Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 261 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included $3 20
One copy, six months postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each: additional copies at same proportionate rate. Postage prepaid.
Remit by postal order. Address

MUNN & CO., 261 Broadway, corner of Warren street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free, on receipt of *seven dollars*. Both papers to one address or different addresses as desired.
The safest way to remit is by draft, postal order, or registered letter.
Address MUNN & CO., 261 Broadway, corner of Warren street, New York.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information: (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.
The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 261 Broadway, corner of Warren street, New York.

NEW YORK, SATURDAY, AUGUST 12, 1882.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 345,

For the Week ending August 12, 1882.

Price 10 cents. For sale by all newsdealers.

MANUAL DEXTERITY.

From Boston on the east to St. Louis on the west, the changes are being rung on the necessity of teaching the fingers as well as the minds of school children. No well conducted teachers' institute fails to take a vote on it, and no educational magazine neglects to publish a paper on "Manual Education in the Public Schools." The great public sentiment seems to have, at last, come to the conclusion that not every free born American citizen can live by his wits, and a few must be content to turn their attention to manual labor, at least the more delicate kinds, and not, of course, such as shall raise big blisters on the finger and coarse calluses on the hands. The jack knife with which the typical school boy has been wont to carve rude characters on his desk and bench, is to be exchanged for a kit of tools, and the native instinct of "cutting" cultivated, instead of being repressed as it long has been—with what success a visit to any district schoolhouse will show. Those fingers which schoolmasters have been wont to look upon as of no other use but be cracked with an oaken ruler are to be dignified and exalted to a first place in our educational system; they are to be trained and taught to follow deftly the dictates of the brain, obedient to its every wish.

What better example of a perfect machine have we than the human hand! Remove the skin and the few little lumps of adipose tissue, and examine its intricate mechanism; its system of levers and pulleys, the economy of space achieved by one muscle passing through another, and the union of cords and tendons whereby one finger is given the power to move totally independently of the rest, and then attempt to calculate the number of movements imparted to the fingers by these few muscles. Watch the movements executed by the fingers of a musician, whether he plays the bass viol, the zither, or the piano; follow the hand of the compositor as he sets these very lines, of the type writer, the telegrapher, the rapid knitter, or a blind man reading raised characters, and tell us whether the hand is capable of being trained, or the fingers of being educated.

How many of the graduates who have this summer left their alma maters feeling that their education was completed, knew all the uses of their fingers, we are unable to say; but it is safe to assume that not one in ten had acquired more digital skill than was needed to write a letter, tie a necktie, button a lady's glove, and conceal "a crib" in his coat sleeve. It is a notorious fact that in every chemical laboratory, in every dissecting room, and every other place where young men of liberal education are compelled to handle tools, they soon find that their "fingers are all thumbs."

One of the first questions that is always discussed by every school board or institute before whom the question of manual teaching comes up is, Shall we teach only the use of tools, or shall we attempt to teach a trade and turn out finished mechanics? Do both, do either, do anything you like, only give the boys a chance, and leave the rest to time. If it has any vitality in it, it will develop into something. The useless members will wither and fall off, those most fit to survive will assuredly prosper, for the law of "the survival of the fittest" is not limited in its field to the growth of plants and animals. Cities and towns, trade and commerce, manufacturing industries, churches and schools, have their development conditioned thereby.

Boston, as usual, claims to lead in this movement. The Massachusetts Institute of Technology has been, under the late Professor Rogers, a remarkable success. Fighting its way against poverty and want, it has conquered all opposition, and Boston feels encouraged to try the experiment of incorporating manual education on her public school system. At the Dwight School a classroom has been sacrificed to the hammer and saw. Carpenters' benches have been put in, and tools provided for eighteen boys. It is needless to say that the boys need no coaxing, that it is more popular than military drill, and that even the time taken from study does not retard their progress.

There is probably no reader of this paper, certainly no inventor, who, if he is not familiar with the use of tools, does not feel that a few such lessons as that class get in sharpening, handling, and taking care of tools would not have been of as much use to him as all the Latin he learned in school, or that his time would not have been as well employed at that as in memorizing all the mountains in Asia or the rivers in Africa. This experiment may not prove a *financial* success in Boston, but we are satisfied that the idea will yet be made practical, and become in time a success.

Grant the desirability of such a modification of the school system, and practical difficulties will present themselves—have done so already. There is a lack of teachers: normal schools do not produce them, nor can they be found in the shops, although the latter can do more than the former. The number of good, thorough, enthusiastic teachers is small, because a good teacher, like a poet, is born, not manufactured in a normal school, and of this little band too few know aught about tools, or could lead and instruct a class in carpentry, while our best carpenters have as little conception of how to preserve discipline among school boys. Another difficulty is the expense; tools cost money, much more than books; wood must be used, and a fresh supply kept up. The pupils must not be asked to bear this expense, and tax payers object. This obstacle is a serious one in the free schools, where it is most needed.

It was not our intention to pass by the girls, but at present they are better provided for than boys. In Boston sewing is a regular part of the school curriculum, and they not only learn to sew but do it well. This is something that can be done at slight expense, and teachers that know how to sew are not so scarce. Mr. L. H. Marvel, in his paper on "Manual Education in the Public schools," which appeared in the June number of *Education*, says that in schools where sewing is taught the sewing does not detract from the efficiency of the other work of the school. The same writer adds: "Sewing was taught in all elementary schools half a century ago, and to boys and girls alike." It is unfortunate that this has not been kept up; it is better that a school boy should sew or knit, than that his fingers should get no training beyond that of clumsily grasping a penholder, while his body is twisted into some painful position to conform to the unhygienic law of the writing master. In the kindergarten, which too few of our children enjoy the advantages of, efforts are made to train the eye, voice, ear, and hand, but the training stops when the child enters the school, and its effects are soon dissipated. One point must, of course, be guarded against, that the occupation of the fingers be not such as to *strain* the eye or produce near-sightedness.

An ingenious teacher would have no difficulty in arranging a series of exercises equal to any of the "finger gymnastics" of the music teacher, without being half so stupid, which should embrace the use of knitting, crocheting, and sewing needles, of stilettos and bodkins, of awls and gimlets, of scissors and penknife; braiding, plaiting, tatting, netting, tying knots, and splicing small ropes, are among the operations adapted to teaching boys and girls what their fingers are good for. One of our very skillful surgeons boasts of his skill in sewing, and the ability to hem the finest cambric handkerchief; and it would not injure any boy to be able to work a button hole, nor any girl to be able to tie up a bundle.

The sense of feeling, since it resides in the fingers, could be cultivated at the same time, and while the skin is young and soft is the best time to learn to distinguish things by touch; the difference between wool and cotton, silk and linen, kid and dog skin, sheep and calf, between flour and meal, between pure sugars and mixed, between silver and lead—these are distinctions a knowledge of which will be of practical value.

EARLY HISTORY OF GAS LIGHTING.

The city of Chaumont has taken the initiative in the erection of a statue in honor of Philippe Lebon, a native of Brachay (Haute-Marne), France, who, so the French claim, was the inventor of gas lighting.

Many managers and directors of gas works, and a number of scientific men throughout France, have promised the town of Chaumont their support. A provisory committee has been formed, with the mayor of Chaumont as an honorary president, and M. Foucart, president of the Technical Society of Gas Industry in France, as the active president.

In order to place before our readers the correct idea of Lebon's relations with this wonderful invention, we give the following brief sketch of the early history of gas making.

As early as 1726, Stephen Hales, in his "Vegetable Statics," states that he obtained 180 cubic inches of an inflammable gas from the distillation of 128 grains of Newcastle coal. Bishop Watson, in his "Chemical Essays," describes experiments made on coal gas, and says that it does not lose its illuminating power when passed through water. Lord Dundonald, of Scotland, took out a patent in 1787 for making coal tar, and erected ovens for this purpose. He obtained, besides the coal tar, a quantity of coal gas, which was burnt in Culcross Abbey and considered a great curiosity.

About the year 1792, William Murdoch, a Scotchman, living in Redruth, Cornwall, began making experiments, and found that when coal was heated in an iron retort an inflammable gas was given off, and with this gas he lighted his residence. Murdoch, possessing the characteristic slowness of his people, made no further use of the gas than burning it for the amusement of his friends, and it was nearly ten years before his invention was published abroad. In the meantime Philippe Lebon, mentioned at the beginning of this article, who was then engineer of bridges and roads, began making experiments by heating wood, peat, etc., in retorts, and found that these bodies, by the action of heat, yielded an inflammable gas, which could be used not only for illumination, but also for the production of heat and power. His apparatus he called a thermolamp.

According to French authors he lighted his residence in Paris in 1796. In 1798 he read a paper before the French Academy describing his thermolamp, and this paper was translated into English and German by Winsor. In 1799 he obtained a patent in France for producing gas from peat, etc., and applying it to purposes of illumination and heating.

Two years later the brother of James Watt, being in Paris, wrote to England, saying "that if anything were to be done with Mr. Murdoch's gas, it must be done at once, as there was a Frenchman in Paris who had similar ideas, and proposed to illuminate that city by these means." Even after receiving this broad hint, Mr. Murdoch took no steps toward securing his invention by a patent, little realizing that this simple invention, in less than a century, would be developed into one of the greatest industries in the world.

Lebon had received a theoretical education, and although his theories were good, there were practical difficulties in the way which he was unable to overcome, while, on the