WOMAN AS AN INVENTOR.

NO ASSERTION in reference to woman is more common than that she possesses no inventive or mechanical genius, even the United States census failing to enumerate her among the inventors of the country. But, while such statements are carelessly or ignorantly made, tradition, history, and experience alike prove her possession of these faculties in the highest degree. Although woman's scientific education has been grossly neglected, yet some of the most important inventions of the world are due to her. Hon. Samuel Fisher, while Commissioner of Patents, said: "Any sketch of American inventions would be imperfect which failed to do justice to the part taken by woman." The New York "Times," in an editorial upon woman's inventive genius, says: "The feminine mind is, as a rule, quicker than the masculine mind; takes hints and sees defects which would escape the average man's attention. Women frequently carry the germs of patents in their head, and cause some rude machine to be constructed which serves their purpose. If women would fix their minds on inventions, it is entirely probable that they would distinguish themselves in this line far more than they have done hitherto." The "Scientific American" testifies of the inventions of women for which they solicit patents, that "in their practical character and in their adaptation of means to effect a definite purpose, they fully equal the same number of inventions made by men."

Ancient tradition accords to woman the invention of those arts most necessary to comfort, most conducive to wealth, most promotive of civilization. Man's first needs are food, clothing, and shelter, and to woman tradition assigns their present practical forms. Isis in Egypt, Minerva in Greece, Surawatí in India, the mother of the Incas in Peru, and several empresses of China,

have alike been worshiped because of their inventive genius. Diodorus, speaking of the worship paid to olden gods and goddesses, says: "The inventors of things useful and profitable to man's well-being were as a reward of their deserts thus honored by all men with everlasting remembrance." He adds, that the gods of Egypt were of two characters: first, the supernatural, or purely spiritual gods; second, "most beloved and most worshiped," those human beings who had been of especial benefit to the world, and who after death were enrolled among the gods. Foremost among these secondary gods he places Isis. To her was attributed the invention of bread-making, and the foundation of agriculture; previous to her time the Egyptians lived upon uncooked roots and herbs. She also taught the art of healing and the manufacture of flax, and laid the foundations of Egyptian literature. Down to the time of Galen many medicines bore the name of Isis. So famed were the medicines of Egypt that the prophet Jeremiah mentions them, and Homer sang their praises. The potion Nepenthes, which lulled sorrow, given by Helen to Telemachus, was obtained in Egypt by the wife of a Trojan hero. Isis also invented the art of embalming; through its means the Israelites were enabled to keep their oath to Jacob, and take his body with them when they fled from Egypt, nearly four hundred years afterward.

Athens, a name synonymous with all that is beautiful in art or generous in culture, a city that still holds power over men's hearts, was under the special protection and guidance of the feminine inventor and goddess Minerva, who, as Pallas Athene, was one of the most ancient religious conceptions of the Greeks. Regarded as the inventor of every kind of work usually done by woman, she was equally deemed the originator of agriculture and mechanics; the inventor of all tools of man's handicraft; of musical instruments, and of the arts; of war chariots; of ship-building, and the breaking of horses. Ceres not only gave corn to the Greeks, but, under the name of Thesmophoros, was revered as the first law-giver. Letters, attributed to the Muses, look back to a feminine source for their invention. Divination, that art which ruled the actions of heroes and turned the fate of empires, with its sibyls, priestesses, oracles, and books, has come down through history as originating with woman. To the Amazons the javelin, shield, and battle-ax were attributed; even the toils and nets of the hunter are also ascribed to woman.

But, leaving the realm of tradition and half-mythical history, we still find woman accredited with some of the earliest and most useful inventions. That she was the primitive artist is quite universally conceded. To her, as the one to prepare the food, the invention and ornamentation of pottery is ascribed. Among savage races it is still easy to trace the inception and growth of this art in woman's hands. The most ancient Chinese writers accord the invention of spinning to Yao, wife of the fourth emperor, and the discovery of silk to Si-ling-chi, wife of the Emperor Hoang-ti, four thousand years before Christ. This country was long known as Ser, or Serica—the land of silk. Its later name of China originated from Sien Tshan, under which appellation, as goddess of silk-worms, Si-ling-chi is still worshiped. When the word China is spoken, it is in perpetual honor and remembrance of this woman inventor. The unparalleled duration of Chinese civilization and the prosperity of that country are largely due to silk, the secret of which was for ages kept from other nations; and which formed an export of extraordinary value, its weight in gold being paid by Roman emperors for a garment. The culture of the mulberry, the rearing of silk-worms, and the manufacture of silk in various forms, are still the great staple domestic industries of this people, to whom cotton was unknown until within the last eight hundred years.

Aristotle was the first European writer to mention silk, yet it was not until a thousand years after his time that the secret of its manufacture became known to the West. It is now, however, an article of great commercial value to many nations. The worth of its raw material produced in France alone is computed at $32,000,000 yearly, and the profits upon its manufacture at $12,000,000. Gauze was the invention of Pamphile, a woman of Cos, who, shortly after the introduction of silk into Europe, Penelope-like, unraveled its web, re-manufacturing it into a transparent fabric known to Roman ladies as "Coa vestis," and to moderns as coan or gauze. One of the most diaphanous fabrics of the ancient world, familiarly designated as "The Woven Wind," it was yet possessed of sufficient strength to take colors, and bear embroidery of silk and gold thread.

Under the forms of velvet, crape, gauze, satin, foulard, pongee, plush, and lace, silk, largely contributing to the wealth of the world, has shaped the policy of states. As lace, its use

dates only from the middle of the eighteenth century. No other fabric requires such delicate manipulation. Upon the white varieties not even every woman can work, as the breath itself must possess exquisite purity. Those who have what is locally termed the *haleine grasse*, i. e., greasy breath, are compelled to confine themselves to the manufacture of the black varieties.

Silk is possessed of the qualities most sought by manufacturers: delicacy, luster, strength, and a capability of taking any color desired. It is the strongest of all fibers, exceeding that of hemp or flax. By a law of eternal fitness, spinners strive for a thread like a woman's hair, "long, fine, strong, and vibrant." As a source of wealth, lace, equally with silk, has largely influenced state policy. The value of the finest thread lace when wrought in points is enormous, far exceeding that of precious stones. No other art, it is said, is capable of bringing about such an extraordinary increase in value from a material worth as little as flax in the unwrought state. The early records of this art are lost in the mists of antiquity, but there is no doubt that woman was its originator. At the exposition of woman's work in Florence, a few years since, visitors were greatly interested in a specimen of the magnificent lace known as "Puleto di Venezia" (Venetian Point). Its stitch, lost since the thirteenth century, has recently been rediscovered by Madame Bessani, a humble workwoman, to whom the Italian Minister of Commerce accorded letters patent, with exclusive control of her discovery for fifteen years. The importance of Madame Bessani's invention to Italy is incalculable, opening to that country an immense source of revenue and political power.

Pillow-lace making, which brought this elegant addition to the toilet within the reach of all, was the invention of Barbara Uttmann, of Saxony, at a period when that country was on the verge of financial ruin. The art spread with great rapidity, and Belgium soon derived an immense revenue from it; and although three hundred years have since elapsed, lace still continues to be its great source of wealth. Nor has its influence upon other countries been less beneficial: not only did wealth accrue to England through its introduction there, but a great moral change for the better soon appeared as one of its effects.

To Mheural Nisa, best known to English-speaking peoples through Moore's "Light of the Harem" as Nourmahal, is the world indebted for its priceless Cashmere shawls, the manufacture of which gives employment to thousands of men and women,

and forms one of the principal sources of revenue in India. To her, also, we owe that most exquisite and costly perfume, Attar, or more properly, Atyr of Roses. Her husband, the great conqueror Jerunzebe, most passionately attached to her, through his love, and for the benefits she had conferred upon her country, caused her name and the title "Light of the World" to be struck on the coins of India. He built to her memory that fairy temple on the banks of the Jumna known as the Taj Mahal, which travelers vie in describing as all that is most light, graceful, exquisite, and picturesque in architecture. With Kamejo, a woman worker in bronze, the decorations in relief, so much used by Japanese artists, originated. Wood-engraving, the pioneer of all other forms of engraving, was the invention of the Cunio children, twin sister and brother, at Ravenna, Italy, in the thirteenth century. The discovery of cotton as a textile fiber, ascribed in the East to Semiramis, was in America attributed to the mother of the Incas, who taught the Peruvians its manufacture. The Caftan, or Eastern robe of honor, also known as "Semiramis's Gown," was ascribed to that Eastern heroine,— an invention for the purpose of concealing her sex when journeying to meet her husband. The right to wear this garment has for ages belonged only to potentates. It was one of the emblems of exalted rank chosen by Haman, when consulted by Ahasuerus as to the marks of distinction to be shown "the man whom the king delighted to honor."

The straw industry of the United States owes its origin to Miss Betsy Metcalf, who, in 1798, made the first straw bonnet* ever manufactured in this country. Within twelve years thereafter the State of Massachusetts alone produced half a million dollars' worth of straw goods. That State now produces six million hats and bonnets annually; a great deal of straw is also manufactured in other States.

The most remarkable invention of the age, in its industrial, social, and political influence, — the cotton-gin,— owes its origin to a woman, Catharine Littlefield Greene, widow of General Greene, of Revolutionary memory, with whom the idea originated. The cotton-gin heads the list of sixteen remarkable American inventions that have been adopted by the world.

After the close of the war General Greene settled in Georgia,

* The Rhode Island Society for the Encouragement of Domestic Industry possesses a *fac-simile* of Miss Metcalf's original bonnet. It was woven of seven straws.

where he soon died. The great difficulty of separating the seed from the cotton was at that time the staple subject of conversation among planters. To separate a pound of the black seed from the lint was a day's task for a negro. The white variety, much more valuable, from its greater tenacity, was scarcely at all cultivated. It was the regular custom of the planter's family to unite in this work every evening, and a fortune was prophesied for the person who should construct a machine capable of doing the work. After a conversation of this character between some guests at her house, Mrs. Greene conceived the idea of such a machine, and intrusted its construction to the hands of Eli Whitney, then boarding with her, who possessed the usual New England facility in the use of tools. The wooden teeth at first tried not doing their work well, Mr. Whitney wished to abandon the machine altogether; but Mrs. Greene, whose faith in ultimate success never wavered, would not consent; she suggested the substitution of wire. Within ten days from the first conception of Mrs. Greene's ideas, a small model was completed, so perfect in its construction that all succeeding gins have been based upon it.

This invention produced an extraordinary increase in the culture of cotton. Instead of the single pound cleaned by hand, three hundred pounds were now daily separated from the lint at the same cost. Not only did the languishing industries of the South receive a sudden and stable impetus, but every part of the world felt the influence of this woman's idea. It may be asked why Mrs. Greene, then a widow, did not take out the patent in her own name; but to have done so would have exposed her to the ridicule and contumely of her friends and a loss of position in society, which frowned upon any attempt at outside industry for woman. Through her second husband, Mr. Miller, she afterward assumed a subordinate interest in it.

A very slight investigation proves that patents taken out in some man's name are, in many instances, due to women. A recent noted instance of this kind is Miss Louise McLaughlin's invention of underglaze painting on pottery. Miss McLaughlin, desiring that all artists should share in its benefits, explained her process to every person who asked her, and even wrote a book giving this information. But a certain man, seeing its value, took out a patent upon it, thus prohibiting even its in-

ventor from using the fruit of her own brains. The Burden horse-shoe machine, turning out a complete shoe every three seconds, was a woman's invention. At a renewal of the patent, in 1871, it was claimed that thirty-two million dollars had been saved to the public during the fourteen years of its use.

A third great American invention, the mower and reaper, owes its early perfection to Mrs. Ann Harned Manning,* of Plainfield, New Jersey, who, in 1817–18, perfected a system for the combined action of teeth and cutters, patented by her husband, William Henry Manning, as "a device for the combined action of teeth and cutters, whether in a transverse or revolving direction." Mrs. Manning also made other improvements, of which, not having been patented, she was robbed after her husband's death by a neighbor whose name appears in the list of patentees upon this machine. Mrs. Manning also invented a clover cleaner, which proved very lucrative to her husband, who took out the patent. Nor was she the only woman whose thought has been turned toward agricultural machines. The name of Elizabeth Smith, also of New Jersey, appears in 1861 among the list of patentees upon an improvement to the mower and reaper, whereby the knives could be adjusted while the machine was in motion.

The smallest inventions sometimes prove the most lucrative. A San Francisco lady, inventor of a baby carriage, received fourteen thousand dollars for her patent. The paper pail, the invention of a Chicago lady, yields a large income. The gimlet-pointed screw, the idea of a little girl, has realized millions of dollars to its patentee.

Among recent inventions of importance by women, are a spinning machine, capable of running from twelve to forty threads; a rotary loom, doing three times the work of an ordinary loom; a volcanic furnace for smelting ore; an improved wood-sawing machine; a space-saving clothes-mangle; a chain elevator; screw-crank for steamships; a fire-escape; a device for correct pen-holding, invaluable in schools; a wool feeder and weigher, one of the most delicate machines ever invented, and of incalculable benefit to every woolen manufacturer; a self-fastening button; a portable reservoir for use in case of fires; a process for burning petroleum in place of wood and coal for steam

* Sister of Mrs. Clemence S. Lozier, M. D., Dean of the Women's Homeopathic College in New York.

generating purposes; an improvement in spark-arresters, to be applied to locomotives; a danger-signal for street-crossings on railways; a plan for heating cars without fire; a lubricating felt for subduing friction* (the last five all bearing upon railroad travel); a rapid change box, a marvel of simplicity and convenience, invaluable at railway stations and ferries, the invention of a girl of sixteen; syllable type with adjustable cases and apparatus; machine for trimming pamphlets; writing-machine; signal rocket, used in the navy; deep-sea telescope; method of deadening sound on elevated railways; smoke-burner; satchel-bottom bags; bag-folding machine, etc., etc. Many improvements in sewing machines have been made by women; as a device for sewing sails and heavy cloth; quilting attachments: the magic ruffler; threading a machine when upon a full run (an idea scouted by male machinists); an adaptation of machines for sewing leather, etc. This last was the invention of a practical woman machinist, who for many years carried on a large harness manufactory in New York City.

Systems for improved drainage; for better ventilation; for forcing water to great heights and distances; a thousand household appliances, etc., are the fruits of woman's inventive genius; but they must be passed by, as this paper is designed simply to attract public attention toward a subject upon which much ignorance and misapprehension exist.

The deep-sea telescope, invented by Mrs. Mather, and improved by her daughter, is a unique and important invention, bringing the bottom of the largest ships to view without the expense of raising them into a dry-dock. By its means wrecks can be inspected, obstructions to navigation removed, torpedoes successfully sought for, and immense sums annually saved to the marine service.

A machine which, for its complicated mechanism and extraordinary ingenuity, has attracted much attention both in this country and Europe, is that for the manufacture of satchel-bottom paper bags. Many men of mechanical genius long directed their attention to this problem without success. Miss Maggie Knight, to whose genius this machine is due, received a compliment from the Commissioner of Patents upon its entire originality. Most inventions are but an improvement upon some preceding one. She refused fifty thousand dollars for it shortly

* Took the first prize at the fair of the American Institute.

after taking out her patent. Miss Knight has since invented a machine doing the work of thirty persons in folding bags, and herself superintended the erection of the machinery at Amherst, Mass. The Eureka street-sweeper, the invention of a Hoboken lady, owes its origin to the fact of this lady's dress having been spattered with mud by a clumsy machine one day in New York. Possessed of a mechanical genius, she determined to try her hand upon a sweeper that should do its work more perfectly. Her success was great, and her invention a vast improvement upon all its predecessors.

The remarkable invention of Mrs. Mary E. Walton, for deadening the noise of elevated railroads, has occasioned much comment. Edison and other inventors had for six months unsuccessfully striven to accomplish this end, when Mrs. Walton brought forward a device which was at once adopted by the Metropolitan and other elevated railways. The benefit to human health and life likely to accrue from this invention can scarcely be realized. The evil effects of persistent noise upon the human system are very great, and an invention tending to lessen its force confers a benefit upon mankind. A prominent New York physician says: "We see very little of the gentle decline of old age in New York City. The constant din of travel and traffic, borne for a time without evidence of injury, suddenly shows itself in a shattered nervous system and imminence of dissolution." Since her noise-deadener, Mrs. Walton has taken out, both in this country and England, a patent for a smoke-burner, that she considers much more valuable. By this device all smoke from a fire, furnace, or locomotive is consumed, as also the dust caused by railway trains, and the offensive, unhealthful odors emitted from factories, gasworks, etc. When in England, Mrs. Walton received the congratulations of British officials for it, as one of the greatest inventions of the age.

While passing by woman's discovery in science, where the names of Hypatia, Maria Agnesi, and Caroline Herschel shine, mention must still be made of the aquarium, the invention of Madam Jeanette Power, one of the most eminent naturalists of the century. It was used by her in making curious scientific discoveries. The value of the aquarium to marine zoölogy is incalculable. Not only can rare species from the Indian, Arctic, and Pacific oceans be brought into close comparison, but the subject

of embryology can be studied, and the great Darwinian problems of evolution and permanence of type are likely to be solved by its instrumentality.

Medicine, even in modern times, owes much to woman. It was to her knowledge of this art that woman's persecution for witchcraft in the middle ages was largely due. Through Madame de Coudray's invention of the manikin, a knowledge of physiology has been much more widely diffused than would otherwise have been possible. Many delicate and important surgical instruments owe their origin to woman, as also the adaptation of wax for recording medical observations Dr. Hunter was indebted for the illustrations of his greatest work to the observations of a woman preserved in wax. *

Chemistry offers an infinite resource to the inventor in a field whose exploration has scarcely begun. A Prussian governess recently invented a new fulminate for needle-gun cartridges, and the Government is experimenting with it with a view to its purchase. From this lucrative field woman is largely debarred through that prejudice and injustice which still deprives her of full opportunities for scientific education. †

But among woman inventors the name of the celebrated sculptor, Harriet Hosmer, must not be passed by. Miss Hosmer has succeeded in producing marble from limestone, closely simulating the finest antique varieties. This process had long been unsuccessfully sought by the Italian Government. But her most valuable invention is that of the permanent magnet as a motive power. Scientific men and practical machinists deem this one of the most important inventions of the century, and its influence upon the world as likely to be far-reaching and extraordinary. No such power was known to inhere in the permanent magnet until Miss Hosmer's discovery, to which she gave fifteen years of study and experiment.

The national value of patents, and the relation of invention to civilization, are subjects that receive marked attention both in England and the United States. A paper upon the latter topic, read in London, in 1881, before the Society of Engineers, forcibly represented the loss sustained by the nation through the obstacles placed in the way of inventors, upon whose genius, this paper

* Mademoiselle Biheron.

† A lady who won the chemical prize at the University of Edinburgh, over 240 competitors, was not permitted to receive it on account of her sex.

claimed, England was dependent for holding her place among the nations.

The inventions of a nation are closely connected with the freedom of its people. During the reign of George III. the average yearly number of patents taken out in Great Britain was but fourteen. At present the average is five thousand, while in the United States it is eighteen thousand. This difference is directly traceable to the progress of freedom and education. While, as has been shown, many of the world's most important inventions are due to woman, the proportion of feminine inventors is much less than of masculine, which arises from the fact that woman does not possess the same amount of freedom as man. Restricted in education, industrial opportunities, and political power, this is one of many instances where her degradation reacts injuriously upon the race. The majority of inventions are the result of much consideration and self-reliant thought. Inventors must not only possess full freedom to exercise their powers, but there must also be a certain welcome and protection to their ideas. Deprived, as woman is, of political power, she has to face contempt of her sex, open and covert scorn of womanhood, depreciatory allusions to her intellectual powers, —all tending to hamper the expression of her inventive genius.

Nor is woman by law recognized as possessing full right to the use and control of her own powers. In not a single State of the Union is a married woman held to possess a right to her earnings within the family; and in not one-half of them has she a right to their control in business entered upon outside of the household. Should such a woman be successful in obtaining a patent, what then? Would she be free to do as she pleased with it? Not at all. She would hold no right, title, or power over this work of her own brain. She would possess no legal right to contract, or to license any one to use her invention. Neither, should her right be infringed, could she sue the offender. Her husband could take out the patent in his own name, sell her invention for his own sole benefit, give it away if he so chose, or refrain from using it, and for all this she would have no remedy.

It is scarcely thirty years since the first State protected a married woman in the use of her own brain property. Under these conditions, legally incapable of holding property, and trained, as she has been, to seclusion, dependence, and abeyance

of thought, that woman has not been an inventor to an equal extent with man is not so much a subject of surprise as that she should have invented at all.

While every invention, however small, develops new industries, provides work for a multitude of people, increases commercial activity, adds to the revenues of the world, and renders life more desirable, great inventions broaden the boundaries of human thought, bring about social, religious, and political changes, hurrying mankind on to a new civilization. Lecky forcibly shows the loss to the world from the celibacy and martyrdom of the best human element in the past. No less is the darkness of the world kept more dense, and its civilization retarded, by all forms of thought, customs of society, or systems of law which prevent the full development and exercise of woman's inventive powers.

MATILDA JOSLYN GAGE.

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