” it was presumably of a round cross-section. Some scholars believe [William Shakespeare](#) did considerable play drafting with a “Gesner pencil” — although of course not while he was “Shakespeare in Love” on camera stage center with a considerably more photogenic inky quill.

Sweden began its own [papermaking](#), at Norrström.

1633

Having studied medicine at various Continental universities such as the ones at Montpellier, Padua, and Leiden, [Thomas Browne](#) received the degree of Doctor in Physick.

When a couple of white men from [Plymouth](#) saw some native Americans near Sturbridge, they observed that their faces had been painted with a ground black powder mixed with oil.



Of course, the white men needed to find out where the red men had mined that sort of rock!



PLUMBAGO

1638

→ The 1st printing press of the North American colonies was brought from England and set up in Cambridge, in the Massachusetts Bay colony, in the charge of Stephen Daye, and the whites began mining [graphite](#) near Sturbridge.



Was this graphite intended for making [ink](#) for their new printing press? I don't know the answer to that question, but one thing I do know is that the initial product of this press, the BOOK OF PSALMES, now better known as the BAY PSALM BOOK, was an exceedingly poor specimen of the printing craft. —But we have nothing to indicate that either Daye or his successor Samuel Green attempted to make their own ink rather than bringing it over with the press equipment from England.

HISTORY OF
THE PRESS

1662

Some pencils of this period are believed to have been octagonal in case cross-section, with a square lead. Because graphite was hard to obtain, we should not presume without evidence that the graphite in such wooden pencil cases extended the full length of the pencils. In this year Friedrich Staedtler opened a [pencil](#) shop in Nurnberg.



Here's a sharp photo of a carpenter's pencil, found while they were working on a 17th-Century roof:



1765

In the village of Stein near Nurnberg, [pencils](#) were manufactured and commercially marketed for the first time, by Kasper Faber. He bound the [graphite](#) with Bavarian clay and encased it in wood, and his descendants are still manufacturing pencils in Nurnberg as well as near Wilks-Barre, Pennsylvania.



1770

Edward Nairne (1726-September 1, 1806) began to sell eraser squares in his shop, that he referred to as “rubbers.” Previously, if one had wanted to clean up some graphite pencil marks, one might have rubbed at them with a mashed-up lump of bread. In these days before the development of vulcanization in 1839, these eraser squares to lift off pencil marks, known as “rubbers,” had an unfortunate tendency to decompose. No-one would think to attach such an object to the blunt end of a [pencil](#), until 1858.



1779

Karl Wilhelm Scheele determined that “[plumbago](#)” was a form of carbon rather than of lead. A decade later, Abraham Gottlob Werner would be sponsoring a renaming of this substance, suggesting the term “[graphite](#)” be used, as a coinage from the Greek word for writing.²




2. Scheele discovered a number of things. A case could be made that he discovered oxygen. Unfortunately, a case could also be made that he discovered mercury to be a deadly poison.

1789

It had been recognized a decade earlier that “[plumbago](#),” although it could be used for marking in the manner in which an edge of lead had previously been used (for instance, by the Romans in the marking of stone), actually was a form of carbon. Abraham Gottlob Werner therefore sponsored a renaming of this substance, suggesting the term “[graphite](#)” as a coinage from the Greek word for writing.



1790

A news item relating to the development of ELECTRIC  WALDEN technology:

ELECTRIC
WALDEN

- William Nicholson invented the rubber [ink](#) roller which would make it feasible to mechanize presswork (it would make possible for instance the cylinder press).



"Among all the manufactures which -for the mental and mechanical skill required in their prosecution, the remarkable steps by which they have attained their present rank, and the influence which they exert on society generally- claim our attention and admiration, none perhaps is more striking than the **manufacture of a book.**"



— George Dodd's DAYS AT THE FACTORIES

HISTORY OF
THE BOOK

HISTORY OF
THE PRESS

During the first half of this decade the artist and experimenter Nicolas-Jacques Conté of France and the potter Joseph Hardtmuth of Austria would be developing the expertise to produce wood-encased [pencils](#) to compete with those manufactured near Nurnberg by Kasper Faber.



1795



It would have been in approximately this year that Nicolas-Jacques Conté developed what we now know as the Conté Process, which regulated the hardness of the [graphite](#) in a pencil by finely powdering the mineral as mined and then mixing it with finely ground clay particles and shaping and baking that mixture. A mixture of clay and graphite was fired before it was put in a wooden case. The pencils he made were cylindrical with a slot. The square lead was glued into the slot and a thin strip of wood was used to fill the rest of the slot. The proximate cause for this grinding and mixing had been war, for during the hostilities between Britain and France of the 1790s the very pure graphite mined by England in its Cumberland district had become unavailable in France, necessitating a technique for processing lower-quality graphite to remove impurities. Graphite would continue to be mined in, among other places, New England and Ontario, until about 1918, when, since it was crushed to a powder anyway, the block mineral form would be replaced by a cheaper powder produced from petroleum coke. By controlling the ratio of clay to graphite this chemist was able to obtain fairly consistent degrees of hardness, that were reproducible from batch to batch. Conté made his earliest pencils in at least four hardnesses and coined a numerical grading designation, 1 being hardest and 4

PENCILS

PENCILS

softest. As the Conté process would come to be used by other pencil makers, similar grading systems would be used by them as well. However, such grading scales would be inconsistent from one pencil maker to another. In the early 19th Century, English pencil makers would use a letter designation, the harder pencils being designated “H” (hard) and the softer “B” (black). Different schemes were used to expand the range of grades, such as “BB” and “BBB” for successively softer versus “HH” and “HHH” for successively harder pencil cores. By the beginning of the 20th Century, a combination letter/number system would be established and in use by nearly all European pencil makers, and also by some American pencil makers. This system is still in use and provides for a wide range of grades, usually consisting of the series: 9H, 8H, ... , 2H, H, F, HB, B, 2B, ... , 8B, 9B where 9H is the hardest, useless except in drafting, and 9B the softest, useless except in art. At the same time a number-only system is in use, particularly in the US:

- #1 B
- #2 HB
- #2½ F
- #3 H
- #4 2H

The common #2 or HB grade pencil at midrange is preferred for general purpose writing. Harder pencils are most often used for drafting, softer for artwork. American-made pencils can often be found with numerically equivalent designations of 2½, 2⁴/₈, 2⁵/₁₀, and 2.5, representing the same grade, but introduced by different manufacturers to distinguish their products and avoid patent lawsuits.



1799

Prior to the turn of the century a young [Concord](#) woman was making [pencils](#) by hand, out of elder twigs, by poking out the pith with a knitting needle and then ramming a mixture of ground [graphite](#) and gum arabic or glue into the hollow tube. We may learn somewhat about such early pencil-making from a short essay which Horace Rice Hosmer would prepare, in about 1880, for [Leffel's Illustrated News](#) of New-York:



[T]here was a school for young ladies ... in Medford, and one of the pupils ... from [Concord](#) ... learned to utilize the bits and ends of Borrowdale lead used in drawing, by pounding them fine and mixing a solution of gum arabic or glue. The cases were made from twigs of elder, the pith being removed with a knitting needle.... [T]he writer [Horace Rice Hosmer], then [circa 1840] a boy of ten years, helped the same lady to make similar pencils from [plumbago](#) and English red chalk.... H. David Hubbard, living in the north part of Concord, made the first cedar wood [pencils](#) for the New England trade; but they were of little value, and but few of them were manufactured. In 1812 William Monroe, a cabinet maker by trade, pounded some plumbago with a hammer, mixed it in a spoon with some adhesive substance, and filled the compound into some cedar wood cases. Some of these pencils were shown to Benjamin Andrews of Boston, who was ready to buy, and encouraged Munroe to make more of them. Twelve days after he carried five gross, which were readily taken and paid for, and a new industry



PENCILS

PENCILS

was fairly started. Munroe ... made the "water cement" or paste lead which was filled into the grooves in a soft state, and after remaining a week or more the surface of the pencil slab was planed to remove the composition which adhered to it, and to leave a clean surface for gluing on a veneer of cedar. The pencil slab was about 1/4 inch thick, and the veneer 1/8 inch and of varying widths from 4 to 10 pencils wide.... Eben Wood of Acton worked with Munroe in Concord, when all the work was done by hand. The logs of cedar were cut into slabs and veneers with a "two-handed saw," by two men; planed by hand to a thickness, grooved with the spur plane or plough, one groove at a time, and so on through all the different processes.... Eben Wood ... saw a tool for cutting the points of shoe pegs, and by applying the principle of the circular saw soon had a grooving machine which would cut six grooves at a time.... A moulding and trimming machine soon followed; then a wedge glue press, holding 12 gross pencils took the place of the hand screws which Munroe used.... His machine for trimming the ends of pencils ... is in use at the time of writing this article [circa 1880].... He made the hexagon and octagon shape cases, halving them together, with similar shaped grooves for the dame.



1803

➡ May 12, Thursday: The Peace of Amiens ended and war was renewed between Britain and France. The period known as “the Napoleonic Wars” began. It was a carefully guarded military secret that munitions makers were using graphite as a mold lining for the casting of cannonballs, and in addition the British government would take the exceptional step of embargoing the sale to France of bulk [graphite](#) — and in addition, of [pencils](#).





PENCILS

PENCILS

1812



July 2, Thursday: While in Prague, [Ludwig van Beethoven](#) visited Prince Kinsky and was assured that his stipend at the new value will be coming soon. He received an advance of 60 ducats.

William Monroe, a young cabinetmaker of [Concord](#) whose business was not doing well due to the war, working in a shop which previously had been used by Andrew Edwards for the manufacture of organs, had the inspiration to develop a technique for the manufacture of pencil bodies. He had cut Eastern red cedarwood into slabs, had planed the slabs to a uniform 8th-inch thickness, and had made 6 grooves at a time in the slabs with a water-powered grinder. Into the grooves he had rubbed a pasty mixture of ground [graphite](#) and fillers. He did not fire his paste, but allow it to dry. Gluing another slab on top of this had created a block of 4 to 10 [pencils](#) which could be sawed apart with other water-powered machinery. These were the 1st pencils manufactured in America, and were 3/8th inch thick, and came in either octagonal or hexagonal cross-section. According to Albert Lane's CONCORD AUTHORS AT HOME, on this date William was able to take his 1st sample of about 30 pencils of local manufacture into Boston and wholesale them to a hardware dealer on Union Street, Benjamin Andrews, and make a contract with this merchant to accept all he could manufacture for a given period of time. For Monroe, the perfection of this pencil-making machinery would be the labor of a decade. At one point during his childhood [Henry Thoreau](#) would labor in this Monroe factory, which would be manufacturing pencils until like 1833.



[T]here was a school for young ladies ... in Medford, and one of the pupils ... from [Concord](#) ... learned to utilize the bits and ends of Borrowdale lead used in drawing, by pounding them fine and mixing a solution of gum arabic or glue. The cases were made from twigs of elder, the pith being removed with a knitting needle.... [T]he writer [Horace Rice Hosmer], then [circa 1840] a boy of ten years, helped the same lady to make similar pencils from [plumbago](#) and English red chalk.... H. David Hubbard, living in the north part of Concord, made the first cedar wood [pencils](#) for the New England trade; but they were of little value, and but few of them were manufactured. In 1812 William Monroe, a cabinet maker by trade, pounded some plumbago with a hammer, mixed it in a spoon with some adhesive substance, and filled the compound into some cedar wood cases. Some of these pencils were shown to Benjamin Andrews of Boston, who was ready to buy, and encouraged Munroe to make more of them. Twelve days after he carried five gross, which were readily taken and paid for, and a new industry was fairly started. Munroe ... made the "water cement" or paste lead which was filled into the grooves in a soft state, and after remaining a week or more the surface of the pencil slab was planed to remove the composition which adhered to it, and to leave a clean surface for gluing on a veneer of cedar. The pencil slab was about 1/4 inch thick, and the veneer 1/8 inch and of varying widths from 4 to 10 pencils wide.... Eben Wood of Acton worked with Munroe in Concord, when all the work was done by hand. The logs of cedar were cut into slabs and veneers with a "two-handed saw," by two men; planed by hand to a thickness, grooved with the spur plane or plough, one groove at a time, and so on through all the different processes.... Eben Wood ... saw a tool for cutting the points of shoe



PENCILS

PENCILS

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1814



Codification of the doctrinal terms for admission to the “Church of [Harvard University](#),” that is, the tests of faith required of any graduating Senior seeking admission to the program of [Harvard Divinity School](#). Henceforth, on the “Form of Admission,” one would have to declare one’s “faith” in Jesus Christ. Not only that, but one would have to declare that one accepted “his religion” (he evidently worshiped himself) and “his laws,” and accepted them without any reservation whatever. Furthermore, one had to believe in the doctrine of salvation, and one would be forced to declare an “earnest desire to obtain the salvation proposed in the Gospel.” It was not enough to run the gantlet and jump through the hoop, you had to be salivating to be allowed to run the gantlet and salivating to be allowed to jump through the hoop. Beyond that, the matriculating student would need to acknowledge his (gender term used deliberately) “humble and grateful reliance on God for the pardon of sin,” of course, and pledge to seek “the riches of divine favour” in our Lord Jesus Christ (be sure to observe all capitalization conventions). Now, when I was in college in the 1950s, in order to graduate one had to pledge allegiance to the flag of the United States of America and to the country for which it stands, and sign a loyalty oath and place it on file in the appropriate repository, and declare that one was not then nor had one ever been a member of the Communist Party or any group considered by the Attorney General of the United States of America to be affiliated with said Communist Party, but that was nothing so intrusive as this must have been! I was able to joke with these people, saying things like “Look, no commie would have any problem signing this stuff, you know that don’t you?” But suppose that in 1837 a student had overlooked to capitalize the word “Lord,” would that have been understood as an oversight or would it have been considered to be prime evidence of an attitude problem?

So we need not ask ourselves why it was that [Henry Thoreau](#) did not go on to divinity school. He didn’t need to. Cambridge was full of young gents who had no alternative but to put up with this sort of happy horse shit, but Thoreau was not of the gent class. He had come from a local family with a solid and independent financial footing in a peasant cottage craft, the fashioning of quality pencils of [graphite](#) and cedarwood, and this gave him a better choice that was available to young gentlemen in suits who could not expect to make a decent living by any skill of their own hands. We need not condemn them for demeaning themselves with these pledges, but then, besides that, we need not wonder that Thoreau chose to avoid such pledges. Simply, he could.

1821

 [Charles Jones Dunbar](#) discovered a superior source of [graphite](#) near Bristol in New Hampshire and filed a mineral claim.



However, some legal details would limit the mineral lease to seven years, and they would need to move all the ore they could as quickly as they could. Deciding to send this stuff to market as [pencils](#),³ he and Cyrus Stow of Concord would team up as Dunbar & Stow and would invite John Thoreau, Sr. to join them in 1823. Stow, and shortly afterward Dunbar, would for unknown reasons drop out of this manufacturing effort, and their firm would be reborn as the famous John Thoreau & Company. Either the Dunbar supply was more suitable than the supply available to the Salem pencilmakers, Mr. and Mrs. Joseph Dixon, or the Thoreaus would be better at improving the process, for these high-quality Thoreau pencils, unlike the Dixon ones, would be saleable without bogus foreign labels. By 1824 the Thoreau pencils would be even of sufficient quality to achieve special notice at an exhibition of the Massachusetts Agricultural Society. Per the New England Farmer, “the Lead Pencils exhibited by J. Thorough [sic] & Co, were superiour [sic] to any specimens exhibited in past years.”



3. The mineral “graphite” is formed by the metamorphosis of carbonaceous sediments, and by the reaction of carbon compounds with hydrothermal solutions or magmatic fluids, or possibly by the crystallization of magmatic carbon. It consists of layered sheets of carbon-ring molecules, one atom thick. It is named in allusion to its use in writing: because these sheets are disconnected from each other, they shear readily when rubbed onto a rough surface, and, because carbon is black and insoluble, they leave a dark smear on paper. Graphite came to be used as a marker in 1564, when the purest deposit ever found was discovered in Cumberland, England. At first it was used in chunks, then the chunks were cut into small square-cornered sticks, then the sticks were wrapped in string to make it easier to hold them, then people began to glue the graphite sticks into grooves cut in small wands of wood. In 1795 a French chemist developed a way to economize the use of [graphite](#) by grinding it, mixing it with clay, and firing it in a kiln. It was mined in, among other places, New England and Ontario, until about 1918, when, since it was crushed to a powder anyway, the block mineral form was replaced by a cheaper powder produced from petroleum coke. The first American [pencils](#) were made in 1812. The wood used at the time was Eastern red cedar, although other species had to be found as that tree became over-exploited.



PENCILS

PENCILS

Brad Dean has located the following passage pertaining to this discovery, in *COLLECTIONS, HISTORICAL AND MISCELLANEOUS: AND MONTHLY LITERARY JOURNAL...* edited by John Farmer (!) and Jacob P. Moore (Concord NH: Jacob B. Moore, 1823), Volume II, pages 30-31:

Plumbago, or Graphite.-This article has lately been discovered in the towns of Bristol and Francestown in this state. In Bristol, it has been found of superior excellence, and is said to be very abundant. By the politeness of Mr. Charles S. Dunbar, the proprietor of the land which contains it, the editors have been furnished with several specimens, one of which, they sent to Dr. Mitchell of New-York, who, in a communication on the subject, speaks as follows:

Your specimen of Plumbago was cordially received. I set a value upon it, by reason of the native and Fredonian in source whence it came, and on account of its own apparent worth and excellence.

It is pleasing to find our landed proprietors inquiring somewhat below the surface, for the good things contained in the grants they received by superficial measurement. When they shall go deep into the matter, they will learn the importance of the French maxim, *approfondessez*, which, you know, means, go to the bottom of the subject. I trust the time is approaching when the purchaser of lands will require not merely a geometrical description, but a geological one; whereby the purchaser shall know that he gets so many acres free and clear; and moreover, such and so many strata nice and proper.

I congratulate you on the discovery of such a treasure in our country. Much is due to the Mines that supply us with pencils and crucibles.

Specimens have been furnished Professor Dana, of Dartmouth College, things equal to the celebrated Borrowdale ore. That which has been discovered in Francestown is said to be of good quality. We are not informed whether it exists in large or small quantities. There has always been found in the south part of Francestown, near Lewis's mills, some beautiful specimens of Rock Crystal.

1822



December 6, Friday: Production began at the 1st large-scale [pencil](#) factory in the US, one created by John Eberhard.



PENCILS

PENCILS

1824



“John Thoreau & Son” entered upon the manufacture of [pencils](#).



From Thoreau’s later journal, the phrase “father’s mill used to be located” indicates that at one point in time, the Thoreau family pencil business had been large enough to sustain its own little sawmill up in the Esterbrook Country of [Concord](#). It was at the site of a small wooded pond, where there had evidently at that time been a mill and where enough water power to turn a saw was available to prepare the cedar strips for the pencils. By the time Henry would be an adult, going on his walks, [John Thoreau, Senior](#)’s sawmill had become nothing but a ruin. Here is a current photograph and an old photograph:



The Thoreaus were renting a brick house at the corner of Main Street and Walden Street in [Concord](#) (the Parkman “Brick House” is not the one in the center of this photo):

PENCILS

PENCILS



PENCILS

PENCILS



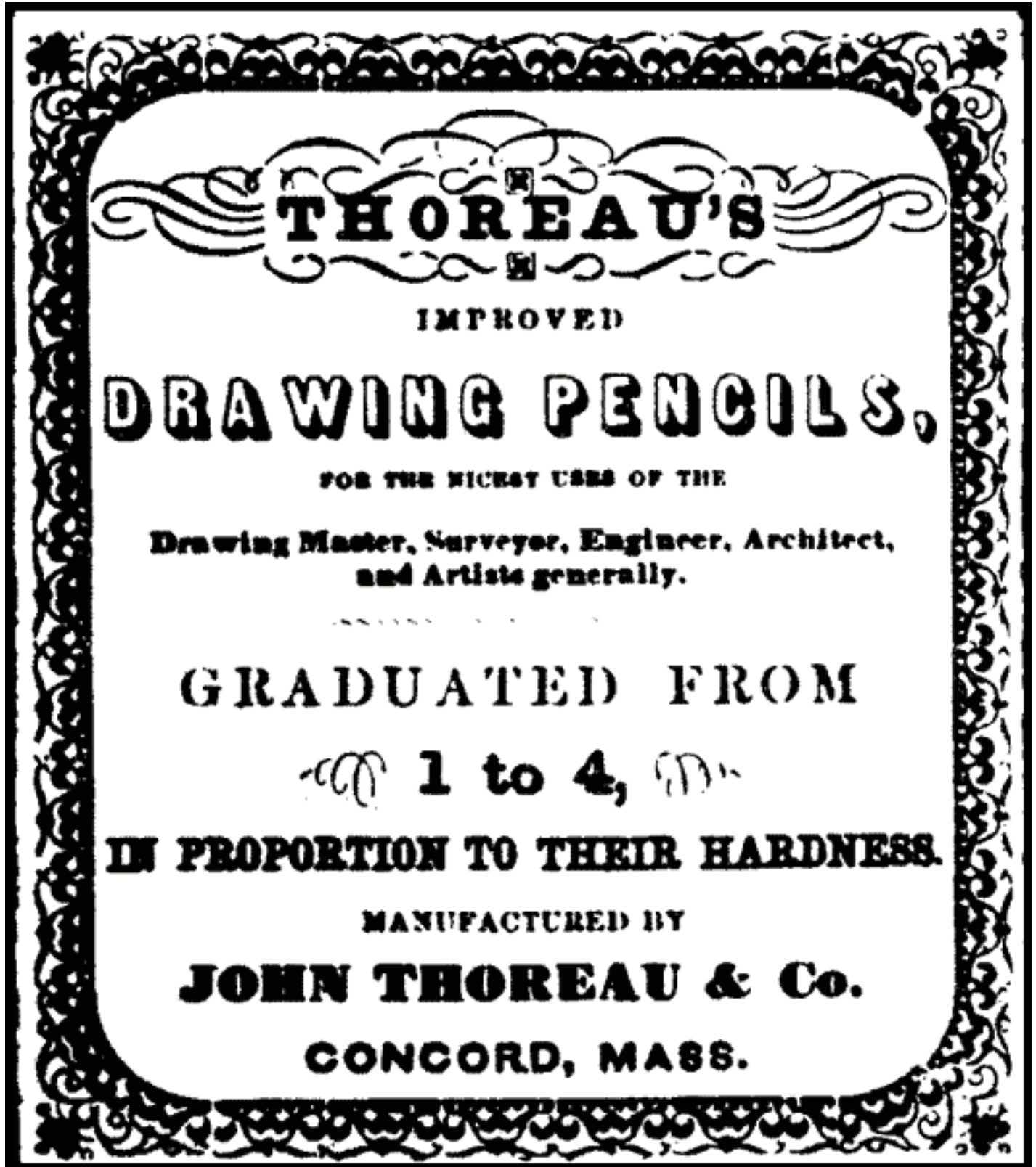


PENCILS

PENCILS

PENCILS

PENCILS



1827

During this year a mechanical pencil was being advertised in a London publication. The advertisement characterized it as a “propelling pencil.”



In Salem MA, Mr. and Mrs. Joseph Dixon began the manufacture of items related to carbon ([pencils](#), stove polish, and lubricants) in their home. Thoreau’s eventual involvement with pencil engineering is traceable, through his father, to Dixon. Although Dixon had had a meager education (the name of the town of manufacture on the case for his pencils was, for instance, printed as “Slem”!), early in life he had been able to devise a machine for cutting files. When he took up printing, lacking funds for metal type for a time he carved his own type out of wood. When he began to melt type metal in Salem, he experimented with the creation of crucibles of graphite. He used this supply of [graphite](#) also to manufacture stove polish and pencils. However, when Dixon tried to peddle pencils of American manufacture in Boston, he was told that to offer them as of high quality he would need to place foreign labels on them. He ceased making pencils for the time being, but apparently not before [John Thoreau, Senior](#) had learned from him the rudiments of pencil making. There is little to indicate that in the 1820s any Americans were aware of the French process for pencil making. From a friend who was a chemist, Francis Peabody, Dixon may have learned of Conté’s use of clay in French pencil leads, but we don’t know that he experimented with such a process. While the Thoreaus may in turn have learned that mixing clay with the graphite could make a better pencil, they also would need to develop the process through experimentation.

(In later years the Dixons of Salem would relocate their enterprise to Jersey City NJ and develop a machine that could produce 132 pencils a minute. The Dixon factory would become the 1st fullscale pencil factory in the United States.)



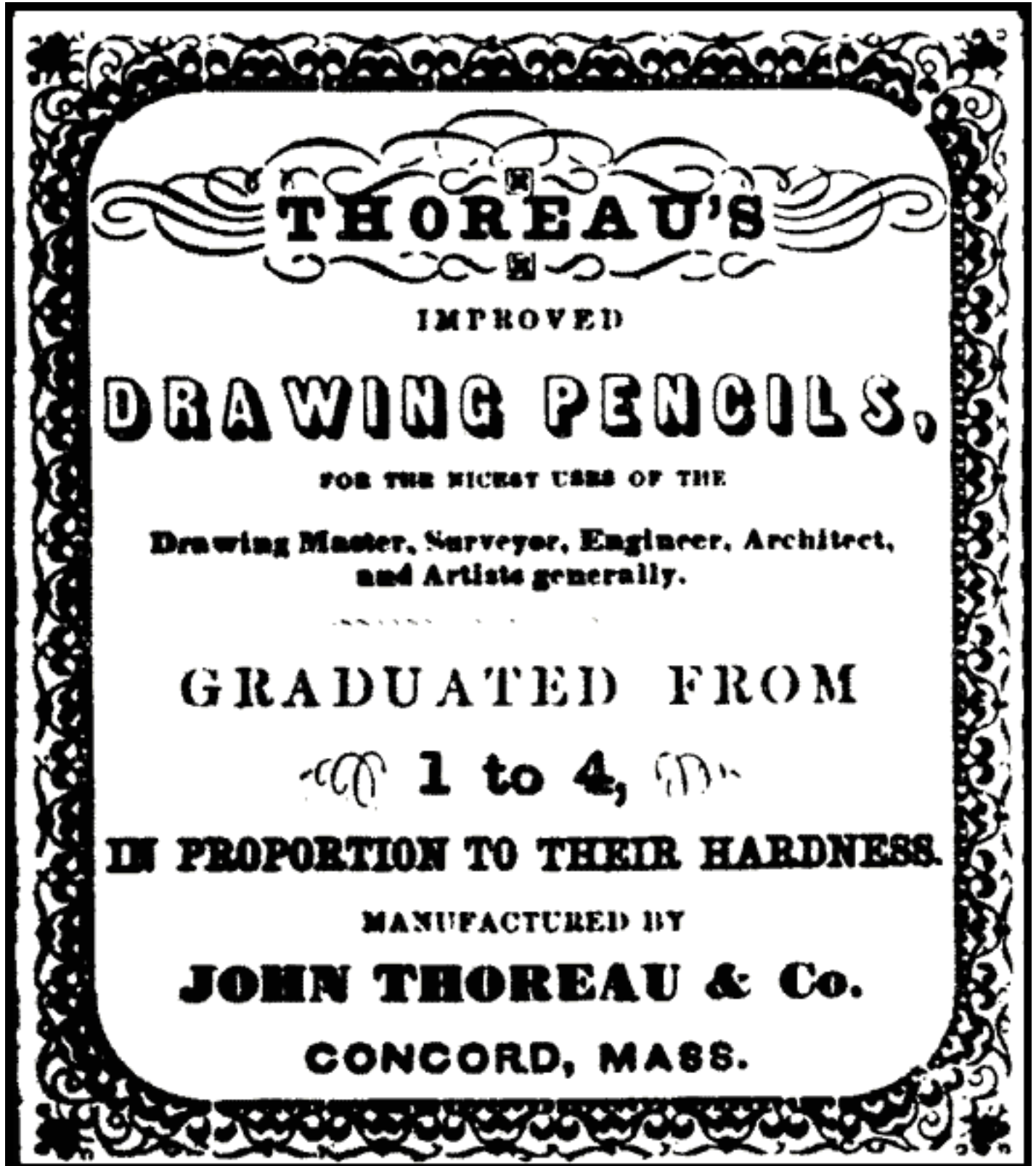
1828

➡ It would have been at about this point in time that the 7-year claim which [Charles Jones Dunbar](#) had made on the [graphite](#) deposit which he had discovered near Bristol in New Hampshire in 1821 ➡ would have expired. After this point the Thoreau family would need to begin purchasing this raw material on the open market.



PENCILS

PENCILS



THOREAU'S
IMPROVED
DRAWING PENCILS,
FOR THE NICEST USES OF THE
Drawing Master, Surveyor, Engineer, Architect,
and Artists generally.
GRADUATED FROM
1 to 4,
IN PROPORTION TO THEIR HARDNESS.
MANUFACTURED BY
JOHN THOREAU & Co.
CONCORD, MASS.



PENCILS

PENCILS

1830



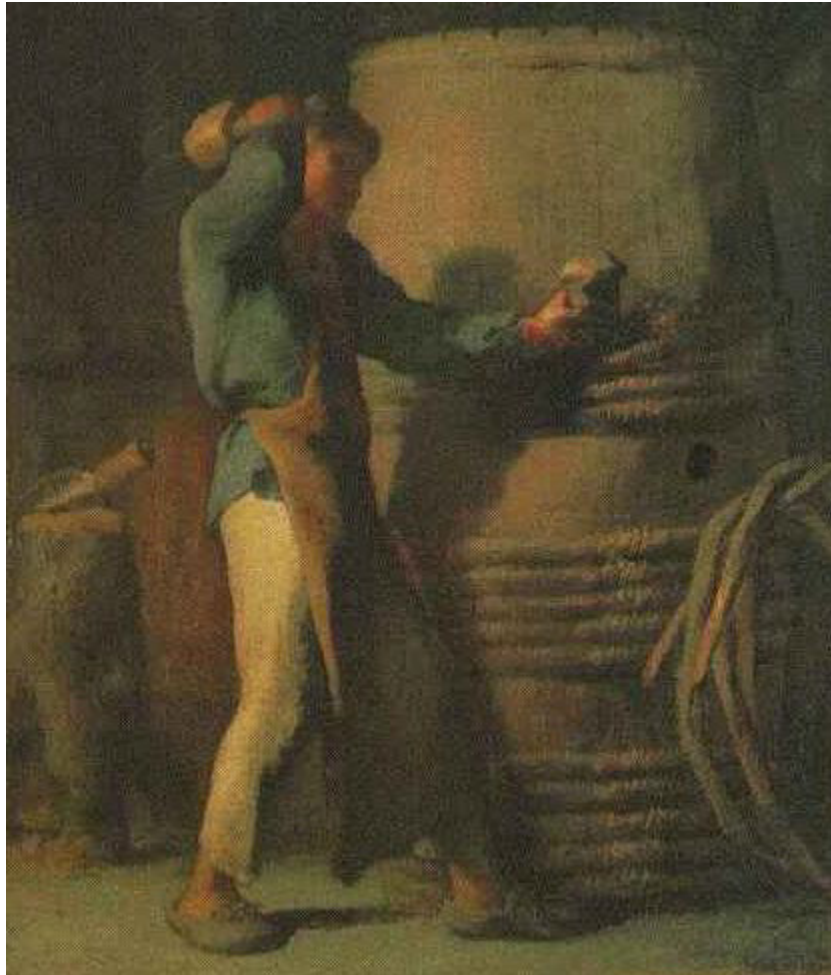
Having completed his studies at the Harvard medical school, Edward Jarvis began medical practice, in Northfield. His practice would not do well and in periods between patients he would walk the woods. He gave lectures on “vegetable physiology and natural history” at the lyceums in and around Northfield, and delivered minisermos at the Sunday School such as one on “the evidence of design, wisdom, and benevolence manifested in the anatomical structure and physiological operation of the animal organs ... [which] presented ... an extremely interesting proof not only of the skill and love of the Creator, but also of the constancy of this skill and benevolence in sustaining our lives and being here.” (It must have been at least interesting, and perhaps also perplexing, for those attending such a Sunday School class to receive such a minisermos on God’s oversight from a man of accomplishment who had been born with a speech impediment.) A group of young women there became interested in botanizing and according to THE AUTOBIOGRAPHY OF EDWARD JARVIS (1803-1884), published in 1992, under his tutelage “became zealous students, and made excellent progress in the science.” According to his TRADITIONS AND REMINISCENCES OF CONCORD, MASSACHUSETTS 1779-1878, very recently published, despite loss of some enterprises [Concord](#) was during this period continuing as a town of some considerable manufacturing importance because David Loring was beginning the manufacture of lead pipe there (we may recall that [Henry Thoreau](#) would do some contract engineering work on the manufacturing equipment for this plant):

David Loring made lead pipe at the site of Warner’s pail factory [from] about 1830 to after 1847. Nathanael Munroe made 8-day clocks on the dam. He had eight hands [employees] to help him. He removed to [Baltimore](#) about 1818. Lemuel Curtis made time pieces, [and] wall clocks, on the dam. He moved to Burlington about 1820. Benjamin R. Haggard made seaman’s compasses in a building on the spot where Mrs. Barber now (1876) lives. He moved to [Baltimore](#) about 1818. Peter Wheeler exported beef and pork, packed and salted, to the West Indies until his death in May 1813, aged 58. He lived in the house now occupied by Nathan Stow. Andrew Edwards made organs in a shop where William Monroe afterwards made [pencils](#). H. David Hubbard made [pencils](#) previously in an old shop on the north corner of Walden and Heywood streets next east of Mr. [John] Vose’s tan yard. Major James Barrett and Jonathan Hildreth made bellows for family use and sold them in [Boston](#), 1822. Nathan Barrett carried on coopering and sent a large quantity of barrels to Boston and Brighton for the beef and pork packers. Stephen Wood had a tan yard on the mill dam. John Vose had one on Walden St. near Heywood St. next to the pond. Stephen Barrett also on his farm near the Carlisle line.... Mr. Joshua Jones drew wire in his shop by use of the trip hammer wheel. Small rods were drawn through steel plates with holes successively smaller until he reached the desired size. At the same time Mr. Jones made cut nails, cutting [them] by machine from the end of iron plates of proper thickness and width. Then these header pieces were put into a vice with a [indiscipherable] and the upper end pounded by hand and a head made.



PENCILS

PENCILS



PENCILS

PENCILS

This was the year in which [John Thoreau, Senior](#) began to manufacture [pencils](#). —So what was the relationship between this Nathanael Munroe mentioned above as having made 8-day clocks on the dam before relocating to [Baltimore](#), and the William Monroe who was still at this point making pencils in Concord?



At some point during this decade, Eben Wood would begin to grind [plumbago](#) exclusively and routinely for the Thoreau [pencil](#) factory of Concord.

1833

→ The “wad,” of Keswick in England, where high-quality [plumbago](#) had originally been discovered, was by this point in time being pretty much exhausted.

1834

→ In the early 1830s, Thoreau pencils were finding a steady market with or without the family name imprinted, and were threatening William Munroe’s similar local business. With both firms having their plumbago ground at Ebenezer Wood’s mill on the fast-flowing Assabet River, it appears that Munroe had attempted to persuade Wood to stop grinding for Thoreau, and his plot had backfired when Wood, who evidently was making more money from Thoreau, instead stopped grinding for Munroe. The Munroe business had faltered while the Thoreaus were prospering. When [graphite](#) could no longer be obtained from their claim near Bristol, New Hampshire, they continued using ore mined near Sturbridge, Massachusetts, and later, when that had been



exhausted, they would purchase ore mined in Canada. It appears that, by the time he went away to college, [Henry Thoreau](#) would have been quite familiar with the manufacture of pencils, since his family had been making them in the shed behind the house for about a decade. Indeed, in this year when Henry made a trip with father [John Thoreau, Senior](#) to New-York, what they were doing was selling pencils wholesale to the stores

PENCILS

PENCILS

there, and the income would be used in part for Henry's education at Harvard College.

PENCILS



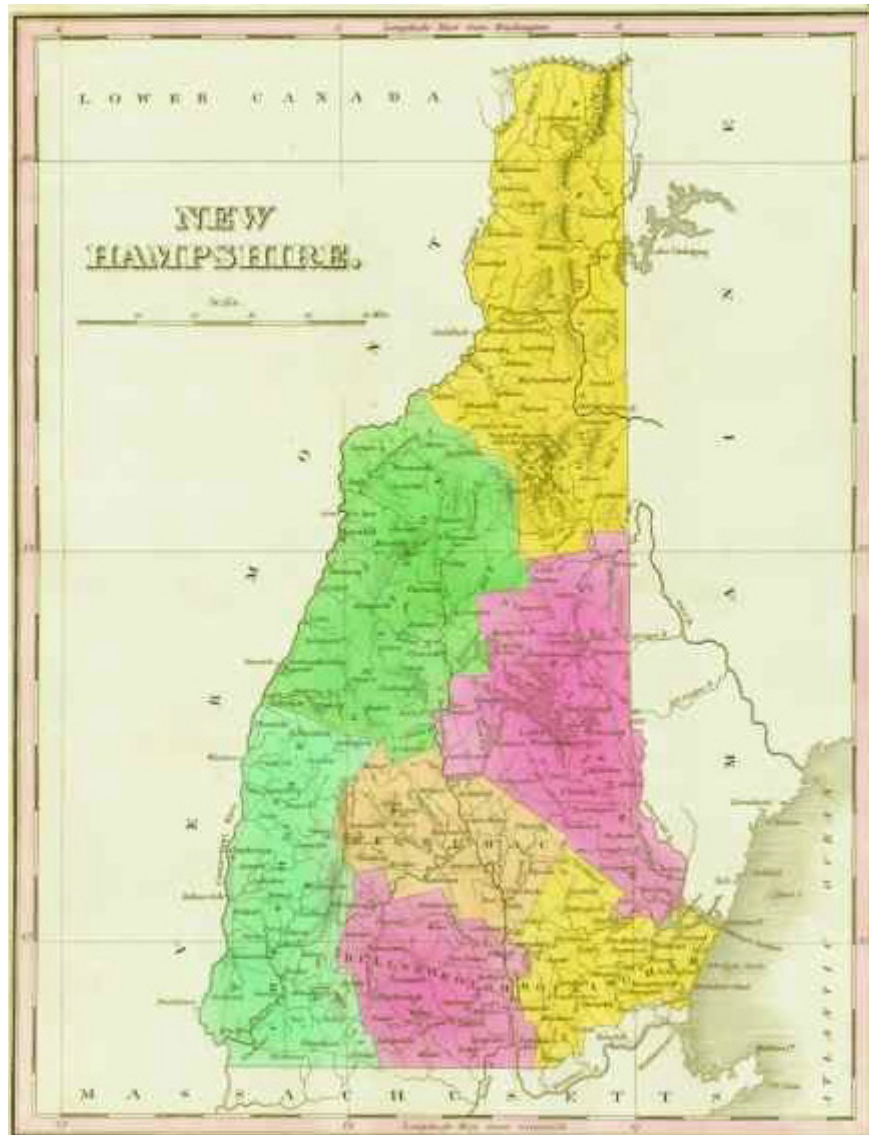
None of the pencils made in America at this time could be manufactured from the pure Borrowdale graphite because as a raw material it was simply not available, and evidently the Conté formula for mixing the graphite powder with clay was either unknown or unperfected outside the European continent, and thus the American offerings would all need to be characterized as “greasy, gritty, brittle, inefficient” products. Users, especially artists and engineers, had always on the lookout for the next piece of grit that would spoil their line or gouge the paper. The Thoreau pencils competed successfully because, in mixing their inadequately purified and inadequately ground [graphite](#) with such substances as glue, in adding a little bayberry wax or spermaceti, and in applying the mixture with a brush while warm to the grooved part of a cedar case and gluing another piece of cedar on top of it, the workers in the pencil shed behind the Thoreau boardinghouse in [Concord](#) were making pencils that were less imperfect than those of their competitors such as Munroe. No American pencils could come anywhere near the quality of the best English or French pencils, but by offering these local pencils at reasonable prices, by the mid-1830s Thoreau & Company had become well established.

This is likely to have been the map of New Hampshire available to the Thoreaus, out of the atlas of Anthony

PENCILS

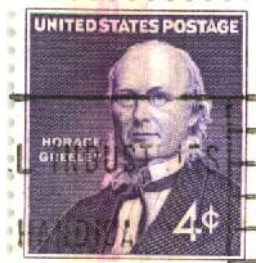
PENCILS

Finley:



1836

➡ On the 1st printed American menu, that of New-York's Delmonico restaurant at 494 Pearl Street, in this year you could order a "hamburger" if you were prepared to pay through the nose for it. A regular beefsteak was \$0.⁰⁴ but if you wanted your meat prepared in the "Hamburger" style, which required extra labor, it would cost the same as roast chicken, \$0.¹⁰. That would have been quite a bit of money for a single dish, as an entire set dinner or "regular dinner" could be had for but \$0.¹².⁴ In this year there would be food riots in New-York. Would [Horace Greeley](#) be indignant? –If so, there's no record remaining of it. There would also be food riots



in [Osaka](#) — and 40% of the city would burn. It seems that in this year new long [pencils](#) costing \$0.⁰³ each (almost as much as a restaurant beefsteak *à la carte*) were considered by school pupils to be of a not insignificant value, so, sometimes, when a schoolteacher decided to award a pencil as a prize, paying for it of course out of his own pittance of a salary, he would cut it into four stubs in order to create more prizes — and back then even such a stub, which today would be considered demeaning, could count among one's pupils as a real prize:



He purchased, for three cents apiece, two long lead pencils –an article of great value in the opinion of the boys of country schools– and he offered them, as prizes, to the boy who would write most carefully; not to the one who should write best, but to the one whose book should exhibit most appearance of effort and care for a week.... The lesson which he learned by the experiment was this, that one or two prizes will not influence the majority of a large school. A few of the boys seemed to think that the pencils were possibly within their reach, and they made vigorous efforts to secure them; but the rest wrote on as before. Thinking it certain that they should be surpassed by the others, they gave up the contest at once in despair. The obvious remedy was to multiply his prizes, so as to bring one of them within the reach of all. He reflected, too, that the real prize, in such a case, is not the value of the pencil, but the honor of the victory; and as the honor of the victory might as well be coupled with an object of less, as well as with one of greater value, the next week he divided his two pencils into quarters, and offered to his pupils eight prizes instead of two. He offered one to every five scholars, as they sat on their benches, and every boy then saw that a reward would certainly come within five of him. His chance, accordingly, instead of being one in

4. To get a sense of what that amounted to in today's money, consult <http://www.measuringworth.com/exchange/>

twenty, became one in five.



Jacob Abbott's THE TEACHER: MORAL INFLUENCES EMPLOYED IN THE INSTRUCTION AND GOVERNMENT OF THE YOUNG had some interesting things to say about pens and pencils.



To call a pen a metal pen was to distinguish it as having a steel nib, by way of contrast with an old-style quill that would need to be continually sharpened and shaped with a penknife:

... it was the old times when quills, instead of steel pens, were universally used. The boys were accustomed to take their places at the appointed hour, and each one would set up his pen in the front of his desk for the teacher to come and mend them. The teacher would accordingly pass around the school-room, mending the pens, from desk to desk, thus enabling the boys, in succession, to begin their task.... Wasted time, blotted books, and fretted tempers were all the results which the system produced. The same teacher afterward acted on a very different principle.... He sat at his table, and the pens of a whole bench were brought to him, and, after being carefully mended, were returned, to be in readiness for the writing hour.

Thus the first difficulty, the loss of time, was obviated.



1838

The 1st Universalist Society of Concord was gathered. (It would be laid down in 1857 when their Reverend went into the business of manufacturing [pencils](#).)



It was at about this point that Thoreau was struggling to come to grips with why it was that the American pencil was so inferior to the European pencil. Since he knew his family's [graphite](#) to be of excellent quality, though apparently not pure enough or not occurring in large enough pieces to be used without being ground and mixed with binding substances as could be done with the Borrowdale graphite ore, Thoreau inferred that the problem must be in the filler materials that were being utilized, or perhaps in the lead-making process. The Thoreaus were still mixing ground graphite, wax, glue, and spermaceti into a paste, and brushing or pouring this while warm and soft into the grooves of their wooden cases. Thoreau hit the books to get some clue as to what was in good European pencil lead mixtures which made possible the "polygrade" pencils, the hardness or softness of which depended upon the proportions of clay and graphite used, or what different process the European pencil manufacturers might be following. It has been offered that the Johann Faber pencil factory of Nürnberg provided the model which Thoreau was trying to emulate, but this is probably not accurate, as we are not sure



PENCILS

PENCILS

that very many pencils marked as produced in Germany were at that time being manufactured by this Conté process. It is true that the Faber family had begun in 1837 to use the Conté process for at least some of their German pencils, but to impress the customer with their quality they were needing to offer these pencils as if they had been produced by a firm “Pannier & Paillard” of Paris.

Thoreau may have been aware that he could obtain fine clay at the Phoenix Crucible Company in Taunton MA or at the New England Glass Company in West Cambridge. He did obtain a good grade of clay from somewhere, and proceeding to experiment with it, he found that while he could immediately produce a harder and blacker pencil lead. This unfortunately did little to solve the problem of grittiness, and so he decided to attempt to correct this fault during the graphite grinding process.

1839

Lothar Faber took over his father's A.W. Faber [pencil](#) factory in Nürnberg, Germany.



1840

To this point only black and vermilion printer's inks had been being manufactured in the USA. Printers who needed other colors would mix their own by grinding dry pigments in boiled linseed oil, or would procure supplies from Germany or England. At this point, however, manufacture of various colored [printing ink](#) began in New-York.

According to a short essay which Horace Rice Hosmer would prepare, in about 1880, on the early making of [pencils](#), for [Leffel's Illustrated News](#) of New-York, during this year at ten years of age he was helping create pencils of sorts in Concord out of [plumbago](#) and English red chalk:



[T]here was a school for young ladies ... in Medford, and one of the pupils ... from [Concord](#) ... learned to utilize the bits and ends of Borrowdale lead used in drawing, by pounding them fine and mixing a solution of gum arabic or glue. The cases were made from twigs of elder, the pith being removed with a knitting needle.... [T]he writer [Horace Rice Hosmer], then [circa 1840] a boy of ten years, helped the same lady to make similar pencils from [plumbago](#) and English red chalk.... H. David Hubbard, living in the north part of Concord, made the first cedar wood [pencils](#) for the New England trade; but they were of little value, and but few of them were manufactured. In 1812 William Monroe, a cabinet maker by trade, pounded some plumbago with a hammer, mixed it in a spoon with some adhesive substance, and filled the compound into some cedar wood cases. Some of these pencils were shown to Benjamin Andrews of Boston, who was ready to buy, and encouraged Munroe to make more of them. Twelve days after he carried

five gross, which were readily taken and paid for, and a new industry was fairly started. Munroe ... made the "water cement" or paste lead which was filled into the grooves in a soft state, and after remaining a week or more the surface of the pencil slab was planed to remove the composition which adhered to it, and to leave a clean surface for gluing on a veneer of cedar. The pencil slab was about 1/4 inch thick, and the veneer 1/8 inch and of varying widths from 4 to 10 pencils wide.... Eben Wood of Acton worked with Munroe in Concord, when all the work was done by hand. The logs of cedar were cut into slabs and veneers with a "two-handed saw," by two men; planed by hand to a thickness, grooved with the spur plane or plough, one groove at a time, and so on through all the different processes.... Eben Wood ... saw a tool for cutting the points of shoe pegs, and by applying the principle of the circular saw soon had a grooving machine which would cut six grooves at a time.... A moulding and trimming machine soon followed; then a wedge glue press, holding 12 gross pencils took the place of the hand screws which Munroe used.... His machine for trimming the ends of pencils ... is in use at the time of writing this article [circa 1880].... He made the hexagon and octagon shape cases, halving them together, with similar shaped grooves for the dame.

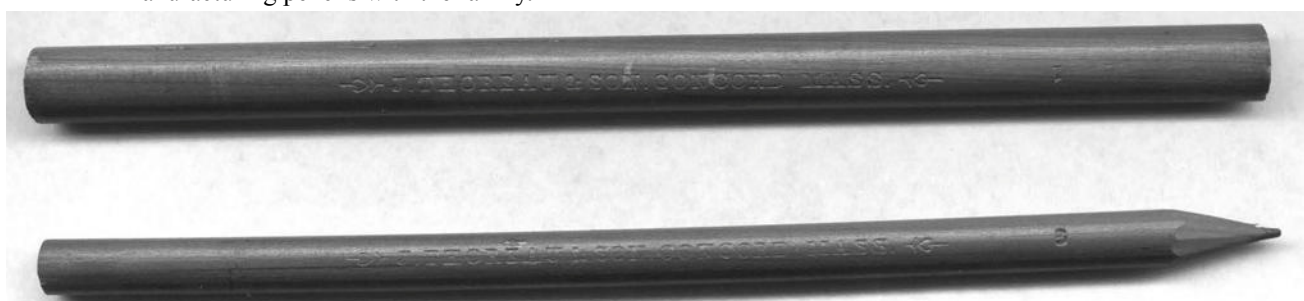


1841

Jön Jakob Berzelius (1779-1848) converted charcoal into [graphite](#), and thus observed two different forms of the same element, or chemical "allotropy."

1847

Thoreau [pencils](#) were very much in demand as a superior writing instrument and in this year the Massachusetts Charitable Mechanic Association awarded them a diploma for excellence. Since [Henry Thoreau](#)'s mother Sophia was taking in boarders for \$0.⁷⁵ per week, about one day's wages, the family could easily presume that Thoreau was holding up his end of it if he spent one day per week in the sheds behind the house, manufacturing pencils with the family.



Be aware that the family business that had been begun by [John Thoreau](#) was not simply the manufacture of [pencils](#). Although they turned their hand to many things, such as the manufacture of sandpaper (which had been invented in 1834) and glass paper, basically the manufacturing part of their business arose out of the processing for sale of a deposit of very pure [graphite](#) discovered by their relative Charles Dunbar.⁵ They processed this graphite in any way that would prepare it for a market: for instance, they manufactured plates for the carbon batteries of the day. The grinding of the graphite was done by water power in the mills at the waterfalls of the Assabet in Acton. Charles had filed this mineral claim for only seven years, and the family needed to get the best of the graphite out of the earth and utilized before the seven years were expired. Then, after their own source of graphite was gone, in order to continue this line of work they had learned, they procured good quality Canadian graphite on the open market.

5. The mineral “graphite” is formed by the metamorphosis of carbonaceous sediments, and by the reaction of carbon compounds with hydrothermal solutions or magmatic fluids, or possibly by the crystallization of magmatic carbon. It consists of layered sheets of carbon-ring molecules, one atom thick. It is named in allusion to its use in writing: because these sheets are disconnected from each other, they shear readily when rubbed onto a rough surface, and, because carbon is black and insoluble, they leave a dark smear on paper. Graphite came to be used as a marker in 1564, when the purest deposit ever found was discovered in Cumberland, England. At first it was used in chunks, then the chunks were cut into small square-cornered sticks, then the sticks were wrapped in string to make it easier to hold them, then people began to glue the [graphite](#) sticks into grooves cut in small wands of wood. In 1795 a French chemist developed a way to economize the use of graphite by grinding it, mixing it with clay, and firing it in a kiln. It was mined in, among other places, New England and Ontario, until about 1918, when, since it was crushed to a powder anyway, the block mineral form was replaced by a cheaper powder produced from petroleum coke. The first American pencils were made in 1812. The wood used at the time was Eastern red cedar, although other species had to be found as that tree became over-exploited.



They produced black lead art [pencils](#), and red and blue to complete their “line,” in various hardnesses, and managed to make them the equal of those produced in Germany by Faber, and in London by Rhodes, and by Beekman & Langdon. Henry developed the first manufacturing method by which the “pencil lead” could be inserted without splitting the wood, and found a way to grind the plumbago mixture much finer by allowing only the finest particles to drift upward on an air current. The powder was mixed with the finest clays of Bavaria to produce pencils that could wholesale at \$6.⁰⁰ the gross and then retail for \$0.⁷⁵ the dozen or, sometimes, \$0.²⁵ each. Various members of the family made trips around New England to solicit bulk orders. There is suspicion that the family’s poor pulmonary health was exacerbated by this constant environment of plumbago - for guests noted that everything in their home was covered with the drift of fine black dust. The cottage manufacture of pencils became more and more competitive and, upon the invention of the high-speed rotary printing press in 1847, [Thoreau](#) gradually shifted the family business into the grinding of the exceedingly fine [graphite](#) powders such state-of-the-art machines used in place of fluid ink. He sold these powders in bulk by confidential contract and relied on industrial secrecy and on the highest standards of quality and customer service to maintain high wholesale prices (instead of trusting to patents, which in effect would merely have spread the word about his new manufacturing techniques and mix ingredients). At first he was able to get \$10.⁰⁰ per pound for his fine electrotyping powders, and he was selling 600 pounds a year. As time went on he had to cut his price to \$8.⁰⁰, then to \$5.⁰⁰, then to \$2.⁰⁰ per pound, but the size of the market kept increasing and the family annual income kept increasing as well. By 1853 the family was no longer bothering to make pencils in the sheds behind the house. Among the other things Henry was, such as “poet/naturalist,” he was an exceedingly competent industrial engineer/marketing planner/sales representative.

September 30, Thursday: [Henry Thoreau](#) responded from Concord to an inquiry about his activities a decade after graduation from Harvard College from Class of 1837 secretary Henry W. Williams, Jr.:

Concord Sept 30th 1847



PENCILS

PENCILS

Dear Sir,

I confess that I have very little class spirit, and have almost forgotten that I ever spent four years at Cambridge. That must have been in a former state of existence. It is difficult to realize that the old routine is still kept up. However, I will undertake at last to answer your questions as well as I can in spite of a poor memory and a defect of information

1st then, I was born, they say, on the 12th of July 1817, on what is called the Virginia Road, in the east part of Concord.

2nd I was fitted, or rather made unfit, for College, at Concord Academy & elsewhere, mainly by myself, with the countenance of Phineas Allen, Preceptor.

3rd I am not married.

4th I dont know whether mine is a profession, or a trade, or what not. It is not yet learned, and in every instance has been practised before being studied. The mercantile part of it was begun here by myself alone.

—It is not one but legion. I will give you some of the monster's heads. I am a School-master—a Private Tutor, a Surveyor—a Gardener, a Farmer—a Painter, I mean a House Painter, a Carpenter, a Mason, a Day-laborer, a Pencil-Maker, a Glass-paper Maker, a Writer, and sometimes a Poetaster. If you will act the part of Iolas, and apply a hot iron to any of these heads, I shall be greatly obliged to you.

PENCILS

5th My present employment is to answer such orders as may be expected from so general an advertisement as the above—that is, if I see fit, which is not always the case, for I have found out a way to live without what is commonly called employment or industry attractive or otherwise. Indeed my steadiest employment, if such it can be called, is to keep myself at the top of my condition, and ready for whatever may turn up in heaven or on earth. For the last two or three years I have lived in Concord woods alone, something more than a mile from any neighbor, in a house built entirely by myself.

6th I cannot think of a single general fact of any importance before or since graduating

*Yrs &c
Henry D Thoreau*



PENCILS

PENCILS

PS. I beg that the Class will not consider me an object of charity, and if any of them are in want of pecuniary assistance, and will make known their case to me, I will engage to give them some advice of more worth than money.

PHINEAS ALLEN

[And now we will pause for a moment of good humor.]

**Response of the Concord School Finance Committee
to Headmaster Thoreau**

TO: David Thoreau, Headmaster

FROM: School Finance Committee

RE: Your Request for Student Pencils

We must regretfully respond that your request is denied. After careful consideration of your unprecedented proposal to provide each student with a pencil, the Committee has elected to purchase only one such unit for use in your classroom. The rationale for the Committee's decision is enumerated below, followed by queries to which you must respond (triplicate) after field-testing the pencil.

- A. Pencils are fragile and break down easily owing to primitive technology.
- B. Acquisition of pencils in quantity leads inevitably to requests for other expensive peripherals such as sharpeners, erasers, tablets, etc.
- C. We cannot justify the expenditures for these systems to patrons whose education was perceived as adequate without any such paraphernalia.
- D. The Committee expressed doubt that students would use the requested pencils for activities more substantial than doodling or tic-tac-toe.

E. We strongly suggest you reconsider your proposal to allow students to use pencils to work ciphers and related mathematics. Apart from the loss of requisite mental rigor implied by your position, what will happen if students become dependent on pencils to solve problems but cannot locate such in time of need?

F. Appropriate usage of pencils presumes teachers who know how to incorporate them into classroom activities. Yet very few teachers have such skills; thus pencils would probably be misused or relegated to storerooms.

Within two weeks of the close of the annual school session the Committee would like to receive your answers to the following questions:

A. Does the requested apparatus have applications in schooling beyond the working of ciphers?

B. Do you recommend the creation of a new discipline of pencil literacy? If so, which of the present legitimate disciplines should be dropped in order to accommodate the new course?

C. Is this “new tool” (as described by you) especially useful for specific sub-groups of students, e.g. the particularly dull or perhaps the brightest?

D. Do students from rich families having pencils in the home distance themselves in achievement from those who do not?

In closing, sir, the Committee feels compelled to remind you that Aristotle managed to become educated –quite satisfactorily, actually– without benefit of pencil.



PENCILS

PENCILS

School District 4J; Resources, Tools & Training; Resources; Two Cents Worth

[And now we will, much refreshed, resume our historical narrative....]



PENCILS

PENCILS

1848

The following is by [Dr. Edward Waldo Emerson](#):

[I]t appears they invented a process, very simple, but which at once put their black lead [[plumbago](#)] for fineness at the head of all manufactured in America. This was simply to have the narrow churn-like chamber around the mill-stones prolonged some seven feet high, opening into a broad, close, flat box, a sort of shelf. Only lead-dust that was fine enough to rise to that height, carried by an upward draft of air, and lodge in the box was used, and the rest ground over. I talked with the mechanic who showed me this [Warren Miles, who after the development of this dust box suggested that they shift from iron balls for grinding to stone balls, since the grit from the stone balls would no longer create a problem], and who worked with the Thoreaus from the first, was actively helpful in the improvements and at last bought out the business from Mrs. Thoreau and carried it on for years, – and with others who knew something of the matter. The evidence is strong that Henry's mind and hand were active in the rapid carrying of this humble business to the front. It seems to be probable that, whether the father thought out the plan alone or with Henry, it was the latter's mechanical skill that put it into working shape.... But here is another chapter to the black-lead story not so well known. About 1848-49 the process of electrotyping was invented, it is claimed, in Boston. It was a secret process, and a man engaged in it, knowing the Thoreau lead was the best, ordered it in quantity from Mr. John Thoreau, the latter guarding carefully the secret of his method, and the former concealing the purpose for which he used it.... As his father became feebler Henry had to look after the business to some degree for the family, and to give some help after his father's death, though Miss Sophia attended to the correspondence, accounts, and directing and shipping the lead (brought in bulk, after grinding, to the house, that its destination might not be known) to the customers in Boston and New-York. Yet Henry had to oversee the mill, bring the lead down, and help at the heavier part of boxing and packing, and this I am assured by two friends he did until his fatal sickness. The work was done in an upstairs room in the L.

1849

The New-York Herald installed a press built by Richard Hoe in which the type beds were mounted directly upon one of the rotating cylinders rather than held in a flat pan under the cylinders. By use of this device they found they were able to achieve 12,000 impressions per hour. (By 1860 this would be up to 20,000 impressions per hour.)



Another hardship of the early ink-maker was ... the amount of physical effort required to grind his pigments by hand. The development of hand- and power-driven grinding machines must have been greeted with open arms. Mechanical hand millers were available at the turn of the nineteenth century, but, so far as can be ascertained, the first really significant step was taken in the 1820s. The stimulus to produce a really good power-driven grinding machine was given by the development of the printing machine. By modern standards, inks ground by hand were very coarse and were found to be unsuitable for use on high-speed equipment. Although no exact date can be put to this innovation, Friedrich Koenig, the inventor of the first successful printing machine, found himself obliged to invent a new grinding machine to provide the inks to work on his machines. The accompanying illustration of the works of Lorilleux in Paris is dated 1824 ... a roller grinding mill driven by steam.... The adoption of the power grinding machine may be said to be the most significant event in the history of ink-making.... When ink-making became industrialized -and an arbitrary date for this would be 1850- and the printer who made his own inks became a rarity, some of the romance of ink-making departed. From being essentially a craft, the secrets of which were jealously guarded and passed on verbally, it became more a science, although not completely.



"Among all the manufactures which -for the mental and mechanical skill required in their prosecution, the remarkable steps by which they have attained their present rank, and the influence which they exert on society generally- claim our attention and admiration, none perhaps is more striking than the **manufacture of a book.**"



- George Dodd's DAYS AT THE FACTORIES

HISTORY OF
THE BOOK

1852

December 27, Monday: During this holiday season the Zion Evangelical Lutheran Church of the Reverend Heinrich Christian Schwan in Cleveland, Ohio had a lighted and decorated [Christmas](#) tree display and –unlike the previous year– no-one denounced the display as heathen idolatry.

The President-elect, [Franklin Pierce](#), had recently paid a visit to his uncle Amos Lawrence in Boston,⁶ taking along his wife and their 10-year-old son Benjamin Pierce. Old Amos had given little Ben a [pencil](#).⁷



MORE

The Pierce family was back in Andover, and on this day little Ben wrote his rich great-uncle a note of thanks for “the beautiful pencil,” saying that he thought he should “find it very useful.” The boy promised to “keep it very carefully for your sake,” and he hoped “that I may learn to write all the better with it.” But this was not to be.

HISTORY OF RR



December 28: Both for bodily and mental health, court the present.... It is worth the while to apply what wisdom one has to the conduct of his life, surely. I find myself oftenest wise in little things and foolish in great ones. That I may accomplish some particular petty affair well, I may live my whole life coarsely. A broad margin of leisure is as beautiful in a man's life as in a book. Haste makes waste, no less in life than in housekeeping. Keep the time, observe the hours of the universe, not of the cars. What are threescore and ten hurriedly and coarsely lived to moments of divine leisure in which your life is coincident with the life of the universe? We live our lives too coarsely, just as we eat too fast, and do not know the true savor of our food. We consult our will and understanding and the expectation of men, not our genius. I can impose upon myself tasks which will crush me for life and prevent all expansion, and this am but too inclined to do. That aim in life is highest which requires the highest and finest discipline. How much, what infinite, leisure it requires, as of a lifetime, to appreciate a single phenomenon! You must camp down beside it as for life, having reached your land of promise, and give yourself wholly to it. It must stand for the whole world to you, symbolical of all things. The least partialness is your own defect of sight and cheapens the experience fatally.... One moment of life costs many hours, hours not of business but of preparation and invitation.... How much, what infinite, leisure it requires, as of a lifetime, to appreciate a single phenomenon! You must camp down

6. Amos Lawrence's brother Abbott Lawrence, manufacturer of locomotives, had once been a candidate for the vice-presidency, but Millard Fillmore had achieved the nomination. In the presidential election Abbott had refused to support [Franklin Pierce](#) in his quest for high office because of his nephew's indifference to the evil and cruelty of slavery.

7. Given the date, could this have been a [Christmas](#) present? Also, could it have been a Thoreau [pencil](#)?



PENCILS

PENCILS

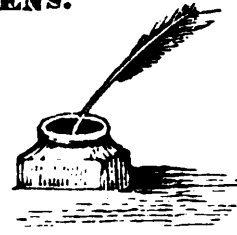


MAYNARD & NOYES' BLACK WRITING INK.

FOR GOLD, STEEL, OR QUILL PENS.



This ink has stood the test of more than **THIRTY YEARS'** trial, and during this time has been constantly increasing in public favor and patronage, and is now the leading article in the country. It flows with freedom, becomes permanently black, and will not mould under any circumstances.



Bank of State of N. Carolina, Raleigh, Mar. 4, 1847.

Messrs. Maynard & Noyes:—Gentlemen, —Your Writing Ink has been in almost constant use by the officers of this banking-house for the last *fifteen years*, and has always been preferred to any other brand. *It flows freely from the pen, and does not mould; and the color, though sometimes pale when first opened, becomes a beautiful permanent black.* I have been a regular consumer of it myself during this time, excepting when curiosity has led me to make trial of other kinds, and take pleasure in being able to speak so favorably of it, and trust that my opinion, founded on such long experience, will induce many who may not be so well acquainted with its merits, to give it a trial. Yours, respectfully,

C. DEWEY, Cashier.

Messrs. Maynard & Noyes:—Gentlemen, —We are happy in being able to say that we entirely concur in the opinion expressed above of your Writing Ink by Mr. Dewey, the Cashier of this Institution.

Respectfully yours, DUNN CAMERON, Pres.
S. W. WHITING, Teller,
D. DU PRE, Bookkeeper.

Post Office, Boston, Ms., Oct. 2, 1843.

The Black Writing Ink manufactured by Messrs. Maynard & Noyes of this city, has been used in this office for several years past. Other inks have during that time been tested, but theirs has been in every instance preferred. *For fluidity, blackness, and permanency, none has been found equal to it.*

GEO. WM. GORDON, Postmaster.

Office Merchants' Ins. Co., Boston, Nov. 18, 1847.

Messrs. Maynard & Noyes:—Gentlemen, —I have used your Writing Ink for the last sixteen years. In 1840 I gave you a certificate of its excellence, and having continued its use ever since, to my entire satisfaction, my opinion is confirmed in its superiority. *It flows freely from the pen, and is in all respects the best ink I have ever used.*

GEORGE HOMER, Secretary.

Registry of Deeds, Boston, Nov. 20, 1847.

Messrs. Maynard & Noyes:—I have made use of your Writing Ink for the recording of deeds, &c., the past *twenty-five years*, and having found it to suit my wishes and purposes entirely, take pleasure in renewing my testimonial of its superiority. From the appearance of the records in my office, I am satisfied it is superior to any I have used, and consider it particularly adapted for all purposes where *permanency of color is requisite or desirable.* *It flows well from the pen, and does not mould; and my oldest records prove its color to be unalterably black.* HENRY ALLINE, Register of Deeds.

Boston, May 27, 1846.

For twenty years past, I have had occasion to use ink daily, and sometimes for the nicest of penmanship; occasionally necessity or curiosity has led me to make use of the article made by different individuals—but I can cheerfully state that I have never found any that combined so many good qualities as that made by Maynard & Noyes.

N. D. GOULD, Teacher Penmanship.

Boston, Feb. 15, 1840.

Messrs. Maynard & Noyes:—Gentlemen, —It is now, I believe more than twelve years since the School Committee passed an order for using your Black Writing Ink in the City Schools. I have used it during that period, and deem it a *first rate article*, and cheerfully recommend it to others. *It flows freely from the pen, and increases in blackness after being committed to paper, and the color is durable.* I know of no ink superior to yours, and I have tried many kinds, both English and American.

P. MACKINTOSH, JR.

Principal of Writing Department, Hancock School.

We the subscribers, Writing Masters in the City Schools, cheerfully add our testimony in confirmation of the superior quality of Maynard & Noyes Ink, expressed by Mr. Mackintosh.

A. B. HOYT, N. MERRILL, D. D. CAPEN,
J. FAIRBANK, L. CONANT, R. SWAN, JR.

FOR SALE, WHOLESALE AND RETAIL,

By the Manufacturers No. 11 Merchants' Row Boston Mass.



PENCILS

PENCILS

beside it as for life, having reached your land of promise, and give yourself wholly to it. It must stand for the whole world to you, symbolical of all things.... Unless the humming of a gnat is as the music of the spheres, and the music of the spheres as the humming of a gnat, they are naught to me.

1853

Sam Turner of Brooklyn obtained a patent for the substitution of colophonic tar for linseed oil in the manufacture of [printing ink](#).



The family business of the Thoreaus had shifted from [pencils](#) into the grinding of the exceedingly fine [graphite](#) powders that state-of-the-art high-speed rotary printing presses had begun to use in place of fluid [ink](#). They were selling these powders in bulk by confidential contract and relying on industrial secrecy and on the highest standards of quality and customer service to maintain high wholesale prices (instead of trusting to patents, which in effect would merely have spread the word about his new manufacturing techniques and mix ingredients). At first they were able to get \$10.⁰⁰ per pound for their fine electrotyping powders, and they was selling 600 pounds a year. By this point the Thoreaus were no longer bothering to fabricate their pencils in the sheds behind their home. Instead, Horace Rice Hosmer was finishing the family's pencils for [John Thoreau](#) at Hayward & Mile's Pencil Shop.

January 6, Thursday: To the north, in the State of New Hampshire, the honored family of President-elect [Franklin Pierce](#) –husband, wife, and 10-year-old Benjy– were boarding the train for their move from Andover to Washington DC. (Life was going to be pretty good at the White House, since in that residence, beginning in this year, to get hot water in the first family’s second floor water closet, all one needed to do was turn a tap — the mansion had just been plumbed for, of all modern luxuries, **hot running water**. Also, the White House orangery was being transformed into a greenhouse.) A few minutes out of the Andover station the train plunged down an embankment and Benjamin was killed.⁸ There is no notice of what became of the boy’s new [pencil](#).



Juan Bautista Ceballos replaced Mariano Arista Luna as interim President of [Mexico](#).

8. Was the train pulled by one of their relative Abbott Lawrence’s locomotives constructed in the mill shops at Manchester NH, which Thoreau visited after January 1849?



After January 1849: Manchester, Warrington & Liverpool

Cylinder	15 inch diam.	£ 1.950-0-0	\$9.750
	16	2.113-10	10.566
	18	2.500	12.500

An engine went through a fourteen inch wall on starting.
Most of their locomotives can draw 600 tons 12 miles an hour. with coke & water in weigh 50 tons apiece.
Inspected after every journey by several persons in succession.
A luggage truck lasts about 12 years.
As soon as the luggage train is unloaded the wheels “are gauged to see that there are no bent axles, and that none of the ‘journals’ or working ends of the axles have been heated, for they sometimes get red-hot; squeezing wheels on to their axles, or wrenching them off.”
The land & receive letters while going 40 miles an hour in the flying post office –with a landing net made of iron which catches them up.
The northern division of the L & N W R. with its branches is 360 miles At their work shop in Crewe there are for this division 220 engines –100 being at work every day– They have “here turned out a new engine & tender on every monday morning” for the last year 1848
Keep a record of casualties which is examined every fortnight by a special committee of directors.
“A boiler of copper inside & iron outside.”
Crewe is a rail way town of 8000 inhabitants
Engine composed of 5416 pieces.
Robert Stephenson said “A locomotive engine must be put together as carefully as a watch.”
The total number of carriages maintained at Crewe is 670 –number of work men 260
“half & inch thick of hair felt” then deal then tarpaulin, secured by iron hoops.
The panels of all the carriages even luggage vans “invariably made of mahogany; ‘the bottom sides’ of English oak; the rest of the framing of ash. The break blocks are made of willow, and usually last about ten weeks work.”
They employ in all over 10,000 persons

Injured, and overcome with grief, Mrs. Pierce would return home and sit out her husband's presidency.

[TIMELINE OF ACCIDENTS](#)



She would meet with the Spiritualist [Maggie Fox](#) in an attempt to summon up the spirit of her dead son.

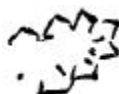
[SPIRITUALISM](#)



January 6th: Walden froze over apparently last night. It is but little more than an inch thick— & 2 or 3 square rods by Hubbards shore are still open. A dark transparent ice— It would not have frozen entirely over as it were in one night or may be a little more and yet have been so thin next the shore as well as in the middle, if it had not been so late in the winter, & so ready to freeze. It is a dark transparent ice. But will not bear me without much cracking. As I walked along the edge I started out 3 little pickerel no bigger than my finger from **close** to the shore which went wiggling into deeper water like bloodsuckers or pollywogs. When I lie down on it and examine it closely, I find that the greater part of the bubbles which I had thought were within its own substance are against its under surface, and that they are continually rising up from the bottom. perfect spheres apparently & very beautiful & clear in which I see my face through this thin ice (perhaps 1 & 1/8 inch) from 1/80 of an inch in diameter or a mere point up to 1/8 of an inch. There are 30 or 40 of these at least to every square inch— These probably when heated by the sun make it crack & whoop— There are also within the substance of the ice oblong perpendicular bubbles 1/2 inch long more or less by about 1/30 of an inch & these are commonly widest at the bottom? —or oftener separate minute spherical bubbles of equal or smaller diameter one directly above another like a string of beads — perhaps the first stage of the former— But these internal bubbles are not nearly so numerous as those in the water beneath. It may be 24 hours since the ice began to form decidedly.

I see on the sandy bottom a few inches beneath — the white cases of Cadis worms made of the white quartz sand or pebbles— And the bottom is very much creased or furrowed where some creature has travelled about and doubled on its tracks — perhaps the cadis worm, for I find one or two of the same in the furrows — though the latter are deep & broad for them to make.

This morning the weeds & twigs & fences were covered with what I may call a leaf frost — the leaves 1/3 of an inch long shaped somewhat like this



with triangular points but very thin. Another morning there will be no frost. I forgot to say yesterday that

I picked up 4 pignuts by the squirrel's hole from which he had picked the meat – having gnawed a hole about half the diameter of the nut in width on each side. After I got home I observed that in each case the holes were on the sides of the nut & not on the edges – and I cut into a couple with my knife in order to see certainly which was the best way to get at the meat. Cutting into the edge I came upon the thick partition which runs the whole length of the nut, and then came upon the edges of the meats & finally was obliged to cut away a good part of the nut on both edges before I could extract the meat because it was held by the **neck** in the middle– But when I cut holes on the sides not only the partitions I met with were thin & partial but I struck the meats broad side & extracted them with less trouble. It may be that it is most convenient for the squirrel to hold the nut thus, but I think there is a deeper reason than that. I observe that out of six whole pig nuts which I picked from a tree 3 are so cracked transversely to the division of the meat that I can easily pry them open with my knife. They hang on as food for animals.

November 20, Sunday: The Russian fleet destroyed a Turkish squadron in the harbor of Sinope.

Thoreau referred in his journal to an anonymous article “Does the Dew Fall?” that was appearing in Harper's New Monthly Magazine for September, that he was currently perusing:⁹

“DOES THE DEW FALL?”



Nov. 20. 7.30 A.M. — To Hubbard's meadow, cranberrying.

Still quite warm as yesterday. I wear no greatcoat. There has been no freezing in the night. I hear a single hylodes in the wood by the water, while I am raking the cranberries. This warmth has aroused him. While raking, I disturbed two bullfrogs, one quite small. These, too, the warm weather has perhaps aroused. They appear rather stupid. Also I see one painted tortoise, but with no bright markings. Do they fade?

I observe on some muskrat-cabins much of that bleached and withered long grass, strewn as if preparatory to raising them, for almost all are covered with water now. It apparently is used as a binder. I find, washed up with the cranberries and also floating over the meadow and about the cabins, many fragments of a root, often with that green, somewhat pellucid, roundish pad attached. This appears to be the muskrats' principal vegetable food now. It is not flagroot, but either yellow lily, pontederia, white lily, — or can it be heart-leaf root?

The shore is so reddened with cranberries that I perceive them fifteen rods off, tingeing it. Many of them being frost-bitten, they have now the pleasant taste of spring cranberries, which many prefer. They, as well as the wreck generally, are covered, as if peppered, with the skipping snow-fleas. In the wreck I find also the common little trumpet-shaped cockle, and some caddis-worms out of their cases. There is an abundance of chaff, *i. e.* broken meadow-grass and cranberry leaves, in it now.

Minott said he heard geese going south at daybreak the 17th, before he came out of the house, and heard and saw another large flock at 10 A.M. Those I heard this afternoon were low and far in the western horizon. I did [not] distinctly see them, but heard them farther and farther in the southwest, the sound of one which did the

9. It is presumably safe to infer from such a reference, and from the fact that we also know that Thoreau read an article in the August issue, that an omnivorous reader such as himself would have been familiar with the contents of all the issues of Harper's Magazine from June to November of this year at least — and therefore all the contents of this particular series of issues of this particular monthly magazine that have come to be bound together as “Volume VII” will be included in this Kouroo Contexture.

HARPER'S FOR JUNE '53

HARPER'S FOR JULY '53

HARPER'S FOR AUG '53

HARPER'S FOR SEP '53

HARPER'S FOR OCT '53

HARPER'S FOR NOV '53



PENCILS

PENCILS

honking guiding my eyes. I had seen that a storm was brewing before, and low mists already gathered in the northeast. It rained soon after I got home. The 18th was also a drizzling day. Methinks the geese are wont to go south just before a storm, and, in the spring, to go north just after one, say at the end of a long April storm. I have not seen any tree sparrows of late, nor white-in-tails. Would it not be worth the while while to flood a cranberry meadow just before the frosts come, and so preserve them plump and fresh till spring? I once came near speculating in cranberries. Being put to it to raise the wind to pay for “A Week on the Concord and Merrimack Rivers,” and having occasion to go to New York to peddle some [pencils](#) which I had made, as I passed through Boston I went to Quincy Market and inquired the price of cranberries. The dealers took me down cellar, asked if I wanted wet or dry, and showed me them. I gave them to understand that I might want an indefinite quantity. It made a slight sensation among them and for aught I know raised the price of the berry for a time. I then visited various New York packets and was told what would be the freight, on deck and in the hold, and one skipper was very anxious for my freight. When I got to New York, I again visited the markets as a purchaser, and “the best of Eastern Cranberries” were offered me by the barrel at a cheaper rate than I could buy them in Boston. I was obliged to manufacture a thousand dollars’ worth of pencils and slowly dispose of and finally sacrifice them, in order to pay an assumed debt of a hundred dollars.

What enhances my interest in dew — I am thinking of the summer — is the fact that it is so distinct from rain, formed most abundantly after bright, starlit nights, a product especially of the clear, serene air. The manna of fair weather; the upper side of rain, as the country above the clouds. That nightly rain called dew, which gathers and falls in so low a stratum that our heads tower above it like mountains in an ordinary shower. It only consists with comparatively fair weather above our heads. Those warm volumes of air, forced high up the hillsides in summer nights, are driven thither to drop their dew there, like kine to their yards to be milked; that the moisture they hold may be condensed and so dew formed before morning on the tops of the hills. A writer in *Harper’s Magazine* (vol. vii, page 505) says that the mist at evening does not rise, “but gradually forms higher up in the air.” He calls it the moisture of the air become visible. Says there is most dew in clear nights, because clouds prevent the cooling down of the air; they radiate the heat of the earth back to it; and that a strong wind, by keeping the air in motion, prevents its heat from passing off. Therefore, I proceed, for a plentiful dew it must not only be clear but calm. The above writer says bad conductors of heat have always most dew on them, and that wool or swan’s-down is “good for experimenting on the quantity of dew falling,” — weight before and after. Thinks it not safe to walk in clear nights, especially after midnight, when the dew is most abundantly forming; better in cloudy nights, which are drier. Also thinks it not prudent to venture out until the sun begins to rise and warms the air. But methinks this prudence begets a tenderness that will catch more cold at noonday than the opposite hardness at midnight.

PENCILS

PENCILS

1856

The [pencil](#)-making company of Faber in [Germany](#) acquired the rights to a high-quality deposit of [graphite](#) in Siberia near the border of China. Soon there would be many pencil manufacturers who were painting their pencils yellow –the color associated with [China](#), as below– in an effort to suggest that they were also utilizing the high-quality graphite of this deposit. Believe it or not, this is why most pencils today –as below– are painted yellow.



1857

The Universalist meetinghouse erected in 1842 in [Concord](#)'s town square was at this point abandoned. The Reverend Addison Grant Fay would go into the [pencil](#) business and then into gunpowder. In 1863 the meetinghouse would be purchased for use as a [Catholic](#) church.



PENCILS

PENCILS

1858

Horace Rice Hosmer borrowed some of [John Thoreau, Senior](#)'s [pencil](#)-making machinery "to make Red Crayons."

It was in this year that Hiram L. Lipman stuck the "rubber" onto the end of the [pencil](#). It was called a rubber because what you did was rub with it; only later would this specific use for such a material come to be termed "eraser," and only after other uses for such "rubber" material had become common. But now both ends of the pencil were business ends and Lipman had made his fortune.¹⁰



1859

February: The Thoreau family's [graphite](#)-grinding business at this time, grinding along slowly and exceedingly finely, was bringing in about \$1,200.⁰⁰ to \$1,500.⁰⁰ per year. The business was no longer to any extent a mere backshed [pencil](#) business, as these profits were being made on bulk supplies of the fine powder. At this point Warren Miles was doing their grinding for them in the Acton mill, although at various times the Thoreau [plumbago](#) had been being prepared in three places:

- by Harris and Hugh Cash of Acton at the Ebenezer Wood mill there
- at Heywood's mill in Factory Village
- by Warren Miles at a mill on Nut Meadow Brook



10. In 1875 in *Reckendorfer v. Faber* (92 U.S. 347) his patent would be invalidated on the perfectly reasonable, if sniffy, legal grounds that all this guy had actually accomplished was the attachment of an object to another object.

READ ABOUT THIS CASE



September 5, Monday: [Henry Thoreau](#) wrote to E.G. Dudley in Boston that on October 9th he planned to “read a lecture to your company” on “Life Misspent” rather than upon “Autumnal Tints.” Dudley’s “company” was the 28th Congregational Society whose regular pastor, the Reverend [Theodore Parker](#), had fled to Europe in a vain attempt to regain his health. While the right Reverend was absent, Dudley was trying to fill the pulpit with speakers and [Waldo Emerson](#) had suggested to him that he solicit Thoreau to deliver “AUTUMNAL TINTS”.¹¹ Thoreau continued, however, by saying that

*I should prefer, however, to bring one which I call
“Life Misspent,” instead of “Autumnal Tints.”*
(CORRESPONDENCE 557)

This lecture Thoreau referred to as “LIFE MISSPENT” was an altered version of “WHAT SHALL IT PROFIT”. It is curious that he changed the title of the lecture, for the earlier title was eminently appropriate for the pulpit. The reason he called the earlier lecture “What Shall It Profit?” is that the sentence immediately following the exordium was

My text this evening is “What shall it profit a man if he gain the whole world,
and lose his own soul?” (paragraph 4)

When revising the lecture in the weeks before his engagement in Boston, however, he dropped this sentence and placed in its stead the sentence

Let us consider the way in which we spend our lives. (paragraph 2)

This change accounts for the change of titles. What is curious, though, is that Thoreau should drop the biblical quotation and the reference to his “text” before he delivered the lecture as a sermon to the Reverend Parker’s Society. Bradley P. Dean wonders if he thought that retaining the earlier sentence in its place of prominence – immediately following the exordium– would be too close to pandering to the expectations of his audience. Thoreau made several other changes in his text of “What Shall It Profit?” in the weeks prior to his first delivery of “LIFE MISSPENT”. In order to add more current material to the lecture, he turned to his journal of 1855-59, and Dean has found, interlined on a few of the leaves he would soon drop from his text, and quotes for us from a MS in the Collection of Walter Harding, notes keyed to passages from his journal of this period. One such note, for example, reads:

*V[ide] Journal—Aug 9—58 for news of Commencements & telegraphic
rejoicings.*

Since he dropped these leaves from the lecture, he did not use the journal passages cited on them in “LIFE MISSPENT”. Of the seven new paragraphs he added to his text, however, he drew six almost verbatim from his journal of 1855-59. The seven new paragraphs are “LIFE MISSPENT” 20-23, 38-39, 47. All except “LIFE MISSPENT” 23 were drawn from the journal. For the journal sources of the six new paragraphs, see the textual

11. Walter Harding, DAYS OF HENRY THOREAU, page 414.

commentary on “WHAT SHALL IT PROFIT” 45, 59, 71. To accommodate this new material, he dropped and placed in his file the leaves containing the material in “WHAT SHALL IT PROFIT” 1-2, 7-30, 65-66, 69, 75, 77, 84-92, and 94-95.¹² He also combined the material in “WHAT SHALL IT PROFIT” 61 and 76, and in “WHAT SHALL IT PROFIT” 67-68 and 70; transposed “WHAT SHALL IT PROFIT” 31 with “WHAT SHALL IT PROFIT” 32-33 and “WHAT SHALL IT PROFIT” 71 with “WHAT SHALL IT PROFIT” 72; and added new leaves containing the material in “LIFE MISSPENT” 20-23, 38-39, and 47. When he had made these and several minor changes, “What Shall It Profit?” was transformed into “Life Misspent.” He did not rewrite an entire draft. All he did was add leaves to, drop leaves from, and interline revisions in his reading draft of “What Shall It Profit?”

This item appeared in the Buffalo, New York Daily Courier:

☞ THE MEN OVER THE FALLS. — In our Saturday’s issue we copied from the Lockport Advertiser, a report that three persons went over the Falls on Thursday, and gave their names as Rousseau, Morse, and a woman. We are informed by Mr. Morse, of Chippawa, whom we saw in this city last week, that there were but two persons lost — two men, named Johnson and Young, both of whom lived on Grand Island. It seems they had been to Chippawa in a sail boat, and before starting on their return, became considerably intoxicated. When in the river, the sail jibed, being struck with a gust of wind, and the boat was upset. They both managed to get hold of the boat, and in this way floated over the falls. No doubt the reason of its being reported that it was Mr. Morse, came from the fact of Young having whiskers very like those of Mr. Morse, and at the distance, seen through a spy-glass, the mistake was a very natural one. Johnson has been a dissipated man, and has had two or three very narrow escapes. About five years ago, he fell asleep while rowing from Navy Island, and his boat providentially floated to the head of Goat Island, where his companion, a boy, secured it.

NIAGARA FALLS



September 5. Spent a part of the forenoon in the woods in the northwest part of Acton, searching for a stone suitable for a millstone for my lead-mill.

PLUMBAGO

1860

A couple of news items relating to the development of ELECTRIC WALDEN technology:

- Christopher Latham Scholes devised a primitive model of what would become a typewriter. (He would construct a model in 1867 and obtain a US patent on it in 1868.)
- Giuseppe Ravizza, quite taken with the concept of visible writing, began to develop a typewriter. (He would claim in 1872 that he had invented a mechanism in which the writing was visible as it

12. The textual and historical evidence for this and the other assertions about the structural changes summarized in this paragraph is presented in Bradley P. Dean, “Sound of a Flail,” pages 99-118.

was being done, but would not until 1883 file for a patent on such a device.)



"If you wish to make an apple pie from scratch,
you must first invent the universe."

— Carl Sagan



Newspapers utilizing Richard Hoe's design of rotary printing press, in which the type beds were mounted directly upon one of the rotating cylinders rather than held in a flat pan under the cylinders, such as the New York Herald, were at this point able to achieve up to 20,000 impressions per hour. Between 1820 and 1860, it has been calculated, the productivity of the printing process had been increased by two full orders of magnitude. (The Thoreau family business would be deeply involved in this, through the production of industrial quantity shipments of the very finely ground graphite powder that was needed for the inks used in such presses.)

HISTORY OF INK



"The modern man's daily prayer is reading the daily newspaper."

— G.W.F. Hegel



In related news, in this year the first dime novel was published. It was Mrs. Anna Sophia Stephens's *MALAESKA: THE INDIAN WIFE OF THE WHITE HUNTER*, and in its first year it would sell 300,000 copies. Immediately Edward Ellis's *SETH JONES, OR CAPTIVES OF THE WILD FRONTIER* would appear, and would sell 450,000 copies. (Typically such material appeared in orange covers.)



"Among all the manufactures which -for the mental and mechanical skill required in their prosecution, the remarkable steps by which they have attained their present rank, and the influence which they exert on society generally- claim our attention and admiration, none perhaps is more striking than the **manufacture of a book.**"

— George Dodd's DAYS AT THE FACTORIES



HISTORY OF THE BOOK

January 9, Monday: Henry Thoreau and Sophia Elizabeth Thoreau went into Boston to spend the day testifying the case of their aunts Aunt Maria Thoreau and Aunt Jane Thoreau vs. the spite fence that had been erected by Eliza Pallies. They were reimbursed by the court for their time and travel.

Thoreau was being written to by Hobart & Robbins in Boston, paying \$9.⁰⁰ for six pounds of plumbago.



PENCILS

PENCILS

*Boston Jany 9, 1860
Mr. Henry D. Thoreaux Concord, Mass.
Enclosed are Nine Dollars, for which, please send at once 6 lbs
best (ground) plumbago, with bill
Yrs &c
Hobart & Robbins*

Thoreau was being contacted by Edward Bangs of Boston,
to testify on January 10th in the case of the Thoreau aunts versus Miss Pallies.

*Dear Sir:
Your Aunts case vs. Miss Pallies will be tried tomorrow – will
you please come down by the first train?
Very truly yours
Edward Bangs*

Thoreau was being written to by the Superintendent of the Franklin Type and Stereotype Foundry of
Cincinnati, R. Allison, who was paying a bill for \$10.⁰⁰ worth of supplies.

*From R. ALLISON
Jany 9th 1860
Mr. H.D. Thoreau Concord Mass.
Dear Sir:
Enclosed please find \$10 Amt of your bill of 27th Ult. Please
acknowledge recpt and oblige
From EDWARD BANGS
Yours truly
R. Allison Supt.*

1862

March 10, Monday: Henry Thoreau was being written to by a firm in Milwaukee, Wisconsin, Sias & Hill, that needed
two pounds of plumbago for electrotyping.



*Milwaukee March 10/62
Mr Thoreau
Dear Sir
Please send us two (2) lbs of Plumbago for electrotyping and send
by express with your bill for collection
Yours &c Sias & Hill
Address Sias & Hill
Type Founders
Milwaukee
Wis*



PENCILS

PENCILS

1875

April 1, Thursday: In 1858 a guy had taken out a patent for sticking the eraser on the blunt end of a [pencil](#). At this point our legal system arrived at the determination that simply attaching one object to another didn't qualify as inventing anything (thus dooming my plan to patent the recycling of old data-storage CDs from my Kouroo Contexture project as shingles for our garage).



1880

According to a short essay on the early making of [pencils](#) which Horace Rice Hosmer wrote for Leffel's Illustrated News of New-York:



[T]here was a school for young ladies ... in Medford, and one of the pupils ... from [Concord](#) ... learned to utilize the bits and ends of Borrowdale lead used in drawing, by pounding them fine and mixing a solution of gum arabic or glue. The cases were made from twigs of elder, the pith being removed with a knitting needle.... [T]he writer [Horace Rice Hosmer], then [circa 1840] a boy of ten years, helped the same lady to make similar pencils from [plumbago](#) and English red chalk.... H. David Hubbard, living in the north part of Concord, made the first cedar wood [pencils](#) for the New England trade; but they were of little value, and but few of them were manufactured. In 1812 William Monroe, a cabinet maker by trade, pounded some plumbago with a hammer, mixed it in a spoon with some adhesive substance, and filled the compound into some cedar wood cases. Some of these pencils were shown to Benjamin Andrews of Boston, who was ready to buy, and encouraged Munroe to make more of them. Twelve days after he carried five gross, which were readily taken and paid for, and a new industry was fairly started. Munroe ... made the "water cement" or paste lead which was filled into the grooves in a soft state, and after remaining a week or more the surface of the pencil slab was planed to remove the composition which adhered to it, and to leave a clean surface for gluing on a veneer of cedar. The pencil slab was about 1/4 inch thick, and the veneer 1/8 inch and of varying widths from 4 to 10 pencils wide.... Eben Wood of Acton worked with Munroe in Concord, when all the work was done by hand. The logs of cedar were cut into slabs and veneers with a "two-handed saw," by two men; planed by hand to a thickness, grooved with the spur plane or plough, one groove at a time, and so on through all the different

processes.... Eben Wood ... saw a tool for cutting the points of shoe pegs, and by applying the principle of the circular saw soon had a grooving machine which would cut six grooves at a time.... A moulding and trimming machine soon followed; then a wedge glue press, holding 12 gross pencils took the place of the hand screws which Munroe used.... His machine for trimming the ends of pencils ... is in use at the time of writing this article [circa 1880].... He made the hexagon and octagon shape cases, halving them together, with similar shaped grooves for the dame.



1890

August: By this point there was no more [plumbago](#), or “wad,” to be extracted from the hillsides of Keswick in England.

“Dr.” Samuel Arthur Jones visited [Concord](#) to study [Henry Thoreau](#) materials. Here are some notes about [pencil](#) manufacture he made during a conversation he had with Horace Rice Hosmer, with whom he would enter upon an extended correspondence:



- “The [pencil](#) secret”
- “The [plumbago](#) was mixed with German clay (fuller’s earth) into a paste, rolled into sheets, cut into leads, and burnt, so as to use up the clay. The father Thoreau **very** secretive as to his process.”
- “Monroe used glue instead of clay.”



1896

Edward G. Acheson accidentally discovered how to synthesize [graphite](#) and was granted a patent. Commercial production would begin in the following year.



PRINTING INK

1897

Some news items relating to the development of ELECTRIC  WALDEN technology:

- J.J. Thomson’s discovery of the electron. (Don’t ask how many of these things he discovered.)

ELECTRONIFICATION



PENCILS

PENCILS

- Lord Kelvin delivered himself of the scientific judgment that “Radio has no future.” (Of course, as we now know, given a long enough timespan — he was absolutely correct.)
- Alexander Graham Bell got into financial difficulties and offered to sell out for a mere \$100,000.⁰⁰ and Western Union’s president, William Orton, took a dismissive attitude: “What use could this company make of an electrical toy?”¹³
- [Graphite](#) began to be manufactured by synthesis (rather than extracted as an ore and then processed).



PRINTING INK

1901

Franklin Benjamin Sanborn’s THE PERSONALITY OF THOREAU (Boston MA: Goodspeed):

[VIEW THE PAGE IMAGES](#)

Sanborn recollected, on pages 5-6: When I first saw Thoreau, in the College yard at Cambridge, striding along the path, away from my room in Holworthy, where he had left a copy of Walden for me, I knew him not, but was struck with his short and rustic appearance, and that peculiar stride which all who have walked with him remember.

Sanborn recollected, on pages 9-10: In a wing of this capacious dwelling was the shop where the Thoreau lead-pencils had been made, perhaps, in former years; but this room, which I never visited while John Thoreau, the father, lived, was devoted, in my time, to the storing and shipping of a fine-ground [plumbago](#) for electrotyping – a business that had been taken up when the [pencil](#) industry became unprofitable. It was the family breadwinner for years, and yielded a modest income, supplemented by Henry’s receipts for land-surveying, lecturing, and writing magazine articles. As late as 1850 he was making pencils; for, in his Journal for November 20, 1853, he writes, of an earlier period: “I was obliged to manufacture \$1,000 worth of pencils, and slowly dispose of, and finally sacrifice them, in order to pay an assumed debt of \$100.” The plumbago, both for pencils and for electrotyping, was ground at a small mill in Acton (the next town west of [Concord](#)), where the Thoreaus had the secret of obtaining the finest-ground mineral; sent to the two-story shop attached to the dwelling-house, and there prepared for the market and shipped. Little was said of this business, although its existence was generally known; and it would not have been good manners to make inquiries about it, though in course of time Sophia spoke of it to me and others. It passed from the Thoreaus to the brothers, Marshall and Warren Miles, and has been carried on by the latter in recent years, but with less profit than in the time of the Thoreaus, who finally gave it up about 1870. After Mrs. Thoreau’s death a weird story was

13. Hello?



PENCILS

PENCILS

invented about her ghost being seen in the pencil-shop.

Sanborn fabricated a tendentious recollection which could not have been true or believed by him to be true,¹⁴ on pages 30-31: One day as I entered the front hall of the Thoreau house for my noonday dinner, I saw under the stairs a pile of books; and when we met at the table, Henry said, "I have added several hundred volumes to my library lately, all of my own composition." In fact, he had received from his first publisher the last parcel of his unsold Week, and for a year or two afterwards he sold them himself upon orders through the mail. [Sanborn did not meet Thoreau until 1855, and Thoreau had received the volume in 1853, so it is unlikely that Thoreau actually said "lately."]

Sanborn recollected, on pages 37-38: When I first heard Thoreau lecture, as he did every year at the Concord Lyceum, and frequently at Worcester and elsewhere, I did not find his spoken essays so interesting as his conversations. He had few of the arts of the orator, in which Emerson and Phillips excelled; his presence on the platform was not inspiring, nor was his voice specially musical, though he had a musical ear and a real love of melody. But for the thought and humor in his lectures they would have been reckoned dull, – and that was the impression often made. He appeared to best advantage reading them in a small room; or when, as with the John Brown Address, he was mightily stirred by the emotions that a life so heroic excited in his fearless heart. At the age of forty, or thereabout, I heard him sing his favorite song, Tom Bowline, by Dibdin, which to Thoreau was a reminiscence of his brother John, so early lost and so dearly loved. The voice was unpractised and rather harsh, but the sentiment made the song interesting.

Ellery Channing recollected, on pages 66-67: His illness might be passed over by some persons, but not by me; it was most impressive. To see one in middle life, with nerves and muscles and will of iron, torn apart piecemeal by that which was stronger than all, were enough to be described, if pen had the power to do it. It was a saying of his, not unfrequent, that he had lived and written as if to live forty years longer; his work was laid out for a long life. Therefore his resignation was great, true, and consistent; great, too, was his suffering. "I have no wish to live, except for my mother and sister," was one of his conclusions. But still, as always, work, work, work! During his illness he enlarged his calendar, made a list of birds, drew greatly on his Journals; at the same time he was writing or correcting several articles for printing, till his strength was no longer sufficient even to move a pencil. Nevertheless, he did not relax, but had the papers still laid before him. I am not aware that anywhere in literature is a greater heroism; the motive, too, was sacred, for he was doing this that his family might reap the advantage. One of his noblest and ablest associates was a philosopher (Alcott) whose heart was like a land flowing with milk and honey; and it was affecting to see this venerable man kissing his brow, when the damps and sweat

14. Franklin Benjamin Sanborn knew very well that he had not met Henry Thoreau until 1855, while Thoreau had long since received these unsold copies and carried them up the steps and stored them in his room, on October 27, 1853.



PENCILS

PENCILS

of death lay upon it, even if Henry knew it not. It seemed to me an extreme unction, in which a friend was the best priest.

BRONSON ALCOTT

Sanborn has taken a detached scrap of paper out of a textbook allegedly owned by Thoreau, the 3d edition, the 1828 edition, of Professor John Farrar of Harvard College's brief 1818 knock-off of Euler's famous textbook, entitled AN INTRODUCTION TO THE ELEMENTS OF ALGEBRA, DESIGNED FOR THE USE OF THOSE WHO ARE ACQUAINTED ONLY WITH THE FIRST PRINCIPLES OF ARITHMETIC / SELECTED FROM THE ALGEBRA OF EULER (Boston: Hilliard, Gray, Little, and Wilkins, 1828), and glued

ELEMENTS OF ALGEBRA

this scrap of paper into the front of copy #105 of his THE PERSONALITY OF THOREAU. (This volume with its holographic fragment is now copy #3 in the special collections of Brown University, at the John Hay Library.) The paper scrap contains a holograph algebraic proof written by Thoreau in Concord on January 10, 1840.¹⁵ The problem he selected is to identify a four-number geometric progression series in which the 4th number of the series is 24 more than the 2d number of the series, and the sum of the 1st number and 4th number is to the sum of the 2d number and 3d number, in the ratio of 7 to 3.

Thoreau's first move was to identify the four numbers of the series as respectively x , xy , xy^2 , and xy^3 .

Then he stated the first of the constraints, that the 4th number of the series is 24 more than the 2d number of the series, as $xy^3 - xy = 24$.

Then he stated the second of the constraints, that the sum of the 1st number and 4th number is to the sum of the 2d number and 3d number in the ratio of 7 to 3, as $3x + 3xy^3 = 7xy + 7xy^2$. Not bothering to write down the steps of the transformation, this immediately became $y^3 = (7y + 7y^2)/3 - 1$.

Then, putting $y^3 = (7y + 7y^2)/3 - 1$ into $xy^3 - xy = 24$ and freeing the denominator and reducing immediately generated $7xy^2 + 4xy - 3x = 72$.

Then comparing $7xy^2 + 4xy - 3x = 72$ with $3x + 3xy^3 = 7xy + 7xy^2$ and eliminating xy and reducing $7xy^2 - 3x + 4xy^3 = 168$ on $xy^2 = 24 + (3x - 4xy^2)/7$ giving xy^3 its value obtained from $xy^3 - xy = 24$, putting the value of xy^2 as it then stands in the geometric progression series and taking the product of the means equal to that of the extremes x^2y [hole in the paper] $4x = 24xy + (3x^2y - 4x^2y^2 - 95xy)/7$.

Then finding by x , freeing of the denominator, and reducing, results in $xy + xy^2 = 18y - 42$.

15. We note that in this writing which is indisputably Thoreau's, he forms the numeral "2" by beginning his stroke at the top left with a minuscule complete circle.



PENCILS

PENCILS

Then putting the value of xy^2 obtained from this into $3x+3xy^3 = 7xy+7xy^2$ and reducing, results in $x+xy^3 = 42y-98$.

Then putting the value of xy^3 obtained from this in $xy^3-xy = 24$ and reducing, generates $x+xy = 42y-122$.

This is followed by $xy+xy^2 = 18y-42$.

This is followed by $18y-42 = 42y^2-122y$.

This is followed, on the basis of $xy^3-xy = 24$, by $x = 24/(y^3-y)$

By comparing $xy+xy^2 = 18y-42$ he obtained $y=3$, hence $x=1$, and so the geometric progression that solves these simultaneous equations would have to be "1 3 9 27."

1918

Up to this point mineral [graphite](#) had been ground, mixed with clay, and fired in a kiln. It had been mined in the hill country of England, in Sri Lanka, in Madagascar, in North Korea, in the Sonora province of [Mexico](#), near the town of Bristol in New Hampshire beginning in 1821 (the small deposit discovered and claimed by [Charles Jones Dunbar](#)), in New York, in the Ontario province of Canada, and, beginning in 1856, in Siberia near the border of [China](#). By this year the block mineral form that needed to be finely ground had been fully superseded by a derivative of petroleum coke which because it could be brought into existence already in the condition of a fine powder was inherently not only of much higher quality but also much cheaper to produce.

1937

The Thoreau [pencil](#) sheds near the [Concord](#) railroad station burned down.

PENCILS

PENCILS

Last seen in 'Geom. Prog. & Day's Algebra.

(There is a Geom. Prog. of four numbers, such that the last is 24 more than the second, and the sum of the extremes is 5 times that of the means, as 4 & 3.) $x \quad x \quad y \quad xy^2 \quad xy^3$ Then $(xy^3 - xy = 24) \text{ ①}$

and $(3x + 3xy^3 = 7xy + 7xy^2) \text{ ②}$ From the last $y^3 = \frac{7y + 7y^2}{3} - 1$

Putting this in N° 1, freeing of the denominator, and reducing -

$7xy^2 + 4xy - 3x = 72$ Comparing N° 2, eliminating xy ,

and reducing $7xy^2 - 3x + 4xy^3 = 168$ or

$xy^2 = 24 + \frac{3x - 4xy^3}{7}$ Giving xy^3 its value obtained from N° 1,

putting the value of xy^2 as it then stands in the Prog.

and taking the product, of the means equal to that of the extremes. $x^2y^2 + 4x = 24xy + \frac{3x^2y - 4x^2y^2}{7} - 36xy$

Dividing by x , freeing of the denominator, and reducing -

$(xy + xy^2 = 18y - 4) \text{ ③}$ Putting the value of xy^2 obtained

from this in N° 2 and reducing. $x + xy^3 = 42y - 98$

Putting the value of xy^3 obtained from this in N° 1,

and reducing $x + xy = 42y - 122$ Comparing N° 3

$xy + xy^2 = 18y - 42$ he obtain

$$18y - 42 = 42y^2 - 122y$$

Hence $y = 3$

From N° 1 $x = \frac{24}{y^3 - y}$

Hence $x = 1$

Prog. = 1 3 9 27

Concord, N.H. 10th 1840

1941

January: After due consideration of all its options and advantages, the USA shared the secret of the [Japanese](#) military code scheme with its British allies.

WORLD WAR II

Based on their experiments with a natural-uranium reactor, [German](#) scientists dismissed the idea of using [graphite](#) as a moderator.

Periodic Chart

KEY:

Atomic Number

Name

Symbol

Atomic Mass

Electronic Configuration

11

Sodium

Na

22.990

92

Uranium

U

238.02

2

8

18

32

21

9

2

ATOM BOMB



PENCILS

PENCILS

1990

[Henry Petroski](#). THE PENCIL: A HISTORY OF DESIGN AND CIRCUMSTANCE, NY: Knopf, 1990.



PENCILS

Henry Petroski, “H.D. Thoreau, Engineer”

[This essay originally appeared as chapter 9, “An American Pencil-Making Family,” from the book THE PENCIL: A HISTORY OF DESIGN AND CIRCUMSTANCE by Henry Petroski. Copyright 1989 by Henry Petroski. It appears here as reprinted with the permission of Alfred A. Knopf, Inc. in Annabel Patterson, ed., “Converging Disciplines at Duke,” The South Atlantic Quarterly for Winter 1991, Volume 90, Number 1, pages 39-60, and in American Heritage of Invention & Technology, Volume 5, Number 2, pages 8-16. On July 22, 1991 Professor of Civil Engineering Henry Petroski of the Duke University School of Engineering kindly granted formal written permission for this material to be included in this Kouroo database.]

Since it was an age of self-reliance and self-education, not only in the nascent profession of engineering and the emerging industry of pencil making but also among citizens generally, what one was called for the purposes of a nineteenth-century census or what one called oneself for the purposes of answering a questionnaire could depend very much on what one was doing at the time of the inquiry. One citizen of Concord, Massachusetts, a member of Harvard's Class of 1837, in response to a letter from his class secretary asking about his life ten years after college, wrote, with little regard for conventional punctuation:

I dont know whether mine is a profession, or a trade, or what not. It is not yet learned, and in every instance has been practiced before being studied....

It is not one but legion. I will give you some of the monster's heads. I am a Schoolmaster - a Private Tutor, a Surveyor - a Gardener, a Farmer - a Painter, I mean a House Painter, a Carpenter, a Mason, a Day-Laborer, a Pencil-Maker, a Glass-paper Maker, a Writer, and sometimes a Poetaster....

For the last two or three years I have lived in Concord woods alone, something more than a mile from any neighbor, in a house built entirely by myself.

Later in life this particular alumnus would also identify himself as a civil engineer. And while he would have had little inclination to join a professional society, as he had little class spirit and less concern for what his neighbors thought of



PENCILS

PENCILS

him, his story is as relevant for an understanding of nineteenth-century engineering as it is for an appreciation of American Transcendentalism. This Harvard alumnus was given the Christian names David Henry in 1817, and that is the order in which his names appeared on the college commencement program. However, he had always been called Henry by his family, and for no apparent reason other than preferring the way it sounded, shortly after leaving Harvard he began signing his name Henry David Thoreau.

Thoreau's story, especially his involvement in the manufacture of pencils, is helpful for understanding the nature of nineteenth-century engineers and engineering for several reasons. First, an engineer before midcentury, like the alumnus Thoreau, would not necessarily be certain that his activity was a profession, for it was not yet "learned." Furthermore, the story of Thoreau shows again that one did not have to study engineering to practice it. College education in his days prepared one for the ministry, law, medicine, or teaching. Those who practiced and advanced engineering in the first half of the nineteenth century had come to it largely through the crafts and the apprentice system. Indeed, participation in the construction of the Erie Canal, which was begun in 1817 and took eight years to build between Albany and Buffalo, was believed to be the best civilian engineering education then available, and the canal itself has been called "the first American school of civil engineering." While the Institution of Civil Engineers was founded in London in 1818, the American Society of Civil Engineers did not exist until 1852, and it is generally the beginnings of such professional societies that are considered to mark the beginnings of professionalism itself.

Second, the story of Thoreau is instructive because it is a reminder that innovative and creative engineering was done by those who were interested in a wide variety of subjects beyond the technical. Whether or not they had college degrees, influential early-nineteenth-century engineers could be a literate lot, mixing freely with the most prominent contemporary writers, artists, scientists, and politicians. And this interaction hardened rather than softened the ability of the engineers to solve tough engineering problems.

Third, like Thoreau, innovative engineers tended to be a bit iconoclastic and rebellious, rejecting traditions and rules. Not a few eighteenth- and nineteenth-century engineers came from professional families that did not always understand why a young man wanted to pursue an apprenticeship rather than go to college, or why he would want to practice engineering after attending college. The Englishman John Smeaton, of whom it was said that he could not touch anything without improving it, was the son of a lawyer. But young Smeaton decided against a legal career and opened his own instrument shop in 1750. On the other hand, John Rennie, responsible for three great London bridges, attended the University of Edinburgh in the early 1780s, studying natural philosophy, chemistry, modern languages, and literature. But his son, also named John, and also to be a distinguished engineer, did not go to college. Even those who



PENCILS

PENCILS

rose out of more humble backgrounds stood out precisely because they could, like William Munroe in America, challenge the craft tradition for its own improvement.

Fourth, like Thoreau's involvement in pencil making, engineering was practiced with the tongue and the pencil, and there was very little written of it or about it before the middle decades of the nineteenth century. Thus there was little left to tell posterity the technical story of how and why certain designs or processes were developed or chosen over others. The truths of the theories of the pioneer engineers were demonstrated by the successful erection of a solid bridge or the efficacious process of producing a good pencil. Major contributions to technology could be incontrovertibly demonstrated without a single word being spoken outside the workshop or committed to paper.

Henry David Thoreau's eventual involvement with pencil engineering in such an environment can be traced to Joseph Dixon, whose own introduction to pencil making was indirect. Dixon had a meager education, but he possessed a mechanical ingenuity that enabled him while still a youth to invent a machine for cutting files. He then took up printing but did not have enough money to buy metal type and so taught himself to carve his own wooden type. As his resources and ambitions grew, he began to experiment with graphite in Salem in order to make crucibles in which to melt his own type metal. Since there was a limited market for the crucibles, he also began to use graphite to make stove polish and lead pencils. However, unlike William Munroe, when Dixon tried to peddle his pencils in Boston, he found little call for them, and "he was told he would have to put foreign labels on them if he expected to make sales."¹⁶

Infuriated, Dixon ceased making pencils, but apparently not before Henry's father, John Thoreau, learned the rudiments of pencil making and, perhaps incidentally, those of chemistry from the self-taught Dixon. There is some indication that Dixon may have learned of Conté's use of clay in pencil leads from a chemist friend named Francis Peabody, but without sufficient experimenting with the process even that knowledge would not have made Dixon's early pencils remarkable. While John Thoreau may in turn have learned that clay mixed with graphite could make an excellent pencil, he also would have need to experiment with the process. However, there is no firm evidence to indicate that the French process of pencil making was really known to all, must less mastered in America in the 1820s.

In 1821 Thoreau's brother-in-law [sic], Charles Dunbar, discovered a deposit of plumbago while wandering around New England. He who had been the black sheep of the family apparently stumbled upon the graphite in Bristol, New Hampshire, and so decided to go into the pencil-making business. Dunbar found a partner in Cyrus Stow of Concord, and the firm of Dunbar & Stow was established to work the mine and manufacture lead pencils. Their graphite was certified as far superior to any then known to originate in the United States, and so the future of the business looked bright. However, when some legal details of establishing mineral rights left the partners with only a seven-

16. Meltzer and Harding, A THOREAU PROFILE, page 136



PENCILS

PENCILS

year lease on the mine, they were advised to dig out all the plumbago they could before their lease expired.

A faster production of plumbago meant that pencils could be manufactured at a faster rate, and this, it appears, was why Charles Dunbar asked Thoreau to join the business in 1823. Soon Stow, who apparently had other means of income, and shortly thereafter Dunbar, for unknown reasons, dropped out of the pencil-making business, and the firm was renamed John Thoreau & Company.

Either John Thoreau had more suitable graphite or he was more persistent than Dixon in improving his pencil-making process, for Thoreau pencils evidently could be sold without foreign labels. By 1824 Thoreau's domestic pencils were even of good enough quality to win special notice at an exhibition of the Massachusetts Agricultural Society. As reported in the New England Farmer, "the Lead Pencils exhibited by J. Thorough [sic] & Co, were superiour to any specimens exhibited in past years."¹⁷ The misspelling of the family name lends support to the oral tradition in Concord that the Thoreaus pronounced their name "Thorough." Indeed, Henry Thoreau to this day is quoted as punning on his name by saying of himself, "I do a thorough job." However, there is also contrary evidence, such as a letter addressed to "Mr. Henry D. Thoreaux," suggesting that the French pronunciation of the name was not unheard of.

Whichever way the name was correctly pronounced, Thoreau pencils found a steady market, with or without the family name imprinted, perhaps even being offered by Boston stationers. By the early 1830s the pencils were threatening William Munroe's business and competition became fierce. Since both firms were having their plumbago ground at Ebenezer Wood's mill, Munroe apparently tried to get Wood to stop grinding Thoreau's material. However, Wood evidently made more money from Thoreau and so stopped grinding Munroe's instead.

While the Munroe business faltered, the Thoreau pencil business prospered. But to prosper is not necessarily to be without worries. One could not make pencils without graphite, and when it could no longer be obtained from the Bristol mine, other sources had to be found. These were located in Sturbridge, Massachusetts, and later, when that was exhausted, in Canada. It is very likely that, by the time he went away to college, the young Thoreau had become familiar with and helped with the manufacture of pencils, which by then had been the family business for about ten years. Indeed, in 1834, Henry David Thoreau made a trip with his father to New York City in order to sell pencils to stores there, apparently because the money was needed for Henry's schooling.

One of the reasons Thoreau pencils could compete successfully with the Munroe variety was that all pencils made in America at the time were "greasy, gritty, brittle, inefficient," and users, especially artists and engineers, were always looking for a better product.¹⁸ The inferiority of American pencils was due in large part to the fact that, since pure Borrowdale graphite was

17. Meltzer and Harding, A THOREAU PROFILE, page 138

18. Meltzer and Harding, A THOREAU PROFILE, page 136



not available and since the Conté formula for pencil lead was apparently either unknown or not perfected in America, firms like John Thoreau's continued to mix their inadequately purified and ground graphite with such substances as glue, adding a little bayberry wax or spermaceti, a waxy solid obtained from the oil of the sperm whale or dolphin and also used in making candles. The warm mixture was then applied with a brush to the grooved part of a cedar case, and another piece of cedar was glued on top of it.¹⁹ John Thoreau worked at improving his imperfect product, and he achieved some success in making it less imperfect than that of his competitors. Although his or any other American pencils still did not come anywhere near the quality of the best English or French pencils, by offering reasonably priced alternatives it was possible for Thoreau & Company to be well established by the mid-1830s.

When Henry David Thoreau graduated from college he had no intention of making pencils for a living. Following in the tradition of his grandfather, his father, his aunt, and his brother and sister, all of whom had taught for a time or were then teaching, Henry accepted an offer to teach in his own childhood institution, Center School in Concord.²⁰ However, after only two weeks, he was called to task for not using corporal punishment to keep order and quiet in the classroom. Apparently overreacting to this criticism, Thoreau proceeded to ferrule students for no apparent reason and that evening resigned from his position. This seemingly irrational behavior, coupled with his insistence on reversing his names, confused the residents of Concord, and from then on many looked askance at the young Thoreau and his unconventional ways.

Without a job, Thoreau went to work for his father. But, true to his nature, the young man did not want to be just another pencil maker, and so he sought to understand why American pencils were so much inferior to ones made in Europe. Since he knew that the graphite was of excellent quality, though apparently not pure enough or occurring in large enough pieces to be used without being ground and mixed with binding substances, Thoreau deduced that the problem was in the filler or in the lead-making process itself. Thoreau pencils at the time were still being made by pressing a mixture of graphite, wax, glue, and spermaceti into a paste, warming it, and brushing it or pouring it soft into the grooves of the wooden cases.

To identify and correct what is causing a product to fail to perform as hoped is the essence of engineering research and development, and whether he or anyone else called it that, that is exactly what Thoreau proceeded to engage in. Since the problem of identifying what was missing from the pencil-manufacturing process was so open-ended, Thoreau wondered if he could determine what was in good European pencil lead or what the European pencil manufacturers did differently.

While it has been said that German pencils made by the Faber family were the models that Thoreau was trying to emulate in the mid-1830s, there is some question whether many German pencils

19. Edward Waldo Emerson, HENRY THOREAU: AS REMEMBERED BY A YOUNG FRIEND, page 135

20. Walter Harding, THE DAYS OF HENRY THOREAU: A BIOGRAPHY, pages 52-54



PENCILS

PENCILS

themselves were then being manufactured by the Conté process, which made possible the "polygrade" pencils whose hardness or softness depended upon the proportions of clay and graphite in the lead mixture. According to one historical sketch of the German industry, in a booklet published in 1893 by the Johann Faber pencil factory in Nuremberg:

...the first Polygrade lead pencils of "Faber" were offered to the trade in Germany in the year 1837 (with French labels) though "Pannier & Paillard" of Paris and represented to be a **French** article, whereas when Mr. Faber on his early journeys explained to his customers that the "Faber" pencils were of **German** and not of **French** origin, his statement was very often discredited.

While the literature of some pencil manufacturers, themselves descendants of the German industry, claims that clay was used in Germany pencil leads as early as the 1820s, it was certainly not used widely, if at all, for export. It was only after he took over his father's A.W. Faber pencil factory in 1839 that "Lothar Faber occupied himself with opening up business connections throughout the civilized world." Thus it is more probable that German pencils were not at all common in America when young Thoreau first sought to improve his father's product, and any German pencils that did exist may not even have been made by the superior Conté process. What Henry Thoreau may have been hoping to do was emulate a French pencil or perhaps just find out how the Germans mixed and processed their ingredients to make a good but far from perfect pencil.

Not being trained in chemistry, Thoreau could not easily analyze a specimen of pencil lead, so he evidently proceeded to look for clues in Harvard's library.²¹ The oft-repeated story is that in a Scottish encyclopedia published in Edinburgh, Thoreau found that German manufacturers combined graphite with Bavarian clay and then baked the mixture. The story appears to have its origins in what Thoreau himself is believed to have said years after the fact, when the Faber pencils were indeed being made according to the Conté process and were being pushed "throughout the civilized world." But at the time Henry is said to have used the Harvard library, in about 1838, it does not seem possible that a Scottish or any other encyclopedia could have described the use of Bavarian clay in German pencil making, for the Germans themselves apparently were not yet using that process to any considerable extent.

It has been generally assumed that it was the *ENCYCLOPÆDIA BRITANNICA*, whose thistle trademark still recalls the work's Scottish origins, from which Thoreau got the idea of mixing graphite with clay. But the "pencil" entry in any edition of that work available to Thoreau had not changed since the second edition, completed in 1784, which was before the clay-and-graphite process existed. While German pencil making is described in the article, it is the process of mixing sulphur with graphite that is being discussed - and criticized, for such

21. Meltzer and Harding, *A THOREAU PROFILE*, page 136



PENCILS

PENCILS

pencils were said to be inferior to English ones. The encyclopedia article also tells the reader how to detect an inferior German pencil – by the fact that the lead will melt and give off a “strong smell like that of burning brimstone” when held in a flame – and this may have given Thoreau a clue about how to make a better pencil. Or perhaps he got a clue elsewhere. There were many encyclopedias published in Edinburgh in the late eighteenth and early nineteenth centuries, and Thoreau may also have consulted the *ENCYCLOPÆDIA PERTHENSIS*, whose second edition was issued in Edinburgh in 1816, in spite of its title’s association with the nearby city of Perth. Or he may have read the *EDINBURGH ENCYCLOPÆDIA*, whose first American edition was published in 1832. But since German pencils were not then generally made with clay, it is not surprising that neither of these encyclopedias describes such a process. Why none refers to the French pencil-making process is more problematic, though it may have been merely a matter of national pride. The omission of any mention of the French industry may also have been due to the fact that Diderot’s great *ENCYCLOPÉDIE*, completed in 1772, appeared before Conté made the discovery that put French pencil making in the forefront on the Continent. Given the derivative nature of encyclopedic works, it is perhaps not surprising that in the 1830s the secret of pencil making was not so readily available in print as has been assumed by some students of Thoreau’s literature. But that is not to say that Thoreau did not look. Most encyclopedias published in Thoreau’s time seem to have relied heavily upon other encyclopedias for information, as a comparison of the “pencil” entries in near-contemporaneous works will demonstrate. The 1832 edition of the *ENCYCLOPÆDIA AMERICANA*, for example, repeats almost verbatim the earlier *BRITANNICA*’s entry that defines the pencil as “an instrument used by painters for laying on their colours.” This edition of the *AMERICANA* is most likely the one that Thoreau was complaining about in an 1838 letter to his brother, John. According to Thoreau, who was evidently trying to learn from books how to form gunflints, the encyclopedia had “hardly two words on the subject.” “So much for the ‘Americana,’” he wrote to John, and then quoted from another source an explanation that he clearly found inadequate: “Gunflints are formed by a skilled workman, who breaks them out with a hammer, a roller, or steel chisel, with small, repeated strokes.” From such laconic written descriptions Thoreau could no more learn to knap gunflints than to bake pencil leads. But if he did not read about combining clay and graphite to make an excellent pencil, then where did Thoreau come up with the idea? If he did not read it explicitly, it is still possible that he did find something in the Harvard library that made him put two and two together. For example, if Thoreau had looked up “black lead” in the *ENCYCLOPÆDIA PERTHENSIS*, he would have been referred to an entry where he could have read among other things about pencils:

A coarser kind are made by working up the powder of black lead with sulphur, or some mucilaginous substance; but these answer only for carpenters, or some



PENCILS

PENCILS

very coarse drawings. One part of plumbago with 3 of clay, and some cow's hair, makes an excellent coating for retorts, as it keeps its form even after the retorts have melted. The famous crucibles of Ypsen are formed of plumbago mixed with clay.

In a first reading of this passage, one might anticipate finding, after the criticism of sulphur as an ingredient suitable only for the lead of a carpenter's pencil, an indication of an ingredient to be preferred for better pencils. Thus, "one part of plumbago with 3 of clay" might be expected to be followed with the phrase "makes a pencil suitable for the use of artists and engineers." Even if Thoreau did not anticipate words, and even if this encyclopedia entry did not tell Thoreau or anyone else exactly how to make a Conté pencil, it might have provided a catalyst to thought.

By juxtaposing the disadvantages of sulphur as an additive with the advantages of clay as a heat-resisting ingredient, albeit for retorts, such an article might have provided the climate for making a leap of invention – or reinvention. Even if it did not make a better mark, a pencil produced with some clay might have a point that would not melt or soften so easily as one containing sulphur. The further juxtaposition of the mentions of crucibles may have also sparked an idea in Thoreau's mind, for he may have been aware of the Phoenix Crucible Company in Taunton, Massachusetts, and thus he would have known of a possible source of appropriate clay. Or he may have known that the New England Glass Company was also importing Bavarian clay at the time. And even if he was not familiar with these sources of supply, Thoreau might easily have found out about them once he had it in his head to experiment with a clay-and-graphite mixture for making pencil leads. Whatever his source, Thoreau apparently obtained some clay and proceeded to work with it.²² While he could immediately produce a harder and blacker pencil lead, it was still gritty, and he suspected that this fault could be corrected by grinding the graphite finer.

As with much of engineering, it seems to be unclear exactly how much Thoreau and his father interacted in developing a new grinding mill for graphite. The older Thoreau's habit of reading chemistry books and his early association with Joseph Dixon may also have provided the basic idea of mixing graphite with clay, but such details as to how fine to grind the graphite and how to remove impurities that caused pencil leads to scratch would most likely have remained to be worked out. While it may have been at his father's suggestion that he focused on a new graphite mill, Henry Thoreau apparently worked out all the mechanical details.²³ But whether a suggestion to work out the details is engineering or managing can depend on whether the suggestion is anything more than simply that – a suggestion. One thing is clear, and that is that Henry Thoreau, at least later in life, was capable of making what we would today call mechanical drawings or plans. He certainly designed and built his own cabin

22. Edward Waldo Emerson, HENRY THOREAU: AS REMEMBERED BY A YOUNG FRIEND, pages 32-33

23. Edward Waldo Emerson, HENRY THOREAU: AS REMEMBERED BY A YOUNG FRIEND, page 135; see also Harding, DAYS, page 56



PENCILS

PENCILS

at Walden, and examples of a more mechanical bent in Thoreau exist in the Concord Free Public Library in his drawings for a barn and stanchion for cows and for a machine designed for making lead pipe. So it certainly seems that the younger Thoreau was not without the talents or inclination to "practice engineering" by working out the details of a solution for a machine to produce finer graphite. According to Ralph Waldo Emerson's son, Edward, who was a young friend of Thoreau, the solution consisted in having a "narrow churn-like chamber around the millstones prolonged some seven feet high, opening into a broad, close, flat box, a sort of shelf. Only lead-dust that was fine enough to rise to that height, carried by an upward draft of air, and lodge in the box was used, and the rest ground over."²⁴ Walter Harding, in his biography of Thoreau, continues the story by describing the action: "The machine spun around inside a box set on a table and could be wound up to run itself so it could easily be operated by his sisters."²⁵

The demand for the quality pencils that the Thoreaus produced with refined graphite enabled them to expand the business. At the same time they restricted access to its premises because they did not want to spend money patenting their machines – or to reveal the process that was not precisely described in any encyclopedia. But apparently Henry Thoreau's personality was such that, once he had succeeded in making the best pencil in America, he found no challenge or satisfaction in the routine of doing so. What he wanted to do then was teach.

Just about the time he joined his father's pencil business, Henry Thoreau began his JOURNAL, whose two million words were to comprise his major written work. In Thoreau's time, the journal, while a seemingly private form of writing, was actually a common means of communication among the Transcendentalists. They would exchange journal passages to supplement their more spontaneous forms of intercourse. Thoreau's first journal entry is dated "Oct 22nd 1837," but over the following decade, during which time he was engaged on and off in the business, he would mention pencil making rarely and then only in passing.

Thoreau grew restless when he did not find a teaching job, and he made plans to travel, setting out for Maine in 1838, but later in the year he was back in Concord running a private school with his brother. The brothers took their excursion on the Concord and Merrimack rivers in 1839, and Thoreau presumably carried his diary and pencil, even if he did not list the latter as a necessary part of anyone else's outfit for such an excursion.

John's health forced the Thoreau brothers to close their school in 1841, and shortly thereafter Henry moved into the Emerson household, where he would stay for two years, conversing with Ralph Waldo Emerson, doing odd jobs around the house, and entertaining the Emerson children. As Edward Waldo Emerson would recall later, after Thoreau told them stories, "He would make our pencils and knives disappear, and redeem them presently from

24. Edward Waldo Emerson, HENRY THOREAU: AS REMEMBERED BY A YOUNG FRIEND, pages 32-33

25. Walter Harding, THE DAYS OF HENRY THOREAU: A BIOGRAPHY, page 56



our ears and noses.”²⁶ When Thoreau’s father needed help in the pencil factory, Henry would go home for a time, and he would also put in a few days at the shop when he had to earn a few dollars. The younger John Thoreau died early in 1842 and it was a great loss for Henry, who would eventually write *A WEEK ON THE CONCORD AND MERRIMACK RIVERS* as a memorial tribute. Its dedicatory quatrain ends: “Be thou my Muse, my Brother—.”

Henry David Thoreau spent about eight months in 1843 tutoring on Staten Island, writing home often to report on his reading in libraries and to inquire after “improvements in the pencil line.”²⁷ Thus the family business was out of sight but not out of his mind, and he may have been thinking of improvements of his own. He returned homesick to Concord late in the year, but soon he was in debt and so went back to work in the family factory – with renewed vigor and inventiveness. He apparently conceived of many ways to improve still further the processes and products of the factory, and according to Emerson could think of nothing else for a while (but with an engineer’s characteristic literary silence about things technical).

Thoreau is reported to have developed many new approaches to fitting the lead in the wood casing, including a reputed method employing a machine to drill holes into solid pieces of wood into which the lead could be inserted.²⁸ In the Concord Free Public Library there is a pen-nib holder that Thoreau is believed to have made out of a rounded piece of wood, but which appears in fact to be a pencil case rejected for that use because the hole in it is very eccentric. While it might not be easy or efficient to insert and glue a brittle pencil lead into a close-fitting hole, and while the idea has even been the object of ridicule, one of the rare passages mentioning pencils in Thoreau’s *JOURNAL* suggests that a seamless pencil case is at least a dream he might have had. In describing his 1846 travels through Maine, after commenting with disdain on a shop full of frivolous toys, he continues: “I observed here pencils which are made in a bungling way by grooving a round piece of cedar then putting in the lead and filling up the cavity with a strip of wood.”²⁹

While this differed from the usual American and British ways of making pencils, it was similar to the procedure used for encasing leads formed by the Conté process. Nevertheless, the passage does indicate that Thoreau certainly thought he knew the ideal or at least the proper way of making a pencil. And, after all, a round pencil lead should certainly be the preferred shape for sharpening to a point, and leads made by the Conté process could be extruded into round shapes as easily as any other. Conté himself apparently produced round leads, and they were made in England for mechanical pencils well before midcentury by passing square strips of plumbago successively through polygonal and round holes in rubies, as if drawing wire. So to insert a round lead in a round hole might have seemed to many to be the most

26. Edward Waldo Emerson, *HENRY THOREAU: AS REMEMBERED BY A YOUNG FRIEND*, page 3

27. Henry David Thoreau, *CORRESPONDENCE*, page 114

28. Walter Harding, *THE DAYS OF HENRY THOREAU: A BIOGRAPHY*, page 157

29. Henry David Thoreau, *JOURNAL*, 1981, Volume 2, page 289



rational of ideas, regardless of how difficult it might have been to execute, for it would have eliminated a lot of grooving and gluing operations. But whether it was even a dream of Thoreau's is not clear.

Apparently there was plenty of reason for Thoreau to believe that he knew what constituted good pencil making. Not only had he developed a fine pencil; he had also found that by varying the amount of clay in the mixture he could produce pencils of different hardness and blackness of mark, just as Conté had discovered. The more clay a pencil lead contained, the harder would be the pencil point, and that Thoreau did not realize this immediately suggests that he did not read about the Conté process explicitly. Thus Thoreau & Company could offer pencils in a variety of hardnesses, "graduated from 1 to 4," as claimed in the wrappers around the pencils, one of which advertised "IMPROVED DRAWING PENCILS, for the nicest uses of the Drawing Master, Surveyor, Engineer, Architect, and Artists Generally."³⁰ By 1844 Thoreau pencils were apparently as good as any to be had, whether of domestic or foreign manufacture, and Ralph Waldo Emerson thought enough of them to send some to his friend Caroline Sturgis in Boston. An exchange of letters in that year tells the tale:

Concord Sunday Eve, May 19

Dear Caroline,

[I] only write now to send you four pencils with different marks which I am very desirous that you should try as drawing pencils & find to be good. Henry Thoreau has made, as he thinks, great improvements in the manufacture, and believes he makes as good a pencil as the good English drawing pencil. You must tell me whether they be or not. They are for sale at Miss Peabody's, as I believe, for 75 cents the dozen....

Farewell.

Waldo

[22 May]

Dear Waldo,

The pencils are excellent, - worthy of Concord art & artists and indeed one of the best productions I ever saw from there - something substantial & useful about it. I shall certainly recommend them to all my friends who use such implements & hope to destroy great numbers of them myself - Is there one softer than S - a S.S. as well as H.H.? I have immediately put mine to use....

[Caroline]³¹

While there appears to be some discrepancies about exactly how much the improved Thoreau pencils did cost, with some reports

30. See Meltzer and Harding, *A THOREAU PROFILE*, page 137

31. THOREAU'S PENCILS: AN UNPUBLISHED LETTER FROM RALPH WALDO EMERSON TO CAROLINE STURGIS, 19 MAY 1844 (Cambridge MA, 1944)



PENCILS

PENCILS

that a single pencil cost as much as twenty-five cents, there seems to be little doubt that they were more expensive than other brands, some of which sold for about fifty cents a dozen. The discrepancies in price no doubt exist because over the years the Thoreaus made a variety of kinds, as surviving labels and broadsides document, and thus sold pencils at a variety of prices. Today, of course, any artifacts associated with Henry David Thoreau are prized possessions, and even as long ago as 1965 a dozen pencils offered by a Boston bookstore sold for \$100 to a collector.

The variety of Thoreau pencils is further suggested by the fact that some were "graduated from 1 to 4," which was the system adopted by Conté, while Caroline Sturgis's letter indicates that the ones Emerson sent her were graduated in terms of the letter S, presumably for "soft," and H, for "hard," with S.S. being softer than S and H.H. harder than H. While Thoreau's, by using antonyms, was a more consistent use of the language than the European system employing abbreviations for "black" and "hard," such dual systems of grading were used throughout the nineteenth century, and they continue to be used with some modifications to this day, with the numeric system now usually designating common writing pencils and the alphabetic one the more expensive drawing and drafting pencils.

Thoreau pencils also appear to have been packaged in a bewildering variety of ways, another practice that persists, presumably to make the buyer feel there is a pencil for every need. Still, all of the Thoreau pencil labels and advertisements that survive, including one in a University of Florida library collection offering black- and red-lead pencils that has been dated as late as about 1845, read "Thoreau & Co.," as do the pencils in the same collection. Pencils in the Concord collections, on the other hand, are imprinted "J. Thoreau & Son. Concord Mass."

While the changing designations and packagings of Thoreau pencils are difficult if not impossible to place in any incontrovertible chronological order, the confusion of undated artifacts only underscores the challenge for the historian of engineering and technology. As the Thoreaus introduced a great variety of pencils and further improvements in their process from the late 1830s through the mid-1840s, it was not doubt desirable, if not necessary, for them to distinguish the newer and improved pencils from the older and superseded ones, but evidently they felt no need to chronicle their changes.

There was certainly no confusion among the Thoreaus about the fact that the latest new pencils they offered were at least different, if not their best, for otherwise there would have been little reason to change labels and designations, and there is little doubt that before Henry David Thoreau was the literary celebrity he has come to be, the pencils that he and his father made came to be without peer in this country. But the Thoreaus, like other pencil manufacturers, did not expect their word alone to sell pencils. Shortly after the Emerson-Sturgis



PENCILS

PENCILS

correspondence, the family business was able to issue a circular which included a testimonial from Emerson's brother-in-law, Charles Jackson:

JOHN THOREAU & CO.,
CONCORD, MASS.
MANUFACTURE
A NEW AND SUPERIOR DRAWING PENCIL,

Expressly for ARTISTS AND CONNISSEURS, possessing in an unusual degree the qualities of the pure lead, superior blackness, and firmness of point, as well as freedom of mark, and warranted not to be affected by changes of temperature. Among numerous other testimonials are the following.

Boston, June, 1844

Dear Sir:- I have used a number of different kinds of Black-lead pencils made by you, and find them to be of excellent quality. I would especially recommend to Engineers your fine hard pencils as capable of giving a very fine line, the points being remarkably even and firm, which is due to the peculiar manner in which the leads are prepared. The softer kinds I find to be of good quality, and much better than any American Pencils I have used,

Respectfully,
Your Obedient Servant,
C.T. Jackson

Boston, June, 1844

Sir:- Having made a trial of your pencils, I do not hesitate to pronounce them superior in ever respect to any American Pencils I have yet met with, and equal to those of Rhodes, or Beekman & Langdon, London.

Respectfully yours,
D.C. Johnson

J. THOREAU & CO. also manufacture the various other kinds of BLACK-LEAD PENCILS; the Mammoth or Large Round, the Rulers or Flat, and the Common of every quality and price; also, Leadpoints in any quantity, and plumbago plates for Galvanic Batteries. All orders addressed to them will be promptly attended to.³²

The use of English pencils as the epitome in the Johnson testimonial and in the Emerson-Sturgis correspondence adds further doubt that it was a German pencil that the Thoreaus set out to emulate. But whatever product they had improved upon, in the last summer of 1844 Henry's mother, Cynthia Dunbar Thoreau, felt the family business had earned them a house of their own, and he put more hours into pencil making to help earn the capital. Thus, contrary to the conventional wisdom then and

32. See Meltzer and Harding, A THOREAU PROFILE, page 138



PENCILS

PENCILS

still current around Concord and elsewhere, Henry David Thoreau was no slouch, even though in May 1845 he left home and the pencil business and began to build his cabin near Walden Pond, where he would live until 1847. Among the many activities he engaged in at Walden was a form of chemical engineering known as bread making, and among his innovations was the inclusion of raisins in some of his dough. This reputed invention of raisin bread is said to have shocked the housewives of Concord.³³ But while he may not have won any ribbons for his cooking, in Thoreau's absence from the family pencil business, the Massachusetts Charitable Mechanic Association awarded a diploma to "John Thoreau & Son for lead pencils exhibited by them at the exhibition and fair of 1847" (perhaps reflecting that a pencil so imprinted was displayed in that year). However, in 1849, the Salem Charitable Mechanics Association awarded a silver medal to "J. Thoreau & Co. for the best lead pencils" at that year's exhibition, suggesting that the son's name even then was not consistently associated with the father's on their products.

There is no mention of pencil making in WALDEN, but there is plenty of economics and sound thinking about business, qualities not alien to good engineering. Thoreau's famous accounting of the cost of the materials of his cabin (\$28.12 1/2) and the profit he made from his "farm" (\$8.71 1/2) attests to his fondness and understanding of business as well as of engineering. As he wrote in WALDEN: "I have always endeavored to acquire strict business habits; they are indispensable to every man." Yet at the same time he recognized the absurdity of the economic system: "The farmer is endeavoring to solve the problem of a livelihood by a formula more complicated than the problem itself. To get his shoestrings he speculates in herds of cattle."³⁴

The Thoreaus had successfully speculated in pencils to get their shoelaces, and when Henry David went into debt in 1849 to publish his first book, A WEEK ON THE CONCORD AND MERRIMACK RIVERS, he manufactured a thousand dollars' worth of pencils to sell in New York. However, the market was becoming flooded with products of American and foreign manufacture, especially those of the world-market-conscious Germans, who by then had mastered the Conté process themselves, and Thoreau had to take a loss on his speculations, selling the lot for only one hundred dollars. While his book got favorable reviews, it did not sell, and he hauled hundreds of copies of it into his attic study. He is said to have remarked that his library there contained "nearly nine hundred volumes, over seven hundred of which I wrote myself."

While Thoreau was trying to sell his book, the pencil business was beginning to receive large orders, not for pencils, but for ground plumbago. The Boston printing firm of Smith & McDougal was secretive about why it wanted such quantities of the material, and the Thoreaus suspected that the firm desired to enter the pencil-manufacturing business. But after swearing the Thoreaus to secrecy, the firm explained that high-quality

33. Walter Harding, THE DAYS OF HENRY THOREAU: A BIOGRAPHY, page 183

34. Henry David Thoreau, WALDEN



PENCILS

PENCILS

graphite was ideal for the recently invented process of electrotyping and the company wished to keep its competitive advantage. Selling the fine graphite powder was extremely lucrative, and the Thoreaus continued to manufacture pencils only as a front. Eventually, in 1853, they gave up the pencil business altogether, and Thoreau is said to have put off his friends, who asked why he was not continuing to make excellent pencils, with the response: "Why should I? I would not do again what I have done once."³⁵

Once pencil making was abandoned as a front, "John Thoreau, Pencil Maker" publicly announced his new product as "Plumbago, Prepared Expressly for Electrotyping," and the black-lead business continued to do well. When his father died in 1859, Henry took over the business, his conscientiousness indicated by his getting himself a copy of *BUSINESSMAN'S ASSISTANT*. In the meantime the American pencil market had become overrun by German manufacturers.

All the while he was dealing in fine plumbago, Henry Thoreau was also writing, publishing, and lecturing about slavery and other matters. But he always maintained a sense of the machine, even in his philosophizing. When he reflected on writing itself in his *JOURNAL*, he wrote: "My pen is a lever which in proportion as the near end stirs me further within – the further end reaches to a greater depth in the reader."³⁶ While Archimedes felt that, given a place on which to stand, he could move the earth with a mechanical lever, Thoreau apparently believed that, given a place to sit and think, he could move the soul within with his metaphorical lever.

Another of Thoreau's professions was surveyor, and among his surveys was that of Walden Pond, a model of quantification that arose out of debunking myth. He wrote in *WALDEN*:

35. Quoted in Walter Harding, *THE DAYS OF HENRY THOREAU: A BIOGRAPHY*, page 262

36. Volume 1, page 315



PENCILS

PENCILS

WALDEN: As I was desirous to recover the long lost bottom of Walden Pond, I surveyed it carefully, before the ice broke up, early in '46, with compass and chain and sounding line. There have been many stories told about the bottom, or rather no bottom, of this pond, which certainly had no foundation for themselves. It is remarkable how long men will believe in the bottomlessness of a pond without taking the trouble to sound it. I have visited two such Bottomless Ponds in one walk in this neighborhood. Many have believed that Walden reached quite through to the other side of the globe. Some who have lain flat on the ice for a long time, looking down through the illusive medium, perchance with watery eyes into the bargain, and driven to hasty conclusions by the fear of catching cold in their breasts, have seen vast holes "into which a load of hay might be driven," if there were any body to drive it, the undoubted source of the Styx and entrance to the Infernal Regions from these parts. Others have gone down from the village with a "fifty-six" and a wagon load of inch rope, but yet have failed to find any bottom; for while the "fifty-six" was resting by the way, they we paying out the rope in the vain attempt to fathom their truly immeasurable capacity for marvellousness. But I can assure my readers that Walden has a reasonably tight bottom at a not unreasonable, though at an unusual, depth.

While his map of the pond in WALDEN has been considered a joke by some critics, who apparently did not wish to allow that Thoreau could seriously be both engineer and humanist, there is too much evidence to the contrary. Among the artifacts in the Concord Free Public Library is a leadless cedar pencil end with a pin projecting from it. Such a simple instrument was a means of copying drawings in the days before the blueprint and xerography. The original outline would be carefully pricked through to another piece of paper, and then the pin marked would be connected with a continuous line. Thoreau apparently not only copied but simplified his map of Walden Pond, not because the details he left out were unimportant, but because they were unnecessary for him to make his point and because they made the survey appear too cluttered. He was as critical of his drawing as he was of his words and his pencils.

Thoreau was no Sunday surveyor, for he goes on in WALDEN in true engineering fashion to specify how accurate his measurements are (three or four inches in a hundred feet). But after observing that the deepest part of the pond is at the intersection of the line of greatest breadth and that of greatest length, he reverts to philosophy and generalizes about the highest parts of mountains and morals:



PENCILS

PENCILS

WALDEN: What I have observed of the pond is no less true in ethics. It is the law of averages. Such a rule of the two diameters not only guides us toward the sun in the system and the heart in man, but draw lines through the length and breadth of the aggregate of a man's particular daily behaviors and waves of life into his coves and inlets, and where they intersect will be the height or depth of his character. Perhaps we need only to know how his shores trend and his adjacent country or circumstances, to infer his depth and concealed bottom. If he is surrounded by mountainous circumstances, an Achillean shore, whose peaks overshadow and are reflected in his bosom, they suggest a corresponding depth in him. But a low and smooth shore proves him shallow on that side. In our bodies, a bold projecting brow falls off to and indicates a corresponding depth of thought. Also there is a bar across the entrance of our every cove, or particular inclination; each is our harbor for a season, in which we are detained and partially land-locked. These inclinations are not whimsical usually, but their form, size, and direction are determined by the promontories of the shore, the ancient axes of elevation. When this bar is gradually increased by storms, tides, or currents, or there is a subsidence of the waters, so that it reaches to the surface, that which was at first but an inclination in the shore in which a thought was harbored becomes an individual lake, cut off from the ocean, wherein the thought secures its own conditions, changes, perhaps, from salt to fresh, becomes a sweet sea, dead sea, or a marsh. At the advent of each individual into this life, may we not suppose that such a bar has risen to the surface somewhere? It is true, we are such poor navigators that our thoughts, for the most part, stand off and on upon a harborless coast, are conversant only with the bights of the bays of poesy, or steer for the public ports of entry, and go into the dry docks of science, where they merely refit for this world, and no natural currents concur to individualize them.

Thoreau always pursued a multiplicity of careers and ideas, and while he wrote his famous books he also practiced surveying throughout the 1850s. His pond surveys were incorporated into the 1852 map of Concord, at the bottom of which he was credited as "H.D. Thoreau, Civil Engineer," a title he sometimes used.³⁷ He even advertised his services, as follows:

LAND
SURVEYING

Of all kinds, according to the best methods known; the necessary data supplied, in order that the boundaries of Farms may be accurately described in Deeds; *Woods* lotted off distinctly and according to a regular plan; *Roads* laid out, &c., &c. Distinct and accurate Plans of Farms furnished, with the buildings thereon, of any

37. Meltzer and Harding, A THOREAU PROFILE, page 172



PENCILS

PENCILS

size, and with a scale of feet attached, to accompany the Farm Book, so that the land may be laid out in a winter evening.

Areas warranted accurate within almost any degree of exactness, and the Variation of the Compass given, so that the lines can be run again. Apply to

HENRY D. THOREAU³⁸

This side of Thoreau was as integral a part of his character as any other. According to Ralph Waldo Emerson, Thoreau became a land surveyor because of "his habit of ascertaining the measures and distances of objects which interested him, the size of trees, the depth and extent of ponds and rivers, the height of mountains, and the airline distance of his favorite summits." Furthermore, "he could pace sixteen rods more accurately than another man could measure them with a rod and chain."³⁹

Thoreau's penchant for measurement and surveying is on display behind Plexiglas in an upstairs cul-de-sac at the end of the tour in the Concord Museum. Among the artifacts from his years at Walden are a T square and compasses and, of course, pencils. But while Emerson knew of Thoreau's pencil making, the fact that he made arguably the best pencil in America seems not to have been sufficient for the essayist, for near the end of the obituary in The Atlantic [August 1862], Emerson wrote of his friend Thoreau:

I so much regret the loss of his rare powers of action, that I cannot help counting it a fault in him that he had no ambition. Wanting this, instead of engineering for all America, he was the captain of a huckleberry-party.

But Thoreau accomplished much more than Emerson seems willing to grant. Thoreau surveyed and built his own cabin on Emerson's land, and it was Emerson's pride that Thoreau fed with excellent domestic pencils, pencils made right in Concord. There are many kinds of engineering for America and for the world.

38. Walter Harding, *THE DAYS OF HENRY THOREAU: A BIOGRAPHY*, facing page 461

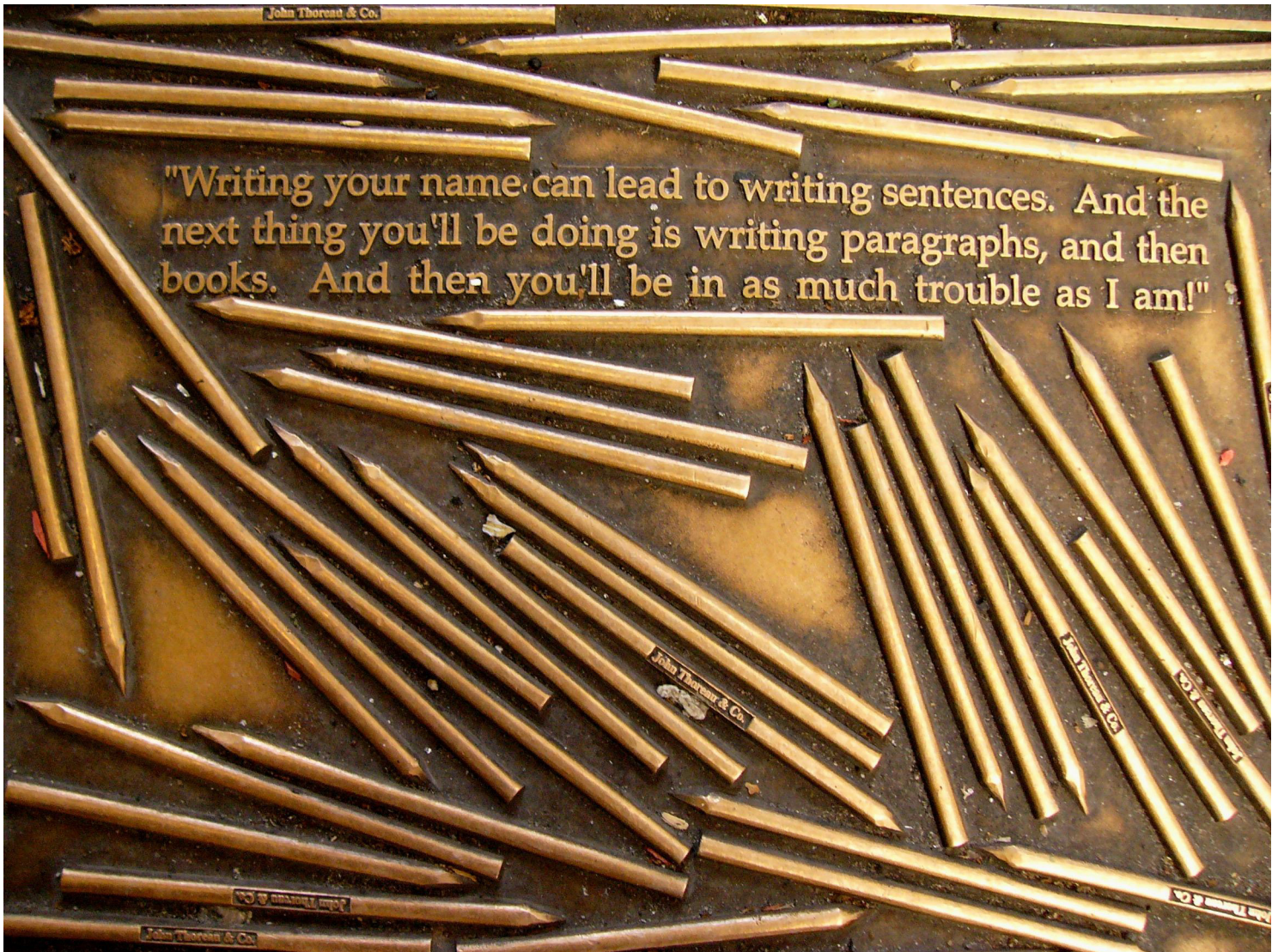
39. See Geoffrey O'Brien, "Thoreau's Book of Life," New York Review of Books, 15 January 1987, page 48; and Edward Emerson, *HENRY THOREAU*, page 242

PENCILS

PENCILS

2003

A series of plaques were created by Greg LeFevre, flush mounted in sidewalks leading toward the New York Public Library. Here is the plaque for Thoreau:





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2007

In Germany, surgeons carefully extracted more than three inches of [pencil](#) from the brain of Mrs. Margret Wegner (at the age of four, 51 years earlier, when she had fallen, a pencil she was carrying penetrated her cheek close to the optic nerve of the right eye and entered the brain; recent advances in imaging had rendered such a delicate operation for the first time feasible).⁴⁰

READING	PAPER	INK	THE BOOK	THE PRESS	THE PENCIL
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"It's all now you see. Yesterday won't be over until tomorrow and tomorrow began ten thousand years ago."

- Remark by character "Garin Stevens"
in William Faulkner's INTRUDER IN THE DUST



Prepared: July 26, 2013

40. In related news, Homer Simpson was found to have a crayon embedded in his brain. When it was extracted he became a genius.

ARRGH AUTOMATED RESearch REPORT GENERATION HOTLINE



This stuff presumably looks to you as if it were generated by a human. Such is not the case. Instead, upon someone's request we have pulled it out of the hat of a pirate that has grown out of the shoulder of our pet parrot "Laura" (depicted above). What these chronological lists are: they are research reports compiled by ARRGH algorithms out of a database of data modules which we term the Kouroo Contexture. This is data mining. To respond to such a request for information, we merely push a button.



PENCILS

PENCILS

Commonly, the first output of the program has obvious deficiencies and so we need to go back into the data modules stored in the contexture and do a minor amount of tweaking, and then we need to punch that button again and do a recompile of the chronology – but there is nothing here that remotely resembles the ordinary “writerly” process which you know and love. As the contents of this originating contexture improve, and as the programming improves, and as funding becomes available (to date no funding whatever has been needed in the creation of this facility, the entire operation being run out of pocket change) we expect a diminished need to do such tweaking and recompiling, and we fully expect to achieve a simulation of a generous and untiring robotic research librarian. Onward and upward in this brave new world.

First come first serve. There is no charge.
Place your requests with <Kouroo@kouroo.info>.
Arrgh.



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To: THOR-SOC LIST <THOR-SOC@ECUVM.CIS.ECU.EDU>

On “60 Minutes,” Andy Rooney was going on and on about the unsolicited useless stuff that people send him. He showed, as an example, a kit that had come in his snailmail that demonstrated the various stages in the manufacture of pencils. He showed that the kit started with a plain wood slat, went on to a wood slat that had been grooved, then to a wood slat in which the grooves had been filled in with graphite composite material, then to a wood slat onto which a wooden cover plate had been glued to form a complete pencil block, and finally a pencil block that had been partially shaped in preparation for severing it into a number of pencils. There was also in the kit one completed pencil.

The “humor” in all this seemed to be in Andy Rooney pointing out how ungrateful he is, as the designated recipient of unsolicited useless items.

Does anyone know who makes this pencil kit? It would be a **marvelous** thing to hand around a class while speaking of the Thoreau family business!

One of the side remarks that had been allowed to appear recently on another scholarly list, a rather tightly moderated one (!), was that

“Thoreau did in fact depend on the female members of his family all his life...,”

quote unquote. After several sessions with my private scratchpad, scribbling and erasing expressions of anger that this sort of malicious and unfounded gossip would be tolerated, rather than air such laundry in public I responded with a brief tart note, to the effect that it will be of interest to note that in Raymond E. Borst’s *THE THOREAU LOG: A DOCUMENTARY LIFE OF HENRY DAVID THOREAU 1817-1862* (NY: G.K. Hall, 1992), the life situation is gone into in adequate detail to establish conclusively, on the basis for instance of many preserved formal receipts for room-and-board payments (Thoreau preserved them for us by using them as scratch paper), that throughout his too-brief life Henry was never a weight on his relatives. His payments, I offered for the benefit of that list, when not made through his day wages for such tasks as shoveling manure, building fences, doing surveying, or lecturing, might on occasion have been made in kind, that is, through specified periods of labor in the family pencil factory, but were otherwise quite identical with the payments being made by non-family-members residing in that boardinghouse. There is reason to believe that his trade-secret mechanical inventions improved the family business, for instance in the fine grinding of graphite for use with the newly invented rotary printing presses of that era, and actually projected that family into a not-negligible prosperity which did much to protect his surviving mother Cynthia and sister Sophia in their old age. Granting that it was appropriate to make some sort of more or less factual response under such circumstances, and to make this corrective promptly — did I get my facts more or less straight above?

[Brad Dean responded:] To paraphrase a line from one of my favorite films, “Austin Meredith is right!”



PENCILS

PENCILS

All indications I have ever seen (and I dig through a lot of Thoreau manuscripts) support Meredith's assertion that Thoreau was much more an asset than a liability to the household of John and Cynthia Thoreau.

Unfortunately, Meredith can find as many facts as he likes; people who are fond of pointing out that Thoreau stole pies off windowsills while at Walden Pond, mooched off his folks, and did any number of other malicious things detrimental to his family and his community will continue to make their assertions. Facts never bother such folks a wit, despite their claims that "Thoreau did in fact" do or not do such-and-such. Thoreau himself summed up the predicament with characteristic acuity:

"The stupid ye shall always have with you."

Amen.