ITEMS OF INTEREST.

SOME arithmeticians have calculated that steam is now doing on the globe, every day, the work of 800,000 men; that is, all the machines and engines worked by steam have 80,000,000 horse-power. Of this the locomotive force represents 30,000,000 horse-power, as it is thought that there are 105,000 locomotives on both hemispheres, which run 220,000 miles.

THE lead used in sounding from a vessel usually weighs about 14 pounds, but in deep sea sounding a weight of not less than 150 pounds is frequently employed. Wire has been largely used for a line, as it makes less friction in sinking through the water. With hemp rope a sinker of 300 weight is sometimes twenty minutes in reaching the bottom in 1,500 fathoms of water, so great is the friction of the line.

A FRENCHMAN has devised a method of converting iron into steel, and at the same time producing illuminating gas. The iron is placed in a retort with charcoal or coke in layers, and is heated to 1650 degrees Farenheit. Fatty matters are then injected, and as soon as decomposition has taken place, a jet of dry steam is passed over the incandescent mass. The iron is thus changed into steel, while carburetted hydrogen is given off from the retort.

MR. MAXIM, inventor of one of the electric lights, ridicules the idea that there is danger to either life or property from the use of that light, and says that he is ready at any time to take the shock from any number of the largest machines. While lightning will jump through two miles of air and forty feet of solid rock, he asserts that no dynamo machine used for the electric light in this country will make a current of sufficient strength to jump through the one-hundredth part of an inch of either air or stone.

ONE of the great trials which the builder has to endure is the "saltpetering" of the brickwork, or the white streaks which too often disfigure the fronts of brick buildings. It is worth noting that this can usually be prevented by adding oil to the mortar at the rate of a gallon to the cask of lime. Linseed oil is generally used, but any kind will do which does not contain salt. If cement is used in the mortar, an extra gallon of oil must be used for each cask of lime. When the incrustations have once formed on a building, they cannot be permanently removed, though they can be for a time by washing with hot water or the muriatic acid generally used for washing down brickwork.

A WRITER in *Les Mondes* ascribes the exceptional healthiness of butchers to their inhaling the nutritive principles of meat, and a French physician of eminence deduces from this the desirability of vapor baths charged with vitalizing principles. Cooks, at this rate, ought to be amazingly full of vitality. The good health of butchers is probably due to the living entirely in the open air, the same cause which gives so many more years of life, on the average, to the grocer's clerk than to his dry goods brother. Thirty years ago butchers in London never wore hats at work, but drove all over the town bareheaded, as many young butchers do now. The inhaling idea is, like all others, old. A century ago consumptive patients were sent to live over cow houses.

ONE of the most gigantic schemes of its kind is that which proposes to direct the current of the St. Lawrence river, opposite Montreal, into the channel between St. Helen's Island and the southern shore—this to be accomplished by running a dam of large proportions from Point St. Charles, in the western part of the city, to St. Helen's Island. This dam would be 2,700 feet long and 900 feet road, and would give a head of twenty feet for mill elevators and factories. As contemplated, this project would cost some $7,000,000, and would realize the following advantages: The dam could be utilized either as a railway or carriage road, or both, thus obviating the necessity of a tunnel; and the harbor would be made a still water one, where vessels might winter.

CERTAIN insects are known which give some thing like an electric shock to anything touching them. The *Reduvius genatus*, or "wheel bug" of the West Indies, is one so described by Kirby and Spence. Two other examples have been lately recorded in the "Proceedings" of the Entomological Society of London, by Mr. Yarrell. A letter from Lady de Grey, of Groby, referred to a shock caused by a beetle, one of the *Elaterida*, or snapping beetle, and extended from the hand to the elbow. The other case is that of a large, hairy caterpillar in South America. Captain Blakeney on touching it had an electric shock so strong that he lost the use of his arm for a long time, and his life was even considered in danger. The last story is almost incredible, as a caterpillar, no matter how large, can hardly be supposed to supply as much electric energy as a gymnotus.

THE colossal crane or derrick—the most powerful in the world—which has been in process of construction for several years at the royal arsenal, Woolwich, Eng., is now an accomplished fact. The size of this apparatus may be judged from the curious details published, as for instance, that more than eighteen hundred tons of iron have been used in its manufacture, while the brass bearings alone amount to more than three tons. The design has been that this monster crane should be capable of lifting three or four 100-ton guns at once; the purpose, however, for which it has been mainly provided, is not to do work which other appliances could accomplish in detail, but, rather, to meet the probable necessity for dealing with pieces of ordnance so enormous as to defy all the means at present available for mounting them in their carriage. The motive power is steam, and, although calculated to raise twelve hundred tons in case of need, the apparatus is also fixed for raising small weights at accelerated speed, and thus adapted, in many instances, to facilitate the ordinary operations.

THE process of making screws is very interesting. The rough, large wire in big coils is, by drawing through a hole smaller than itself, made the size needed. Then it is put into sawdust and "rattled," and thus brightened. Then the head is shaped down smoothly to the proper size, and the nick put in at the same time. After "rattling" again in sawdust, the thread is cut by another machine, and after another "rattling" and thorough drying, the screws are assorted by hand (the fingers of those who do this move almost literally like lightning), grossed by weight and packed for shipping. That which renders it possible for machines to do all this is a little thing that looks like and opens and shuts like a goose's bill, which picks up a single screw at a time, carries it where needed, holds it till grasped by something else, and returns for another. This is about the most wonderful piece of automatic skill and usefulness to be seen, and it has done distinctive work at the rate of thirty-one screws a minute, although this rate is only experimental as yet; ninety-three gross per day, however, has been the regular work of the machine.

DR. JAMES EDMUNDS, of London, points out in the *English Mechanic* some of the advantages of double glazing in promoting the health of homes in winter. Skylights, he says, ought never to be put up unless double or double-glazed. Double-glazing answers perfectly if the sashes are grooved out for glass on each side, and are then glazed with an air space of one-half inch or more between the panes of glass. The glass must be put in with the inner faces perfectly bright and clean, and the glazing should be done on a cold, dry day, so as not to include watery vapor, which in cold weather will condense inside the air-space and cause mistiness. The double-glazing with an air-space makes a window almost as warm as a brick wall, and not only keeps up the temperature of a room in winter, and saves firing, but it keeps the room cool in hot weather, and it makes the temperature more uniform throughout the apartment. With ordinary thin glazing in winter the inmates are always being chilled on that side which looks toward the window, and baked on the side which is toward the fire, and no sooner do ladies leave the dining-room than the gentlemen instinctively make up to the fire-place and proceed to bake the cold side of their persons. Double-glazing our window sashes would save all this trouble.

HOW TO FIGURE SPEED.—THE REASON WHY.

In selling machinery, the maker usually recommends that it be run at a certain rate of speed, which has been demonstrated by experience to be most favorable to its successful operation. To fix upon the relative size of pulleys to be used in communicating this motion from the "line shaft" is a calculation which seems to be very imperfectly understood by the average mechanic. Conversation on the subject with a large number of engineers, millwrights, and others, has led me to think there was a demand for more light, and accordingly I offer the following system, the convenience and accuracy of which I have proven by years of practical use. This simple example will illustrate:—

Given, a 20-inch pulley revolving 100 revolutions per minute, a belt from which will drive a 10-inch pulley how fast?

The "rule" laid down on the "books" says, "Multiply the diameter of the driving pulley by its revolutions per minute, and divide by the diameter of the driven pulley." I find no fault with this rule, but would suggest that the teacher and text book of the future will be successful in proportion as they abound in "reasons why," and give the student *principles* from which to form his own rules. As every *rule* must be based upon a *principle*, when one is familiar with the latter the former becomes self-evident and not easily forgotten.

The speed of a driven pulley will bear exactly the same relation to the speed of its driver as its diameter does to the diameter of the driver.

In the above instance, the driven pulley being smaller, let its size represent the denominator of a fraction, of which the diameter of the driving pulley shall stand as a numerator, thus:

$$\frac{20}{10} \text{ of } 100 = 200$$

Or, suppose the diameter of driver was 25 inches its speed 180, and a speed of 600 was required, what must be the diameter of driven pulley?

Reasoning: Since the speed must be greater, its diameter must, of course, be less than that of the driver. How much? As much less as its speed is greater, thus its size will be

$$\frac{180}{600} \text{ of } 25 = \frac{75}{10} \text{ or } 7\tfrac{1}{2} \text{ inches.}$$

This not only leaves less room for a misstatement of the problem, but in most cases the multiplications and divisions may be made mentally, thus saving time and avoiding liability to error.

These advantages are of still greater importance where intermediate pulleys or "counter" shafts are used to multiply motion. For instance, it is required to "set up" a planing machine, the cylinder of which must run 3,500; it has a pulley 4 inches; the counter shaft has pulleys 6 and 24 inches, respectively; the line shaft runs 160; what size driving pulley will be required?

Reasoning: The 4-inch pulley being driven from one 24 inches, the larger pulley will revolve as much slower as 24 is greater than 4, and the drive pulley on line shaft must be as much larger than the driven or counter shaft, as its speed is slower than that of the counter shaft which it drives. The entire operation may be analyzed as follows:

For the sake of clearness, I will suppose that the motion was communicated *direct* from the line shaft to the 4-inch pulley, in which case the drive pulley must be

$$\frac{3500}{160} \text{ of } 4, \text{ or } 87\tfrac{1}{2} \text{ inches.}$$

The use of a counter shaft will decrease the size of driver exactly in proportion to the relative size of its pulleys. In the above instances the pulleys on counter shaft are 6 inches and 24 inches, consequently the driving pulley will only require to be 6-24 as large as when no counter shaft was used, and this being understood the whole problem may be disposed of as follows:

$$\frac{3500}{160} \times \frac{6}{24} \times 4 = \frac{175}{8} \text{ or } 21\tfrac{7}{8} \text{ inches.}$$

This method is even more useful where pulleys are not exact as to measurement and also in computing trains of gearing, etc., of which I shall have something to say at another time.

STERLING ELLIOTT.

THE DESTRUCTION OF WOOD IN CANADA.

A correspondent of the *Scotsman*, taking notes in Ontario and the outlying districts, writes:—"The Canadians have been so accustomed to a plethora of wood that they contemplate the waste of it with remarkable indifference. To the west of Lachute," he says, "additional fields were in course of being conquered, not from the primeval forest, but from a good second growth of larch and maple." The simple process appears to be to cut down the trees, burn the trunks and branches, and leave the stumps in the ground. At one time the export trade was very extensive here, but within the last twenty years there has sprung up in these lumber districts a class of men who assume independence of any extraneous help. In referring to a district traversed by rail, the writer says:—"As far as the eye could reach, the timber clothing of the country consisted of a second or third growth of aspen, birch and various kinds of fir. High over the rich expanse of foliage there rose gaunt skeletons of older trees, melancholy records of those bush fires which have robbed and are to-day robbing Canada of so much of her natural wealth." Originating in the thoughtlessness or carelessness of settlers, these conflagrations have been known to devastate thirty or forty square miles at a swoop. "In one day's journey," he says, "I saw six fires burning, which only seemed to want fanning breeze to produce the same serious results."

Further on, in speaking of the snake fences, he writes:—"Their stability is secured without fastenings by the use of three or four times as much material as might have served the purpose, and on every patch of waste ground may be seen a litter of logs and branches in all stages of decay." Even at more than one of the sawmills he noticed the refuse timber shot into the adjoining rivers to be carried away at pleasure, and probably form with the admixture of mud, after sinking, a serious obstacle to navigation. In a concluding paragraph the writer states "that from the whole of the north-east region of Ontario there has for the past four years been a steady flow of emigration towards the north-west—as an instance, during last spring the Grand Trunk Railway moved some 4,000 persons."

A $25,000 Raft.

H. Pigeon & Sons, of Boston, mast and spar builders, started from below Starbuck's Island to-day for Boston via New York the largest raft ever shipped from this city to the Hub. The timber was cut in Ontario, Canada, north-east from Toronto. On the lake it was made into a raft and towed to Oswego, where it was separated into two rafts of six "cribs" or sections each, and one of seven cribs. John Wells, of Oswego, towed the rafts from that city to Troy. The propeller *Lafayette* left with them for New York. The united rafts were 900 feet long and 84 feet wide. At New York they will be increased by 113 pieces from Clearfield county, Pennsylvania. The raft thus formed will be 1,300 feet long and 64 feet wide. On the ocean the pieces will be united by six tons of cable chains, each piece being bound separately by the chains. The large tug boat *Charles Pearson* of Boston will tow the raft along the coast to Boston. The cost of towage from Canada to the destination will approximate $3,500. It has already amounted to $2,000. The raft will be worth $25,000 when it reaches the Hub. Large timber such as make up this gigantic raft were formerly shipped from this city to Boston by rail. The experiment of sending by the river and coast was tried last year by H. Pigeon & Sons, rafts containing 80 and 180 pieces being selected for the trial. The results were perfectly satisfactory, the great economy being in the matter of expense. The pieces in the raft which left to-day were from 75 to 95 feet long, and from 18 to 30 inches in diameter. They will be made into masts and spars of all sizes and descriptions, and will speed the voyages of all kinds of vessels from fishing schooners to the largest men-of-war.—*Troy Times.*