

Connecticut's Minor Metals and Her Minerals Part 2

By Charles Rufus Harte

Presented at the 60th Annual Meeting
of the Connecticut Society of Civil Engineers, 1944

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CONNECTICUT'S MINOR METALS AND HER MINERALS*

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Connecticut's iron and copper were the most important of her metals, but they were far from being the only ones mined; here, as elsewhere, apparently it was only necessary for some one to dig a hole, allege that it reached a valuable mineral deposit, and organize a company to work it—"it" usually proving to be the stockholders—to have otherwise staid and sedate citizens fall over each other in their rush to subscribe to the venture.

Of the less important mining projects, that ranks first which gave its name to its location.

COBALT

The "Kobold" of the old German folk tales was a mischievous imp, evidently an ancestor of our present-day "Gremlins," which took particular delight in getting mortals to pursue riches or pleasures which, just as they were apparently within grasp, vanished into thin air. And so, when the old German miners found an ore which by its silvery appearance, gave every indication of containing the precious white metal, but which, when treated, merely produced an evil odor, they naturally called it "kobold."

Today we know how to obtain the metal, anglicized to "Cobalt," which is an important element of many exceedingly valuable alloys, but at Connecticut's one deposit, at Great Hill, a little south of Portland, the evil "kobold" spirit has been ever present.

As of May 25, 1661:

"The inhabitants of Middletowne for ye encouragement of ye designes of our much honoured governor m Jon Winthrop for ye discovery of mines & mineralls & for ye setting up of such works as shall be needfull for ye improvement of them, doe hereby grant unto our said much honoured governor any profitable mines or mineralls yt he shall finde or discover, upon any conion land witin ye bounds of our towne, & such wood land as may be convenient for ye same to ye value of 500 or 1000 acres as it may by, so yt it be not nearer then two or 3 miles from ye present dwelling houses of ye towne as ye towne shall judge to be least prejudiciall to them selves for their necessary

*Presented at the 60th Annual Meeting of The Connecticut Society of Civil Engineers, Inc., at Hartford, March 22, 1944. (Part II.) Part I appeared in 60th Annual Report, p. 131.

firewood, provided that ye towne shall (have, CRH) free liberty of comonage as far as our towne bounds goe, untill ye improvers shall see good to impropriate ye same into inclosures, provided further yt the said governour & such as may be coimproovers with him will set upon ye worke to improve such mines & mineralls as he shall finde with these 5 years, and let us know whether he doth accept of this our grant within two yeares, & so it to be to him & his heirs and associates forever, from ye time of their setting up of such work else at two or 5 years end to be in ye liberty of ye towne to grant ye same to any other."

It is not clear whether it was before or after this grant was made that Winthrop was making the trips on which he is supposed to have found sufficient gold to make rings and give the local name of "The Governor's Ring" to what is now known as "Great Hill," nor does Winthrop's known correspondence with his scientific friends in England seem to carry any reference to the nature or amount of what he may have found.

Nothing further seems to have been done in the locality for one hundred years, but in 1762 a German, Dr. John Sebastian Stephauney, who may have noticed ore outcrops, employed a number of men who dug in the hill for a short time. It is not clear what he found, or what led him to stop work; quite likely it was lack of funds, but he must have had some success, for eight years later he had formed a partnership with two men usually referred to as Germans, although the names, Gominus Erkelens and John Knool seem Dutch rather than German.

The partnership was short-lived, but Stephauney, who sold out to the others, evidently had faith in the venture, for he reserved to himself a share of the profits, and it was agreed that such metals and minerals as were shipped to Holland were to go to friends of Erkelens,—a bit of circumstantial evidence that he was Dutch—while any sent to England were to go to friends of Knool. The two remaining partners seem to have been quite active. A large opening was made in the hill, apparently an adit or tunnel, for Dr. David Dudley Fields, describing it in his address on the occasion of Middletown's bi-centennial celebration, said that:

"The superincumbent matter was prevented by stanchions from falling upon the laborers."

For contemporary information regarding the property, we have the following entry, dated June 1, 1787, from the diary of President Ezra Stiles of Yale College:

"Mr. Erkelens visited me, full of his Cobalt mine & China Voyage. He some years ago bought the Governor's Ring, as it is called, or a mountain in the N. W. corner of East Haddam, comprehending about 800 acres, or above a sq mile area. Here he finds plenty of Cobalt, which he manufactures into Smalt, with wh is made the beautiful Blue on china Ware. One Ton of ore is manufact into eighteen, viz 1 part ore 3 pts Flint & 3 pts potash,—and repeats

this on the Regulus. (Colloquially:—"and repeats by stewing in its own juice." The mixed ingredients were added in batches to the already melted Smalt, the "Regulus". CRH) The Smalt is worth 2/ ster. p. pound, in Holland brot from China. But at 1/ it will become £100 per Ton. So 1 Ton becomes £1800 sterlg.

"Gov. Trumbull has often told me that this was the place to which Gov. Winthrop of N Lond used to resort with his Servant, and after spendg three weeks in the woods of this mountain in roastg ores assaying metals casting gold rings he usd to return home to N Lond with plenty of gold. Hence this is called the Gov. Winthrop's ring to this day. Gov. Winthrop was an Adept, in intimate correspond with Sir Knelm Digby and first chemical and philosophical characters of the last century—as may be seen in the Dedicⁿ of 40th vol. phil. Transaction 1740.

"Mr. Erkelens about 1775 being a Projector, erected a Distillery in Had, (Haddam, CRH) 6 m fm Middletn on a stream descending from this mountain—he also purchased the Cobalt mine there; He has been at £2,000, ster expense to no Profit. He is going on a Voyage to China, carrying with him 20 Tons Cobalt Ore."

(Literary Diary of President Ezra Stiles, Manuscript volume 13, page 34.)

Dr. Fields suggests that Erkelens'

"object in building a distillery probably was, as at that time the regular trade with the West Indies was liable to be greatly interrupted, that he might supply his workmen more conveniently with a beverage which they loved, and have wherewithal to supply exposed and suffering soldiers, who in the current opinion of that period, would hardly be expected to live and fight bravely without the aid and stimulus of strong drink."

The departure of Mr. Erkelens for China seems to have been the signal for shutting down the operations, and the mine remained closed for some thirty years. We will let Dr. Fields tell the story of the next victim of the "Kobold."

"Mr. Seth Hunt, from New Hampshire, commenced operations at Great Hill in the autumn of 1818 and continued them about two years. Anticipating great results, he expended liberally and exhausted his own resources. In these circumstances he sold interests in what he had done and obtained, say one sixteenth to one friend and one sixth to another, until he had gathered around him six associates, only one of whom is now (1850, CRH) living. This survivor states that Mr. Hunt expended about \$20,000; that his main outlay in mining was in following the vein opened by the Germans downward, but that he also opened the earth and traced near a quarter of a mile eastward, where he found more mica and the absence of hornblende, and that he expended much in repairing the old glass furnace in Glastonbury and in fitting it to smelt; in carting ore thither (where most was sent); stamping it by hand and reducing by potash. This survivor further states, that though Mr. Hunt read books on mining, he did not well understand his work, and that he doubts whether the man on whom he relied for chemical and scientific information knew more than he did himself; that he obtained as he supposed

1,000 lbs of Cobalt which was proved in England to be nickel, containing from 3 to 4 parts Cobalt. This proof induced an entire suspension of operations."

(Field's Middletown Bi-Centennial Address, page 276.)

Hunt's operations came to an end in 1821, and for the next twenty-three years the property lay idle. Then Dr. Charles Upham Shepard, the author of the "Report on the Geological Survey of Connecticut" of 1837, took a brief fling at it, employing a small force of men for but a few days and then quitting, leaving no known record of what or how much he may have obtained, or what, if he found anything, he did with it.

But the lure was strong, and six years later a group of Philadelphia capitalists employed one Edmund Brown to see what he could do with the "prospect." With a large force of workers, Brown sank a shaft with a cross-section seven feet by nine, to a depth of 38 feet, ran a drift from it for some 50 or 60 feet, and from a point 700 feet east of the shaft and in the ravine of the brook he drove a tunnel, intending to carry it to the shaft opening; actually, however, it only reached a length of 35 feet. Meantime he was erecting a crushing plant, a smelter and a laboratory, but the heavy expenditures, coupled with the absence of any corresponding returns, so alarmed his employers that they sent a French mining expert, one Dr. Francfort, to investigate, and although Francfort expressed his confidence that there were richer deposits Brown had missed, the fact that the best ore the latter had raised contained but two per cent of cobalt led to another abandonment of operations. Brown's unsuccessful administration had lasted but eighteen months, and it is said that shortly after its termination he died.

Francfort's confidence in the possibilities of the property, however, resulted in another group of capitalists becoming interested, and by 1853 the "Chatham Cobalt Mining Company," organized under the General Laws of New York, and with an authorized capital of \$500,000, issued, as a prospectus, a pamphlet entitled "By-Laws and Officers of the Chatham Cobalt Mining Company." Following the list of officers, the by-laws, and analyses by C. F. A. Simonin showing that "general run of the lode, crushed and washed" contained "18.2% of Oxide of Cobalt and Nickel" while "washed ore" contained 13.7 to 13.85% of the same, and a "specimen of general run of the lode, not washed" showed 2.2%, came the important feature, the offer by W. Coffin, Esq., head of a large copper and nickel refining laboratory in Philadelphia—and incidentally, President of the Mining Company—to purchase at least a considerable part of the prospective output, under the following conditions:

"We base our offer on the ore being washed up to eighteen per cent of Cobalt and Nickel as per sample taken from the mine and washed and tested

by our Mr. C. F. A. Simonin."

"For the above we will give you two hundred dollars per ton of 2240 pounds delivered at the wharf in Philadelphia, on twelve month's credit from delivery; or a deduction for cash."

"We will take two hundred tons of the ore for the first year (commencing from the time of the first delivery of the same,) at the price named, and after that time will refine all that we can sell. Cobalt is worth fourteen shillings sterling per pound, at the present time. . . . in case the price of cobalt or nickel should vary from fourteen shillings sterling per pound for cobalt and one dollar and seventy cents per pound for nickel, that you should bear half the loss in case the price falls, and that we should allow you one half the extra profits in case the price advances above the price named . . . on condition we are to have twenty-five hundred shares . . . at the regular subscription price (the capital was 100,000 shares at \$5.00 each. CRH), and the refusal of twenty-five hundred additional at the same price at a future time."

That W. Coffin, Esq., as head of the Philadelphia laboratory, did not let the fact that he was President of the Mining Company as well influence him to "let down" his Philadelphia associates seems fairly evident from the "twelve months' credit" to be given.

In the "First Annual Report" of September, 1853, Dr. Francfort, apparently acting only as a consultant, estimated that a ton of run-of-mine ore could be raised and delivered at the "stamping house" for \$8.00; that stamping and dressing, assuming proper equipment, would add \$6.00 and would produce one-eighth of a ton of 15 per cent cobalt concentrate, making the cost of a ton of the latter \$112.00 at the plant. Supposing that the cost of transportation to Philadelphia was "about \$8.00," the total cost "at the wharf in Philadelphia" would be \$120.00. This, he said, would bring \$250.00 leaving a profit of \$130.00 per ton. He did not explain, however, how he could get \$250.00 per ton for "fifteen per cent cobalt" when Coffin's price was but \$200.00 per ton for ore "washed up to eighteen per cent of cobalt and nickel."

Apparently at the time of this report, September, 1853, but little more than prospecting had been done, for he closes with the pious wish:

"After having thus given you my opinion, I hope you will appoint some competent person or persons to confirm or reject them.

"Hoping that you will soon be so organized that the necessary improvements can be proceeded with, and assuring you that the best results can be anticipated from these improvements, I am

Your very respectfully
E. Francfort"

The "Second Annual Report" dated July, 1855, started out with a report by Professor J. C. Booth of the United States Mint, which, while decidedly "iffy," was pretty good confirmation of the conclusions reached by Dr. Francfort.

Booth stated that the Roberts Lode, the one then being worked, was from six to seven feet wide; that it had been identified for a distance of 200 yards and might well extend for a mile or so; and that:

"In depth it is rather richer in ore in the 20 fathom (the use of the naval unit "fathom" in all the earlier mining reports is interesting. CRH) level than above . . . and may be fairly inferred . . . to be of unlimited depth."

He believed:

"that the lowest estimate (of the contents, CRH) would be five per cent of clear-washed ore"

and he continued:

"If I fairly state that the mine contains *five per cent* of *pure ore*, in a vein averaging six feet in width, and that it is readily extracted by simple mechanical means, then it is not *extravagant to entertain an exalted opinion of your mines.*—*Such an opinion I entertain,* and I am fully entitled to do so from the facts in relation to your mines which I have presented above, and from my having been for years either actively engaged in refining these metals, or indirectly connected with a Refinery.

"I fully believe that the mines of the Chatham Cobalt Mining Co., when fairly developed, which must soon be the case, will exercise a powerful influence on the market for the metals Cobalt and Nickel."

Francfort, now Superintendent of the Mine, started his report with an understandable "I told you so":

"I am able to assure you that the prospects held out in my last Report, published in 1853, have been fully realized by the explorations and discoveries made at your mines since then. I am happy to inform you, that, as soon as certain objects, to which I shall take liberty to refer, will have been gained, which can easily be done in a short time, your property will rank highly among the very few legitimate Mining enterprises of this country, and your mines will be the most productive and reliable source from which Nickel and Cobalt hereafter will be obtained."

Francfort then proceeded to describe the situation in considerable detail. The Roberts Lode, running northeast and southwest, had been traced for a mile, and the "Engine Shaft," seven feet by ten in cross-section, had been sunk to the 20 fathom level, from which a cross-cut had been extended to the Roberts, proving that the latter was at least 120 feet deep. A second shaft, "Bucks," had been sunk 5 fathoms directly on the lode, while an adit "48 fathoms long" apparently also was on it. He makes no mention of the "Champion" lode of his first report, but he mentions three others, the "Coffin," about two feet in width, the "Barrett," and the

"Fluckan," which from the slight investigation they have had apparently are not as rich as Roberts.

There had been erected an engine and mill building, containing two 100 horse-power engines; three batteries of stamps, each with four 580 pound heads; and 8 Bradford Ore Separators, each capable of treating two tons of ore daily. Three more 4-stamp batteries had been ordered, and the mill was designed for a total of 50 stamps. Tramways extended from the Engine Shaft, Bucks Shaft and the adit to the mill, and promised, when the hauling machinery then on the ground was installed, marked economy in getting the ore to the stamps, which, with the separators, were so arranged that the material moved largely by gravity.

No figures were given as to actual output, but it was noted that Bucks Shaft produced approximately 4% of ore at the 5 fathom level, while at the 20 fathom level 5% was obtained, giving promise of greater percentage farther down in the Roberts lode. Simonin, sampling at the surface for the Philadelphia laboratory, had found but 2.2%.

These conditions as of July, 1855, have been given in this detail as particularly interesting in view of what followed, apparently almost immediately. Although here was an extensive mining plant, and as far as can be determined from the only available records, a well-ordered one, with ample sources of ore, Kobold seems once more to have worked his evil spell, even to the extent of suppressing any account of what ended this, the last project. The nearest approach to an explanation is in Carl Price's "Yankee Township." Speaking of Cobalt, he says:

"Horace Johnson once showed me a record he had of the shipment by this company of forty tons of ore to Philadelphia, for which they received \$370—about what it had cost them to mine and have ground, roasted, prepared and shipped. After spending much money the company finally abandoned the mine and the buildings were dismantled."

Today the locality is a part of the State Park System, and the ravine tunnel, some of the stonework of the mill building, and the partly filled Engine Shaft is practically all that is left of a project which induced 5 companies in turn to attempt its successful operation, only in turn to fail.

NICKEL

Although no such attention as was given cobalt seems to have been directed to the mining of nickel, the close relationship of the two, which are quite generally found together, which was the case at the Cobalt, Connecticut, mine, makes this the logical place for such history as exists of nickel mining.

The fact that the Chatham Company ores were ores of nickel as well as of cobalt has been noted previously; it was the discovery that the thousand pounds of ore Hunt sent to England proved to be chiefly nickel instead of cobalt as had been supposed, that largely was the cause of his undoing; and the Coffin contract with the Chatham Cobalt Company was based on ore carrying approximately equal parts of the two metals, but no record of actual amounts of nickel obtained have been found, although it is stated in the contract that the price of nickel at that time—1853—was \$1.70 per pound.

The Cobalt nickel ores were compounds of arsenic, but there were other nickel mines in which the metal occurs in combination with sulphur, and not associated with cobalt, at least to any extent.

Outcrops of nickel ore, on Prospect Mountain, about $3\frac{1}{2}$ miles west of Litchfield, were explored to some extent by open pits, the first investigation occurring about 1842. Schairer—Mineralogy of Connecticut—lists three mines, the Granniss, just west of the mountain; Buck's, on the southeast slope; and the Connecticut Nickel Company's mine, one mile south of the summit. Dr. F. A. Genth, in a report dated December 1, 1859, to a Mr. T. Mason Mitchell, refers to a shaft on the northeast slope of the mountain—apparently Schairer's "Connecticut Nickel Company's mine"—which he elsewhere calls "the old mine," which had been worked down to the vein to a depth of about 40 feet, and says:

"People of undoubted honesty and entirely disinterested, state that mines have driven on the vein and in the same in all directions for a distance of about 60 feet, and that the whole was ore, and in fact when I compared the pile of dead rock with that of valuable ore lying on the surface, I do not doubt the truth of their statements."

He concludes his report in the best tradition of the mining expert:

"From the analysis of the ore and their occurrence, I come to the conclusion that the Prospect Mountain vein is the most valuable nickel vein developed at present, and that by the facility and little expense with which an inexhaustible quantity of valuable ore can be raised, and the easy extraction of nickel therefrom, it is able control the nickel market of this country and Europe."

In 1863 Thomas Petherick, a mining engineer of Pottsville, Pennsylvania, visited the Granniss. He reported to the President and Directors of the Nickel Mining and Smelting Company:

"On visiting your "Granniss" property, near Litchfield in Connecticut, I was very favorably impressed with the prospect which I found developed there of an abundant supply of nickel ore, obtainable at a cheap rate.

"The openings on the vein on the "Granniss" property are very limited in extent. The principal ones of them are at two points at the Smith shop at but a little distance apart; the deepest being only a few feet below the sur-

face. These openings afford the prospect of yielding very large quantities of good ore at a very moderate cost. The width of the vein I am not able to state; in the deepest opening it is opened in width above 9 feet, which is probably but a small part of its general thickness. There is no "wall" yet seen in this opening. I consider it to be a very powerful vein. That it is longitudinally very extensive I am perfectly satisfied from my examinations of the openings, and from various indications which I observed on the property."

In "Economic Geology" for 1915, volume 10, page 330, Ernest Howe describes a visit to the mines, which apparently failed to "control the nickel market of this country and Europe," for he paints a somewhat different picture from that of the earlier "experts."

"In years past a few nickel bearing sulphide deposits were explored by shallow shafts near Prospect Hill, but according to local accounts active mining ceased some fifty years ago (1860, about the time of the Petherick report. CRH), when it became evident that the ore was a too low grade and in too small quantities to warrant further operations. Although economically of no value, the "ores" are of some interest. (from a mineralogical point of view. CRH).

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"At the Granniss mine, there is a water-filled shaft and a short tunnel evidently started as a cross cut but abandoned before reaching ore. The Buck mine consists of four shafts within a hundred feet of each other, and at the Connecticut (Nickel) Company's mine there is one shaft."

Finally, we have a report dated May, 1917, by one J. S. Miller, which tends, if he is to be believed, to restore confidence in Genth and Petherick. Miller first notes:

"Judging from the evidence the writer has gathered from the reports of Mining Engineers and others familiar with the district, there was a considerable effort made by the former discoverers and operators to make these mineral deposits of commercial value, and in trying to do this, a considerable quantity of ore was mined and shipped to different places, both in this country and in Europe for treatment, but as there was no known method at that time for the reduction and separation of such ores, this mineral (Pentlandite, a nickel-iron sulphide. CRH) was then considered as worthless, and the properties were abandoned. Since that time they filled up with water, timber and brush grew up so as to obscure them from view and their history and existence was known only to a few of the local citizens whose association with the owners of the property kept them in touch with it. Through them the writer was induced to visit the district, and after careful inspection, it was arranged to pump the water out of one of the workings and to put it in shape for examination and sampling of the ore bodies."

The working which was unwatered would seem to have been the "Old Mine" of Genth, the "Connecticut (Nickel) Company's" of Howe:

"Its location is apparently about the center of the district and the working consists of an underhand stope or pit in the deposit, carried to a depth of about



Photo by the author

THE "OLD MINE" OF GENTH (NICKEL)

forty feet, and some thirty feet wide and eighty feet long. This entire working is all in ore and the total width of the ore body is not disclosed as there is no evidence of a wall in any direction."

Analyses of samples of the ore showed from 1.65 to 2.86 per cent nickel; 0.97 to 1.31 per cent copper; and 11.99 to 16.45 per cent sulphur as compared to Petherick's 3.20 nickel; 0.03 copper; and 25.21 sulphur.

Miller continued:

"The ore as shown by the analysis is very desirable as a product for the manufacture of sulphuric acid, being free from arsenic and antimony and other objectionable elements. The location of the deposit which is twenty miles from large consumers of acid, adds much to its value as the acid can be conveyed to the consumers at Waterbury, Connecticut, through a lead pipe

by gravity in the form of a low degree acid and used by them for pickling purposes. Thus, the advantage over other acid producing plants is apparent, because of the small cost of producing a low degree acid over the high cost of concentrating it to a sixty degree commercial acid for transportation. It is evident that the saving in transportation alone would enable the producers of acid from these ores to undersell all competitors if necessary and yet derive a fair margin of profit for the sulphuric acid contents as a by product.

* * * * *

"It is my opinion that this property when extensively opened up, will produce a large tonnage (sic) of very attractive ore which will be unique in American mineral deposits, producing nickel, copper, and sulphuric acid."

The opportunity still waits for some one to seize it; in view of the differing opinions of the "experts" it might well be said: "You pays your money and takes your choice." Judging from our other mining projects, however, in any case you leave your money.

LEAD

While there seems to be very little on record concerning the mining of lead, what there is indicates that in returns to the State it ranks third in importance. It occurs in many parts of the State as galena, the sulphide, and has been mined at a number of localities, but there appears to have been but one really important working.

The Middletown Mine

Somewhat prior to the outbreak of the Revolutionary War "foreigners" opened and operated a lead mine on the east bank of the Connecticut River and in the Town of Middletown, expending, so it is said, much money in connection with it. It is not clear whether the British Colonel James, who was in possession of the mine when war was declared, and who had a large quantity of ore ready to send abroad, was, or was not, one of the "foreigners," but be that as it may, Connecticut at once seized mine and ore. On May 25, 1775, Titus Hosmer wrote Silas Deane, Esq., then a Connecticut delegate to the Continental Congress:

"The state of the lead mine in this town has likewise engaged our attention. Upon enquiry, we find the ore is plenty and reputed rich, the vein is opened, seven tons of ore now raised and ready for smelting, and any other quantity may be had that may be required. The only desideratum is; how to smelt the ore and the metal. This may unquestionably be done if skilful workmen can be obtained. Mr. Wales, who is now in New York, has orders to make enquiry there for such workmen, and gain every information necessary on this subject. If you could give us any light, from enquiries you can make where you are, either with regard to workmen, or the process, you will render an acceptable service to your country, as there can be no reasonable doubt if we can succeed in refining, that this mine will abundantly supply not only New

England, but all the colonies with lead, in such plenty as to answer every demand of war or peace."

(Beers History of Middlesex County, page 78.)

In May of 1775 a committee of three, including Hosmer, was appointed: "to work the ore at the lead mine at Middletown, and the sum of 500 appropriated for that purpose"; and that the desired workmen and information had been secured seems evident from a later letter, of November 19, 1775, which said:

"Our Lead Works have been kept back by the great rains this month past. In ten days at farthest I shall be able to inform you how they succeed. The stamping mill is going and the furnace will begin to blow next week, unless prevented by stormy or cold weather."

The mine and furnace remained in the hands of the State Committee for the next three years. On March 23, 1776, the Committee was ordered to send one ton of lead to Nathaniel Shaw at New London; on the second of July they were authorized to sell 1,000 pounds to a committee from "the Coos Country" (New Hampshire, CRH); and on July 16, of that same year they were instructed to give Joseph Webb 1,000 pounds, to be replaced by the selectmen of Wethersfield and delivered to Captain Wadsworth, for the army at Cambridge. It was some time in 1776 when it was reported there were 5,140 pounds of lead "in the care of the committee appointed to improve the furnace at Middletown." In 1778, however, the Committee informed the Assembly "that the manufacture of said ore was unprofitable to the State," and they were advised to discontinue any further smelting of lead at the mine as soon as they finished with the ore on hand.

Nothing further seems to have been done at the mine, although in an article in the Middletown "Sentinel and Witness" in 1852 or 1853 Dr. Francfort of Chatham Cobalt fame, expressed the opinion that by recovering other metals present the mine could be worked profitably, and that he proposed to do so. There seems to be no account, however, of any actual attempt to work the mine since 1778 by Francfort or anyone else.

None of the other lead mines seem to have been of any particular importance. Shepard mentions "The silvermine in Wilton" where "Here is an excavation said to be seventy-five feet in depth, and reported to have been made during the period of the revolution." This would seem to be one of the "lead mines in New Canaan" which the Connecticut Assembly in 1775 instructed Joseph Hopkins and Captain Samuel Forbes (of Salisbury cannon fame. CRH) to "examine the quality of the ore, the state of the mines, &c., and report to the next Legislature." (Hinman, page 192).

Shepard lists also "the more recent discovery of galena in Brookfield," which, while "the main body of ore was indeed exhausted very soon"

“ . . . the nature of the containing rock as well as that of the immediate vicinity . . . affords much encouragement to the idea of a valuable mining district.” a promise quite evidently not realized. He mentions also a deposit at “Monroe, known as Lane’s mine” where the galena is unusually rich in silver, and where “future research may lead to a discovery of the ore in greater abundance. There was at Sandy Hook a “tunnel” called a silvermine; in Kensington Parish, in Berlin, was “another of these old lead-diggings” which was “explored during and prior to, the revolutionary war” and where “Unsuccessful attempts to find a body of ore were also made about thirty years (1807, CRH) years ago” and a number of minor occurrences are noted.

Schairer lists the Wilton mine, and continues:

“There was an old lead mine along Lead Mine Brook, Harwinton, but the author has been unable to find its exact location. Lead, silver and copper were mined without much success near Maltby Lakes, New Haven . . . There is an old lead mine one and one-half miles west of Canton . . . The old Brookfield lead mine . . . locality is now (1931 CRH) overgrown and difficult to find.”

Again, except in the case of the Middletown mine, we have little more than locations and disappointments for another of Connecticut’s mining ventures.

TUNGSTEN

On December 20, 1828, Elijah Hawley:

“In consideration of one-third of the minerals dug on said ground received to my full satisfaction of Ephraim Lane (did) lease unto said Lane for one hundred years, 4 acre tract called “Shagnawamp” (Long Hill, Trumbull. CRH) for the purpose of digging as they may deem proper, ores and minerals, and the liberty of passing from the same with teams and carts for all necessary purposes of carting and transporting ores and minerals from said locality.”

Ephraim Lane seems to have sold or leased to Thomas R. Hubbard, who worked “in a primitive manner, for copper, lead and silver,” the openings started by the Lanes, the only concern with the tungsten at this time being that of the mineralogists, who were greatly interested, due to the fact that the original tungsten-bearing mineral at Trumbull was scheelite, calcium tungstate, CaWO_4 , of the chemist, but in which, in the course of time, the calcium had been replaced by iron, making wolframite, FeWO_4 , but without change in the characteristic form of the scheelite crystals, thus forming what the mineralogists term a “pseudomorph after scheelite.”

Several successive owners quarried limestone and feldspar and made

artificial stone from material obtained on the property, and one story has it that "quartz" from the deposit was used in making the "Blue Light" signals of the Civil War, but as these contained no quartz nor any other mineral found at Long Hill, it is evident that some one has "misremembered."

In the autumn of 1887 Professor Adolf Gurlt of the University of Bonn visited the locality, and the lease of the property from the Hubbard heirs by The New York Mining Company and The Rare Minerals Mining Company, represented by Edward B. Machette and William R. Hinsdale may well have been a result. Little seems to have been done, however, until May, 1897, other than the transfer of the lease to The American Tungsten Mining & Milling Company. At that time Adelaide Hubbard made a new lease and agreement to run three years, with Machette and Hinman, representing the new company, for:

"All the iron, clays, ores, also any of the minerals, or fossil substances being, and laying, in, on, or under . . . said tract . . . to include the mineral rights . . . for the purpose of searching, boring, mining, digging, for iron, clays, ores, or any and all minerals and all fossil substances . . . quarry operations . . . building roads, buildings, etc., as deemed necessary."

It is not clear what was done in the next two years, but in July, 1899, The American Tungsten Mining & Milling Company negotiated a loan of \$100,000, issuing to secure it gold bonds, maturing in July, 1914, of \$500 denomination.

About this time there was erected an extensive plant for concentrating the ore. Built on the steep incline close to the mouth of the mine, both to reduce haul and to have the advantage of gravity operation, the ore, broken to large size, was further reduced by a Blake crusher of ten tons per hour capacity. It was then carried across a table where it was hand cleaned; then to other crushers and rolls; up to the top again by an elevator; down through screens; and then to the Hooper dry concentrators; after which the concentrate was roasted to remove the small amount of pyrites. How many concentrators there were is not of record, but they were said to be capable of treating 10 tons per day.

In the 22d Annual Report of the United States Geological Survey, part 2, page 7, dated June 30, 1901, W. H. Hobbs, after stating that there had been spent some \$60,000 on the plant, but that no appreciable quantity of the product appeared to have been placed upon the market, added: "At this writing (June 1901, CRH) operations have been discontinued, with little prospect of resumption of work in the near future." It seems probable that it was at this stage that the Bethlehem Steel Company took a hand in the proceedings. Work was resumed, however, and additions and changes

were made at the plant. An article in the Bridgeport "Times Star" of October 6, 1933, after describing an artificial stone plant on the same property, states that the mine finally became the property of the Bethlehem Steel Company, who mined tungsten employing three elevators to bring the material out of the pits; that it was then run through water-filled troughs and over seven concentration tables; and that it had been in operation about 8 months when the fire occurred. As the date of the fire was May 21, 1916, it would seem that Bethlehem Steel started up the plant about the middle of September, 1915, about four months after a judgment had been obtained against the Long Hill Mining Company and Frederick C. Beach as President of the American Tungsten Mining & Milling Company. Another account, which set the total loss by the fire at between \$250,000 and \$300,000, stated that The New Reform Tungsten Company of America, lessee at the time, held an option to purchase the property, which was entirely destroyed, and that the product being mined at the time "ran into \$1,000 a day."

Today, the property, taken over by the Town of Trumbull, has been made a park with a swimming pool and recreation grounds for the townspeople. So pass the glories of Connecticut's mining!

GOLD

Said Dr. Shepard in 1837:

"It is not perhaps a matter of wise regret that gold and silver do not find a place among the metallic productions of the State. Should these metals be detected within our territory their pursuit would neither operate favorably upon our agricultural interests, nor tend to the successful working of the more useful metals, whose existence has already been pointed out."

Nearly 100 years later Schairer said:

"In the past there have been sporadic attempts to mine for gold in Connecticut. All were complete failures."

However, he pointed out that:

"The quartz veins in the town of Litchfield are alleged to contain traces of gold. An assay of the copper ore at Bristol showed a trace of gold."

But our citizens are not so easily discouraged. The story of what has been attempted in the way of gold mining begins with President Stiles' tale:

"Gov. Trumbull has often told me that this (Great Hill, Cobalt. CRH) was the place to which Gov. Winthrop of N Lond used to resort with his Servant, and after spendg three weeks in the woods of this mountain in roastg ores assaying metals casting gold rings he usd to return home to N Lond with plenty of gold."

(Literary Diary of President Ezra Stiles.)

Evidently Winthrop exhausted the supply of the precious metal, for since that time not a trace of gold has been found there.

Since Winthrop's alleged success, almost every part of the State has been dug into by some enthusiast confident he was on the trail of a rich deposit of gold. A tradition tells of a lost—and of course, a very rich—gold mine somewhere in the vicinity of Ridgefield; there is on Mount Carmel an excavation from which gold is said to have been taken; and on Mt. Sanford lives a man who is confident he has a gold mine in his yard.

In at least two or three instances companies have been organized and stock sold. About 1886 one August Prehn, who had a farm on what is now Saw Mill Road in West Haven, picked up a piece of quartz which on analysis showed traces of gold, silver and copper. On the strength of this Prehn's son gave up his position in Pittsburg, and returning home, he organized a company, obtained some financial backing, and sank three shafts. Stories differ as to the amount of ore taken out, or if any was raised, but all agree that after a short time the mine was abandoned.

SILVER

Connecticut's silver has a little better standing than her gold, for it occurs, legitimately associated with lead and copper in a number of localities, but only in very small quantity. Shepard's comment has been given under "Gold"; by Schairer's time more was known about the occurrence of the white metal. He says:

"There are a large number of old mines scattered throughout the State where attempts have been made to mine lead and silver. . . . Lead, silver and copper were mined without much success near Maltby Lakes, New Haven, in quartz veins. . . . The author examined an old silver mine about a mile east of East Kent, but no minerals of interest were seen. . . . Small quantities of silver were obtained as a by-product in working many copper mines."

Schairer's Maltby Lakes mine is said to have been operated by an Englishman prior to the Revolutionary War, but being suspected of Tory leanings he was jailed by the Committee of Safety. In 1807 Dr. Eneas Munson took a group of Yale students—Professor Silliman's class in geology—to study it, and from time to time unavailing efforts were made to lease or purchase the property, until 1852, when it was leased to Nelson H. Gaston of New Haven. Six years later the lease was taken over by "The Orange Copper Mining Company," with an authorized capital of \$50,000 in 2,000 shares of \$25.00 each. It is said that several "experts" analysed the ore and made the traditional favorable reports, and \$1,500 was spent on tools, buildings and labor, but as with practically all of Connecticut's mining

ventures, other than the capitalization and that the "experts" are said to have made glowing reports, very little is known other than it soon joined the rest of the failures.

BISMUTH

Shepard reported that:

"This is found in small masses. . . . It occurs disseminated through the metalliferous quartz-bed of Monroe associated with mispickel (the arsenic pyrite, CRH), wolfram, galena and blende (zinc sulphide, CRH). The small quantity in which it is found, has thus far discouraged all attempts to separate it from its gangue (the associated other material, CRH) for the purposes of the arts."

By Schairer's time, however, conditions had changed to some extent. He says:

"Bismuth ore was mined at Booth's bismuth mine, Monroe. The mine is situated just north of the road which runs first east and then slightly northeast from Monroe, about one and one-eighth miles from the village. There is an open vein and a small mine dump.

"Native bismuth was also found at Lane's mine, west of Monroe, in quartz. . . . No large bismuth deposits have been found in Connecticut."

No record has been found of the amount of bismuth which may have been obtained in any of these operations; references to its occurrence elsewhere in the State seem to indicate that they were little more than "occurrences."

ARSENIC

Arsenic occurs as one of the elements in the several nickel and cobalt ores, and in arsenopyrite or "mispickel." Schairer says:

"Arsenic and nickel ore was mined on a small scale along a small brook near its mouth in the township of Seymour. The locality is along a brook flowing into the Naugatuck river on the west side of the river about a mile below Seymour. Arsenopyrite may still be found here. There is an old shaft with abundant arsenopyrite scattered on the dump at an old mine on a hill two miles northwest of Monroe."

He gives no record of any attempt to reclaim the arsenic, however, and although the cobalt-nickel ores of Cobalt carried much arsenic, except in the analyses the latter is not even mentioned. It would appear, therefore, that Shepard's is the only account of any use of this quite obviously abundant element. After stating that only at the Bassett mine in Derby is arsenopyrite in such quantity as to render it of economic value, he continues:

"The proprietors of this mine have been in the habit of applying it to a very

ingenious use, viz. that of expelling crows from his corn-fields. Fires are kindled on the windward side of a field, and fragments of the ore thrown upon them; either the odor of the garlic (the characteristic odor of roasted arsenic, CRH), or the deleterious impregnation of the atmosphere with arsenic, effectually deters this cautious bird from his customary depredations."

MAGNESIUM AND CALCIUM

Connecticut is producing these two metals, which have but comparatively recently become of commercial worth, in quantity, and it seems very likely that they will play a part of importance in the post-war economy of the State. At the present time, however, it is deemed advisable merely to mention that they are being produced for military and naval purposes.

OTHER METALS

Such other metals as have been found in this State—and there are a number of them—have occurred in too small quantities to lead even the most enthusiastic mining "shark" to attempt any recovery except as minerals containing them are collected for the mineralogist; a branch of mining, by the way, which has proved more profitable than a number of the projects here described.

THE COMMERCIAL MINERALS

In submitting to Governor Edwards his "Report on the Geological Survey of Connecticut," Dr. Shepard wrote:

"The advantages possessed by the State in respect to materials for architecture, decoration and porcelain,—for flagging, quicklime and cements,—if on the whole better known and admitted than those connected with her metallic resources, are still far from being appreciated to their full extent. . . . Large and growing maritime cities must still continue to depend upon us for the supply of much of their most valued architectural material; and in the improvement of harbors and the construction of fortifications we are doubtless destined to contribute as largely as before. To an agricultural people, the possession of so many quarries under such circumstances, is peculiarly favorable; surpassing perhaps in direct advantages to them, the existence of mines. For the working of these, together with the smelting of ores, are arts of slow and difficult acquisition, requiring in many instances the investment of an immense capital, which, in the fluctuating successes that often attend such operations, must sometimes remain unproductive for an entire generation. But the working of a stone quarry is little more than a branch of agriculture. A farmer supplying himself with a few additional instruments and materials, may work his ledges as well as his soil, according as one or the other rewards him best for his labor; or he may manage both, without prejudice to either. His labor in each case, is alike conducted in the broad light and fresh air of open day."

While modern quarrying is apt to be a little more complicated than it appeared to Shepard, it is an interesting fact that while today there are no real mining activities—except possibly for mica—in the State, a number of quarry operations persist, and the case of the Ritch granite quarry near Portchester, where, it would appear, stone for three churches and a cathedral and bishop house has been taken out with only two little derricks, one hand-, the other horse-operated, for equipment, reads like a prime example of what Shepard had in mind. And the “ores”—dolomite and limestone—for the two metals, magnesium and calcium, which promise to be of importance after the war, are both of them quarried rather than mined.

BROWNSTONE

The quarrying at Portland of brownstone for both building purposes and for gravestones, began soon after Middletown was settled, apparently under no restrictions until 1665, when the town resolved:

“That whosoever shall dig or raise stone at ye rocks on the East side of the Great River for any without the town, the diggers shall be none but an inhabitant of Middletown and shall be responsible to ye town 12 pence per tunn for every tunn of stone that he or they shall digg for any person whosoever without ye towne, this money to be paid in wheat and pease, to ye townsmen or their assigns, for the use of the towne within six months after the transportation of said stone.”

Use of the stone developed until fifty years later it was felt necessary to cut off outlanders from the supposed dwindling supply.

“At a Town Meeting March 4th 1715 the town by Voat doe prohibit all persons getting any stone in the town Quarry on the East side of the Great River for transportation out of the town, and whosoever shall presume to get and to transport any stone for the future contrary to this act by the town shall forfeit the sum of 20 shillings a stone for every stone by him or them transported out of the town, or sold in order to transportation (one half to him who complains and prosecutes the other half to the town).”

The town gradually sold or granted to persons for services rendered much of its quarry holdings. An advertisement in the local paper carried the following information:

“The Free Stone Quarry, at Chatham (known by the Name of JOHN-SON'S QUARRY,) is now worked under the direction of SHALER and HALL, who will supply the Stone at the shortest Notice, and at the lowest Prices, either in the Ruff or finished, and in such Dimensions as may be required. They will contract to furnish any Quantity, for public or private Buildings, Flags, Grave-Stones or Monuments, and deliver them at any Port in North-America. Orders directed (post paid) to SHALER & HALL, at the Quarry, Chatham, will have due Attention.

“October 13, 1788.”

This, the "Old Shaler & Hall Quarry" was actively employed from the first, working a force of some thirty men and four to six teams eight months of the year. In 1819 the "Patten & Russell Quarry" was opened north of Shaler & Hall, and after becoming the "Russell & Hall Quarry," in 1841 it was incorporated with the "Old Shaler & Hall," the two becoming the "Middlesex Quarry Company." Apparently Shaler and Hall either were bought or squeezed out of the latter company, for shortly after its formation they opened up another quarry "near the ferry from Middletown to Portland," which became a new "Shaler & Hall." Meantime, in 1783, "Hurlburt & Roberts" had opened a quarry south of the "Old Shaler & Hall" pit. In 1814 it was purchased by the Brainerd Brothers, and thereafter for many years it was the "Brainerd Quarry."

The town in 1786 still owned quarry land between the "Old Shaler & Hall Quarry" and that of Hurlburt and Roberts, and:

"At a meeting of the proprietors of the common and undivided lands of Middletown and Chatham it was voted that what remains undivided of the two quarries in Middletown and Chatham remain for the use of the inhabitants of said towne to get stone for their own particular use, or for the general use of either of said towns."

At a proprietors meeting, April 14, 1812, a committee was appointed to give a deed of the quarries to the towns of Middletown and Chatham equally. This committee failing to act, January 29, 1822, a new committee carried out the plan, and by an act of the Legislature at the May 1822 session, all individual rights in the properties were extinguished. Two years later it was:

"Voted, to give Washington College the net profits and rents of our interest in the Quarries at Chatham and Middletown until the net profits and rents of said Quarries shall amount to \$20,000 on condition that said College be located and continue in said town."

This bid, however, was unsuccessful, Washington College going to Hartford, later to become Trinity, but Wesleyan having located at Middletown in 1831, "on the fourth Monday in November, 1833" it was voted:

"That the interest of the town in the town quarry at Chatham should be appropriated to the use and benefit of the Wesleyan University for the period of forty years, on condition that when the net amount of the avails thereof shall equal the sum of ten thousand dollars within said period said grant shall cease."

The grant ceased in 1860, by which time many of the fine buildings of the University had been constructed from the stone provided by it. The quarry was held and operated by the town until 1884, when it was sold for \$20,000, the money being divided among Chatham, Cromwell, Middletown

RULES AND REGULATIONS

OF

BRAINERD & CO'S QUARRY.

- 1st. Every man employed, whether by the day or month, (unless a special contract is made to the contrary,) will be hired for the Season.
- 2d. The year is divided into two working seasons, Summer and Winter, for each of which a separate contract for wages must be made.
- 3d. The Summer Season commences on the first day of April, and will close with the discharge of all season hands, the time of such discharge to be determined, in all cases, by the Company.

HOURS OF WORK FOR SUMMER SEASON.

- 4th. Every man employed, will commence work, morning and afternoon, at the Ringing of the Bell, and will quit work at 12 M., and at sunset respectively, at each of which times, notice will be given by the ringing of the Bell.

FORENOON.—On the first day of April, the Bell will be rung at 7 A. M., and the time will be gradually increased until the 16th day of May, when the hour will be 6 A. M., at which hour it will continue until the 16th day of August—after which date the time will gradually decrease, until the noon recess is one hour.

AFTERNOON.—On and after April 1st to May 1st, the Bell will ring at 1 P. M.
 " " May 1st to May 16th, " " 1 1/2.
 " " May 16th to Aug. 15th, " " 2 P. M.
 " " Aug. 15th to Sept. 15th, " " 1 1/2.
 " " Sept. 15th " " 1 P. M.

- 5th. Every man leaving the work during working hours, without permission from the Time Keeper, or a Superintendent, shall receive no compensation for service for a portion of a day—and if by permission, his time will be computed as one fourth—one half, or three-fourths of a day—provided he shall actually have worked such portion of a day.

WINTER WORK.

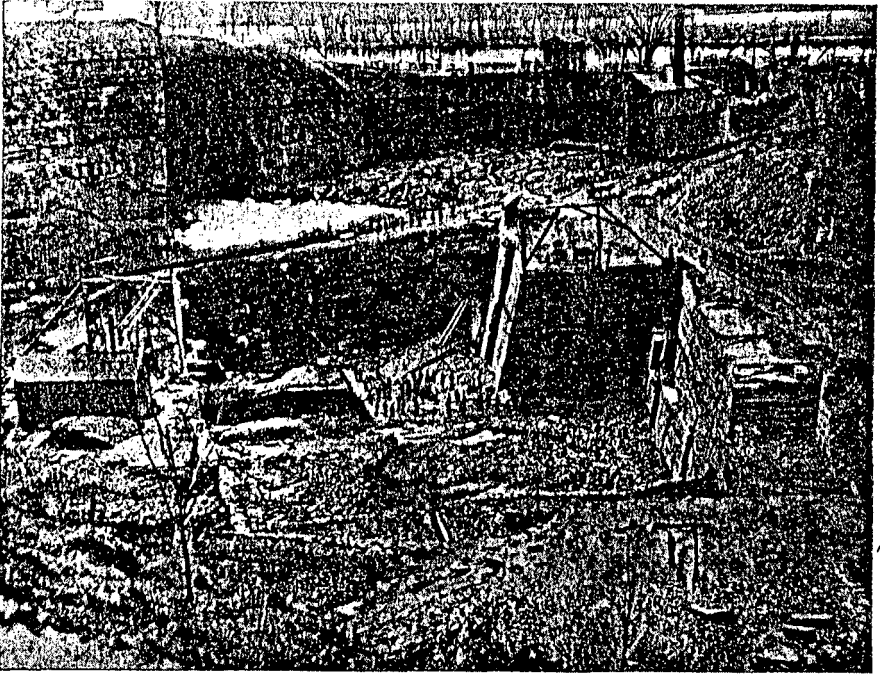
- 6th. **FORENOON.**—Bell will ring at or near one-half hour after sun-rise to commence work, and at 12 M., to quit.

AFTERNOON.—Bell will ring at 1 P. M., to commence, and at sun-set to quit work.

- 7th. Every man justly chargeable with intemperate habits, disobedience of orders, unfaithfulness in performance of duties, or with quarrelsome and immoral habits, whereby he would be deemed a bad citizen, may be discharged at the option of the Company.

Courtesy Mr. Frank Brainerd

and Portland. Lying between the Middlesex quarry on the north and the Brainerd on the south, one-third of the two acres went to the former and two-thirds to the latter which for some time had been using for a dumping place a part of the pit it now received, the town having carried it as deep



Courtesy Mrs. Raymond Hodges

A BIT OF THE BRAINERD & COMPANY QUARRY

as it considered practicable. Eventually, however, thanks to better pumps, all the pits were carried considerably further down, to a depth of about 200 feet. This sale extinguished the rights of "digging stones" for their own use enjoyed by the townspeople for nearly 200 years, and also put an end to the office of "Town Quarry Agent," one William Beebe having the honor of being the last incumbent.

Thereafter, for a number of years, the three corporations, the Shaler & Hall Quarry Company at the most southerly location; the Middlesex at the north; and the Brainerd in between, quarried a vast amount of the stone. At the peak of the business there were employed some 1,500 men, 100 yoke of oxen, 60 horses, and a fleet of over 50 schooners besides a little steamboat, and in that peak year the value of the stone quarried was over a million dollars; in the seven years 1890 to 1896 inclusive, the average annual output was valued at \$575,000.

The oxen were the pride of the quarries, and were exhibited and paraded at the annual Agricultural Fair long after extension of railroad sidings to

the pits, soon after 1884, led to a material reduction in their numbers. Oddly enough, although at one time there must have been many of them, the writer so far has been unable to locate a photograph of a single pair, let alone one of the parades. When necessary, they were "hooked up" for heavy work; it is said that sometimes forty or even more yokes of oxen were used to haul some of the heaviest blocks.

For many years no one in Boston or New York who wanted a fine house would consider anything other than a "brownstone front," while Albany, Milwaukee, Philadelphia and even San Francisco, not to mention a host of smaller cities, were important customers. Gradually, however, the demand fell off until in 1908 the value of the year's output was but \$55,949. There was a partial revival about 1926, the former three companies now being merged into the "Portland Brown Stone Quarries," while the cutting and dressing of stone from this and other quarries elsewhere was done by the "Connecticut Steam Brownstone Company," but this activity was short-lived, and today very little quarrying indeed is being done here, and the pits are filled with water said to be 150 feet deep.

Brownstone has been quarried elsewhere in the Connecticut Valley, but to no such extent as at Portland, and much of this other stone is red rather than brown. At Chester the quarrying of stone for the New York and Philadelphia markets was extensively carried on for many years prior to 1830. Durham is said by Beers—History of Middlesex County—to have:

"An inexhaustible supply of excellent freestone . . . the foundations of the North Church is built of Durham freestone, which has been thought to be superior to the Portland stone . . . One of the old buildings of Yale College was built largely from this quarry, as were also the houses of Benedict Arnold and Pierrepont Edwards (155 Water Street and 20 Elm Street respectively, CRH) of New Haven."

A quarry in East Haven furnished a particularly strong and durable stone, used largely in early railroad bridge work, while North Branford, East Windsor, North Haven, Granby and Farmington all produced stone some of which is to be seen in Farmington Canal and old railroad masonry, and in many of the more pretentious old buildings in the Connecticut Valley.

GRANITE

Granite, a term which, as generally used, includes both the true granites—"a rock massive in structure, with crystals of quartz, feldspar, and usually mica, all of about one size"—of which Connecticut has but little, and granite-gneiss—practically a granite which heat or pressure has changed to a stone with real or apparent layers—comprising the bulk of the material, has long been one of, if not the, most important of those materials of which, in 1837, Dr. Shepard said:

"The building stone of Connecticut, both ornamental and common, must

be regarded as constituting one of the most valuable resources of the State, whether considered as affording a supply to its own wants, or material for transportation. The principal kinds in use are granite (the term being used in its widest sense), gneiss, sandstone, marble, sandstone conglomerate and trap."



MILLSTONE GRANITE QUARRY FROM THE SOUTH

Photo by the author

In Shepard's time, Millstone, with about 20 men employed, was the most extensively worked granite quarry in the State, but he feared that:

"as the quarry covers but a few acres of ground, and is but fifteen or twenty feet above the Sound, it will be exhausted in ten or fifteen years, at the present rate of working."

In 1911, however, it had:

"two derricks, one of them with a 110 foot mast and a capacity of 50 tons; two hoisting engines; two Blondin carriers and engines; a locomotive crane; a locomotive; an air compressor (capacity under 500 cubic feet of air per minute); four large rock drills; twelve air hand tools; a surfacer lathe for stones 30 by 2 feet; a polishing lathe; four vertical polishers; two steam pumps; a stone crusher (capacity 50 cubic yards a day); and a 75 horse power steam engine."

while at present there is a much greater plant, although the most active period was several years ago, when over 300 men were employed.

Other less important granite quarries mentioned by Shepard were the "Mine Hill" in Roxbury, employing but two or three hands; the Stoddard,

three miles below Poquetonnock and eighty rods from the Thames, employing eight hands—"The quarry has yielded 30,000 feet in one year, the proprietor receiving six cents a cubic foot delivered at the river," and:

"The pseudo sienitic granite (of) Chatham, two and a half miles north of Middle Haddam landing, at a place called Great Hill (or Steward's Hill), which adjoins the cobalt-mine hill. It has been quarried for several years, and is decidedly the most valuable repository of granite in the State, taking into consideration its contiguity to water-communication. The number of hands employed at present (1837, CRH), is but six, though the quarry has furnished employment some seasons to upwards of thirty men. It supplied a large quantity of stone in 1832 to the contractor for the Delaware & Hudson Canal, and has aided in the construction of the fortifications at the mouth of the Chesapeake. At present, it is chiefly wrought for the supply of the New York market."

In 1911 the United States Geological Survey published as Bulletin 484, "The Granites of Connecticut," by T. Nelson Dale and Herbert E. Gregory, describing in some little detail all of the active or recently active granite quarries of the State, 64 in all, there being one each in Middlesex and Tolland counties; 5 in Windham; 9 each in Fairfield, Litchfield and New Haven; 10 in Hartford; and 20 in New London. Notable among them were:

Booth Brothers, Waterford

"A very fine-grained monumental and inscriptional granite of buff medium gray but without mineral contrasts." Used for the City Deposit Bank, Pittsburg; and for the addition to the Williamsburg Savings Bank and the basement of the Clark residence, Riverside Drive, New York City; for the Hoy Mausoleum, Mt. Moriah Cemetery, Philadelphia; the Soldiers' Monument, Whitinsville, Massachusetts; the Dudley Celtic Cross, Woodlawn Cemetery, New York City; and the Littlefield shaft, Swan Point Cemetery, Providence.

Hoadley Neck, Branford

This quarry furnished the stone for the anchorages of the first Brooklyn, and for the Niagara, suspension bridges; the approaches and abutments of the Madison Avenue highway bridge over Harlem River, New York City; the piers and abutments of the Hartford Memorial Bridge over the Connecticut River; and the pedestals of the General Anderson monument at Fort Sumter, of the Soldiers' and Sailors' monument, Riverside Drive, New York City, and of the Statue of Liberty, New York Harbor.

Millstone, Millstone Point

"A dark gray granite of fine, homogeneous texture, showing strong contrasts of color between polished and dressed surfaces," it has been largely

used for monuments and buildings. It furnished the stone for the "Tombs," New York City, prison, and for Keating Hall, Fordham University, that city; for the foundatoin of the old Brooklyn Bridge and the old New York Post Office building at Broadway and City Hall Park; the tablet, the interior, and all but the upper 10 feet of the Saratoga Monument; the base, pedestal and cap of the P. T. Barnum monument, Bridgeport; and the George W. Childs mausoleum, Philadelphia; also the portal tablets for the Queens vehicular tunnel, New York City. Millstone is particularly fortunate in that it not only is located on navigable—up to 12 feet draft—water, but it has a railroad siding as well.



PANEL AT BASE OF SOLDIERS' MONUMENT,
WHITINSVILLE, MASSACHUSETTS
BOOTH BROTHERS QUARRY

A SALTER QUARRY MONUMENT

Norcross, Stony Creek

"That its strength and attractive color (Branford red granite, CRH) have more than counterbalanced its irregularity of texture is evidenced by the important structures in which it has been used." It furnished the stone for the arches and coping of the Hartford Memorial Bridge over the Connecticut River; for the South Station, Boston; the Bessemer Building, Pittsburgh; the Newberry Library, Chicago; the polished, 43 feet long columns, 6 feet 2 inches at the bottom, of the Battle Monument, West Point; the 45 feet long obelisk at Locks Park, Sault Sainte Marie; and the pedestals of the Sherman statue at Fifty-ninth Street, New York City, of

the King Frederick statue at Washington, and of the General Hooker statue, State House grounds, Boston.

Ritch, just east of Portchester, New York

This is an interesting example of what can be done with a very small plant. Equipped with but two small derricks, one operated by horse power, the other by hand, it is credited with furnishing the stone for the Catholic churches in Flushing, Long Island, Mamaroneck, New York, and Stamford, and for the Cathedral and bishop house at the intersection of Clermont, Green, Lafayette and Vanderbilt avenues, Brooklyn.

Rockside, Mine Hill, Roxbury

This stone is used chiefly for buildings, railroad bridges and retaining walls, notably the 1,350 feet long retaining walls of the New York Central & Hudson River Railroad from Sixty-seventh to Seventy-second Streets, New York City, with a maximum height of 58 feet and a base width of 21 feet; and the 16,000 feet long retaining wall and numerous bridge abutments of The New York, New Haven & Hartford Railroad through Bridgeport, averaging about 20 feet high, with a base width of 12 feet.

Sachem's Head, Guilford

One of the largest quarries in the State, its product has been confined to rip rap for breakwaters, Point Judith, Rhode Island and New Haven harbor being two examples.

Salter's, Groton

A monumental granite particularly adapted to sculpture. Examples are the monuments to Colonel William Ledyard, murdered by the British in Fort Griswold, in the Ledyard Cemetery, Groton; to the first four founders of Stonington, in the Wequetquoock burying ground, Stonington; the Edward Newman obelisk, Woodlawn Cemetery, New York City; the Reverend Byron A. Woods sarcophagus, Forest Hill Cemetery, Philadelphia; the Charles Tyler statue, Druid Hill Ridge Cemetery, Baltimore; and the Kennard Celtic cross, Kensico Cemetery, Valhalla, New York.

Stony Creek, Stony Creek

The stone from this quarry has been used chiefly for New York buildings, notably the Broadway Chambers Building and the New York Central post office and office buildings, New York City; a Brooklyn water-tower; the Erie County Savings Bank of Buffalo, New York; and the First National Bank of New Haven.

The value of the annual output of Connecticut's granite reached a peak, in 1906, of \$1,167,000, and averaged about \$756,000 for the years from

1890 to 1913. Thereafter, however, it fell off rapidly, having a value of but \$104,068 in 1940; today the market is largely confined to breakwater, fine building, monumental and curbing fields.

TRAP

Trap is one of the minerals the extended use of which is comparatively recent and which is growing. Apparently in Shepard's time little if any use was being made of it, for under the head of Paving he says:

"This is a subject deserving the attention of the two principal cities of the State; and though hitherto much neglected (which throws an interesting side-light on city conditions in 1837 CRH), a regard to comfort and convenience will soon lead to its consideration. Whenever it shall be thought an object, the materials best suited to the purpose will be found at hand in the prismatic trap of the country. Scarce any considerable tract of the trap-region fails to afford the variety which separates spontaneously into three, four or five sided prisms, of a length several times that of their diameter. As a preparation for their employment, the street would require to be graded as usual, and then covered with a bed of coarse gravel. The prisms selected should have a diameter of from eight inches to one foot, and a length double that of their breadth. They should be arranged side by side in a vertical position, and in such a manner as to leave the fewest possible spaces; after which, the surface of the street should be kept covered with sand until all the crevices are filled. A pavement thus constructed would have all the smoothness of a macadamized road, and from the strength and shape of the materials, must excel for perpetuity every other mode of paving."

The use of block paving developed slowly at first, however, and then the discovery that granite was far more readily cut to blocks of uniform size, thus facilitating laying, while it was practically as resistant to wear as was the trap, pushed the latter as a source of paving blocks farther and farther into the background, although its use as road-metal, ballast for railroads, and in concrete was steadily increasing. In 1900 the value of trap quarried in Connecticut was given as \$150,188, of which but \$767 represented paving blocks, \$144,293 was "crushed for roads, or ballast," the balance being "other uses." In 1941 the total value had risen to \$2,100,077, with no paving blocks, \$1,891,095 for concrete and road-metal, \$104,639 for ballast, and the remainder, \$104,343, for breakwater rip-rap.

Replacement of gravel ballast with trap in the future is not likely to materially change as to quantity required, but the increasingly heavy traffic on all our highways, forcing the use of road surfaces correspondingly increased in strength, will undoubtedly result in a very marked gain in trap production for this purpose, while improvements in the methods of placing and of finishing concrete, both in mass structures and in pre-cast work, are

creating new, and expanding old, fields for trap, at the same time pushing cut stone of other kinds into a limited field of special uses.

There are some 12 operating companies in Connecticut, ranging from the New Haven Trap Rock Company with a capacity of roundly a million tons annually, to some capable of handling only a very small local demand. Practically all the quarries have a good, high face; in the smaller ones the material is thrown down by blasts from top drill-holes, using, depending on the size of the blast, hammer drills or well drills, often "springing," or enlarging, the bottom of the hole, by means of a light preliminary "shot" with high-power explosive. The larger quarries are apt to use tunnels parallel to and near the bottom of the face, often combined with well-holes from the top and practically horizontal "snake holes" at the base. These tunnel shots throw down a hundred thousand tons or more of rock, and employ about a pound of explosive to five tons of rocks moved. The thrown down material is later passed through a series of crushers and rolls, and screened to the desired sizes.

At one time many contractors had their own little plants, usually portable, but today the tendency is to purchase from the big stone companies.

LIMESTONE

The principal uses of Connecticut's limestone other than the building marble has been as flux for her iron ores, and for lime. Shepard lists ten operators "burning" dolomite to produce magnesian lime, Hill's kiln in "Reading" being the largest. Of this he says:

"Mr. Hill burns twelve kilns of twelve hundred bushels each, annually.

Forty cords of wood are required to a kiln, and the burning lasts for six days.

It sells for two dollars and an eighth per cask of three and a half bushels, at the kiln." (60½ cents per bushel, CRH).

Wildman's kiln in Brookfield, and Chapman's in Ridgefield, are of the same size. Wildman's:

"holds but seven hundred bushels. It is burnt several times in the year. The quantity of wood consumed is thirty-five cords to the kiln, and the burning lasts eight days. Its price is ten shillings the cask, the barrel being returned."

(57 cents per bushel, CRH).

Of the "pure lime" kilns, Shepard lists 7. Of these, Bassett's in Derby:

"holds two hundred and seventy bushels, and is burnt once a fortnight during several months in the year. The burning is kept up for five or six days and consumes from eight to ten cords of wood. The lime sells at forty-five cents per bushel at the kiln."

from which it would appear that Hill got 30 bushels to the cord of wood. Wildman, 20, and Bassett from 27 to 34.

These kilns were usually circular in section, though sometimes they were square; of stone or brick, in the latter case often with an outer shell of sheet iron; and lined with a heat and wear resisting material. The interior usually was of uniform diameter from top to bottom, but in some cases the top third was a little larger at the upper end and was called the "hopper." The middle portion where the burning occurred was the shaft; the part below the two or three fireboxes for the fuel—almost invariably wood—was the "cooler," and had a large door by which the burned lime was taken out. The kiln was 20 to 30 feet high, 10 to 12 feet in outside diameter, and had a lining about eighteen inches thick.



Photo by the author

OLD LIME KILNS, EAST CANAAN

Decline of the New England iron industry; growth of production of Rosendale and Portland cements; and the increasing use of raw limestone in agriculture, gradually cut down the production of lime. Of the five companies Moore—"Marbles and Limestones of Connecticut"—listed as active in 1935, but two, the Allyndale Lime Company of East Canaan, and the New England Lime Company of Canaan, were producing "calcined marble"; two others, the Connecticut Agstone Company of Danbury and the Redding Marble Company of Redding, were producing "ground marble"; while the U. S. Gypsum Company of Falls Village produced "ground dolomitic marble."

In the 27 years, 1904 to 1930, Connecticut's annual production of lime averaged 65,294 tons, with average annual value \$466,596. The average value per ton increased steadily, however, from \$3.56 in 1904 to \$14.27 in 1922, so that while the year of maximum production, 93,576 tons, was 1910, the maximum value, \$813,254, was in 1923, though the production was but 59,158 tons. Limestone mined that year, however, amounted to 100,330 tons, valued at \$191,781, of which 41,680 tons were used in agriculture, their value being \$118,653.

MARBLE

The principal deposits of marble are in the western portion of the State. Quarries at Marbledale, a short distance southwest of New Preston, were opened about 1800, and at one time this was an important industry. Shepard says:

"The quarries are five or six in number, and almost contiguous to each other, within a space of one mile. Unfortunately for the economy of working them the beds are in the valley of the Little Aspetuck, and at a low level; consequently the drainage of them is often attended with difficulty. The contiguity of the stream, though an evil in this respect, proves nevertheless of essential importance for carrying the mills by which the marble is slit into slabs. The number of mills for this purpose within a few miles of each other on this stream, is sixteen; but all of them are not in operation at present. The average yield *per annum* of the quarries, in rough blocks, is between seven and eight thousand dollars; and nearly the same amount is delivered to the mills and marble-shops of the immediate vicinity, for preparing the marble for use."

The "Guide to New Milford," compiled and published by Mr. A. C. Worley, Editor of the New Milford Times, in 1928, said the sawmill erected "just north of the store" was the first stone-sawmill in the State, and that at one time, between Lake Waramaug and Northville, a distance of less than three miles, there were 21 mills where marble was sawed. About 30,000 feet of the stone was sold annually throughout New England and in states as far distant as Ohio and Louisiana. He added:

"The quarries are now deep, sullen holes, filled with water and numerous little fish. They lie to the east and south of the village and are of little value except as they offer the farmers a necessary supply of ice."

Many buildings within the marble region have been built from the local stone, the most important source being East Canaan, which furnished the stone for the State Capitol at Hartford. Unfortunately, this marble contains tremolite which tends to weather out and leave the stone with a pitted face. Today, except for occasional local use, no marble is being quarried for building purposes.

In 1811 one Solomon Baldwin discovered a ledge of beautiful variegated green marble near Milford, and a few years later two quarries, one just east of Milford, the other two and a half miles west of New Haven, were opened. Shepard says:

"They were wrought with considerable activity for several years, and furnished an abundance of very rich marble; but as the working of them was attended with heavy expenses, from the difficulty of obtaining blocks of large dimensions that were perfectly sound, and from the labor required in sawing and polishing, they were in a few years abandoned; and have for a long time been in a neglected condition."

It was during this period that there were sent to Washington several mantels of this marble, one of which is in the east room of the White House, four in the National Capitol building, and one in the Smithsonian Institution.

In 1838 a new company re-opened the Milford quarry and took out quite a little stone, part of which is to be seen in mantels and hearth stones in some of the older Milford houses. It was particularly adapted for interior use, as out of doors it tended to lose much of its fine color by weathering, but the corner-stone of the Milford Masonic Temple quite appropriately came from the Milford quarry. Under the new management the latter had a few years of activity, but then it closed down, this time permanently.

NATURAL CEMENT

The discovery, about 1825, that Southington had deposits of limestone which, when "burned" to "water-lime" and ground fine produced "natural cement," started an industry which lasted fifty years, and is ably described by Former-President Wiley of this Society in the 1933 "Proceedings."

Shepard, in 1837, said the quantity of cement annually supplied by the town of Southington did not fall much short of 500 tons (this would be about 3,300 barrels, CRH); in 1845 it was reported that Berlin had one factory; it had a capital of \$600, employed 3 hands, and in that year had produced 1,350 barrels of cement valued at \$2,500; while Southington, employing 10 hands—the number of plants was not stated—manufactured cement worth \$2,000. Competition of the Hudson River plants cut heavily into the business, which at its peak had quite a wide market, and eventually led to the closing of the last plant in the "seventies."

The stone was burned in egg-shaped, little end up, kilns with a capacity of about 100 barrels (approximately one and a half tons, CRH), eight cords of wood being required for the burning, which took two days and a night, while three or four more days were spent waiting for the material to cool to a point at which it could be handled. It was then broken to about $\frac{3}{4}$ inch mesh size in a "cracker," two heavy horizontal iron discs

with corrugated faces and about two feet in diameter, the top one, which revolved, being so arranged that it could be raised or lowered. The broken material then went to a pair of horizontal millstones five feet in diameter and ten or twelve inches thick, their faces being grooved like those for grinding grain. As in the case of the cracker, the upper stone revolved, and could be raised or lowered. The ground cement, after screening, was barreled, the plant being so arranged that the material flowed by gravity from cracker to stones to screen to barrel.

QUARTZ

Shepard cites a number of places where quartz is found, for it is probably the most abundant mineral in the State, but at that time it apparently was being put to no important use; at least, he has nothing to say on that score. Cothren,—“Ancient Woodbury”—seventeen years later—1854—speaks of a deposit of quartz sand on the shore of Lake Quassapaug,—which Shepard also listed—but like the latter, he merely says it is well suited to the manufacture of plate and flint glass, and porcelain ware, but with no mention of its actual use.

The first “record” the writer has found of the alleged use of quartz seems obviously an error. It is to the effect that “quartz from the Trumbull tungsten mine was used in the “Blue Light” signals of the Civil War. Unfortunately for the story, the “Blue” or “Bengal” lights contain no quartz, and it seems likely that the earliest actual use of the mineral was of that from Lantern Hill. Rice and Gregory—“Manual of the Geology of Connecticut”—say:

“At Lantern Hill, North Stonington, occurs an enormous mass of quartz, showing itself topographically as a conspicuous elevation. The range is 1,000 to 1,500 feet in width, and fully a mile in length, extending from the southern end of Long Hill to the relatively low hill north of Lantern Hill, and descending into the narrow east-west valley beyond. The summit of Lantern Hill rises 520 feet above the sea and over 400 feet above the surrounding country. The walls of the hill are nearly vertical, for a distance of 200 to 300 feet down from the top, while the base is surrounded by talus slopes of large quartz boulders.”

Just when the quartz was first mined, or for what it was then used, has not been satisfactorily determined. In the latter 1870's the mine was referred to as the “old” silix mine, and it was rumored that the material was used to adulterate sugar, but this may well have been due to the fact that the disintegrated “silix” is sometimes called “sugar quartz.” About 1900 it was being teamed to Mystic, where it was ground by the wet process. The late Ernest E. Rogers of New London, who had a vivid recollection of the mill, thought it was used chiefly as a wood filler, although he had heard it

said some went into tooth-powder. Mr. Everett F. Wilson, Postmaster at Mystic, well remembers how as a child he and other children often rode to school on the teams which hauled the stone to the mill past his house, and how difficult it was to brush the white dust from stockings and seats of pants. The mill was at the corner of Washington and Cottrell Streets, close to a wharf where much of the fine material was loaded on schooners for shipment to pottery works in New Jersey.

Following several years of inactivity, another group took over, and in 1916 and 1917, the now defunct Norwich & Westerly Railway having run a spur track to the quarry, shipped some 1,000 car-loads to the Grasselli Chemical Company, for one of their plants in Alabama. Another shut-down followed, and then a few years ago the Lantern Hill Silica Company, Incorporated, took over, and is now in active production, processing the quartz at the site.

The quarry is roughly circular, about 150 feet in diameter, with walls 50 to 80 feet high; it is entered from the side of the hill, at floor level. The entire hill, except for a very light over-burden, is 98 per cent pure quartz, occurring as a pocket of the soft "sugar quartz," which is easily taken out with pick and shovel, and surrounded with other quartz so hard that it requires blasting. Loading is by hand at present, the stone being teamed down to the mill, perhaps a quarter of a mile away. Here it is rough-broken to about $\frac{3}{4}$ inch mesh in a jaw crusher, then put through rolls, then a rotary drier—the soft quartz is decidedly damp—then to a tube mill, and finally through vibrator sieves and a pneumatic separator, after which it goes to the several storage bins.

The plant is an exceedingly interesting example of Yankee ingenuity. Faced with the high cost of some needed apparatus, and the practical impossibility of getting some other, the operating force has built much of the equipment and facilities, the rotary drier, made from second hand material, and with the motor speed cut down by double reduction belting, being a case in point. A particularly clever procedure was the substitution of the exceedingly hard quartz lumps for the very expensive pebbles for the tube mill. The quartz works even better, and at the same time the material worn off produces just that much more output.

The plant, disposing of all the quartz it can produce with its present equipment, is furnishing the American Thermos Bottle Company of Norwich with all the sand it uses, some 2,500 tons of 16 mesh silica. An equal amount of 40 mesh sand goes to the makers of a noted brand of hand soap, while a newly developed field, that of 120 mesh dust for core and parting sand for foundries and for electrical porcelain, is taking some 1,000 tons, all figures being for annual consumption. The increased demand for



LANTERN HILL SILEX MINE

Photo by the author.

the more important uses has ended for the present a local branch of activity, chicken grit, which until recently was furnished at the rate of 10 to 20 tons monthly.

According to Bastin—U. S. Geological Survey, Mineral Resources, Part II, Non-Metallic Products, 1907—in 1907 there were three Connecticut plants producing ground quartz: Lantern Hill, Southford and Roxbury.

The Southford quarry, $1\frac{3}{4}$ miles south of the Southford Station, was a single pit about 200 feet long, 100 feet in maximum width, and 50 feet in maximum depth. It was worked by steam drilling and blasting, the lump quartz being teamed to the railroad station and shipped either to the Still River mill of the Bridgeport Wood Finishing Company, or to the one at Branchville.

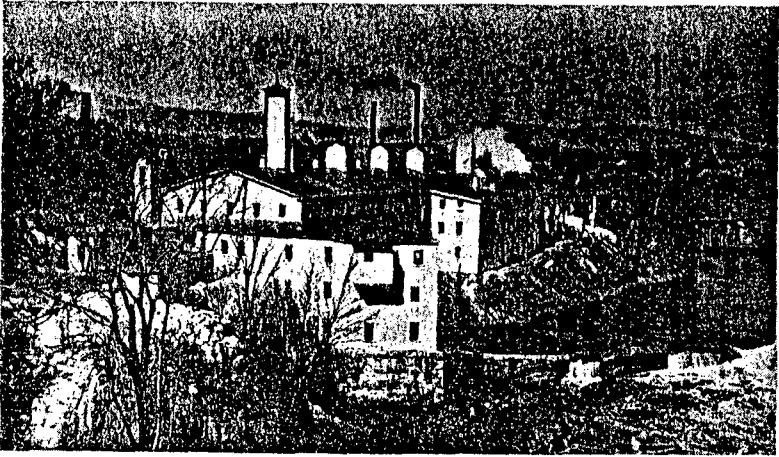


Photo by the author

STILL RIVER MILL OF THE BRIDGEPORT WOOD FINISHING COMPANY
NO LONGER IN EXISTENCE

Bastin describes the Roxbury quarry as about 250 feet long, 75 to 100 feet wide, and 50 feet in maximum depth, and locates it about two miles east of Roxbury Station, where he places the mill to which the lump quartz is teamed. He says:

"At the mill the material (which is to be finely ground) is first burned in kilns to fracture it and to facilitate grinding. It is then crushed in jaw crushers, chasers, and crushing rolls, and ground in continuous-feed tube mills. After this it is graded to various degrees of fineness by air separators, which also remove most of the micaceous impurities. Some of the quartz is not finely ground, but is crushed without previous burning and is graded to various degrees of fineness for use in filter beds and for sandpaper, sand belts, etc."

Bastin places the mill at Roxbury Station, but so far the writer not only has been unable to find anything to support that location, but he has found several persons besides himself who are reasonably familiar with the locality, who are confident it was *not* there. The WPA "Guide to Connecticut" notes that "an old silica mill crumbles beside the rushing stream near an iron bridge" at Roxbury Falls, which may well be the mill in question.

FELDSPAR

Shepard notes that:

"A feldspar admirably adapted to the purpose of forming a glaze to porcelain ware has within a few years been discovered in the south eastern part of Middletown. . . . The situation of the quarry is favorable for being easily worked, and it is capable of supplying an unlimited quantity of the material. Seven hundred tons were delivered at Middletown last year, of which six hundred were shipped to Liverpool and one hundred to the porcelain-factory at Jersey city near New York."



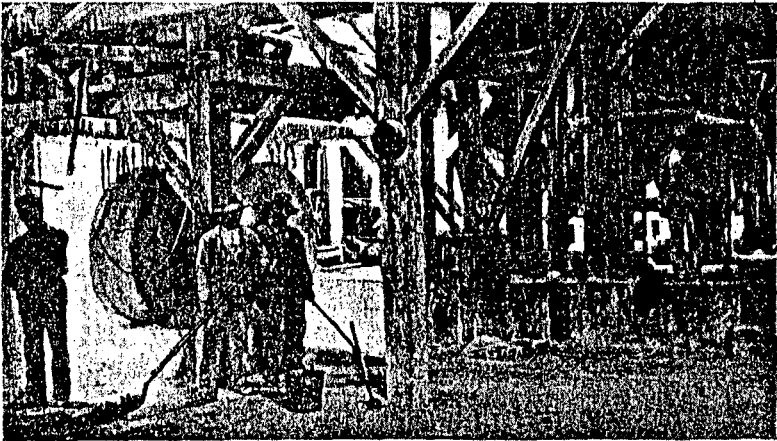
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THE HOWE FELDSPAR QUARRY, SOUTH GLASTONBURY

The use of Connecticut feldspar developed steadily but rather slowly for some time thereafter. The great Howe quarry, about two miles south of South Glastonbury, was opened in the "sixties"; the Middletown quarry noted by Shepard had been started about 1835. Beers—"History of Middlesex County"—speaks of the Alfred Brainerd quarry at Haddam Neck, opened in 1844, which he says—incorrectly—was "the first quarried in the United States," and which sent its stone to England; and the "Spar Mill" of Brainerd & Cook, at Higganum, built about 1866, which ground feldspar from a quarry four miles north; the Portland mine "near Deacon Ralph Pelton's" had been worked since 1872, and several thousand tons of "spar" had been taken from it by 1884, the date of "Beers."

Feldspar was quarried to some extent in the western part of the State, and at one time a feldspar mill was operated at Glenville, in Fairfield

County, but the majority of the quarries were along the banks of the Connecticut River for a distance of some twenty miles, with Middletown as the mid-point. North of that city the quarries all are on the east side of the river; south of it they are on both sides. In 1896 but 1410 "short tons" were produced, valued at \$5,050; in 1907 production reached a peak of 30,054 tons worth \$124,536, and Connecticut stood first among the producing states. At that time Bastin—U. S. Geological Survey, Mineral Resources, Part II, 1907—listed 8 active quarries, ranging in size from the Howe, the largest, 500 feet long, with an average width of 100 feet and a maximum depth of 50; to some little ones hardly more than prospect pits. Much of the grinding was done out of the State, but there were four mills in Connecticut. Production has gradually diminished, until in 1948 there were produced but some 13,000 tons, worth \$76,463. Today's production is used almost entirely for scouring powder, although for a long time its chief use was for pottery, its freedom from iron making it particularly desirable for that purpose.



Courtesy Mr. and Mrs. A. J. Andrews

INTERIOR OF WIARDA FELDSPAR MILL—NOTE "CHASERS" AT LEFT

The feldspar occurs in great veins, and is taken out in open pit workings, using steam drilling and blasting. The stone, hand broken if necessary, to a size it could handle, until recently was crushed in a "chaser," dried, and then powdered in a ball-mill; today a gyratory or a jaw crusher and rolls take the place of the chaser, which was used because of the difficulty of keeping the spar free of iron if jaw or gyratory crushers of the alloys then available, were used. It consisted of a bed-stone, five or six feet in diameter, sloping gently outward from the center. On this, at the ends of

a horizontal axis, ran two great stones, five or six feet in diameter and about two feet thick, a slot in the vertical shaft, through which the axle passed, and by which it was turned, allowing the wheels to rise and fall as they rolled over varying depths of stone. The feldspar was fed against the vertical shaft, and then slid under the wheels, working its way gradually to the edge of the bedstone as the wheels crushed it by their weight. Here it was screened, the fines going to the drier and then to the ball-mill, the retained material, back to the chaser. The ball-, or tube-, mill has a lining of vitrefield porcelain or of silex, and the grinding is done by a charge of flint pebbles, two or three inches in diameter, which pulverize the "spar" as the ball or tube is rotated at a speed of about 16 revolutions per minute.



Photo by the author

WORN "CHASER" STONES

Today there are no chasers in operation in the State, if indeed, one is to be found anywhere, but the writer was fortunate in locating several of the worn-out "wheels" in a brook near the old Wiarda mill. This mill was located on Roaring Brook, in South Glastonbury, and had a capacity of 15 tons per 12 hours; the Howe, a short distance below it, on the same brook, had two chasers—Wiarda had but one—and could produce 27 tons in the same time; the Consolidated, at Middletown used crushing rolls, with a capacity of 30 tons in 10 hours; no record was found of the capacity of the mill at North Manchester, which had a "rotary crusher" as a preliminary to its chaser.

BARYTES

About 1835 an old colored woman apparently known only as "Jinny," found some very pretty stones at a point a mile and three-quarters south of Cheshire, and three-quarters of a mile east of Route 10, thereafter to be known as "Jinny's Hill." Brought to the attention of Professor Benjamin Silliman of Yale, and identified by him as barytes, of much value as a "filler" for felt, paper and some textiles, and less reputedly as an adulterant for white lead—today its chief use is in "lithopone" a legitimate pigment for certain white paints, and also as a filler—it resulted in the development of what at one time was a very important local industry.

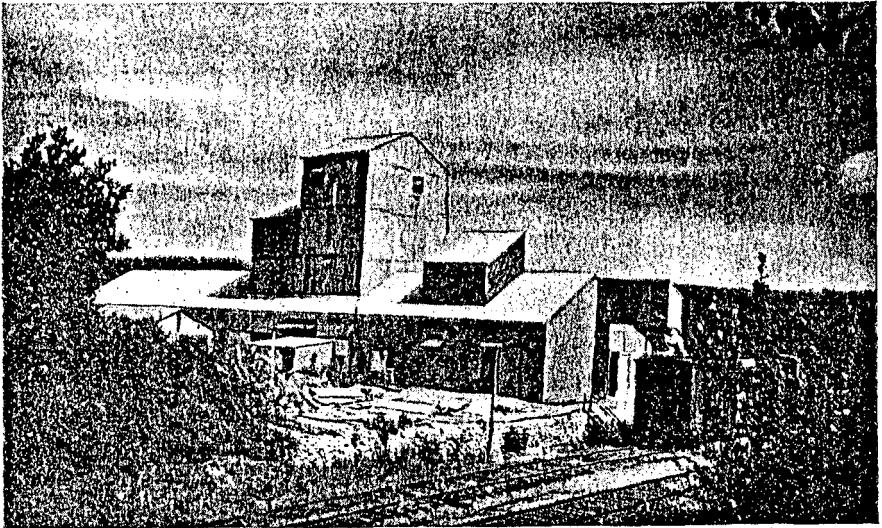


Photo by the author

PRESENT-DAY FELDSPAR MILL SOUTH OF PORTLAND, CONNECTICUT

The mines were opened by the N. G. Gaston Company of New Haven, in 1840 or 1841, and were operated by them until 1855, when the property was sold to the Stamford Manufacturing Company of Stamford, which continued its operation until 1878, when it became unable to successfully compete with foreign barytes brought in as ballast, and stopped work. In that period of 38 years over four miles of tunnel had been driven, 160,000 tons of barytes, worth some $4\frac{1}{2}$ millions of dollars had been mined and sold, and at the height of its activities, in 1866, over 500 men, largely Cornish miners, had been employed, James Lanyon, the father of the present Town Clerk of Cheshire, Mr. James R. Lanyon, being the highly capable and efficient manager throughout the entire period.

The principal workings until 1875 were at Jinny Hill, where three shafts were sunk, the deepest one going down 500 feet, and where most of the tunnels were driven. In that year, however, the company purchased a mine in the northwest section of the town which had been opened by a Captain William Peck, and which, of much less depth and located much closer to the railroad, could be worked to better advantage. It, and another near it were operated until 1878, when, as noted, the competition of foreign barytes forced the company to suspend.

The barytes was carted to the Northampton Railroad and shipped to a mill on Long Wharf, New Haven, where it was ground, probably by chasers, although neither Mr. James R. Lanyon of Cheshire, nor Mr. Minotte Chatfield of New Haven, both of whom well remember how dusty the mill used to be, recall ever seeing how the grinding was done.

MICA

In Shepard's time the only uses for mica were as a substitute for glass, and there was but little demand for it. A little later its use as windows in stoves, furnaces and elsewhere where great resistance to heat was required, somewhat enlarged the market, but not until the development of the electrical industry did it come into its own.

Mica is a very common mineral, but its common occurrence is in scales too small to be of value. In the veins of pegmatite,—“giant granite”—however, it often occurs in sizes making it worth mining. Connecticut has much pegmatite, particularly in the valley of the Connecticut River; on the east side, from a little above Hartford to Middletown, and on both sides from the latter city to a point some ten miles below, and these veins carry much mica, some of very large size, but unfortunately a good deal of it has defects which greatly reduce its value. High grade mica should split into exceedingly thin sheets; tough, flexible and elastic, and for some uses it should be very transparent; Connecticut mica frequently has a structure which prevents splitting into sheets of any appreciable size, and much of it is said to be unduly hard and brittle; at that, the fact that the mica mined in the State in 1941 was worth \$133,879, of which \$129,896 was for the better grades, indicates at least a fair production.

The urgent demand for mica for strategic purposes led to the working of some of the mines for mica alone in the early years of World War II, an activity presently almost entirely stopped by inability to obtain worker priority for the New England mines; prior to that time the production of mica was in conjunction with the production of feldspar, another pegmatite specialty.

One of the early, and in terms of the quality of the mica produced, most important, was the George Roebling mine at Upper Merryall, about six miles due north of New Milford. Operated between the years 1880 and 1900, it yielded much excellent mica in "books," as the masses are called, several inches across. In addition, the mine produced in the same time enough potash-feldspar to pay the expenses of operating, while the gem-beryl, of which \$17,000 worth was taken out in one period of four years, was "velvet."



Courtesy State Development Commission

MICA FROM STRICKLAND QUARRY

At the Strickland quarry on Collins Hill, Portland, mica in plates 12 inches across has been obtained, but much of it does not split well, and either produces much smaller sheets or has to be sold as scrap. As at Roebling, at least until the war, after which it worked only on mica, feldspar was an important product, as were also the mineralogical specimens, for which the quarry has been famous for many years.

In the old Gillette quarry at Haddam Neck, as at Strickland, mica was obtained as a by-product of the feldspar production. Books over a foot across and six inches thick were obtained, but some of the large size split badly. At this quarry gem tourmaline and mineralogical specimens also have played an important part in its income.

Connecticut was credited with an average production of mica for the five years 1936-1940 of 691 tons each year, valued at \$58,723; the 1941 production has been noted previously. In 1906 it was said she had "a small

production" while in 1907 it was said she produced none. Presumably because of war conditions the Bureau of Mines gives no figures for either 1942 or 1943.

CLAY

Connecticut's deposits of kaolin, the porcelain clay, are few, and with possibly one exception, of very little importance. The exception, at West Cornwall, has been worked, and some kaolin from it shipped to out-of-state pottery concerns, but the amount was small; the location of the bed, on top of a hill, proved too much of a handicap; and the project was abandoned. None of the others have been worked to any extent, or at all, for many years.



Photo by the author

SHARES BRICK COMPANY CLAY PIT, NORTH HAVEN

But Connecticut's brick industry, employing the clays of the central lowland, is something quite different. The bed supplying the brick yards of Hartford and vicinity is from four to five miles wide, and extends from Wethersfield to Warehouse Point. At Hartford, it is chiefly west of the river; at South Windsor, east; its depth varies from a few feet to at least 95, this latter at Parkville. Another bed, perhaps a mile wide, extends from Berlin to the Connecticut River and is known to be at least 85 feet deep at Beckley; while the Quinnipiac bed, stretching from North Haven to New Haven under the Quinnipiac Meadows, has a maximum width of two miles, and is at least 30 feet deep.

The clay is taken out of open pits, today largely by steam shovel; formerly by hand. It is then tempered by adding sand and working. The old mixer was a circular pit where a wheel, pulled around by a horse on a path at its edge, rolled through and mixed the material; today tempering is usually done in the moulding machine. Moulding, formerly by hand, is today by

machine, and after drying under open sheds, the "green" bricks are burned in a kiln built of the green bricks themselves, using wood for fuel.

The industry grew steadily until in 1896 there were produced some 166,995 thousand common brick, valued at \$996,738, pressed brick and other clay products bringing the total to \$1,119,920. The average annual production for the 17 years 1897-1913, when Connecticut and Rhode Island figures were combined, was 186,643 thousand; average annual total value, \$1,300,834. In 1941 Connecticut alone produced clay products worth \$1,521,000. This fell to \$850,000 in 1943, but there is every reason to hope that with the return of normal times the average annual value will come back to at least one and one-half million dollars.

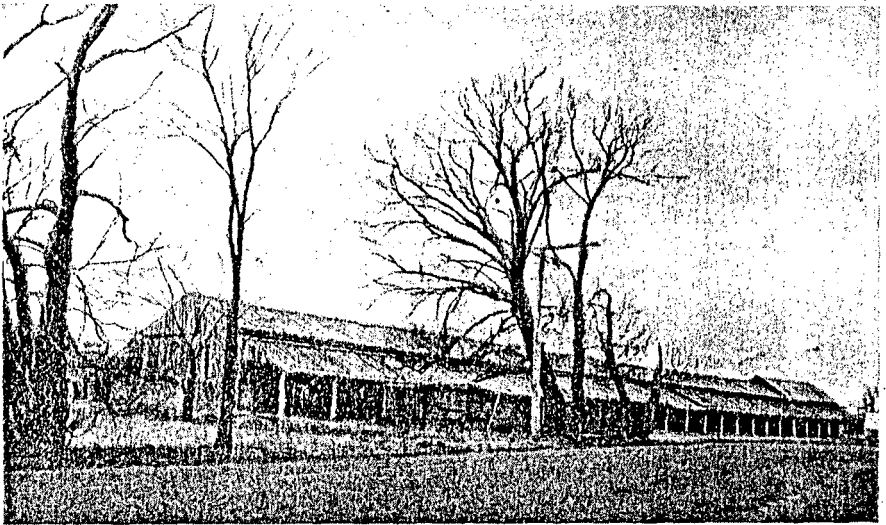


Photo by the author

SHARES BRICK COMPANY KILN SHED, NORTH HAVEN

DIATOMACEOUS EARTH

A small local industry was started in 1906, when Leslie B. and his father, Zalmon F. Purdy formed "The Infusoria Company" to work a bed of diatomaceous earth on the farm of the elder Purdy, a little south of the Upper Stepney Green. Employing but two or three men, they produced in the neighborhood of 25 tons a year, making and selling a very fine silver polish, both as a powder and as a cream; a tooth powder; in bulk for insulating purposes, for which it was calcined; and to parties who were said to use it as a base for antiphlogistine, a curative "mud."

In 1919 the business was sold to Earl E. Gordon and William R. Davis of Stratford, who formed a stock company under the name of the Connecti-

cut Infusoria Company. Evidently believing that the bed was of great extent, and that there was a fine future for the business, they are said to have spent thousands of dollars in erecting large kilns and buildings and in experiments in calcining the material. Unfortunately, the experimental work resulted in there being shipped out improperly prepared material, and as a consequence, the loss of important customers, and eventually, failure of the concern. The equipment was sold as junk; the buildings are only decayed ruins. It is quite possible that even had the experiments proved successful, unless another source of the raw material had been found, the company would have exhausted the bed in a short time; a war-time investigation, while very superficial, indicated that the deposit was a very small one.

There are known to be a number of deposits of diatomaceous earth at Bristol, one of which, according to William A. Terry—"Diatoms of Bristol" "The Red Book"—covers some 15 acres, and is known to be at least seven feet thick, but no record was found of the use of any of these.

GEM STONES

Connecticut has produced a very considerable number of gem stones of the semi-precious variety, but the value of the average annual production is small indeed. Their "mining" is more a matter of chance than anything else, for while the pegmatites are the chief source, the locations of the pockets in which the gems occur is very largely a matter of guess-work; the best that can be done is to hope that blasts will disclose the pockets without, as has many times been the case, shattering the contents. A list of localities where gem stones have been found would have to include most of the quarries in the State; three particularly notable ones are the Roebing at Upper Merryall, whose beryls have been noted, and the Gillette and the Strickland, famous for their tourmalines.

CONCLUSION

In the preceding pages an attempt has been made to at least outline the more important of Connecticut's ventures in mining and quarrying. It is hardly necessary to say that it is very largely a series of quotations from various sources, but after all, in most cases these were the only sources available, and it seemed wiser to quote verbatim rather than substitute—and quite possibly at that with unintentional incorrectness—a version in the words of a second party.

The writer regrets the incompleteness of much here set down; he has personally investigated some of the localities, but present-day conditions have made it impossible to give to all the "fine-tooth combing" desirable, for in a number of cases apparently the only facts known are in the memories of "old timers," and while these have been most generous in their

replies to letters, personal conversation is almost certain to bring out more than correspondence.

A complete list of those who have helped compile the material, and to whom the writer hereby expresses his appreciation of and thanks for, the assistance, would be nearly as long as a telephone directory; particular thanks are due, however, to the following: Mr. and Mrs. H. J. Andrews of South Glastonbury; Mr. Albert Bates and Miss Hoxie of the Connecticut Historical Society; Mr. Frank Brainerd of Portland; Mr. James Brewster and staff of the State Library; Messrs. Sidney Edwards and Elmer Coburn of the State Development Commission; Mr. Arnold Dana of New Haven; Mr. C. O. Dueval, Jr., of the American Thermos Bottle Company; Messrs. R. A. Graham and E. H. Porter of the Lantern Hill Silica Company; Mr. Kenneth Gregg of Washington, D. C.; Mr. R. S. Hardy of Bantam; Mrs. Raymond Hedges of Portland; Mr. F. A. Hewett of Middletown; Mr. Edward Ingraham of Bristol; Mr. James R. Lanyon of Cheshire; Dr. E. M. Marshall of Redding Ridge; Mr. Harry McNaught of Norwich; Messrs. Ray Reigeluth, Clarence Munson and Robert Rose of the New Haven Trap Rock Company; the staffs of the New Haven Colony Historical Society, the New Haven Public Library, and the Sterling Library; Mr. Fred Pierce of New York City; Mr. Leslie B. Purdy of Bridgeport; Mr. James Ranta of Millstone; Professor Edward Troxell, State Geologist, of Hartford; Mr. Clarence Wiley of Milford; and Mr. Frank W. Wilson of West Cheshire.

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