MICHAEL FARADAY.*

Toward the end of the last century, in an obscure part of London, over some stables in a yard, lived an honest blacksmith named James Faraday. He was the son of a stonemason and tiler, and was one of a family of ten children, all of whom were laboring men and women in the humblest walks of life.

James had married the daughter of a farmer, and was a member of a peculiar religious sect called Sandemanian, after its founder, and was a thoroughly religious man. He had four children, Elizabeth, Robert, Michael, and Margaret. Michael was born in 1791, and when a little boy used to tend his baby sister in the stable yard, and sometimes was able to earn a penny by holding a horse or running an errand. When he got to be big enough to be trusted with parcels he was regularly installed as a newspaper boy, and on Sundays hurried through with his business so as to be at home in time "to make himself neat and to go to church with his parents." Robert chose the father's profession and was apprenticed to a blacksmith. He appears to have been a generous man, as he used occasionally to give his brother Michael money to go to chemical lectures or to buy apparatus for experiments; but we soon lose all track of him, and his fame never went beyond the sound of his anvil.

We are not told why Michael was apprenticed to a bookbinder rather than to some other mechanic, but can infer that he read the papers he carried and showed an early fondness for books, so that his father placed him at a trade where he could earn something and yet have an opportunity to read. The bookbinder and stationer with whom Faraday learned his trade was a kind master and evidently pleased with the fidelity and industry of his apprentice.

We find that Faraday, while binding books, took occasion to look at their contents, and among other works that fell into his hands was one by Mrs. Marcet, on chemistry. He had a great fancy for proving the accuracy of all the statements in the book by simple experiments, and spent all the pennies he could spare in procuring the necessary apparatus. An article on electricity, in the "Encyclopedia Britannica," particularly attracted his notice, and he set about to construct an electrical machine. His master was so much pleased with the success of this effort that he showed the apparatus to a member of the Royal Institution, who came to the shop to have some work done. This gentleman had some conversation with the apprentice, and finding him uncommonly bright and intelligent, invited him to go to hear Sir Humphry Davy lecture at the Royal Institution. This was a treat of the utmost importance to the young man. He wrote out full notes of the lecture with such drawings and illustrations as he could make, and afterwards sent them with a letter to Sir H. Davy. "The reply was immediate, kind, and favorable;" and some time afterward a grand carriage, with a servant in livery, drove to his humble lodgings with a note, asking him to call to see Sir H. Davy, and offering him the place of assistant, just vacant, at a salary of twenty-five shillings per week, with the use of two rooms at the top of the house. On March 1, 1813, Faraday was regularly appointed by the board of managers to be Davy's assistant. His days of bookbinding were thus brought to an end, and he became himself the maker of books for other people to bind and to prize most highly.

Sir Humphry Davy in a letter to the managers recommending him for the place, wrote that he "had found a person who is desirous to occupy the situation in the Institution lately filled by William Payne. His name is Michael Faraday, a youth of twenty-two years of age. His habits seem good, his disposition active and cheerful, and his manner intelligent."

The youth of twenty-two years had made a marvelous use of his time previous to the appointment under Davy. He had read everything he could lay his hands upon, and in a note book wrote down the names of the books and subjects that interested him. This he called "The Philosophical Miscellany—being a collection of notices, occurrences, events, etc., relating to the arts and sciences, collected from the public papers, reviews, magazines, and other miscellaneous works, intended to promote both amusement and instruction, and also to corroborate or invalidate those theories which are continually starting into the world of science. Collected by M. Faraday, 1809–10."

Fortunately this book has been preserved and can serve as a model for all young men of humble origin and slender means. We are astonished at the extent and variety of his reading at that early day, as gathered from that collection, and as displayed in a correspondence with Mr. Abbott, a Quaker clerk. The letters to Abbott, commencing when Faraday was twenty years of age, are often verbose, inflated, and abounding in big words, but nevertheless display the early training, study, reflection, and anxiety to learn, of the bookbinder's apprentice. Abbott had been educated at a good school, and hence Faraday looked upon him as greatly his superior.

There is a great temptation to quote from these letters, as they cover a period of Faraday's life hitherto wholly unknown to the world. In his first letter he gives an account of some galvanic experiments, and of a pile he had constructed out of disks of malleable zinc (a great curiosity in those days), copper coins, "and pieces of paper soaked in a solution of muriate of soda." He was surprised to find that with seven pairs of plates he could decompose the sulphate of magnesia. In another letter he has a good deal to say about chlorine, and gives the theory of bleaching as maintained by scientific men of the present day. "Pure chlorine has no effect upon vegetable colors; but when water is present it decomposes it, and the oxygen causes the change of color." He writes to his friend some admirable ideas on the subject of lectures, how they should be prepared and how delivered, which show the foundation upon which he afterwards built up his fame as the best lecturer in England. Here is a choice passage, written when Faraday was twenty-one years of age:

"A lecturer falls deeply beneath the dignity of his character when he descends so low as to angle for claps and asks for commendation. Yet have I seen a lecturer, even at this point. I have heard him dwell for a length of time on the extreme care and niceness that the experiment he will make requires. I have heard him hope for indulgence when no indulgence was wanted, and I have heard him declare that the experiment now made cannot fail from its beauty, its correctness, and its application, to gain the approbation of all. Yet surely such an error in the character of a lecturer cannot require pointing out, even to those who resort to it; its impropriety must be evident, and I should perhaps have done well to pass it."

In reference to the choice of a friend he writes: "A companion cannot be a good one unless he is morally so; and however engaging may be his general habits, and whatever peculiar circumstances may be connected with him so as to make him desirable, reason and common sense point him out as an improper companion or acquaintance unless his nobler faculties, his intellectual powers, are, in proportion, as correct as his outward behavior."

And in the same letter he adds: "In every action of our lives, I conceive that reference ought to be had to a Superior Being, and in nothing ought we to oppose or act contrary to His precepts."

We have thus a picture of Michael Faraday before he went to act as an assistant to Sir Humphry Davy. The son of religious parents, himself a thoroughly conscientious man, endowed with good health and indomitable industry, his start in life was such as to inspire his friends with every confidence in his ultimate success. As soon as he entered the Royal Institution he continued the researches he had begun with humble means while working as an apprentice, and, with such a teacher as Sir Humphry Davy, was soon able to overcome all defects of early training. Davy and Faraday were two widely different characters. The former was also of humble birth and had been aided by Mr. Gilbert, who heard that the "boy was fond of making chemical experiments," and had by his remarkable discovery of the metals of the alkalies, rendered his name famous and had won knightly honors. He had become Sir Humphry Davy, and it was not long before he gave up further original investigation, and retired to Geneva, in Switzerland, where he died in 1829. He was always seeking for honors and eternally pining for rank, and in his early treatment of Faraday displayed unworthy traits of character. For example, while traveling on the continent, he declined to accept an invitation to dine because Faraday, his Secretary, was also invited. The host, De la Rive, of Geneva, sent back word, "then I shall be obliged to give two dinners." And Davy opposed Faraday's election to the Royal Society. But Faraday uttered no word of complaint, and never ceased to feel and express gratitude to his early benefactor.

It is probable that no man of science ever lived whose whole life could better serve as a model than Faraday's. Although born poor he never coveted riches, but on the contrary gave up all remunerative occupations in order that he might devote himself exclusively to scientific research. Of humble birth he never sought social distinctions, but declined the offer of knighthood, and utterly refused to accept the office of President of the Royal Society which was pressed upon him. The humility, simplicity, singleness of purpose, and liveliness of disposition never deserted him even in the hight of his prosperity. He was ever ready to help a beginner, and seemed never to forget how he had been aided at a critical period of his life. He was indeed a perfect contrast to Sir Humphry Davy.

In 1821 Faraday was married, and having been appointed superintendent of the house and laboratory, took his wife to reside in the Royal Institution. He never was blest with children, but lived for forty-seven years of perfect happiness with the choice of his youth; the only change being, as he said, "in the depth and strength of its character."

When Faraday first went to the Royal Institution, he took up the study of chemistry with great zeal, and among other important discoveries made by him was that of benzole, to which we virtually owe the whole aniline industry. His researches on the condensation of gases, in which he proved them to be the vapors of volatile liquids; also on regelation, on glass, on steel, on alloys, were among his earliest works; but the crowning glory of his life was the publication of his "Experimental Researches on Electricity," which he commenced at the age of forty and continued during a period of twenty-six years. The value of these discoveries to the world cannot be easily overrated. We can trace them into practical life, in the electric light, in magneto-electric machinery, in electro-metallurgy, in the applications of electricity to medicine, in telegraphy, and in the success of the submarine cable, and yet the work was carried on in penury; he made himself poor that others might be rich, and he has left a name without parallel in the annals of science.

The Queen of England, no doubt instigated by Prince Albert, assigned a house for Faraday's use in the royal park, at Hampton Court, and had it put in thorough repair for his occupancy. Here he spent the declining years of his life, surrounded by affectionate relatives and devoted friends; and in the summer of 1867, while sitting in his arm chair at his study window, was suddenly summoned to his eternal rest.

The same year of his marriage Faraday joined the Sandemanian church by profession of faith, and he afterwards became an elder and used to preach; but in his sermons there was wanting that clearness and precision, that familiarity with the subject, that characterized his lectures on scientific topics. He never adopted the same course of reasoning in religious matters that he did in scientific. In science he believed nothing without the facts or experimental demonstration; but in religion he accepted everything with the humble faith of a Christian.

* "The Life and Letters of Faraday." By Dr. Bence Jones, Secretary of the Royal Institution. 2 vols. 8vo., pp. 427, 499. Philadelphia: J. B. Lippincott & Co. 1870.

Magnetic Iron Sands of Canada.

The American Exchange and Review contains the following epitome of a letter of Dr. T. Sterry Hunt, on the magnetic iron sands of Canada, of considerable interest to iron and steel masters:

"The sands from the crystalline rocks of Canada are in large degree a mixture of nearly pure magnetic ore with a titanic iron ore and garnet sand, the last two ingredients not being attracted by the magnet, and the titanic ore containing from 30 to 35 per cent of titanic acid. The bar iron made from these sands at Moisie is of excellent quality, not alloyed by titanium. The slags, however, contain the titanic acid as silico-titanate. The magnetic portion is separated from the titaniferous sand and from the silex by a magnetic separator which, according to Dr. Hunt, will, in one hour, separate from three tuns of sand, containing one tun of magnetic ore, one tun of ore, containing 99 per cent of magnetic iron, or twenty-four tuns in twenty-four hours. It is six feet long by five wide and four high. These magnetic sands are said to be found on the north side of the St. Lawrence, in quantities practically inexhaustible, from the Saguenay to Newfoundland, at Batiscan, between Montreal and Quebec, and there is a large accumulation at the mouth of Lake Huron; also, on both shores of Lake Erie, and along the seaboard of Connecticut and Rhode Island. The iron sands of Taranaki, New Zealand, are well known. Dr. Hunt places considerable reliance upon the magnetic separator for success in working the sands. This separator is the invention of Dr. Larue, professor of chemistry in the Laval University, Quebec. The advantage arising from these sands is found in their freedom from phosphorus and sulphur.

"In this connection it will be interesting to speak of the metallurgical process of reducing these magnetic sands, as performed at Moisie, a name not found in Lippincott's Gazetteer, and, therefore, needing some notice as a place. Moisie is said to be the seat of the most northern iron works of this continent, and remarkable for the exclusive use of the magnetic sands spoken of above. Moisie is near the mouth of the St. Lawrence, some seventy miles west of Anticosti island, at the mouth of the Moisie river, which empties into the St. Lawrence upon its northern shore. The sands are about half a mile distant on either side of the works, which consist of charcoal bloomeries, or modified Catalan forges, with all their necessary accompaniments. The blast is heated in U pipes, placed in the chimney. The hearths have each a cast iron frame, are three feet square and high, closed by a plate in front for a foot from the bottom, with slag-holes and with a shelf on the level of the tweer, which is semi-circular, with a radius of an inch, placed on one side at an inclination of fifteen degrees. The ore is thrown upon the fire from time to time, as the bloomers see fit, until a bloom is made of the average weight of 200 pounds, and after about three hours' work. An interesting fact appertains to the charcoal economies of the place. The charcoal is burned in kilns cylindrical at the bottom and dome-shaped at the top, of about thirty feet diameter at the base and twenty-five feet high, with walls a foot thick and requiring about 40,000 bricks. They hold about 100 cords apiece, yielding 4,000 bushels of charcoal; require about twenty-five to thirty days' burning, affording a fine coal at a reckoned cost of four and a half cents a bushel, weighing fifteen pounds to the bushel, the wood being almost all fir tree and some birch, but small, and hence denser. The wood is supposed to cost at the kiln eighty cents a cord. Ten of these kilns afford about 40,000 bushels a month, a little more than is sufficient to supply four forges. Four forges make about three tuns of blooms per day, using 1,400 bushels of coal.

"Of the ore, it is interesting to know that the storms work the sand at times as well as could be done by manual labor, leaving the true magnetic ore in irregular patches, and advantage is taken of the beneficial effect of the waves and winds. A patch of sand one hundred yards long by fifty yards wide, averaging two inches thick, should yield about seven tuns of ore. The separation of the ore from sand and impurities is done by washing tables. The gentleman from whose account we have derived our information for this condensed statement, and who visited the place October, 1869, gives a very interesting description of the exceeding isolation of the works, and of the unlimited forests around, together with the loneliness of a situation which, as we have stated, is upon the northernmost boundaries of the iron manufactures of the North American continent."

POLISH FOR PATENT LEATHER GOODS.—Take half pound of molasses or sugar, 1 ounce of gum-arabic, and 2 pounds of ivory black; boil them well together, then let the vessel stand until quite cooled, and the contents are settled; after which, bottle off. This is an excellent reviver, and may be used as a blacking in the ordinary way, no brushes for polishing being required.

TO REMOVE OLD IRON MOLD.—Dr. Thomson recommends that the part stained should be remoistened with ink, and this removed by the use of muriatic acid diluted with five or six times its weight of water, when it will be found that the old and new stain will be removed simultaneously

Hoisting Stone in Quarries.

The dangers that attend the men who go down to the sea in ships and occupy their business in great waters, are scarcely greater than those which await the toilers who descend into the bosom of the earth to win the mineral treasures to which this country, in particuler, owes so much of her greatness. Whether it be in the mine or in the quarry, death or disablement are there awaiting the unfortunates who may happen to fall a prey to them. In the case of mines, we hear too frequently of fatal catastrophes, but, strangely enough, the disasters which occur in quarries rarely find their way into the columns of the press, perhaps because each disaster is, in itself, too insignificant as compared with the wholesale slaughter of a colliery explosion. We have good reason, however, to know that the annual loss of lite and limb, in quarrying operations is by no means trivial; unfortunately, too, a large proportion of these quarry accidents are more or less preventible by improvements in the hoisting machinery and appliances used to raise the stone when hewn to the surface of the ground.

A large quarry, in full work, presents a considerable area of operations, and, as a rule, there is but one engine to hoist the material; this is usually placed on the edge of the quarry, at the end of the tramway, along which the stone is taken when raised. The engine is generally on the surface ground, but a sort of step or recess is cut close alongside it, and whose level is about ten feet lower; the tramway is brought to the edge of the quarry along this step so that the lorries for the stone are beneath the engine level. In a large and deep quarry it is evident that nothing in the way of a jib crane can be made available, and a gantry and traveler would be too expensive, even did such an apparatus give sufficient scope to reach all the area in work. Instead, therefore, of either, the following plan is adopted. A large chain is stretched from the enginehouse across quite to the other side of the quarry, and there secured, but not permanently so, this end being shifted from time to time, as the position of the stone being hewn requires. On this chain a sort of carriage runs; it is something like an iron block, with two sheaves set side by side in the direction of their diameters, not of their axis. They are wide and deep enough in the grooves of their edges to run on the chain as on a rail. This block carries a real block, or what answers to one, suspended under but close to the chain; through this the rope or chain for lifting is passed.

It will be evident that the hoisting rope has a merely vertical action, but the block, or "horse," as it is technically called, gives both a vertical and horizontal motion, as the chain is most generally on a considerable inclination.

The *modus operandi* is as follows: When a certain stone is to be raised, the chain is moved over it and the quarry end made fast. The "horse" is run along the chain till "plumb" over the stone. A "toggle" or pin is secured in a link behind it to prevent it moving down the slope of the chain, and the hoisting rope is payed out and the stone hooked on, which is raised till the lifting hook reaches the "horse," when it is secured to it. The engine then draws the "horse" along the chain till the stone is fairly brought out of the quarry, and over the step already described, as well as over a lorry placed there in readiness. A "toggle" is put into a link of the chain to prevent the "horse" going back, the stone is lowered into the lorry, and the operation is complete.

Any person with the most moderate knowledge of engineering must perceive that, however cheap and convenient this arrangement may be, it is fraught with danger to those working or passing beneath the chain; the very best chains carefully tested are uncertain affairs, even when subjected to a simple statical strain, and the strain of the main, or as we may term it, "gantry" chain in a quarry is not a purely statical one by any means, as the "horse," when it begins to move, "jumps" over the links sufficiently to cause a considerable "jar," which, as a matter of course, is constantly breaking the chain, or if the hauling chain or rope from the engine happen to break, the "horse" runs violently down the incline of the chain, and the latter, already, perhaps, loaded nearly to its limit of strength, succumbs to the vibration, and the stone and ends of the fractured chain, in all probability, fall on some luckless workmen beneath.

We have good reason to know that appalling accidents from this cause are common, a fact scarcely to be wondered at, seeing that there is no adequate inspection of the arrangements of quarries, and the chains and whole apparatus are of inferior quality in too many instances.

We will proceed to sketch the outlines of an arrangement which we consider to present some advantages over that already described. The chain should be abolished altogether, and either a steel wire rope or a rail substituted. The rope would be little, if at all, more expensive than a chain, while it would be infinitely more trustworthy; less power, too, would suffice to raise the loads, as the wheels of the "horse" would have a comparatively smooth and uniform surface over which to travel. We believe a rail might be arranged made of round iron jointed much as a gas pipe is, the ends of the joint sockets being rounded on their outer edges to give freer passage to the wheels of the "horse." Instead of the "toggle" used with the chain, to prevent retrograde motion, a "clip" should be put on the rail (or rope) made of two pieces of iron hinged at one end, and with a coach screw at the other, each half being nearly semicircular in the center; this part would embrace the rail, and, if screwed up tightly, would prevent backward motion, or at the worst would act as a brake if the strain were too much for it. As to the catenary formed by a chain or rope, the rail would equally well assume that curve, as if of good iron its diameter need not exceed by more than one half that of the round iron in the chain links, and being without a weld, would be reliable to an extent such as the very best chain can never equal. This round iron rail arrangement would be far cheaper, too, than the chain.—*Mechanics' Magazine.*

Pyrometers.

A trustworthy means of determining with accuracy the high temperatures of furnaces, or any elevated temperature exceeding that of boiling mercury, has not as yet, perhaps, been successfully secured. The earliest pyrometer which actually came into use was that of Wedgewood, invented about 1780. The principle on which this invention was founded is the well-known property of clay to contract under the action of heat. In form, the pyrometer of Wedgewood was extremely simple. It consisted merely of a gage for measuring the dimensions of certain little clay cylinders before and after their subjection to the heat of the furnace. The test was in itself a very rude one, but the uncertainty of the indications of the instrument was increased by the fact, subsequently discovered that clay may contract under the influence of a comparatively low temperature, long continued, to as great a degree as under a higher or less duration.

It was proposed, at about the same time with the origination of Wedgewood's invention, to construct a thermometer for high temperatures on the plan of the mercurial thermometer, employing a fusible alloy instead of mercury, and a tube of clay enamel, or translucent porcelain, instead of glass. This was the conception of Achard, and it has a *prima facie* plausibility in its favor; but it is not known to have been reduced to practice. In fact, considering the liability of the porcelain to contract in the furnace—the property from which the pyrometer of Wedgewood derives all that it has of practical utility—the indications of the high-temperature thermometer here proposed would be liable to uncertainty in a very high degree. Several very distinguished physicists have endeavored to reach a more satisfactory solution of this difficult practical problem by availing themselves of the expansibility of air under high temperatures. These efforts have been to a certain degree successful; but the methods to which they have conducted depend for their accuracy upon the truth of the assumption, not yet fully established, that the expansibility of gases at the highest artificial temperatures follows the same law as at those at which this law has been experimentally verified.

One of the most promising methods of pyrometric measurement which has yet been proposed is the suggestion of Professor Edmond Becquerel, of Geneva, and is founded on the principles of thermo-electricity. In the Exposition of 1867, Mr. Ruhmkorff, of Paris, exhibits a thermo-electric pyrometer constructed under the direction of Professor Becquerel, which, in the experimental trials to which it has been subjected, has furnished indications remarkably consistent with each other; while it is free from complication of parts and apparently capable of being made practically available for all the uses for which such an instrument is needed. The thermo-electric combination employed by Mr. Becquerel is a single couple formed of two equal wires of platinum and palladium, each being one millimeter in diameter and two meters in length, united by one extremity in a junction formed by binding them firmly together with a fine platinum wire. The two elements, which are placed parallel to each other, are in contact to the extent of about one centimeter at the junction. In order to keep them separate for the rest of their length, the palladium wire is passed through a tube of porcelain; and this tube, with the two wires, is subsequently introduced into a larger tube of the same material, which last is to be exposed to the heat of the furnace. Both tubes are then filled with sand. The two wires are suitably connected at their outer extremities with the binding screws of a Weber's galvanometer, which indicates electric intensities with great exactness. A scale of temperatures related to the intensities of the developed currents has been prepared by Mr. Becquerel, by comparing the indications of an air pyrometer with those of the electric pyrometer when both are similarly exposed side by side. The divisions of this scale are equivalent to ten degrees Centigrade each.

It cannot yet be said, perhaps, of any form of pyrometer, unless of that of Wedgewood, which, as we have seen, is untrustworthy, and which at best indicates differences of temperature very imperfectly, that its use for practical purposes is entirely unattended with inconvenience; but the electric pyrometer of Mr. Becquerel seems to come as near to fulfilling this condition as any that has yet been suggested.—*Barnard's Report on the Industrial Arts.*

Prize Offered for a Machine to Separate Rheea or China Grass Fiber.

The Government of India, after communication with various agricultural and horticultural societies in India, and with persons interested in the subject, has arrived at the conclusion that the only real obstacle to the development of an extensive trade in the fiber of Rheea or China-grass, is the want of suitable machinery for separating the fiber and bark from the stem, and the fiber from the bark; the cost of effecting such separation by manual labor being great.

The requirements of the case appear to be some machinery or process capable of producing, with the aid of animal, water, or steam power, a tun of fiber of a quality which shall average in value not less than £50 per tun in the English market, at a total cost, all processes of manufacture and allowance for wear and tear included, of not more than £15 per tun. The said processes are to be understood to include all the operations performed, after the cutting and transport of the plant to the place of manufacture, to the completion of the manufacture of fiber of the quality above described. The machinery must be simple, strong, durable, and cheap; and should be suited for erection, at or near the plantations, as the refuse is very useful as manure for continued cultivation.

To stimulate the invention or adaptation of such machinery or process, the Government of India hereby offers a prize of £5,000 for the machine and process that best fulfills all the requirements.

Rewards of moderate amount will be given for really meritorious inventions, even though failing to meet entirely all the conditions named.

Arrangements will be made by the Government of India for the supply of carefully dried stems, and specimens of fiber separated from the bark, but subjected to no other process, to mechanical firms and others desirous of competing, on application to the Secretary to the Government of India in the Home Department.

All machinery, etc., must be brought by the competitors, at their own charge, to a locality which will be notified hereafter, probably in the north-west provinces of the Punjab, and there worked under the supervision of their own representatives for a sufficient time to enable the judges appointed by Government to determine whether all the conditions named have been complied with. The prize machine is to be transferred, if required, to Government at 5 per cent above cost price; the patent right in any such machine to be also transferred, if required, to Government, on the latter securing to the patentee a royalty of 5 per cent on the cost price of all machines manufactured under the patent during its currency.

One year from February 10th, 1870, will be allowed for the preparation of the machines, and their transport to the locality named for the competition, and the trials will then be made, and the decisions of the judges announced. If no invention of sufficient merit is received in the above-named period to obtain the prize offered, the Government will continue to allow machines to be tendered for trial till the end of two years from the same date, after which, or on the award of the prize, the offers herein made will be withdrawn.

By order of the Governor General in Council,

E. C. BAYLEY,
Secretary to the Government of India,
Fort William, Calcutta.

WILL IT PAY TO BUILD THE DARIEN CANAL.—In our recent editorial under the above title, an error crept in which obscured our meaning. Instead of saying "If we condense the Erie Canal one tenth in length *without altering its cubic contents*," we were made to say the same with the italicized words omitted. Printers will readily see how such errors as this sometimes escape notice; but as the general reader might be misled, we make this correction. Instead of saying it would make a canal 36·3 miles long, 400 *feet wide at the top*, 280 *feet wide at the bottom*, and forty feet deep, we should have said *forty feet* wide at top and twenty-eight feet wide at the bottom.

PATENT OFFICE DECISIONS.

In the matter of the application of David Stuart and Lewis Bridge for letters patent for a design for a cooking stove.—The applicants on November 3, 1868, patented the arrangement of ovens and flue in a cook stove having a peculiar external conformation. On February 5, 1870, they filed an application for a design, substantially identical with that shown in their patent of 1868.

Upon this state of facts the Examiner asks:

1st. Should the application be rejected on the patent?

2d. If so, can the patentees reissue in two divisions, one of which shall be for the design?

3d. If, so, what fees are required?

Section 11 of the act of March 2, 1861, provides that the new design, etc., shall not be "known or used by others before his, her, or their invention, or production thereof, and prior to the time of his, her, or their application for a patent therefor," etc.

It will be observed that no provision is made for use or sale of the invention prior to the application, as in the case of other inventions; and the reason of the distinction is found in the fact that as designs relate to form and shape only, no time is required for experiment before application. At all events, the language of the statute is plain. The design must not have been known or used by others prior to the application of the inventors. It is obvious that, if the design be described in a prior patent, granted either to himself or others, it is known to others within the meaning of the law. The present application must therefore be rejected upon the former patent.

The second question is, whether the original patent can be surrendered and reissued in two divisions, one of which shall be for the design.

Patents for designs may be granted for three and one half, seven, and fourteen years, at the election of the applicant, made at the time of application. Patents for other inventions are granted for seventeen years.

The patent granted to applicant in November, 1868, was of the latter kind, and was granted for seventeen years.

It is provided by section 13, of the act of 1836, that upon applications for reissue it shall be lawful for the commissioner, etc., to cause a new patent to be issued to the said inventor for the same invention, for the residue of the period, then unexpired, for which the original patent was granted.

This language is explicit, and it is obvious, that, under this section, any reissue of this patent, or any division of such reissue, must be granted "for the residue of the period then unexpired for which the original patent was granted;" that is, for the residue of seventeen years. But no patent for a design can be granted for seventeen years, or for the residue of an unexpired period of seventeen years; and this fact seems decisive of the question.

The result is, that an invention of a design, if shown in a patent for a mechanical invention is lost, and cannot be included in a subsequent application and patent for a design.

(Signed) SAMUEL S. FISHER, Commissioner.
February 23, 1870.

In the matter of the application of Israel C. Mayo, for letters patent for a design for a transparent shield.—The applicant makes application for a patent for a design. He pays ten dollars into the Treasury, and adds to his petition the following proviso: "Should the Commissioner be willing to allow a patent on this application, the undersigned wishes to pay into the Treasury the further sum of twenty dollars and have such patent granted for fourteen instead of three and a half years."

Section 11 of the act of March 2, 1861, provides that upon application for a patent for a design "the Commissioner on due proceedings had, may grant a patent therefor, as in the case now of application for a patent, for the term of three and one half years, or for the term of seven years, or for the term of fourteen years, as the said applicant may elect in his application: provided that the fee to be paid in such application shall be for the term of three years and six months, ten dollars; for seven years, fifteen dollars; and for fourteen years, thirty dollars.

This language contemplates an election to be made by the applicant, at the time of his application, of the term for which he desires his patent to issue, and the payment of a fee corresponding to that election. It does not contemplate the contingency of an application for one term and the payment of one fee, and a subsequent election, at the time of issue, of another term, and the payment of another fee. The words are, "elect in his application." The choice is to be made there, and not elsewhere or otherwise, and being made, must be final.

I can see that the practice proposed might be desirable and might result in the granting of design patents for a longer period, and the receipt of a larger revenue; but I have no power to alter the plain language of the statute, or to extend the time of election beyond the time of making the application for any purpose.

In the present case the applicant has paid a fee of ten dollars. His patent, if granted, can issue only for three and a half years.

(Signed) SAMUEL S. FISHER, Commissioner.
February 23, 1870.