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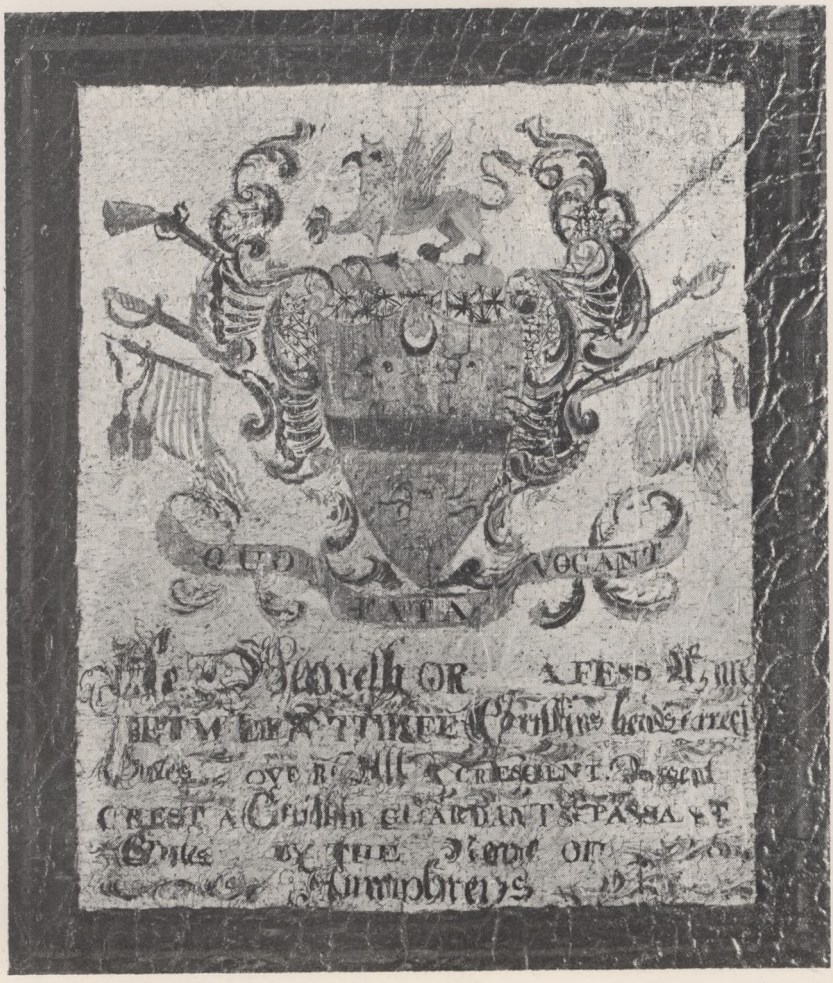

Technological Innovation in the Woolen Industry

The Middletown Manufacturing Company

BY HOWARD DICKMAN*

Woolen cloth manufacturing developed slowly in the United States in the late eighteenth and early nineteenth century. The years between 1760 and 1830 saw the slow rise of factory production, and the era was characterized by rapid technological change.

Here we follow the story of the Middletown Manufacturing Company, whose enterprising founders established the first woolen mill to utilize steam power to run its machinery. A creature of the trade disturbances engendered by the Napoleonic wars and the War of 1812, the company was until 1815 a technological "frontrunner" and "the largest manufactory of fine cloths and cassimeres in operation in New England, if not in the country. . . ."

The most influential founder of the Middletown Manufacturing Company was Arthur Magill. He was born in North Ireland in 1743 and emigrated to the British colonies, settling in the river port of Middletown, Connecticut.

By 1768 he was a partner in the merchant firm of Josiah Williams and Co., whose operations included the North American coastal trade as well as Europe. Magill married Esther Wetmore in 1771, and had two children. His son and future business partner, Arthur W. Magill, was born in 1772; a daughter, Esther, was born in 1774 who eventually married into the Williams family.

Magill's affairs prospered in the last quarter of the eighteenth century and during the first decade of the nineteenth. With his commercial profits he accumulated property in the environs of Middletown, engaging in the practice of buying and selling land continuously. Middletown in those years was a prosperous city with a large volume of trade. As the town (and thus the potential market) grew, we note the signature of Arthur Magill, appearing on numerous road-building petitions sent to the Hartford legislature in this decade. As early as 1804 Magill became involved in a wholesale importing store —the first definite evidence of his interest in textile goods. He was basically a merchant, and while his son lived to have even greater manufacturing interests than the father, both maintained throughout their careers intimate connections with the retailing of general goods.

Until the Embargo and Non-Intercourse Acts seriously curtailed trade with Europe, fine woolen goods such as broadcloth were supplied to Americans almost solely by the British. During this time a domestic market grew for these goods which was to nurture and sustain American "infant industries" in the 1807–1815 years. Commencing in 1806, the supply of fine woolen goods grew scarce, threatening transatlantic merchants such as Magill with ruin. As

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if this were not enough, a founding member of Williams' firm, Captain Stephen Clay, died in 1809, forcing the company to dissolve in that same year. With only dismal commercial prospects, Magill and other merchants decided to put their capital into manufacturing. Appropriately enough he decided to manufacture woolen and cotton-woolen cloths, the commodity with which he was best acquainted.

An Act of October 1810 incorporated the Middletown Manufacturing Company. The officers were Arthur Magill, Joel Barlow, Alexander Wolcott, Daniel Buck, Arthur W. Magill, and Isaac Sanford. The capital stock of the Company was not to exceed $200,000, each share being valued at $1,000, while the value of the real estate of the Company was limited to $50,000. The Company could begin operating when $40,000 of its capital stock was paid in, and the debts contracted by the Company were not to exceed the value of the capital stock actually paid in. Stockholders were made liable to assessment only up to the value of their stock. Article Twelve of the Act of Incorporation held the Company directors responsible for providing three months of schooling for the children they employed. The precedent for this policy had been set in the May 1810 session by David Humphreys, in the incorporation of his Humphreysville Manufacturing Company (Seymour, Connecticut). Originally an incentive offered to attract child labor, the policy was made a general law of the State in 1813.

The Middletown Manufacturing Company was located on Washington Street in Middletown, at the site then called "deep hollow." Its principal building, originally a sugar house, was a brick structure 40′ x 36′ of five stories; this was connected to a rear building, 40′ x 20′. In addition to various outbuildings, there was a separate dye house. The dyeing operations were conducted by a Mr. Partridge, originally from the west of England, and considered an expert in his trade.

What made this establishment noteworthy, apart from its size, was the fact that it was the first woolen factory in the country to use a steam engine to run its machinery. In 1802 Oliver Evans, the "Watt of America" had developed and built his high pressure "Columbian" steam engine for industrial use. These engines (with water temperature of 302 degrees Fahrenheit) generated steam pressure of 120 pounds per square inch of piston and were able to "carry a load from fifty to one hundred lbs. to the inch area." By the use of an ingenious rotatory valve, steam was directed alternately to either end of the piston. In this way, both strokes of the engine "worked," and there was no need for a condensor. The engines had the additional advantage of requiring "not more than one-fortieth of the usual quantity of water." Evans' machines were expensive, but their small size made them capable of wide use, including water transportation, and by 1810 there were ten of Evans' engines in use, with more being built.

The directors of the Middletown Manufacturing Company procured a twenty-four horsepower engine from Evans and had it operating by June, 1811. The engine cost the Company between $15,000 and $17,000; a large part of this sum represented transportation costs.

Isaac Sanford, an incorporating partner, was originally an English mechanic who had worked with Watt's engines. Soon after the Middletown engine was installed, Sanford wrote an enthusiastic letter to Evans:

> as to the engine we had from you, it continues to perform with increasing credit, and thus far exceeds anything of the kind I ever saw. It is my opinion that it will continue superior to all other modes of constructing steam engines; as to all former constructions for that purpose, they are as far inferior, in my opinion, that I would not take them at a gift, could I obtain yours at a price.

In February, 1812, Arthur W. Magill (in his capacity as Factory Superintendent) also wrote to Evans, providing some interesting information on the operation, maintenance, and advantages of his steam engine:

> It is now nine months since we have had your improved steam engine in operation at our woolen manufactory; during which period, we have been gradually loading it with machinery of different kinds. . . . Its simplicity is such, that any lad of common parts can take care of it, with a day's instruction. Very little sediment collect in the boilers, and an examination of them twice a year is sufficient — the piston requires packing once a month. . . . Our engine requires about 96 feet of oak wood, or three fourths of a cord, to work twelve hours with our present machinery. We derive great advantages in using your steam engine in preference to water power, in our woolen manufactory — the heat escapes from under the boilers, and the steam that has done its work enables us to warm our rooms in winter, so that the risque from fire is greatly lessened — and we have a temperature that is very advantageous to us in working wool in winter. Our factory is not liable to be carried away by freshets (note: a spring flash flood) and in using steam, we have an agent always at our command, that will neither freeze up in winter, nor be affected by draught in the summer.

Isaac Sanford had taken out a patent on a "brushing machine for dressing cloth" in 1799, and this device was utilized in the Middletown factory, as reported in Niles *Weekly Register:*

> [the steam was] applied in connection with the brushing machine in finishing [the] cloth, without adopting the method of oiling and hot pressing as is commonly practiced in England. In this method of finishing the cloth does not require sponges before it is made up.

The finished product of this process did not have the "disagreeable gloss" of English cloths; it was considered at least the equal of them, and was displayed for sale in the warehouse of the Domestic Society in Philadelphia.

Carding machines, introduced in this country by Arthur and John Scholfield of Montville in the 1790's, had long been used in woolen mills, but getting the carded wool to the spinning machines, by rolling or condensing the wool into "ropes" was a production bottleneck. A "billy", or "roping machine" was in general use in 1810; it was inefficient and hand run, and ropes rolled on the billy were only slowly formed and were often uneven in quality. Arthur W. Magill came up with a "perpetual roller" process in 1810, aimed at joining the carding and condensing processes into a single operation. The final solution to this problem in mechanization did not come until 1826 with John Gould's "Condenser," but it, too, was based on the idea of a perpetual roller. We might mention in this context that rolling the carded wool on the billy was the main job of the children employed in the woolen mills. Mechanizing this process was a key step in eliminating the need for child labor in the woolen industry.

Evans reported in 1812 that the steam engine of the Middletown Manufacturing Company drove "all the machinery for carding, spinning, reeling, weaving, washing, fulling, dyeing, shearing, dressing, and finishing." This

claim cannot be fully verified, however, due to the fragmentary knowledge we have concerning what machinery was in fact mechanized before 1815.

Power driven spinning "jennies" were a rarity, and a power "jack" (predecessor of the "mule") was not reported in industrial operation until late 1814. Power-driven looms (water power) are not otherwise known to have been used before 1816, and then in Massachusetts. Furthermore, power-driven *broadlooms* (and the Middletown Manufacturing Company made broadcloth rather than the narrower fabrics like satinet) were not reported in use until 1820. If not power driven, then, it is still true that weaving was done on the premises of the Middletown factory; this is in itself a novelty, because weaving was normally "put out" to private weavers in this era. In sum, it can only be claimed with reasonable assurance that washing, carding, reeling, fulling, and the finishing processes were steam driven.

Interestingly enough, Isaac Sanford (with Mr. Partridge) installed the second steam engine used in the woolen industry, a thirty horsepower machine obtained by the Providence Woolen Manufacturing Company in 1812. Also a maker of broadcloth, the Providence concern did not survive the post-war price collapse and shut down in 1815 with heavy loss to the owners.

Obtaining a supply of wool suitable for fine woolens had long been one of the problems of domestic manufacturers, and only a trickle of Spanish merino sheep came into the country before 1807. A "merino mania" was set off after this date, however, as the prices of wool soared. The manufacturers were instrumental in the heavy importations of 1810–1811 that brought down prices and speculation. One device utilized to insure a steady wool supply was to acquire merinos and rent them out to farmers, buying up all the fleece at a guaranteed price. Arthur W. Magill tried this method, though with what success we do not know. Another policy of Magill's was to accept flax and hemp in payment for the various dry goods and groceries sold in his store; this material could be used in mixed-material manufacture. It is worth noting that during the war years Arthur W. Magill and Christopher Wolcott maintained a general store, in addition to the woolen factory.

Arthur Magill, Sr., died February, 1812, leaving his share of the Company ownership with his family. Two months later, the Company bought out the Magill shares; Arthur W. Magill remained with the firm as its business agent (and possibly as a creditor), but no longer in the capacity of owner-director.

As the woolen goods supply from Great Britain was shut off, the number of chartered factories grew from a handful in the years 1787–1807 to over two hundred by 1815. War years were prosperous for the newcomers. The prices of wool goods, which had been anywhere between $1.00 and $10.00 per yard (1800–1810) went up to $8.00–$12.00 between 1812 and 1814, reaching $18.00 at one point. In 1815 prices hovered around $12.00 to $15.00. Profits were made, "notwithstanding a rise of 20%–50% in the wages of operatives (200%–300% in mill seats), and of many raw materials in the same proportion."

A rough idea of the revenue and costs of the Middletown Manufacturing Company in its first years can be presented from the scattered data this author has collected. The Company in a very good year (1812, for example) employed between sixty and eighty hands, and manufactured daily between

thirty and forty yards of broadcloth. They could sell this cloth for $9.00 to $10.00 a yard by the piece. A cord of oak wood sold in Middletown for somewhat over $4.00; since the firm only used ¾ cord per day, we will estimate generously their fuel costs at $4.00 per day. Precise data on wages for factory operatives could not be found; neither is it known what proportion of the labor force was female or child. This would make a difference, for they were as a rule paid less. Nevertheless, adult male labor in 1812 was probably worth not more than $20.00 per month. For purposes of computation we will assume all eighty operatives were male, and were employed all year round (six-day week). The final important cost is raw wool. Two pounds of wool were necessary to produce one yard of cloth and at the end of 1812, raw wool sold in Connecticut for $1.50 per pound.

If the firm produced thirty yards in a day and sold it for $9.00 per yard, their revenue would be $270.00. Wool costs would be $90.00, and labor costs $68.00 (80 x .85/day). A day's gross profits would thus be approximately $108.00 (higher of course, if they sold at $10.00, or if they could vary their labor input). If the work year was approximately 300 days, this would mean $81,000 income, and $32,400 gross profit (there would certainly be other costs, such as rent, advertising, etc.). We must also remember that the wool price-cost ratio changed in 1813–1815. However, these estimates are probably within reason. David D. Field, writing in 1819, maintained that the Company manufactured about $70,000 worth of cloth in a year; he does not say what year, however, and he is not the source for the prices of the final goods.

It is reported that Company profits were used to purchase two hotels, one of them being the Washington Hotel on Main Street, Middletown. This author can find no record of the transaction, other than a purchase of two shares of stock in the Washington Hotel Co. by Arthur W. Magill in 1814.

When the war ended in 1815, British manufacturers naturally wished to unload their inventories of unsold goods and recapture lost markets. Chester W. Wright in *Wool Growing and the Tariff* states, "The ups and downs of the British woolen trade resulted in the shipping of vast quantities of English goods to the American market which frequently sold at a price that did not even cover cost." 1815 was the year of heaviest wool importation when the value of imports, (4,200,000 pounds sterling) was far in excess of the preceding three years. The Middletown Manufacturing Company, though undoubtedly adversely affected, managed to survive this crisis.* A period of

* *There is some confusion on this point. Alice Bridge Richter in* A History of the Church of the Holy Trinity, Middletown, Conn. *and J. B. Beers,* History of Middlesex County, Connecticut *imply that the Company went out of business soon after the war ended. This is not the case, and is contradicted by evidence by John C. Pease and John M. Niles in* A Gazetteer of the States of Connecticut and Rhode Island, 1819, *and various references in the legal battles of Arthur W. Magill after 1820. It probably is true, as David D. Field says in 1819 that the Company was never very profitable after 1815. What might have confused these authors was the fact that in April, 1815, the "firm" of "Magill and Wolcott" dissolved* (Middletown Gazette, *April 20, 1815*). *This was the* merchant *dry goods store, however, and it was Christopher, Wolcott, a relative of Alexander Wolcott. Magill had previously entered into another dry-good business with Samuel Williams, in March 1815* (Middlesex Gazette, *March 23, 1815.*) *Besides the name confusion involved, April was the month when the Company (mill) announced stockholder business to be decided upon in May; April 20th would be about the time to announce a dissolution, in order for the subscribers to be on hand for the general stockholder meeting in May.*

painful readjustment was to follow, and there was a clamor for protection resulting in the Tariff of 1816 which imposed a 25% ad valorem duty on imported woolen manufactures. In 1816, prior to the passage of the Tariff, Arthur W. Magill and William Young, another woolen manufacturer, authorized a memorial to the Chairman of the House Committee on Commerce, pleading the importance of the woolen industry to the Connecticut economy.

The Tariff was considered by many to be insufficient, and State Legislatures "assisted" their infant industries by relieving them from State-imposed duties. Connecticut passed a law in 1817 relieving workmen employed in cotton and woolen manufacturing of the poll tax and military duty for four years. In 1818, a general limited liability law was enacted for all joint-stock manufacturing companies in the State. Privately, voluntary associations were formed to "promote industry," such as the one in Middletown in 1817. To be sure, manufacturers adopted improved machinery such as power looms and spinning machines and it is the opinion of most historians that domestic technology was ultimately responsible for the survival of the woolen industry in these years. The cold wind of competition blew despite the insulation of the Tariff. As if to belie the predictions of the advocates of greater Tariff protection, capital continued to flow into the textile industry. Arthur W. Magill, Samuel Williams, and Joshua Starr began a cotton factory in Berlin, Connecticut, in 1818, with a capital stock of $50,000. By this time, wool prices had dropped from their wartime high of $18.00 to $6.00 per yard (broadcloth).

The Middletown Manufacturing Company continued its operations well into the 1820s but by this time had sunk into obscurity. The trend in the 1820s was toward larger and larger productive units, consuming greater and greater amounts of wool. Indeed, close to 15,000,000 pounds of wool were used in factory production in 1830, versus about 400,000 pounds in 1810. The capital invested in woolen factory production probably quadrupled in this time. The "factory system" was still a distant dream, however; even in 1830 domestic factory production supplied only a *third* of the total demand for wool cloths while the rest was from importations or household manufacture.

The first really successful post-war steam mill was opened in 1819 in Steubenville, Ohio. Like the Middletown Manufacturing Company, the Steubenville concern began by manufacturing broadcloth; eventually, however, it shifted to the coarser fabrics, for which a greater market existed. Also, like the Middletown factory in its heyday, the Steubenville factory "stood out as (a) conspicuous establishment(s), even for the whole American industry."

The final years of the Middletown Manufacturing Company are a legal story, rather than an economic-technological one, but some brief comments are appropriate. In August, 1820, Arthur W. Magill received ownership of the Company from a private damage suit. The damages awarded against the Company amounted to some $17,000; the land, buildings, and machinery of the Company were appraised at the shrunken value of $2,885. Alexander Wolcott and his son, Henry, continued in their capacities of President and clerk, respectively. Interesting here is the fact that Arthur W. Magill's wife was Alexander Wolcott's daughter.

Meanwhile, Arthur W. Magill had been a bonded cashier in one of the offices of discount and deposit in the Middletown branch of the United States Bank (he was also a county Justice of the Peace.) In October, 1820, the President and Directors of the Bank discovered that he was guilty of "gross breach

of trust" in "knowingly suffering overdrafts to be made by individuals; also by making overdrafts himself." Suspended from his post and required to forfeit the $50,000 penalty bond, plus interest, that he and his sureties (Joshua Stow, Elisha Coe, and Nathan Starr) had pledged, a court battle ensued which was ultimately settled by a Supreme Court decision in 1827. The judgment was in favor of the Bank.

In November, 1820, the Bank had seized Magill's estate, including the woolen factory, but his property was restored to him in March, 1821, on first appeal. The case dragged through the Courts; in 1822 Arthur W. Magill left Middletown with his wife, eventually settling in Ottowa, La Salle County, Illinois. Control of the woolen factory was left in Wolcott's hands, and it was from him that the Bank finally received it in 1828. At this time the value of the land, buildings, and machinery had depreciated further to $2,650.

This is the last record we have of the Middletown Manufacturing Company. The factors in its decline and ultimate disappearance were no doubt personal as well as "economic." Arthur W. Magill ended his days under the cloud of scandal, an unfortunate end for a man who was considered a "leading light." His involvement in other business activities cost the Middletown Manufacturing Company a good deal of its original talent. The Post-war period was a difficult one generally for textile manufacturers, though not so catastrophic as some would believe (witness the success of the Steubenville concern). One might have supposed that the Middletown Manufacturing Company would have had a large advantage over new entries into the industry—but past achievements did not, and do not, assure the success of any business establishment in competitive industry.

NOTE: This article, with footnotes, may be consulted at the Connecticut Historical Society.

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