Sewing Machines. On 17 July 1790 Thomas Saint, an Englishman, secured a patent on a machine to be used for "quilting, stitching, and sewing, making shoes and other articles." The patent was for some sort of a machine connected with boot-making, and the specifications and drawings of the patent comprised, among other things, a crude stitching device for forming a chain-stitch. This patent was discovered a few years ago by a searcher among the ancient archives of the British Patent Office, where it had lain unnoticed for well-nigh a century, no attempt, so far as is known, having ever been made to introduce into practical use the mechanisms described in the patent. Between 1790 and 1841 several parties obtained patents for stitching devices, making the tambour and chain-stitches, none of which was commercially successful, one of the fatal defects in each being the fact that the cloth had to be fed by hand. When, in 1841, Newton and Archbold patented in England a needle with an eye near the point, and which is essentially the same needle now in use by all sewing-machine manufacturers, one of the greatest difficulties that had theretofore stood in the way of making the sewing machine a practical success was overcome. In 1818 a sewing machine which made a back-stitch was invented by the Rev. John Adams Dodge, of Monkton, Vt., but was neither patented nor manufactured for sale. The first sewing machine put into operation was patented in France, in 1830, by Barthlémy Thimonnier, and was used principally in the manufacture of clothing for the French army, but it was later destroyed by a mob. In 1848 he put another machine on the market and on 3 Sept. 1850 took out a patent in the United States.

A machine having a needle with an eye near the point attached to the end of the vibrating arm was invented and manufactured in 1832–4, in New York, by a machinist named Walter Hunt. This machine was a lock-stitch and used two continuous threads. In 1842 a machine for sewing leather and various other heavy materials was invented by J. J. Greenough, but this did not become generally used. In 1843 a machine somewhat similar to the Greenough machine was invented by George H. Corliss. This had an automatic feed, and the needles, of which there were two, were run horizontally through the goods to be sewed. Numerous other inventions were made between the years 1849 to 1851, the most important of these being the machine for the manufacture of clothing made by Lerow and Blodgett. This had a curved shuttle, adjustable feed, and automatic tension, and the baster-plate consisted of a circular hoop studded with pins. The next invention patented that covers a fundamental and important feature was that of John Bachelder, patented 8 May 1849. Bachelder's machine was the first to embody the horizontal table with a continuous feeding device that would sew any length of seam. His invention consisted of an endless leather belt set with small steel points projecting up through the horizontal table and penetrating the material

to be sewed, carrying it along intermittently at a proper time to meet the action of the needle.

Elias Howe, Jr., began his experiments in 1843, and secured his first patents 10 Sept. 1846. Howe's principal improvements were the shuttle, producing the lock-stitch, and the feed motion. Later, Howe made other improvements, but the machine bearing his name was not patented until 1857. Howe's invention consisted of the combination of the eye-pointed needle with a shuttle for forming a stitch, and an intermittent feed for holding and carrying the material forward as each stitch is formed. The mechanical device for the feed was called the "baster-plate," and the length of the seam sewed at one operation was determined by the length of this plate. The material to be sewed was hung by pins to the "baster-plate" in an upright position, and if the seam to be sewed was of greater length than the plate it was necessary to rehang it on the plate, which was moved back to position in the same manner as a log is carried back and forth in a saw-mill.

In 1847, Allen B. Wilson, then working as a journeyman cabinet-maker in Adrian, Mich., conceived the idea of a sewing machine, although he had never heard of one. He did not complete full drawings of his machine until the latter part of 1848. Early in 1849, he determined to build a model, and began, on 3 Feb. 1849, the construction of his first machine. which he completed in about 60 days. Having been compelled, by lack of means, to construct every part of the machine himself, the iron and steel as well as the wood, although he was not a practical machinist and lacked suitable tools for the metal work, the machine was consequently of imperfect construction, and could not illustrate in the best manner the principles of his invention. It worked, however, and with it were made dress waists and other articles that severely tested its capacity. This machine made the lock-stitch, the lower thread being carried by a double-ended shuttle. The machine contained the first automatic feed movement ever produced, and was the first that could sew curved seams or turn a sharp angle. Without such a device, the machine would have been a practical failure, as Howe's really was, and as were all others until Mr. Wilson's inventions. His first device was what is known as the "two-motion feed," to distinguish it from his "four-motion feed," a still more effective device afterward invented by him. The "two-motion feed" consisted of a horizontally reciprocating tooth surface (the pitch of the teeth being forward) engaging the material at all times, and while the needle was in the material moving back to take a new stroke. A patent on this machine was granted Mr. Wilson on 12 Nov. 1850. Wilson had, while in New York, constructed a model of a machine containing a rotary hook and reciprocating bobbin, gave all his energies to perfecting the new machine, and obtained a patent for it 12 Aug. 1851.

It is a remarkable coincidence that on the same day a patent was granted to Isaac M. Singer for his first machine. The main features of the Singer machine were its straight needle, working at the extremity of a stationary overhanging arm, and its feed, consisting of a roughened wheel. A straight shaft in the overhanging arm imparted the motion to the needle, and the shuttle was driven in its race below the feed table by a mechanism deriving its motion from the shaft by means of gearing. The feed consisted of an iron wheel with a corrugated surface, the top of which was slightly elevated above the level surface of the table. By an intermittent motion the feed carried the cloth forward between stitches without injury to the fabric. This device permitted the cloth to be turned in any direction by the operator while sewing, which was impossible with the styles of feed which perforated the goods. The material was held in place by a presser foot alongside the needle. This presser foot embraced an important feature possessed by no other sewing machine up to that time — the yielding spring, which would permit of passage over seams, and adjust itself automatically to any thickness of cloth. It was claimed that this was an improvement over Mr. Wilson's first feed, in that there was no backward motion while in contact with the cloth. It had, however, the disadvantage of touching the cloth only on a small portion of its periphery — theoretically at only a point, and practically only a little more. It was claimed by Messrs. Wheeler & Wilson to be really an infringement of Wilson's patent, the principle of which was the holding of the cloth between a roughened or toothed surface on the under side and a smooth surface touching it with an intermittent motion, permitting the turning of the cloth in either direction while the machine was in motion; and this claim was sustained by the court.

On 19 Dec. 1854, a patent was issued for Mr. Wilson's celebrated "four-motion feed," so called from the peculiarity of the device by which the flat-toothed surface of the feed, being in contact with the cloth, is moved forward, carrying the cloth with it; then drops out of contact with the cloth, is moved backward and then rises up against the cloth and is again ready for the first motion. This device solved the problem of a thoroughly practical and effective feed, and was soon generally adopted and has become the feed motion of the world. This feed motion, although it was not patented until this late date, had been long previously invented by Mr. Wilson, and was described in his application for a patent in 1851, but the claim was not pursued for the reason that he believed at the time that he had been anticipated by W. O. Grover, of the firm of Grover & Baker. It was ascertained afterward, however, that Mr. Wilson was really prior in the invention, and, without contest on the part of Mr. Grover, the patent was granted to Mr. Wilson. This machine was invented by Grover & Baker on 11 Feb. 1851, and had a double-loop stitch made by a combination of a circular reciprocating under needle and a curved upper needle with an eye near the point. This eliminated both shuttle and bobbin and rendered it possible for the upper and under threads to be taken from commercial spools. These machines, though once popular, are not now manufactured.

In 1855 litigation arose involving the three principal sewing-machine companies then in existence, each claiming that the others were infringing upon certain of their patent rights, and numerous suits were instituted, more par-

ticularly by Howe, whose patents were so skillfully drawn that he claimed all others were infringements.

In 1856 the three principal sewing-machine companies — Wheeler & Wilson, Singer and the Grover & Baker — formed a combination. It was contracted by the three companies and Mr. Howe that they would stop their litigation, and, with a fair payment to each other and to Mr. Howe for special rights, would carry on the business with only honorable competition. They finally agreed to license any responsible person who should propose to engage in the manufacture of a good machine on the payment of a royalty, which for several years was $3 on a machine.

The next machine to be put on the market was the Willcox & Gibbs. This machine, which had a rotating hook for using a single thread to make the twisted loop-stitch, was first patented in June 1857, by James E. H. Gibbs, of Millpoint, Va. Later James Willcox, of Philadelphia, added some further improvements, and the machine then became known as the Willcox & Gibbs. Several years afterward an automatic tension was placed on this machine by Charles H. Willcox.

While the manufacture of machines for the home has been developing and progressing, those for manufacturing purposes have in no less a degree been brought to a state bordering on perfection. There are now machines for making — or which have special attachments for making — every conceivable article of clothing, upholstery, embroidery, leather goods, etc. We have the button-hole, the button-sewer, the French-knot, the faggoting, feather-stitching, hemstitch, side and box-plaiters, corset machines; the cylinder for seam work on sleeves, trousers, bootlegs, leather buckets, etc.; machines for embroidery, smocking, carpet, awnings, etc.; the single and double-needle machines and those with four, six, and eight needles for glove work, special machines for overalls, sail-making, flag-making, and a host of others too numerous to mention. Many of the machines may be used for several different purposes by simply changing the style of feed motion, presser foot, needle, etc., while the other parts of the mechanism remain substantially the same. There have been several thousand patents granted on sewing machine appliances.

The production of sewing machines has become a wonderful industry in the United States, which leads the world in their manufacture. In 1900 there were 58 concerns engaged in the industry, capitalized at $18,739,459; employing 624 salaried clerks and officials, with salaries aggregating $842,468, and 10,635 wage-earners, with wages of $6,213,938; their miscellaneous expenses were $864,451; cost of material used, $7,809,796; and the value of their production was $18,314,419. Besides these there were 7 establishments making sewing-machine cases, producing goods annually to the value of $2,815,142. The product in 1900 included 747,587 machines for domestic use and 55,227 machines for manufacturing purposes. In the same year the exports amounted to $4,541,774.