

Not for sale

PROCEEDINGS  
OF THE  
VERMONT  
HISTORICAL SOCIETY

FOR THE YEARS  
1921, 1922 AND 1923



CAPITAL CITY PRESS  
MONTPELIER, VT.  
1924

**Leadership of  
Early Windsor Industries  
in the  
Mechanic Arts**

---

**A PAPER  
READ BEFORE THE  
VERMONT HISTORICAL SOCIETY  
AT WINDSOR  
SEPTEMBER 4, 1922**

---

*By Guy Hubbard*

THE MODERN VILLAGE OF WINDSOR,  
from the Cornish, N. H. Hills.

"Windsor, Vt., [small and secluded as it is] has contributed signally to tool building throughout this country and Europe."

PROF. JOSEPH W. ROE

*in "English and American Tool Builders."*



# The Influence of Early Windsor Industries Upon the Mechanic Arts

---

## SETTLEMENT AND EARLY INDUSTRIAL LIFE OF WINDSOR, VERMONT.

Upon the summit of a high hill in a certain Vermont township one may sit upon a mossy rock beneath an ancient first growth pine and see stretching in a gentle curve before him, and winding out of sight in the distance, one of the more serene reaches of the upper Connecticut river, in its valley of level meadows and curious sugar loaf hills. Below him in the valley he will see a terraced village almost hidden by shade trees, which lies in the shadow of shapely Mount Ascutney, whose spruce clad slopes rise more than three thousand feet above it. With the exception of a sleepy looking single track railway, a modern shop upon one of the river meadows, and a few scattered stacks amidst the trees, there are none of the familiar, and often times unpleasant, signs of industrial activity; yet this is Windsor, of whose industries Professor Joseph Wickham Roe, a noted industrial historian and mechanical engineer, has said, "...but few plants have had so great an influence upon American manufacturing."

Far distant from other centers of production, and from the sources of raw material; with apparant disadvantages of transportation, and with no apparent advantages in regard to labor, the village of Windsor seems to have deliberately violated the laws of Economics. Not only is this village in the upper valley of the Connecticut, notable today in the engineering field for its complicated automatic machinery, but also it has behind it more than a century of remarkable history in Mechanics and Invention. The great importance of this history may be realized at once by consulting Professor Roe's "English and American Tool Builders." This masterly

work covers the development of machinery from the boring of James Watt's first steam engine cylinder by John Smeaton at the Carron Iron Works in the year 1769, down to the year 1915; yet not only is there a full chapter devoted to the Windsor industries, but also elsewhere through the book numerous references to them occur, so that no less than one eighth of its 294 pages are concerned with the mechanical developments emanating from this Vermont village.

In the broader sense the industrial development of Windsor, like that of New England as a whole, did not begin until subsequent to the year 1800, yet the beginnings of industry are bound up in the very inception of the town.

While Windsor is at least 125 miles north of the city of Hartford, Connecticut, its name, the names of its neighbors, Weathersfield and Hartford, and the original name of the state, New Connecticut, all indicate that many of the early settlers of the region were from that colony of mechanical geniuses down the river. Bishop in his "History of American Manufactures" says, "Windsor County is particularly rich in the water-power of the Queechy, the White, the *Mill* and other rivers, the last of which has a fall of sixty feet in one third of a mile." As the lower portion of this fall is plainly visible from that earliest highway, the Connecticut river, it undoubtedly attracted to the future site of Windsor those pioneers in whose veins flowed the blood of Mark Twain's "Connecticut Yankee."

Instances of a future industrial center being planned about an undeveloped water-power are not unknown; the great Amoskeag Manufacturing Company and the city of Manchester, New Hampshire, having been so projected in the wilderness about the Amoskeag falls of the Merrimack by Samuel Slater, the famous inventor of textile machinery, in 1822; while the author himself can testify to having seen the much talked of city of Muscle Shoals, Alabama, spring up in 1918 from the oak groves and cotton plantations about the site of the mammoth Wilson Dam on the Tennessee.

Long before the earliest of these, Windsor, Vermont, was of similar origin.

Although Windsor was chartered on July 6, 1761, it was not until August, 1764, that the first settler, whose mechanical name, Steele Smith, was so prophetic of the future of the town, removed there from Farmington, Connecticut. Meanwhile the grantees at their headquarters at Winchester, New Hampshire, were not idle, for they were planning their new town—just as Samuel Slater did his sixty years later. On April 12, 1762, these gentlemen sowed the seeds of future manufacture and commerce by appointing a Committee of Two for “. . . the building of mills and the laying out of roads.”

Then at their next meeting, held at Winchester on August 24, 1763, it was voted, “To grant to Israel Curtis, fifty acres of land adjoining Mill Brook, so called, in the town of Windsor, in what form he thinks best, leaving the common land in good form. . . . This done in case the above named Israel Curtis shall give a bond to the Committee to see that mills are built, of one hundred pounds sterling money of Great Britain, to build a sawmill in said town of Windsor by the first day of August 1764, and to build a grist mill as soon as there shall be twenty inhabitants that shall raise an acre of grain apiece in said town; and that said Curtis shall have the privilege of said Mill Stream, so called.”

#### FIRST INDUSTRIES

Shortly after the settlement of Windsor, two log dams, about two hundred yards apart, were built near the mouth of Mill Brook, and before 1769 a sawmill at the upper one and a grist mill at the lower one were in operation, Israel Curtis and his son Zebina thus becoming the pioneer manufacturers. The two mills served as a nucleus about which grew up other small manufactories, such as blacksmith's shop, a wheelwright's shop, a carding mill—and possibly a cooper's shop, as Windsor in those unregenerate days supported a distillery.

It was about these two dams that much of the mechanical history was to be made in the next one hundred and forty-two years.

The machinery for these mills was built by one Benjamin Tyler of West Claremont, New Hampshire, a self-taught but highly competent Mechanical engineer and Iron master, the first in the Windsor region. Tyler ran a forge, bloomery and slitting mill, which were the colonial equivalents of the modern smelter, foundry and rolling mill, about nine miles south of Windsor near the mouth of Sugar river, at a time when such an establishment was strictly prohibited by the notorious Townsend Act. It is extremely difficult to keep a Yankee genius from playing with tools, and George III was soon to discover that it is impossible to prevent a nation of men like Benjamin Tyler from doing so. There have been wars for religious freedom, and for political freedom, but in the face of this Townsend Act a good Yankee cause may be given for the American Revolution, a war for industrial freedom. From 1767 until the early part of the nineteenth century Benjamin Tyler did a thriving business, smelting the bog iron of the neighborhood, fabricating it into machinery, and shaping his millstones of biotite granite in his quarries on the southeastern slope of Mount Ascutney. Because of their nature these stones are today lying by the sites of long forgotten mills, lasting memorials to their maker.

It is likely that the work of Benjamin Tyler as a builder of mill machinery aroused the anger of the famous Philadelphia engineer, Oliver Evans, who because of his invention of the High Pressure Steam Engine, is called the "Watt of America." In 1818 Evans journeyed to Vermont and in October, 1818, published in the Windsor paper a dire "Warning to Millers" regarding the infringements of his patent, which he discovered in this region.

As I mention this Windsor paper I am reminded that the press upon which it was printed happened by curious workings of fate to be the famous Daye Press, the first in America

north of Mexico. This mechanical veteran, like a typical "journeyman printer" started its wanderings by coming to Cambridge, Massachusetts, from England in 1638, and in 1783 stopped on its way to the Vermont Historical Society to print the "Vermont Journal" at Windsor for a time. This venerable relic of national interest has a massive timber frame so suspiciously like the frames of certain pioneer Windsor machine tools that it seems almost certain that their designers must have used it for a model.

With the opening of the nineteenth century there came about an Industrial Awakening in New England which seemed to be reflected in the awakening of Windsor to its greater industrial possibilities. It was not with cotton, which under the influence of Samuel Slater's inventions was then elsewhere becoming a great industrial factor, that Windsor was concerned, but with the old colonial standby, wool, and this not on account of any particular improvement in machinery, but because of a local improvement in the locally produced raw material.

#### EFFECT OF THE INTRODUCTION OF MERINO SHEEP

The American sheep of colonial days were of a very inferior breed in regard to the quality of their wool, and for that reason numerous unsuccessful attempts were made to smuggle into this country some of the merinos which were carefully guarded as a national asset by the governments of Spain and Portugal. Suddenly, in 1810, this condition was completely reversed on account of the Peninsula Wars, and the Spanish authorities became anxious to dispose of their finest flocks to prevent their slaughter by the enemy and to furnish ready money for military purposes.

William Jarvis, Esq. of Weathersfield, Vermont, a gentleman who was deeply interested in the raising of sheep, happened at that time to be the American consul at Lisbon and he seized this opportunity at once. Through the vigorous efforts of Consul Jarvis, nearly 20,000 of the finest merinos

in Spain were transported to the United States between April 1, 1810 and August 31, 1811, thousands of them being sent to his great estate at Weathersfield Bow, some six miles below Windsor. These transplanted merino sheep were found to thrive in their Vermont home and place this state in the foremost place in the wool industry, a position which it long held.

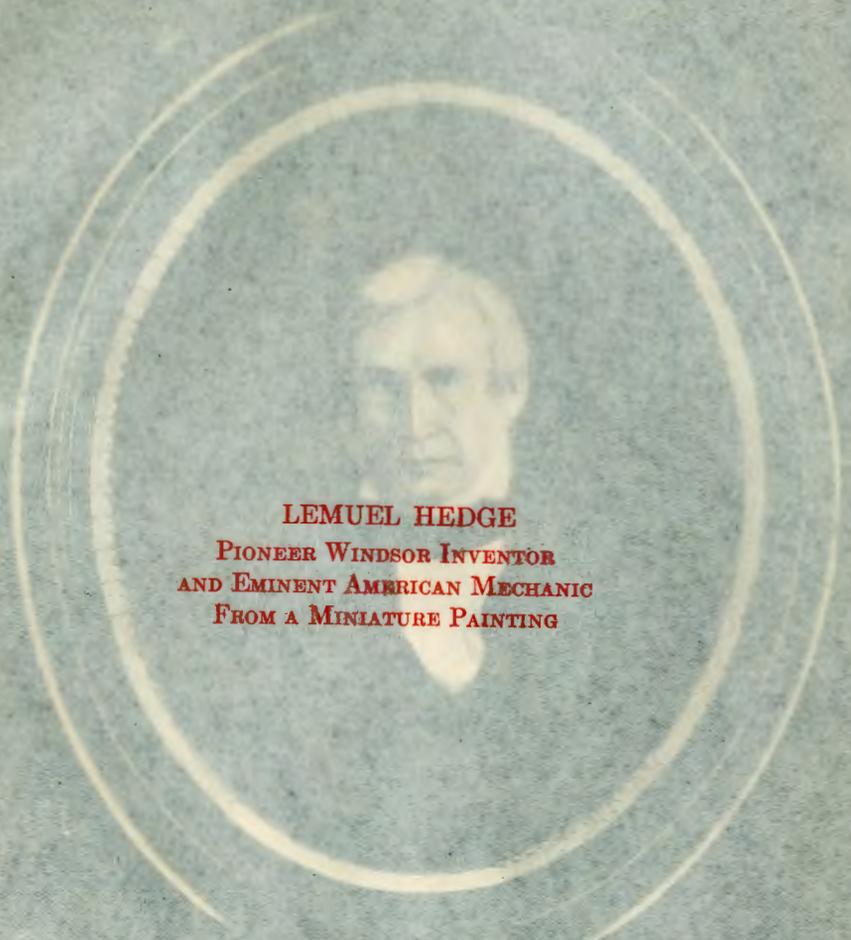
Windsor was prompt to take advantage of this, and the former small carding mill on the upper fall of Mill Brook was greatly enlarged by the so called Essex Merino Association into a textile mill of considerable size. Special machinery for handling the long fibre merino wool was designed and between 1812 and 1815, because of the blockade during the War of 1812, Windsor experienced the first of her industrial booms. As soon as normal foreign trade was established the Essex Merino Association, in common with hundreds of other woolen companies throughout New England, was pushed to the wall. They ceased to do business in the fall of 1818. The lasting benefit of this incident was the vast improvement in the quality of American wool, and the modern American woolen industry is a monument to Consul William Jarvis.

#### LEMUEL HEDGE

At about this time Windsor introduced to the world her first strictly "home grown" mechanical genius, in the person of Mr. Lemuel Hedge, who should be classed as one of the eminent American inventors.

Lemuel Hedge, son of Solomon Hedge, one of the earliest Windsor blacksmiths, was born at Windsor on November 2, 1786. He received his first mechanical training as "striker" for his father, but being a born mechanic he was attracted to the finer work of cabinet making, and learned that trade, which was in those days of wooden machinery, closely allied to that of machine building.

In those days there held forth at Windsor a character by the name of Thomas Pomroy, who carried on the combined

A faint, circular portrait of Lemuel Hedge is centered on a dark blue background. The portrait is rendered in a light, almost white tone, making it subtle. It shows a man with light-colored hair, looking slightly to the right. The portrait is framed by two concentric, light-colored circles.

**LEMUEL HEDGE**  
**PIONEER WINDSOR INVENTOR**  
**AND EMINENT AMERICAN MECHANIC**  
**FROM A MINIATURE PAINTING**



businesses of printer, book binder, book seller and stationer in the "Tontine Block", a wooden building and the largest in the business district.

#### HEDGE'S RULING MACHINE, ORGAN AND DIVIDING SCALE

In this shop of Thomas Pomroy, the inventive Lemuel Hedge watched the tedious process of ruling blank books by hand, and as a result he invented and patented on June 21, 1815, and March 3, 1817, respectively, his ingenious "Spring Pen Ruler" and "Revolving Ruling Machine" which in combination would rule a ream of ledger paper on both sides in twelve minutes, and which inventions form the basis of all modern ruling machines. These two are probably the first Windsor patents.

The inventor and stationer went into partnership under the name of Pomroy & Hedge, and in the fall of 1818 fitted up a 91 x 40 foot shop on the first floor of the Tontine Building for the quantity manufacture of the Hedge ruling machines. In the midst of these preparations, early in the morning of November 25, 1818, the Tontine Block burned to the ground, and this promising industry was completely wiped out at a loss of \$3,500 to Pomroy & Hedge. In an attempt to recoup his shattered fortunes, Lemuel Hedge set out on a long journey through the West and South selling State Rights to manufacture and sell his ruling machines, and through this procedure their use became wide spread with no great benefit either to the young inventor or to his home town.

After this journey Hedge returned to Windsor and set up as a cabinet maker and organ builder, becoming skilled in this latter art and building many fine organs with mahogany cases for the old time meeting houses, the historic "Old South Church" at Windsor among others, at the time when organ music first ceased to be looked upon with suspicion.

His keen and restless mind was constantly at work upon mechanical inventions and on June 20, 1827, he patented at Windsor his "Engine for Dividing Scales," mentioned by

Bishop as one of the notable inventions of that year. This pioneer machine for the rapid and accurate automatic marking and numbering of mechanics' scales was of national importance in the development of the machine industry, for by the quantity production of cheap and accurate scales it unified the linear measurement system of the country, which made possible the Interchangeable or American System of manufacture as we know it today.

Hedge built and for some time operated this Dividing Engine at Windsor, but being unable to finance a very extensive scale factory in his town, he interested Mr. E. A. Stearns, a Brattleboro capitalist, in the proposition and in 1830 they organized E. A. Stearns & Company at Brattleboro, where Hedge spent the next ten years in perfecting his machinery, manufacturing scales in great quantity and incidentally inventing that familiar instrument, the Carpenters' Folding Two Foot Rule.

In 1840 Lemuel Hedge sold out his interests to Mr. Stearns and went to New York City where he set up as a Mechanical Engineer and Inventor. E. A. Stearns & Company did a thriving business at Brattleboro under the original name until 1862, when they sold out to Mr. Charles L. Mead. In 1868 Mr. Mead became treasurer of the Stanley Rule & Level Company of New Britain, Connecticut, and consolidated his Brattleboro business with this latter one. The amalgamated businesses exist today as the great Stanley Works of New Britain, one of the largest tool and hardware manufacturing plants, and strange to say, one of the original Hedge Dividing Engines is still in use at this plant for dividing expensive ivory scales.

#### BAND SAW

In 1849 Lemuel Hedge produced his best known invention, which was the Band Saw in exactly its modern form. To get ahead of my story, I will say that the first one of these now universally used machines was built for Mr. Hedge by

the Robbins & Lawrence Company of Windsor and from their car shop its use has spread to all parts of the world.

In his later years Lemuel Hedge was an exquisite draftsman, working freely in colors and perspective, and through constant study he cultivated his natural ability to a point where his mind was able to work out its complicated conceptions so completely that scarcely any experimental work was necessary upon the finished mechanisms. He passed the last of his life in New York City in comfortable circumstances an active Engineer to the last. He died in his 67th year in Brooklyn, August 1, 1853, and was buried in Evergreen cemetery of that city.

#### ORIGIN OF THE HYDRAULIC PUMP

One of the results of the industrial awakening of Windsor was the attention given to the navigation of the upper Connecticut; such men as Captain Samuel Morey, the steamboat inventor, Governor DeWitt Clinton, of Erie Canal fame, and Thomas Blanchard, the inventor of the gunstock Lathe, visiting in Windsor and lending their efforts to this project—which as far as relates to steamboats on the Connecticut was never destined to be a great success, but which indirectly furthered industrial development very decidedly when the dams and canals, originally built for navigation, were converted to power purposes.

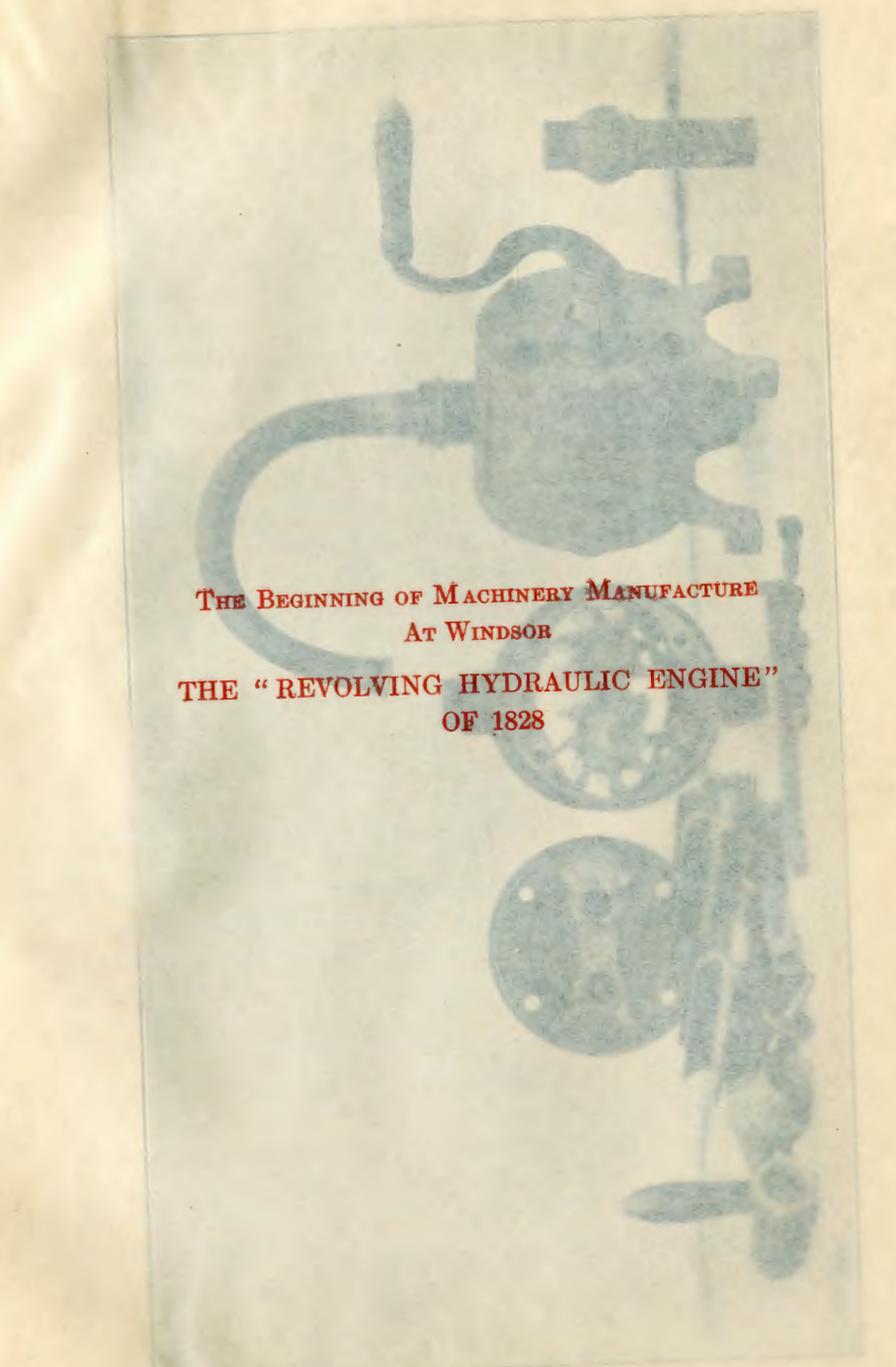
On July 16, 1827, John M. Cooper an inventive mechanic of Guildhall, Vermont, patented his "Rotative Piston" a device which he believed to be particularly suited for a combined bilge and fire pump for steamboats, and as the steamboat excitement was then at its height, Cooper journeyed to Windsor and succeeded in interesting two local capitalists, Mr. Elisha Phelps and Mr. Edward R. Campbell, in his invention. The Rotative Piston consisted of a drum having four curved leaves hinged to its periphery, which was located off center in a casing having an inlet at the side and an outlet at the top. The water was pumped by the opening and clos-

ing action of the leaves in the case as the Rotative Piston was turned.

#### ASAHEL HUBBARD'S HYDRAULIC PUMP

Even before thorough trials had been conducted upon the device, plans were made to manufacture the new pump in quantities and one of the abandoned buildings of the Essex Merino Association was fitted up for this purpose, under the name of the American Hydraulic Company, which was incorporated for \$100,000. As soon as the Cooper pump was put upon the market serious defects became apparent, and within a short time the elaborate project collapsed, with considerable loss to the promoters. This failure might easily have killed the Windsor machine industries almost at birth, had it not been for the fact that this unsuccessful Cooper invention inspired Asahel Hubbard, one of the native Windsor mechanics, to invent his successful "Revolving Hydraulic Engine."

This inventor was born at Meriden, Conn., on January 8, 1787, and came to Windsor in 1800, where his father and grandfather were among the earliest land holders. As a boy he drove freight wagons between Windsor and Boston, and later he ran a store and tavern, but being a natural mechanic he seized the opportunity to become the proprietor of a "water mill" near the "West Parish" and it was there that he built his experimental pump. On April 28, 1828 he obtained a strong patent upon his "Revolving Hydraulic Engine," which is a beautifully simple machine, consisting only of two peculiarly shaped gears, revolving in an accurately bored water tight casing. The inlet is at the bottom and the outlet at the top. The water is carried between the teeth and the sides of the case from the bottom to the top, being prevented from returning by the meshing teeth in the middle, it is forced out at the top in a continuous smooth stream. Soon after the patent was granted, the inventor succeeded in interesting in the manufacture of the new pump Jabez Proctor, a leading



THE BEGINNING OF MACHINERY MANUFACTURE  
AT WINDSOR  
THE "REVOLVING HYDRAULIC ENGINE"  
OF 1828



citizen of Proctorsville, Vermont, who incidentally was the father of that distinguished Vermonter, the late Senator Redfield Proctor, and grandfather of the present Governor, Redfield Proctor. On October 28, 1829 they together organized the National Hydraulic Company, and in doing so founded a chain of machine industries which has existed unbroken at Windsor down to the present day, in which have developed some of the most important improvements in the Mechanic Arts, and some of the most notable American Mechanics; and from which have sprung no less than thirty descended and related industries notable in the Engineering field.

Through his political influence, Jabez Proctor had Asahel Hubbard appointed Warden of the Vermont State Prison at Windsor, and influenced the State to install an engine and machine shop there. The National Hydraulic Company then took up their abode at the prison where they built the pumps, partly by the convict labor, paying the state twenty-five cents per day for the use of the prisoners—who thereby now had an opportunity to learn a useful trade.

Agencies were established all over the United States, and even so far away as Matamoros, Mexico. One of the earliest and most important orders was for the twenty horse power pump of the first water works of the city of St. Louis. This "huge pump" was built at Windsor and in the spring of 1830 it was taken by the inventor to St. Louis; the journey being made by wagon over the Green Mountains to Albany, thence by the Erie canal to Buffalo, and by lake steamer to Chicago, (which was then but a small settlement) and then by wagon and river boat to St. Louis. The pump was successfully installed by Asahel Hubbard, but when he came to settle the bill he discovered that the Aquaduct Company did not have sufficient cash to pay for it. A collection was then taken up among the citizens by the forerunners of the present Chamber of Commerce, and this additional amount, together with a white saddle horse "to boot", was accepted by the inventor as payment in full.

Asahel Hubbard and his horse returned by the same route by which he went West, and months after his departure he rode into Windsor, where his mount was long remembered by the old inhabitants as the "St. Louis Horse."

In view of such transportation difficulties it is not surprising that the National Hydraulic Company was a staunch supporter of the Connecticut River Valley Steamboat Company, as indicated by the fact that the clerk of the Hydraulic Company was also clerk of the Steamboat Company.

In 1833 Asahel Hubbard sold the Rhode Island state rights to manufacture his pump to Messrs. David Fales and Alvin Jenks of Central Falls. This concern, now known as the Fales & Jenks Machine Company, is one of the largest industries of Pawtucket; after ninety years it is still manufacturing this Windsor invention, unchanged in principle, in sizes varying from small bronze chemical pumps to stationary electric fire pumps of a thousand gallons per minute capacity.

#### NICANOR KENDALL AND HIS RIFLES

In 1835 Nicanor Kendall, a young gunsmith of the West Parish, Windsor, became a son-in-law of Asahel Hubbard and the company added to their manufactures his Patent Underhammer Rifles. Kendall, who was the son of a blacksmith, was born in the West Parish on Dec. 20, 1807, and learned his trade under Asa Story the local gunsmith. One day when riding in a sleigh with his future wife, Kendall started to draw one of Story's rifles from beneath the fur robe to shoot a squirrel, but instead he maimed his hand and sent a bullet through the hair of the young lady as the gun exploded prematurely. This startling accident inspired him to invent his new rifle, which was one of the safest, simplest and most dependable sporting arms ever devised, and it became the standard of the locality as long as the percussion lock remained in use.

It is a peculiar fact that of the few specimens of these so-called Kendall Underhammer Rifles now in existence, two

occupy an important place in the great museum in the Tower of London, and a third, which was the boyhood companion of President Chester A. Arthur, is preserved in the museum of the Vermont Historical Society.

One of the first large orders for Kendall Rifles came from the struggling Republic of Texas in 1836. In payment for these arms some 2000 acres of Texas Land were deeded over to the Windsor Company.

In 1839 Asahel Hubbard sold his interests to N. Kendall and moved "way out west" to Davenport, Iowa, where he settled on a "quarter section" and continued to satisfy his taste for engineering by becoming a surveyor of government land. He laid out many parts of the city and in line with his duties he met his death from fever on September 18, 1845 in a surveyors' camp in the wilds of Mahaska county, more than a hundred and fifty miles from any human habitation. His body was carried to Davenport by his Indian guides, and was eventually laid to rest at Windsor within sound of the industries whose wheels he set turning.

His son Colman Hubbard, who learned his trade under his father at Windsor, went to New Haven in 1840 and became a skilled gunsmith at the armory of Eli Whitney. During the Civil War he was secretary of the Whitney Arms Company under Mr. Eli Whitney, Jr.

As to the Revolving Hydraulic Engine, we all know it today as the Rotary Gear Pump which is in almost universal use in motor cars for circulating both the cooling water and lubricating oil.

#### RICHARD SMITH LAWRENCE—DEVELOPMENT IN FIREARMS

In the year 1838 there came to Windsor a young man who was destined to leave his impress upon the industries not only of the town but also upon the country as a whole. This was Richard Smith Lawrence, born in Chester, Vt., on November 22, 1817, who, upon the death of his father, left school at the

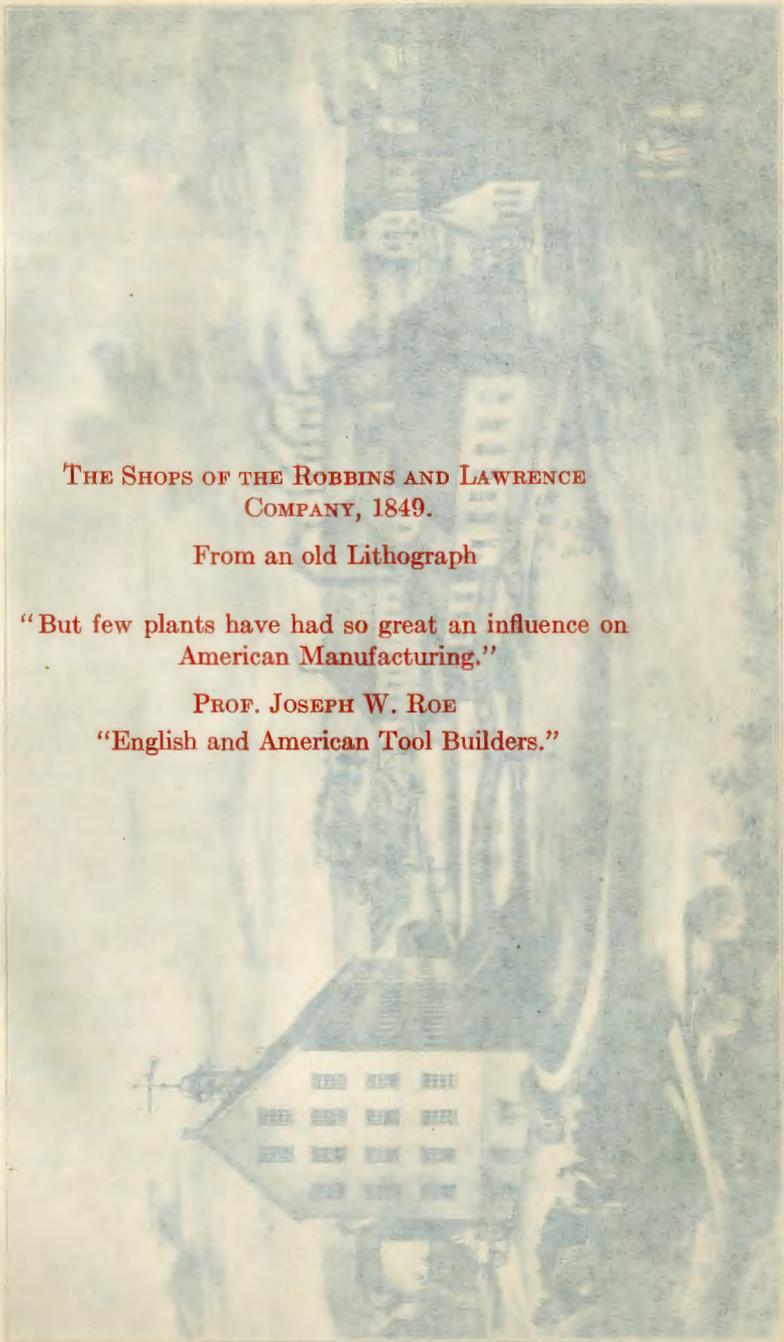
age of nine, and learned his trade in the "school of hard knocks" in the neighborhood of Watertown, New York.

It happened that his aunt was a sister-in-law of Asa Story, and this brought him to visit the West Parish gunsmith. The skill of young Lawrence in repairing an old squirrel rifle for Doctor Dyer Story of Brownsville, West Windsor, led the boy to be given an opening in the shop of N. Kendall at Windsor, and beginning in 1838 at \$100 per year and board, his rise was rapid. In 1843 he became a partner with N. Kendall and they removed from the prison to the shop on Mill Brook once occupied by the American Hydraulic Company, where the Ascutney Mill Dam Association had lately built permanent dams in the hope of accelerating the industrial development of the village.

ROBBINS & LAWRENCE CO., MANUFACTURE RIFLES  
FOR U. S.

In the winter of 1844 Kendall & Lawrence were visited by a wealthy Boston lumber dealer, Mr. Samuel E. Robbins, with the proposition that they take a contract for U. S. Government Rifles, war with Mexico then being imminent, and the government sorely in need of guns. They agreed to this and so Mr. Robbins went to Washington, where in the name of Robbins, Kendall & Lawrence he took a contract for 10,000 Harpers Ferry Model Rifles at \$10.90 each, a price which made the other contractors whistle with derision.

These men however, did not reckon with the skill and energy of Richard Lawrence. This young mechanic immediately designed and superintended the building of commodious factories on both sides of Mill Brook, including the handsome three story brick armory which is now used as a power station by the Windsor Electric Light Company; he designed and constructed novel machinery which largely eliminated hand work; and he gathered together more than three hundred skilled workmen from all parts of the country. Among these men were Mr. Henry D. Stone and Mr. Frederick W.



THE SHOPS OF THE ROBBINS AND LAWRENCE  
COMPANY, 1849.

From an old Lithograph

“But few plants have had so great an influence on  
American Manufacturing.”

PROF. JOSEPH W. ROE

“English and American Tool Builders.”



Howe, who with Mr. Lawrence are ranked by authoritative writers as three of the great American mechanics.

In the midst of this expansion Mr. Kendall, who was a rather cautious individual, and unacquainted with manufacturing on such a large scale, withdrew from the concern. He went to Davenport, Iowa, and was associated with Mr. Austin Corbin who became a railway President and also the Founder of Coney Island, near New York City. Mr. Kendall later returned to Windsor, where he died on December 24, 1861.

The concern was incorporated in 1849 as the Windsor Car & Rifle Company, on account of their associations with Sewel F. Belknap, the dashing young contractor of the Central Vermont Railway, as builders of railway cars. While this car venture was not a financial success, during that time Mr. Lawrence introduced the modern method of pressing on car wheels, a very important improvement in railway engineering, and as mentioned before, it was in this Car Shop that the Band Saw was introduced.

#### THEIR WORKMAN—HENRY, WESSON, SHARPS

In 1850, after the untimely death of Mr. Belknap at the age of thirty-six and the abandonment of the car business, the name of the corporation was changed to The Robbins & Lawrence Company. In that year Mr. Lawrence and his expert gunsmith Benjamin Tyler Henry, who was a grandson of Benjamin Tyler the pioneer mechanical engineer mentioned heretofore, undertook to develop for Mr. Courtlandt C. Palmer, a New York capitalist, the so-called Jennings Repeating Rifle, then in a crude and impractical state. They were successful in this and 5,000 of their improved 20 shot rifles were built at Windsor. Mr. Henry later took this early Windsor Repeating Rifle to New Haven and making a few changes to adapt it to new ammunition, he built hundreds of them during the Civil War as the Henry Rifle. In 1866 he and Gov. Oliver Winchester founded the Winchester Repeating Arms Company, and the Jennings Rifle became the far

famed Winchester Repeater, which has had so great a place in the history, and especially in the winning of the West. It was in connection with his experiments upon this Jennings Gun that Mr. Lawrence invented the lubricated bullet, which made the breech loading gun for the first time practical.

Another famous gunsmith who worked for Mr. Lawrence at Windsor about 1850 was Daniel Baird Wesson, an expert on the Robbins & Lawrence Revolving Pistol. Mr. Wesson was later the founder of the Smith & Wesson Company, the Revolver Manufacturers of Springfield, Mass., and it may be added that in their fine plant are running to this day numerous Robbins & Lawrence machines which are doing, they say, "more and better work than modern ones."

In 1850 Mr. Christian Sharps appeared in Windsor with a model of his Breech Loading Rifle which he invented in 1848. Mr. Lawrence perfected this gun, adding to it the "Lawrence Pellet Primer Lock", and as the call for the improved Sharps Rifle was great the Robbins & Lawrence company in 1852 established a branch called the Sharps Rifle Manufacturing Company at Hartford, Conn. of which Mr. Lawrence became Master Armorer. After Col. Samuel Colt, who began the manufacture of rifles two years earlier in the same city, the Robbins & Lawrence Company were the first large manufacturers to locate in Hartford, and they opened up what is now Capitol Avenue, one of the greatest manufacturing districts of this industrial city. This Company laid the foundations of the Weed Sewing Machine Company, of the Pope Manufacturing Company, who manufactured the Columbia Bicycles, and also of the great Pratt & Whitney Company who now occupy the site and remaining buildings. The Sharps Rifle was used during the Civil War by the Sharpshooters and was the most noted arm in the Union service. It had the distinction of being the first breech loader extensively used in warfare, and it not only won numerous battles but also sealed the doom of the muzzle loading gun as a military arm.

## AMERICAN INTERCHANGEABLE RIFLES IN ENGLAND

In 1851 the Robbins & Lawrence Company sent to the Crystal Palace in London a representative with six of their Interchangeable U. S. Army Rifles, which could be disassembled, the parts mingled and reassembled perfectly without regard to the gun from which the parts came. These accurate and dependable guns came to the attention of high authorities, James Nasmyth and the Duke of Wellington among others, and the result was that in 1854 the Royal Small Arms Commission was sent to America to investigate this American System of manufacture. They naturally gravitated to the Robbins & Lawrence Company at Windsor, and as a result this back woods concern was honored by being given the contract for nearly all the mechanical equipment of the new Royal Armory at Enfield, England, and also for the first 25,000 Interchangeable English Rifles, many of which were used in the Crimean War. This machinery contract was completed in 1855 and the Windsor machines were widely copied, laying the foundations of the Interchangeable System of manufacture in England. At this same Enfield Armory were made most of the rifles used by the American Expeditionary Forces in the World War, and many of the Windsor machines are in operation there to this day.

The rifle contract did not prove so successful to the Robbins & Lawrence Company, on account of poor business management and many unforeseen difficulties such as lack of black walnut for stocks due to a dry summer in Pennsylvania. Finally upon the unexpected ending of the Crimean War in 1856, this famous Windsor organization failed, and their plant at Windsor went into the hands of one Col. Henry Sebastian Rowan of "Her Britannic Majesty's Artillery", through whom money had been advanced by the British Authorities. The Sharps Rifle Plant at Hartford continued in business until 1876, when it was purchased by P. T. Barnum

and others and removed to Bridgeport. This Sharps plant at Bridgeport is now the Columbia Gramophone Company.

In 1872 Mr. Richard S. Lawrence retired from the Sharps Company and became Commissioner of Streets of Hartford. In this position, which he held for many years, he laid out many of the beautiful parks which grace this thriving Connecticut city, in whose growth he had so active a part. Mr. Lawrence died in Hartford on March 10, 1892, his name being perpetuated in Lawrence Street, one of the main thoroughfares of that busy industrial district of which he was the founder.

OTHER ROBBINS & LAWRENCE WORKMEN—G. E. BILLINGS  
AND G. A. FAIRFIELD

Of the Robbins & Lawrence workmen Charles E. Billings born in Weathersfield, Vermont, on December 5, 1835, founded the Billings & Spencer Company, at Hartford, Conn., in partnership with the noted inventor Christopher M. Spencer, in 1869. This is the pioneer and leading drop forging concern of the world. Mr. Billings, who died on June 4, 1920, was president of the American Society of Mechanical Engineers in 1895. George A. Fairfield, who also was a Robbins & Lawrence workman, and Mr. Billings in 1868 founded the Weed Sewing Machine Company in the old Sharps plant. In 1876 Mr. Fairfield and Mr. Spencer (who was a protege of Mr. Richard S. Lawrence) founded the Hartford Machine Screw Company, which introduced the Automatic Screw Machine to the world and which is today one of the largest industries in Hartford. Both Mr. Billings and Mr. Fairfield became millionaires.

FREDERICK W. HOWE & HENRY D. STONE—TURRET LATHE  
MILLING MACHINES

Frederick Webster Howe, who was Mr. Lawrence's right hand man at Windsor, became one of the four original partners, and the Mechanical Engineer, of the famous Brown & Sharpe Manufacturing Company of Providence, when it was



THE AUTHOR'S COLLECTION OF WINDSOR RIFLES

1. Kendall Underhammer Rifle, 1836.
2. Robbins, Kendall and Lawrence U. S. Rifle, 1845.
3. Robbins and Lawrence "Windsor" U. S. Rifle, 1851.
4. Jennings Breech Loading Rifle, 1850.
5. Sharps Breech Loading Carbine, 1850.
6. and 6a. Small and Large Revolving Hammer Pistols, 1850.
7. and 7a. Windsor Built British "Enfield" Rifle and Bayonet, 1855.
8. Windsor Built U. S. "Springfield" Rifle, 1861.
9. Palmer's U. S. Breech Loading Carbine, 1863.
10. Ball's Repeating Carbine, 1864.



organized as a corporation in 1868, and for two years he was president of that concern, which is today without the slightest question one of the leading machine companies of the world. Mr. Howe and Mr. Henry D. Stone were the inventors at Windsor about 1855 of the modern Turret Lathe, which is considered one of the most important modern machine tools. Mr. Howe also designed at Windsor what is now called the Lincoln Milling Machine, of which nearly 300,000 have since been built, and also of the original Universal Milling Machine, both of which machines are found in almost every machine shop.

GEORGE W. HUBBARD

COFFEE PERCOLATOR AND GLAZIERS' POINT, AND DRIVER

George W. Hubbard, (1836-1916) a nephew of the pump inventor and an apprentice under Mr. Howe at Windsor in 1854, in 1860 was a founder of the Crescon-Morris Company, still one of the large Philadelphia machinery concerns, and in 1876 was the inventor at Windsor of that now familiar household utensil—the Coffee Percolator. In 1880 Mr. Hubbard conceived, from the "Primer Lock" of Sharps' Rifle his patent Glaziers' Point and Driver, which revolutionized the setting of glass in windows. In 1888 this inventor was one of the founders, and first superintendent of the Windsor Machine Company, mentioned later as a successor to the Robbins & Lawrence Company. He and Mr. Billings, who were schoolmates and lifelong friends, were the last survivors of the numerous Robbins & Lawrence organization.

LAMSON & GOODNOW MANUFACTURING CO'S. SEWING  
MACHINES, AND SPRINGFIELD RIFLES

In 1858, the Lamson & Goodnow Manufacturing Company of the Shelburne Falls, Mass. purchased the Windsor Armory and began the manufacture of Windsor Sewing Machines, which were designed by Henry D. Stone and Edwin Clark in 1858, after studying a Grover & Baker Sewing Ma-

chine, brought from St. Louis in 1856 by Mr. Richard Hall, a Robbins & Lawrence workman. When the Civil War broke out this prosperous sewing machine business was sold by Mr. Ebenezer G. Lamson to Mr. Thomas White of Orange, Mass. who in 1866 removed to Cleveland and founded the White Sewing Machine Company for its manufacture. The White Sewing Machine is a lineal descendent of these early Windsor machines.

During the Civil War Mr. Ebenezer G. Lamson employed at the Windsor Armory nearly 500 men who worked night and day. Under the names of Lamson, Goodnow & Yale, E. G. Lamson & Company, and the Windsor Manufacturing Company, he manufactured over 50,000 Springfield Rifles, 1,000 Palmer Breech Loading Rifles and 1,000 Ball Repeating Carbines for the Union Army, besides hundreds of machine tools for the Government and private armories. A portrait of Mr. E. G. Lamson appears in the frontispiece of Bishop's "History of American Manufactures", as one of the ten representative American manufacturers of the Civil War period.

**THEIR WORKMEN—GEN. HIRAM BERDEN, ALBERT BALL  
AND QUIMBY S. BACKUS, AND OTHERS**

Of the Lamson workmen General Hiram Berdan, a mechanical engineer who from 1861 to 1864 commanded the Union Sharpshooters, invented the modern Center Fire Cartridge and the Berdan Rifle at Windsor, and later became the firearms expert of the Russian Government, which adopted the Berdan Rifle and for many years used it in their army.

Albert Ball, inventor of the Ball Repeating Rifle, which is now incorporated in the Winchester, and the superintendent of the Windsor Armory from 1863 to 1868, with Mr. Roger Love, a bookkeeper at the Lamson Office, in 1868 went to Claremont, N. H. and with Mr. Phineas Upham founded the Sullivan Machinery Company there to build the mining and quarrying machines which Mr. Ball had invented at Windsor, where endless injunctions and lawsuits has hindered

its manufacture. Mr. Ball, hale and hearty in his eighty-eighth year, has lived to see this concern, based upon his more than one hundred patents, become the largest of its kind in the world.

William Palmer, inventor of the Palmer Carbine, went to Germany and introduced his gun to the Prussian Government, which employed an adaptation of it with deadly effect during the Franco-Prussian War.

Dennis Lane, inventor of the Lane Saw Mills which were built originally at Windsor, founded the Lane Manufacturing Company at Montpelier.

Quimby S. Backus invented the Backus Vise at the Windsor Armory, and founded the Backus Vise Company at Windsor. In 1872 this became a part of the present Millers Falls Company at Millers Falls, Mass., where the Backus Vise is still manufactured. David Moore, another Lamson workman, invented at Windsor in 1864, the Ratchet Wrench, which is the foundation of all the familiar ratchet wrenches, bit, braces, screw drivers, etc., which are today extensively manufactured by the Millers Falls Company and others.

Fredrick E. Wells, Cashier of the Lamson Companies from 1860 to 1865, went to Greenfield and was the founder of the Greenfield Tap & Die Corporation, now the largest industry in Greenfield and one of the largest tool companies in the world. Mr. Wells, at the age of 78 is one of the leading citizens of Greenfield and a man of large fortune.

George H. Coates, a Windsor boy who learned his trade in the Lamson shops during the Civil War, later invented the commonly used flexible shaft and the so-called Coates Clipper. He was a founder of the present Coates Clipper Manufacturing Company of Worcester, Mass.

Eben Stocker, another Lamson apprentice, and a brother-in-law of Mr. Charles E. Billings, has for forty years been the Secretary of the Billings & Spencer Company of Hartford.

## HENRY D. LAWRENCE OF WINDSOR AT SHERBROOKE, P. Q.

Henry D. Lawrence\*—a cousin of Mr. Richard S. Lawrence, the eminent mechanic—was born at Windsor in 1851. He entered the employ of the Windsor Manufacturing Company shortly after the Civil War, and received his early business and engineering training there. After his graduation from Dartmouth in 1873, where he studied Civil Engineering, Mr. Lawrence went to Sherbrooke, P. Q., where he drifted from teaching into Consular Service, and thence into the study of law. Eventually he was admitted to the bar and became a leading Attorney of the Canadian city. Through his combined power as an engineer and as a keen man of business, Mr. Henry Lawrence has made his life work the building up of Sherbrooke into an industrial center of Canada. He has done much to make it grow from a town of 5,000, with none but local industries, to a city over 20,000 with fifty large industries. Of two of these, the Ingersoll-Rand Company and the Sherbrooke Machinery Company, Mr. Lawrence is a founder and director. Incidentally Mr. Lawrence has always "kept his hand in" by being one of the most skillful amateur cabinet makers in the Dominion of Canada.

## JONES &amp; LAMSON

In 1870 Mr. E. G. Lamson sold his gun machinery to the Winchester Repeating Arms Company, and in association with Mr. Russell Jones, he re-equipped the armory building as a cotton mill, concentrating the machine business, under Mr. Henry D. Stone, in the buildings across the brook. It is needless for me to say that this association was the beginning of the Jones & Lamson Machine Company, well known to fame, both in engineering and in political circles.

## NATIONAL ACME COMPANY

When this now nationally known concern left Windsor in 1888 and began their picturesque and successful career

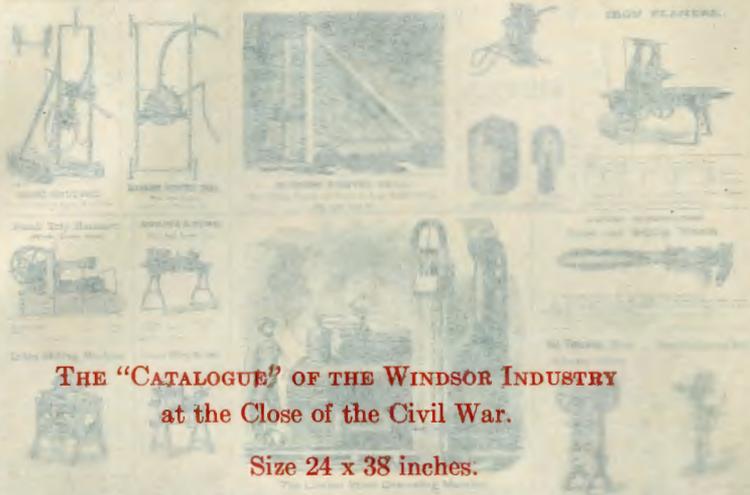
\*Mr. Lawrence died at Sherbrooke, P. Q., March 13, 1924—*ed.*

# THE WINDSOR MANUFACTURING CO.

WINDSOR, ONTARIO, CANADA.

Manufacturers of Sewing Machines, Milling Machinery, and other Machinery for the Home and Foreign Markets. Also, Patent Diamond Pointed Spade, and other Patent Tools, and all kinds of Milling Machinery, and all kinds of Milling Machinery, and all kinds of Milling Machinery.

## Our Patent Diamond Pointed Spade, and other Patent Tools.



### THE "CATALOGUE" OF THE WINDSOR INDUSTRY at the Close of the Civil War.

Size 24 x 38 inches.

This "Catalogue" was the immediate Forerunner of Jones and Lamson





under Governor James Hartness at Springfield, Vermont, a group of the old and loyal workmen who did not wish to see Windsor wiped from the map as a manufacturing center, remained and made great personal sacrifices to found the Windsor Machine Company and to keep the wheels of industry turning in the old Robbins & Lawrence shops, in which many of them had served their apprenticeships many years before. From 1889 to 1902 this concern maintained a rather precarious existence. But with the inventive and mechanical ability of such men as Mr. George O. Gridley and Mr. Frank Cone, backed by the business ability and financial power of the late Mr. Maxwell Evarts the best friend that Windsor ever had, this descendant of notable mechanical forebears by 1910 outgrew its ancestral home and expanded into one of the largest and finest machine tool plants in New England—and now as the New England Plant of the National Acme Company it is helping to uphold the engineering traditions of Windsor at the present time.

An independent spirit certainly animated those patriots who met in the "Old Constitution House" at Windsor on July 2, 1777, and it seems that a similar independent spirit must have inspired the early Windsor mechanics to break away from current practice in the field of Engineering. Such combined characteristics have frequently appeared in other northern races who dwell in mountainous districts—both the Swiss and the Scotch, for instance, being noted both for their love of Freedom and for their genius and skill in Mechanics.

The "Green Mountain Boys" were certainly much like the bands of William Tell and Rob Roy in purpose, in organization and in temperament. Nor does it require a great stretch of the imagination to recognize a striking similarity between the ingenious sons of Vermont "hill farmers" who, having learned their trade in primitive Green Mountain gun shops, became leading manufacturers in the city of Hartford, Connecticut, and elsewhere; and those boys who, after learning the rudiments of mechanics made cuckoo clocks and

wooden toys in some Alpine farm house and later became the leading clock and instrument makers of Geneva; or those other boys who made nails and cutlery at some obscure Highland forge, and later became the famous Engineers and Iron Masters of Glasgow.