

the concrete is molded, and the frames of doors and windows. For warehouses, it admits of the use of iron for pillars and braces, while everything else, floors, partitions, ceilings, etc., may be of concrete. It is estimated by an expert of this city that 100 cubic feet of Portland cement concrete wall can be constructed for \$22.75.

If plastering is used on interior walls, only one coat is required, so that this item of cost is considerably lessened.

For sidewalks this cement also furnishes a cheap and beautiful material, which can be formed in blocks on the spot, presenting a perfectly uniform surface, rivaled only by cut stone.

The rebuilding of Chicago furnishes an admirable field for the employment of concrete; and we trust that, as economy must be perforce consulted, our Western friends will be induced to turn their attention to the system, as it offers advantages possessed, as we believe, by no other.

DR. DRAPER'S EXPERIMENTS WITH BRICK AND STONE.

We desire to call special attention to an article, published in our last, which is followed by a second, in our present issue, from the pen of Dr. John C. Draper, on the absorption of moisture by brick and stone. His experiments will show that bricks, properly compounded and burned, are really superior to many kinds of natural stone for building purposes.

A brick is an artificial stone, homogeneous and without cleavage. It may be made so as to absorb less moisture than many varieties of stone in popular use.

The experiments conducted by Dr. Draper were made with brown stone, Nova Scotia stone, fine red Philadelphia bricks, and a white, or rather cream colored, brick, made by A. Hall & Sons, of Perth Amboy, N. J. A specimen of the latter now lies on our table, and is undoubtedly one of the best building bricks ever produced in this country.

In color it is soft, yet brilliant, its tint being very agreeable to the eye. In texture it is dense and hard, ringing with a clear belllike sound when struck, and chipping more like dense, hard stone than like the ordinary bricks in market. With granite or blue stone trimmings, these bricks would produce a beautiful architectural effect for fronts, in our opinion far superior to the somber appearance of the brown stone, now so much in vogue, and which is undoubtedly one of the least durable of building stones in use.

Even ordinary bricks will endure our climate better than brown stone, as will appear upon an examination of buildings constructed of bricks with brown stone fronts. In such buildings, that have been erected for a considerable time, it will be found that the fronts are the first parts to become dilapidated, the surface becoming disintegrated and peeling off.

Nova Scotia stone is, perhaps, not much better, in this respect, than brown stone.

The senior member of the firm of Hall & Sons has, perhaps, as extensive theoretical and practical knowledge of brickmaking as any one in the country, and this journal has been enriched by his contributions upon this important subject. The result of the application of this knowledge, and the use of a very excellent article of clay, has enabled his firm to produce the bricks alluded to.

In conclusion, we would say that any who have any doubt as to the superiority of brick over the brown stone and Nova Scotia stone, as building material, will do well to peruse Dr. Draper's articles with attention.

THE STUDY OF SCIENCE IN SCHOOLS.

There is not an inventor or mechanic who does not suffer for want of a good elementary training in mathematics and the sciences; and yet, notwithstanding this notorious fact, it seems impossible to introduce such a reform in our school education as will successfully remedy the evil. The chief difficulty in the way of reform is in the supply of teachers. Our training schools have raised up teachers whose minds run in the same groove, and who have no mental switch by which they can turn off on to a new track. The custom of learning everything by rote, and reciting like a parrot, has become so embedded in our system of education, that it seems almost impossible to find any explosive sufficiently active to blow it up, and no jack screw or hydraulic ram is powerful enough to move our Boards of Education from their firm foundations. But as the continued dropping of water may wear away a stone, we propose to keep adding here a little and there a little, until some impression has been made and some good has been accomplished. It is probable that we must look to the West for our chief support in the war that it is proposed to wage against the relics of monastic education. They have a practical way of viewing things in that section of the country, and common sense is allowed to have due weight in questions of all kinds. We are, therefore, not at all astonished to learn that, at the University of Iowa, instead of teaching physics, chemistry, geology, and astronomy, by oral recitations and unillustrated lectures, they have established laboratories and workshops, where practical things can be practically learned, and theoretical ones can have all of the weight that properly belongs to them. The trustees of the Iowa State University have resolved that the only way in which instruction in science can become thorough is by placing the elements of physical science at the very beginning of the course. They do not propose to wait until the pupil, by droning over dry facts and abstract principles, has acquired a disgust for every branch of knowledge, but they think it wiser to pursue the natural method, and begin when the mind is anxiously inquiring into the cause of things, and the boy takes his watch apart to see what makes it go. The old-fashioned way was to give the boy a sound flogging, to

take the watch away, and make him learn by rote the principle of compensating balance wheels.

"My dear boy," says the teacher, "the duration of an oscillation depends on the radius of the wheel, the mass of its rim, and the strength of the spring," which, of course, is very intelligible to the lad, and would enable him at once to construct a new watch.

Common sense would dictate the propriety of showing up the parts of the watch, and by degrees expounding the principles upon which the construction is based. Theory and practice is what we want, and not either of them alone. Technical instruction alone will not result in the advancement of science, but that, together with a thorough training in the phenomena of Nature, will lead to great progress.

For the purpose of aiding in the introduction of experimental science in our schools, Professor Gustavus Hinrichs, of Iowa, has published "The Elements of Physical Science," and "The School Laboratory of Physical Science," books which are intended to serve as guides to teachers and pupils.

The author says that, under his system, the result is "a marvel of studious industry." The students enjoy measuring, weighing, testing, demonstrating, and recording facts which, in former times, were pored over in a maze of bewilderment in the driest text books, to be afterwards bolted in sections without question. He proposes that the course shall be divided into three parts, rudiments, elements, and general principles—all of which should be completed in the high school course, and be conducted with facilities as good as have so long been afforded in other departments. By securing in this way a sound elementary training, two very important advantages are gained: First, if, as often happens, the boy is unable to pursue his studies beyond the high school, he will not be compelled to grope about in utter darkness in his subsequent career, but will be so far grounded in principle and practice as to be able to avoid the errors which now pervade society, and give aid and comfort to believers in perpetual motions and mysterious agencies. Second, the advantages, to those who have the means of pursuing their studies beyond the confines of the high school, will be very great. Having surmounted the elements of knowledge, they are in condition to prosecute their studies to a higher point than was hitherto possible, and the advantages to themselves and to society would be very great.

In the first part of his book, Professor Hinrichs takes the pupil through a course of simple and easy experiments relating to magnitude, weight, machines, properties of matter, light, electricity, and magnetism. The metrical system is taught by means of actual measurements performed by the scholars themselves, and the pupil constructs his own measures of weight and length, makes numerous determinations, and puts down results in his journal. There are blank pages at the end of the volume for independent observations and experiments.

This strikes us as the only sensible way in which to impart instruction in science, and after it has been practiced for one generation, the condition of society will be found to be vastly improved. The best interests of education demand that we should begin at the bottom of the ladder and not at the top. The top can take care of itself, but if the foundation be weak and rotten, the bottom and the top will topple down to a common ruin.

[Special Correspondence of the Scientific American.] A NUMBER OF EXTENSIONS.—TEDIOUS SEWING MACHINE CASE.

WASHINGTON, D. C., Nov. 18, 1871.

Among the extensions recently granted is the patent to J. W. White for a cotton seed planter. It consists of a frame with a seed wheel mounted within, a furrow opener attached to the forward part of the frame, and an adjustable seed coverer suspended from the rear. It is said to save fifty per cent in labor, and do much better work than hand labor. The civil war prevented the patentee from securing a suitable reward for his invention.

Also the patent of George S. Butterfield is extended. It is a grinding and polishing machine, designed especially to improve the manufacture of knives for planing machines, in which a perfectly plane and true surface is a great desideratum, the grinding by hand being very defective in this respect, as well as laborious. The result is secured by causing the article to be ground to reciprocate, vertically and horizontally, in a plan tangential to the face of the grinder. The mechanism for giving the vertical movement is very ingenious and elaborate. This particular compound movement, however, was not new, the same having been provided for in a patent issued to William Harvey as early as 1847, and in other patents antecedent to Butterfield's. The invention reduces the cost of the knives at least ten per cent. The machine is a valuable one and substantial profits have already been realized.

Also an extension is granted to E. H. Smith for a sewing machine shuttle. The invention is pronounced by the Examiner to be a very meritorious one, and as yet not suitably rewarded.

Willard & Ross' improvement on harvesters. This patent was reissued in 1864, in seven divisions, and in four of these, extensions have been granted. The patent is an improvement on what is known as the Ball machine or Ohio Mower. In that machine the double hinged coupling arm is used, giving a flexible connection to the finger bar, and rendering it capable of freely conforming to an uneven surface. The improvement consists in projecting the inner end of the finger bar beyond the lower joint, to form a knuckle, and in pivoting to the coupling arm a lever to act in connection with it, by which the lower joint is made rigid; so that, when the heel of the finger bar is raised to pass obstructions,

the outer end can be lifted also. This locking and lifting device constitutes the leading feature of the invention, and in the original patent there were but two claims, though the reissues embrace fourteen claims. The devices are simple but useful.

John Griffin's pile for wrought iron beams and girders. This improved pile closely resembles, on a cross section, a finished beam, and the rolling is therefore effected without any great reduction of its different parts, and consequently without any very unequal tensions of the fiber of the metal. In the case of other piles, the tension during the process of rolling is so unequal as, more or less, to tear the metal and separate the flanges from the web, thereby checking the edges of the flanges. Griffin's pile has thus far been used exclusively by the Phoenix Iron Company, of Phoenixville, Pa., and by Palmer & Co., at Buffalo, N. Y.; and these companies have manufactured more than two thirds of the beams and girders made in this country since the patent was issued, amounting to 37,758 tons. The advantages arising from the invention are, first: that cheaper iron may be used. Second: lighter and cheaper machinery may be used in rolling it. Third: the beams are much superior to those made of the ordinary rectangular pile. Fourth: larger beams can be rolled, the size being limited only by the size of the roll trains and the capacity of the furnace. The royalties to the patentee have already amounted to a large sum, but in consideration of the value of the invention, the Office does not consider that he has been suitably rewarded. To the public, the saving has been from one to one and a half cents per pound, amounting already to the sum of \$700,000. The use of wrought iron beams in public and private buildings has greatly increased of late years, and in 1857 the manufacture was exceedingly limited. Since 1861, the Government has procured from the companies referred to, not less than 4,000 tons of fifteen inch *chassis* rails, for fortification ordnance; and the saving arising from this invention is not less than \$120,000. It is patented in England, France, and Belgium.

William Pratt, for an improvement in safety lamps. This is a protection against the explosion of vessels containing a volatile inflammable liquid; and consists of a volute of ribbed metal wound together, forming a series of regular tubes, inserted in the main orifice. The parts are so arranged that the wick cap cannot be removed until the cap of the feeder tube has been removed. The invention does not appear to have gone into general use, but it is claimed to be one of great utility.

William Sellers' improved machine for threading bolts the object being to avoid the necessity of reversing the motion of the cutting dies or stopping the machine to change the bolts, and to facilitate the change of the dies. It is claimed that the machine does twice the work of an ordinary machine. If the 402 machines, manufactured and sold, had been in constant use during the fourteen years since the patent was granted, it is calculated, and the estimate is supported by practical machinists, so that the saving to the public would have amounted to the sum of \$1,081,500. The profits to all the parties interested are estimated at about \$50,000.

W. H. Nettleton's machine for turning pillars for clock movements. Nearly all the clock pillars made in the country are manufactured on this machine. In the town of Bristol, Conn., there are nine clock making companies; and one of these manufactured last year 40,000 clocks.

Pierpont Seymour's machine for spreading lime and other fertilizers. The invention is a mechanism for operating a hopper with an inclined bottom provided with reciprocating bars.

Richard M. Hoe's printing apparatus consists in locating the cam shafts for driving the fly frames close up to the frames, greatly reducing the jar and wear of those parts. A simple invention, but one which saves annually, to each press on which it is used, the sum of \$150. Patented in England.

Alexander S. Newton's machine for turning wooden boxes. An arrangement of devices by which round wooden boxes can be made from a square stick, thereby saving the expense of rounding the timber before it is placed in the lathe.

The following applicants have been refused:

Nicholas Whitehill, for a cultivator. The machine is a straddle row cultivator, the middle being elevated to pass over the row of corn, and provided with a compound evener suspended on three points. Remonstrants claimed that the patent was anticipated by the patent to Stahl and Hiffenbacher, as early as 1835, and also by five other patents of later date.

W. N. Clark, for an elastic door guard, being a rubber buffer, confined by an escutcheon ring, to receive the force of the door knob and protect the wall. In this case, the original application as well as the application for re issue was refused by the Examiner, but finally allowed on appeal. The Commissioner decides that "applicant has monopolized more than his invention in his re-issue, and is not entitled to further monopoly of even what he did invent."

It is not uncommon in the regular routine of the Patent Office for an application to become somewhat snarled and tangled, and generally off the track. In January, 1869, William Duchemin, of Boston, applied for a patent for an improved sewing machine for manufacturing shoes, and its history in brief is this: February, 1869, letter from office rejecting some claims, showing needed corrections in specifications, and calling for an additional drawing. May, 1869, applicant informed that a certain clause of his claim must be limited if he wishes to avoid an interference with a subsequent application. May 20, 1869, interference declared. June 9, 1869, interference dissolved. New interference declared between applicant and three other applicants. September, 1866, decision in favor of Duchemin. Case appealed to Examiners-in-Chief, who, in January, 1870, decided against