1-5. *Ira Allen, builder of some of Vermont's earlier ironworks, is immortalized by his statue at the college he founded (University of Vermont) at Burlington.*

In the process of the survey, some high grades of iron ore were discovered near the tri-state corner with Massachusetts. A bloomery was built in 1734 by Thomas Lamb nearby at Lime Rock, Connecticut. More forges soon followed at Canaan, Colebrook, Kent, Cornwall, and Salisbury. Ore for Lamb's forge came from Ore Hill in Salisbury. Business was profitable, and Lamb bought additional mining property and the water rights to Wononscopomuc Lake. Around 1760, he sold it all to the Owen brothers, who in turn sold it in 1762 to the partnership of Samuel and Elisha Forbes of Canaan, John Hazeltine of Uxbridge, and a 22-year-old adventurer from Cornwall named Ethan Allen. The partnership constructed a blast furnace at the outlet of Wononscopomuc Lake, which was the first blast furnace built in the Taconic Mountains of western New England. A small prosperous community called Furnace Village (today's Lakeville) developed around the furnace (Smith 1946:257-259). Allen soon tired of staying put, sold his share in the successful ironworks to Charles and George Cadwell in 1765, moved on to Northampton, Massachusetts, and went into the silver mining business.

Meanwhile, dozens of blast furnaces sprang up all over the Taconics of Massachusetts and Connecticut, many providing valuable ordnance during the Revolutionary War. One of these, the Lakeville furnace, provided iron that was cast into guns and cannon at the nearby Salisbury cannon foundry. At Ancram, New York, an ironworks cast parts of the huge chain that was initially planned to block British access to Lake Champlain at the head of the Richelieu River near the Canadian border; it was finally strung across the Hudson River at West Point. Continuing his ever-northward migration, Ethan Allen followed the frontier into Vermont and kept himself (plus New York and the British) busy in other ventures.

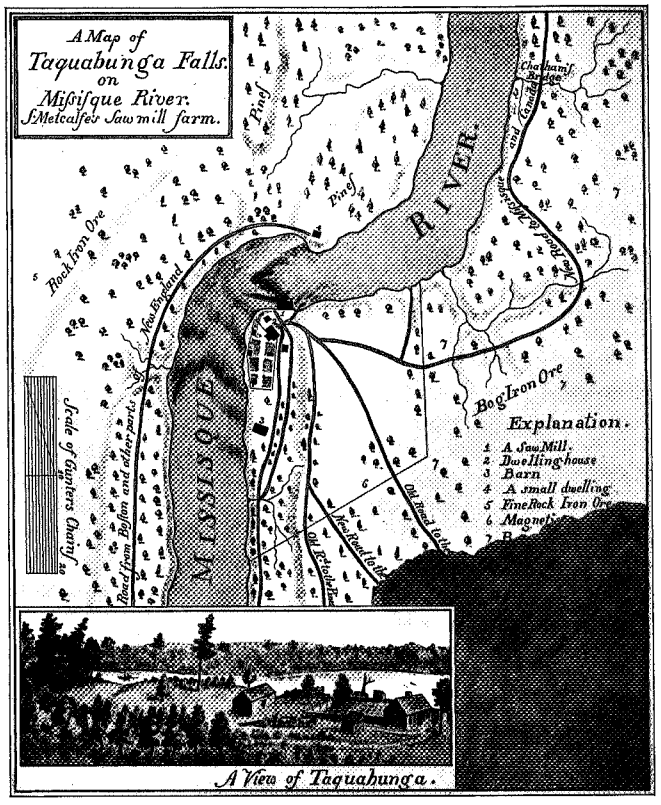
Some of Ethan Allen's ironworks experience and abilities rubbed off on younger brother Ira Allen, who in turn became one of the progenitors of Vermont's iron industry. The Allens, maintaining their former contacts in Connecticut, ordered much iron hardware from the Salisbury forges for the construction of an anchor shop at Colchester and other forges in northern Vermont. Down at Lakeville, meanwhile, the furnace continued in operation until 1823. It had outlived not only Ethan and Ira Allen, but all its founding partners. (There are no visible remains of Ethan Allen's furnace at Lakeville, although his house still stands.)

Early Vermonters

Exhaustive research has not been made into the matter, but it does not appear that Indian inhabitants of Vermont ever worked iron. Chance finds of bits of meteoric iron might have been pounded into ornaments, but judging from published archeological work done in Vermont, the only prehistoric working of metal was that of copper. But the Indians did know of red ocher, an oxide of iron that takes the physical form of a reddish powder. They used it in burials, relating the red powder to blood. "When the first white men came to America, the natives had no knowledge of working iron. Now and then they picked up a bit of meteoric iron and fashioned it into some charm of iron. Copper and bronze were used, but no iron" (Perkins 1971:61). "The red stained soils [of the Indian burials at Swanton] are undoubtedly due to the liberal use of red ocher. Evidently all but two burials were accomplished by this 'red paint'" (Haviland and Power 1981:119). If the Indians noticed the outcrops of iron-bearing stone, they either could not learn how to extract and work it, or its lusterless appearance as compared to their bright copper beads did not encourage them to investigate

it. It was left to the next wave of settlers, the Euro-Vermonters, to discover the iron resources of the land and to become the first Vermont iron makers.

The first non-Indian Vermont residents were the French. In the century-and-a-half following Samuel de Champlain's 1609 exploration of the lake that today bears his name, the French sent missionaries up the lake in attempts to enforce their claims to it and by the 1750s had granted patents for vast tracts of land, called seigniories, along lands bordering both sides of the lake. One seigniory, to Rene-Nicolas Levasseur, included what is today the falls of the Missisquoi at Swanton. At the falls, a community of 50 French families developed around a sawmill (Graffagnino 1983:16). British victories in Canada forced the French to abandon the falls before 1760. Ten years later the old Levasseur mill site came into the hands of New York surveyor and land speculator Simeon Metcalfe, as part of a 25,000-acre grant from New York identified as Prattsburg.



1-6. *A pre-Revolutionary War map of Swanton showing Metcalfe's sawmill village on the inside curve of the river, with indications of iron ore in the vicinity* (Tercentenary *1910:facing 24).*

Metcalfe's holdings in the vicinity of the falls at Swanton are depicted on a 1772 map that shows the Missisquoi River and the sawmill farm on the east side of the falls (*Tercentenary* 1910:24ff, 29). The falls were known as Taquahunga Falls at the time (Huden 1971:65). In addition to showing the falls at today's Swanton village, the map also shows roads north to Canada, south to Boston, and eastward. Symbols indicate the sites of the sawmill, a house and barn, and a small house across the river. The map also indicates "fine rock iron ore" northwest of the falls, magnetic iron ore to the southeast, and bog iron ore to the east and northeast. With all the iron ore deposits around the falls, it is difficult to believe that no iron ore was worked here in the early 1770s, if not previously by the French in a small bloomery. When Metcalfe returned after the Revolutionary War, settlers holding leases issued by Ira Allen (from the New Hampshire charters) were already occupying the area of the falls (Graffagnino 1983:17). The stage was now set for the third wave of settlers.

Following the end of the Revolutionary War, settlers and land speculators by the thousands came into Vermont from all directions. Many were families of men whose introduction to Vermont had been military action at or near Hubbardton or Bennington. With the clearing of land and opening of farmlands, the natural resources of the countryside were immediately exploited by settler and speculator alike. The latter attempted, in some cases, to capitalize on these resources as inducement to sell tracts of land, and either leased already-built mills or advertised the proximity of potentially excellent mill sites to available acreage. Whatever the method, a Vermont population that was about 7,000 people in 1771 became 85,000 by 1791; 155,000 in 1800; and 218,000 by 1810 (Holbrook 1982:xii; U.S. Census).

As steady as the growth of population was, it was geographically irregular. The valleys containing good farmland and abundant resources were settled first; the balance went to late arrivals. Accordingly, the development of Vermont's pioneer industries reflected this irregular pattern that found sawmills and forges commencing operation in widely scattered locations. During the 1780s, for example, a forge operated at Colchester 3 years before one of similar size opened 125 miles to the south in Bennington.

Commercial Empire of the St. Lawrence

This pioneer period was affected by political as well as geographic and economic factors. At the end of the Revolution much of Vermont was still being claimed by both New York and New Hampshire, a situation that discouraged many from investing capital and effort there. Since Vermont was not a British colony before the Revolution, no colonial authority was displaced. Whereas patriot governors replaced colonial governors in bordering New York and New Hampshire, a political vacuum existed in Vermont. Into this vacuum came outside people with all their political, religious, and family prejudices, each jockeying with the other for position in the power struggle. Nowhere is this more obvious than in the antagonisms that existed between Ira Allen, Nathaniel Chipman, and Matthew Lyon. The state of political warfare that prevailed affected not only the lives of those concerned, but also their struggling attempts to develop the timber and iron resources of the emerging state.

Industrial production activity in New England in general, which for a time was given a boost by the Revolutionary War, dropped off following the war, and 10 years of unhindered

international trade cut into markets of domestic products (Robertson 1955:183-185). Manufacturing output could do no more than keep pace with the population increase. National production fluctuations, however, did not fit the Vermont experience.

A number of factors unrelated to the national production and trade picture had a direct effect on early industrial expansion in Vermont. One was the character of the state itself. Vermont in 1780 was essentially still a wilderness with settlers just starting to trickle in, joining those who had settled before the Revolution. Pre-1800 mills generally supported the needs of these settlers, with sawmills to cut lumber, forges to make nails, horseshoes, and wagon hardware, and gristmills to grind grain. What production surplus remained (and in the area of grain and lumber, early Vermont had a significant surplus) found ready markets outside the state. The character of this market was the second factor.

The nature of Vermont's trading with the outside world was molded by its geography. Its external geographic characteristic was its land-locked situation. Vermont was the only such state in New England until the construction of the Champlain Canal. Internally, the Green Mountains essentially divided Vermont down the middle. The eastern towns identified with New Hampshire and the Connecticut River Valley, using the port of Boston. But the western towns were further fractured, north and south. The latter, mostly in Bennington County, were economically oriented over poor roads to the Hudson River Valley ports of Albany, Troy, and New York City. Central and northwestern towns on the Champlain plateau found their economic future gravitating more and more toward strong ties northward—with British Canada.

Ira Allen was not the first to take advantage of Lake Champlain and funnel lumber and bar iron northward to the natural markets at Québec. Philip Skene and William Gilliland, two prominent colonial New Yorkers who were developing respective estates at Skenesboro (Whitehall) and Willsboro, New York, were also buying supplies in Québec with shipments of lumber in the 1760s and 1770s. But Ira Allen's shipments of lumber and iron northward were needed so badly by Québec merchants that in 1787 they persuaded the Canadian government to no longer consider Vermont as being part of the United States (Williamson 1949:142). This exempted Vermont from Britain's Navigation Acts and drew it closer into the commercial empire of the St. Lawrence.

The Champlain Canal

The realization in Albany that Canadian markets were attracting an increased amount of Champlain Valley trade that might otherwise profit New York prompted action in 1792 to build a canal connecting the lake with the Hudson River. Vermont had been interested as early as 1790 in such a canal. A committee representing Rutland and communities bordering on the lake surveyed the region through which a canal could pass and reported that it was not only practical but the advantages of the canal would be "almost inconceivably great." It recommended the Vermont legislature and governor afford reasonable encouragement and aid to New York to build the canal. But the recommendations were largely ignored by both (O'Hara 1984:30). A New York company went on alone with the canal, and actually succeeded in digging many miles of it before going bankrupt in 1796. Repeated appeals to Vermont failed at upper levels, although some help was afforded on a lesser scale. One such form of aid came from Matthew Lyon, who owned forges at Fair Haven, and who accepted a contract to construct one section of the canal (O'Hara 1984:31). But even this was too little effort to have any effect. Other leaders such as Ira Allen did much to discourage official support for the canal and instead supported the construction of a canal from the lake northward to the St. Lawrence River. Allen argued that the lake's flow northward showed that nature never intended New York as a seaport for Vermont (O'Hara 1984:322).

Not until after the War of 1812 was the canal to the Hudson River finally built. And as it turned out, the first boat to pass the entire length, in September 1823, was a Vermont boat named the *Gleaner,* out of St. Albans. On its return trip from New York City it carried lobster, oyster, crab, and other shellfish as witness that the vessel had found her way to the ocean (O'Hara 1984:114-115). That same month some 59 tons of nails, 78 tons of iron, 2 tons of iron castings, and 95 tons of ore were locked through (O'Hara 1984:268). The effect of the canal on trade with Canada was immediate and significant. The amount of lumber passing down the Richelieu River to Québec in 1821 from both New York and Vermont was 780,000 feet. The next year, after only a portion of the Champlain Canal had opened, only 22,000 feet went north to Canada. And soon after, lumber trade with Canada was reduced to practically nothing (O'Hara 1984:211).

The effect of the canal on Vermont's iron industry, however, was quite different from that on its logging industry. As early as 1792, the high-quality ore and smelting facilities of the Champlain Valley caused many to agree that this part of the country was to become the seat of the nation's iron and steel industry (O'Hara 1984:265). At that time, a few forges operated on the New York side of the lake, but more forges plus blast furnaces and rolling mills were already operating on the Vermont side.

The initial rush to capitalize on Vermont's resources died out in the early 1800s when the state's economy was affected by such national events as the Embargo Act of 1807, the War of 1812, and, finally, the Tariff Acts starting in 1816. Forges that initially produced for purely local needs now became concerned about costs of transportation needed to carry heavy iron products to marketplaces much farther away. Mining operations that at one time could just pick-and-shovel ore from an exposed ledge now were required to weigh practical and economic considerations involved in expensive shaft-digging and hoist machinery. Works operating marginally were abandoned in favor of more promising ventures that required larger outlays of capital. And though an amount of this early capital came into Vermont in the form of out-of-state capitalists who developed substantial ironworks at Vergennes, Plymouth, Shaftsbury, and Troy, other ironworks at Sheldon, St. Johnsbury, Bennington, Pittsford, Dorset, and Brandon were initially developed through local means.

The opening of the Champlain Canal resulted in a dramatic

change of commercial activity on Lake Champlain: it finally drew Vermont trade from the St. Lawrence. Whereas its timber had been choking ports at Québec, it now jostled Adirondack logs for price and position at the head of tidewater navigation at Albany and Troy, New York. Davey's ironworks at Fair Haven were unshackled from strictly local demand as a result of the canal and could now ship iron south and west. Conant's ironworks at Brandon found new markets in New York for stoves and castings. The canal also opened new paths to market for Barney's forge at Swanton (O'Hara 1984:278).

New York, however, thought it sound policy to encourage its own manufacturing production through light tolls, and to derive as much canal revenue as possible from "foreign" ones. New York interests recognized early on the potential for a major iron industry in the Adirondacks and undertook to encourage its development through a preferential canal toll system. Toll collectors classified iron, nails, etc., made in New York "not enumerated," the toll being one cent per hundredweight per mile. But non-New York, or "foreign," paid three times the rate per mile (O'Hara 1984:268-269).

The Vermont legislature had shown as much disdain toward the construction of the Champlain Canal as it had during the earlier 1792–1796 attempts. It spurned every appeal for cooperation by New York before the canal was built, yet both knew that Vermont was also destined to reap benefits that the canal would provide (Swanton's marble industry and Burlington's transshipping facilities, for example). And by the 1830s, the Lake Champlain Transportation Company, incorporated by Vermont in 1826, enjoyed a virtual monopoly of the lake business (O'Hara 1984:125). But the Vermont iron industry came under the canal's classification of "foreign iron," and so was forced to pay the higher toll. What more benefit might the industry have gained had legislators at Montpelier cooperated earlier? What might the character of the Vermont (and New York) iron industry have been had preferential tolls not been established?

It has been the contention that coincident with the opening of the canal, New York and Albany money "discovered" the iron ore and water resources of the Adirondack Mountains. The numbers of ironworks in New York's Essex County increased from 4 to 24 with the canal's opening (O'Hara 1984:310-311). The canal did in fact stimulate some renewed ironworks activity at Vergennes with the construction of Rathbone's new blast furnace there and Ward's purchase and reopening in 1828 of what remained of the ill-fated Monkton Iron Company. But Crown Point and Port Henry, New York, some 20 miles up the lake from Vergennes, came to be the new seat of the iron business in the Champlain Valley. Port Henry became the largest shipping port for ores mined in the region, and by 1865 could boast of 8 blast furnaces, 20 forges, 3 rolling mills, and 2 foundries (O'Hara 1984:269-270). Within a few years of the canal's opening, the output from ironworks on the New York side of the lake appeared to have mortally wounded Vermont's earlier, significant position in the industry. But at whose profit and at whose expense? Surely not at the expense of some sharp-eyed, ambitious Vermont industrial families, who respected no state boundaries and who eagerly made their own killing in the industrial market alongside the Yorkers.

The Marriage Connection

Family interrelationships found in industrial expansions throughout the nation were also obvious in the iron industry in Vermont. The Penfield and Hammond families, for example, both involved in mills in the Pittsford area, were also involved in ironworks operations at Crown Point. They became closely related through marriage: Allen Penfield to Anna Hammond in 1810, Thomas Hammond to Sarah Penfield Stewart about 1820, and Augustus Hammond to Mary Penfield in 1839. Whether any of these marriages were arranged with business gain in mind is unknown, but they do indicate the tendency of families with similar industrial pursuits to socialize. In the process, loose business alliances were made between families, some capital may have supported either or another in-law's pursuits, and technical "family secrets" were probably discussed and shared.

John Penfield, born in Fairfield, Connecticut, in 1747, married Eunice Ogden, also of Fairfield, in 1770. Their 10 children were born before they arrived at Pittsford in 1795, at which time they purchased some land and a gristmill. A son, Allen Penfield, built a sawmill and later a gristmill at Crown Point in 1808. Two years later he married Anna Hammond and, together with his brother-in-law Charles F. Hammond, commenced to build an ironworks empire in New York. In 1812, Allen, John, and Sturgis Penfield (brothers), Thomas Hammond (Allen's father-in-law), and others formed the Pittsford Manufacturing Company, which carded and dressed woolen cloth.

Allen sold his shares in the mill in 1827 and the next year constructed his homestead in Crown Point at Ironville. He built the first forge at Ironville that year and a blast furnace a few miles west, nearer to the mines, in 1845. The works were operated by a company formed that year and composed of Allen Penfield, his brothers-in-law Charles F. and John C. Hammond, and Jonas Tower (of New York). In 1851, Tower sold his interest in the company to William H. Dike and Edwin Bogue, both of Pittsford. Dike's mother was the former Tamesin Hammond; Edwin Bogue was Dike's brother-in-law. Vermonters all, they organized the Crown Point Iron Company, and turned much iron into gold over the next decades.

Allen Penfield died in 1871 and was buried at Ironville, and the blast furnace was soon after shut down. His shares in the iron business and properties were sold to John and Thomas Hammond, who reorganized the company, built blast furnaces along Lake Champlain, and laid dozens of miles of railroad track between the mines and the furnaces. The community of Hammondville grew around the mines, located about 4 miles southwest of Ironville. When the ore ran out in 1893, everything shut down.

Thomas Hammond, progenitor of the Hammonds of Pittsford, arrived there in 1785. He was born in Newton, Massachusetts, raised at Leicester, Vermont, and served during the Revolution in the Continental Army. Returning to Vermont, he married Hannah Cross in 1784. The marriage accounted for much of his success, although he persevered also due to his own wits and skills in the wilderness and hardships of early Vermont. An active Congregationalist, he served in many local and state offices, and rose to the rank of colonel in the state militia by the War of 1812. The Hammonds, like the Penfields,