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ECONOMY OF FUEL.

There is much homely truth in the old proverb—"economy is wealth." A saving effected in the consumption of any article, such as fuel, with the attainment of equally favorable results, amounts to an increase of wealth in proportion to the value of fuel economized. At the present time, when coal is so high in price in all the districts on the eastern coast where the population is most dense, great attention should be directed to the economy of fuel; because a vast amount is wasted, either through carelessness, or ignorance of the best modes of using it. We recently heard a manufacturer, who carries on a very extensive business, assert most emphatically that double the quantity of coal necessary for domestic and manufacturing uses, was consumed annually. The person who made this assertion is not a random declaimer, but a most intelligent and observing chemist, well acquainted with the theory and practice of combustion. About five million tuns of anthracite coal are now consumed annually, and with the present retail prices—for domestic use, eight dollars per tun, and six and a half dollars for manufacturers and steamships—the total cost to consumers will amount to about $37,000,000. There is great room for improvement in economizing fuel for steam engines; as it is well known that not one-fifth of the heat power capable of being obtained from coal is developed in the working of the best of them. And as used for domestic purposes, the waste of fuel is much more in grates, stoves, and furnaces, than under steam boilers. These remarks are equally applicable to the use of bituminous coal and wood.

A pamphlet on "The Economy of Fuel," by Henry Gerner, C. E., of this city, lately circulated, has been furnished to us. It is therein stated that furnaces may be altered according to his discoveries, to save from twenty-five to fifty per cent of the fuel. It contains a short treatise on the combustion of coal—a subject which the author seems to understand well. Coal requires an intense heat and a large supply of air to produce perfect combustion. When a furnace is charged with wood or bituminous coal, a portion thereof is liable to pass off unconsumed as smoke. To prevent this waste, air is now generally supplied above the fuel, to mix with the smoke to supply the requisite quantity of oxygen. The best modes of supplying air to furnaces, and in proper quantities, are important considerations. Too much or too little air supplied to fire, tends to waste fuel. It has for some time past been the practice to admit fresh air above the fuel, through small orifices in the furnace door, as well as between the bars of the grate, and to furnish the greatest quantity of air above the fuel immediately after a fresh charge. The English patent of Mr. Prideaux for producing perfect combustion and preventing smoke, is based upon this principle. Mr. Gerner asserts that this principle of supplying the air is wrong, and we think he is right. His method is to admit but a very small quantity of air above the fuel for about eighty seconds after a fresh charge, to prevent the furnace from being too much cooled down; and after this he furnishes a larger supply. He also advocates the use of compressed air by blowers, for all furnaces, as also for heaters in houses; and recommends that a supply of compressed air be furnished for buildings in cities, from some central establishment, conveyed by pipes in the same manner as gas and water. By this system air can be supplied both for combustion and ventilation. For all furnaces, in factories where a blower can be driven by steam power, it should be employed in preference to a tall chimney. On this subject Prof. Rankine says:—"When the draught is produced by means of a blowing machine, no elevation of temperature above that of the external air is necessary in the chimney; therefore furnaces in which the draught is so produced, are capable of greater economy than those in which the draught is produced by means of a chimney."

As no smoke is emitted from a chimney in burning anthracite coal, many persons suppose that no loss of its heat results in combustion like that arising from the smoke of bituminous coal. This is a mistake. All fuel requires about two pounds of oxygen for one of carbon, to produce perfect combustion; therefore the fire must be supplied with the requisite amount of air to convert the carbon when burned into carbonic acid (CO^2). But carbon, such as anthracite will also combine under combustion with one equivalent of oxygen and form carbonic oxide (C O)—a colorless gas. The bluish-colored flame sometimes seen at night at the top of the smoke pipes of steamboats, is caused by heated carbonic oxide gas meeting with oxygen which should have been supplied in the furnace. A vast amount of anthracite is wasted, from the same cause, in private families, as well as in public establishments and on steamers. Only one-third of the heat of coal is developed when the fire is furnished with but one-half of the air necessary to produce perfect combustion. In view of this scientific fact, we are confident that one-fourth, at least, of the coal generally used is wasted by passing off as carbonic oxide, and that with more care in burning it all this waste might be prevented.

AN HOUR IN A SCREW FACTORY.

Some time ago a pertinent question was raised as to what became of all the pins manufactured. We may ask, not unreasonably, what becomes of all the screws? During a recent visit to the city of Providence, R. I., we were permitted to visit the American Screw Factory in that place, and had an opportunity to examine the wonders of screw-making. We are not allowed to detail at length any of the processes by which the screws are made, and our readers must content themselves with the following generalization of the operations:

Screws, such as are used in ordinary carpentry and joiner work, are made from wire previously rolled especially for the purpose. This iron is of a very soft and even texture, and necessarily of the best quality. The coils of wire are not rolled on the premises where the screws are manufactured; but the several preliminary operations of rendering the wire fit for use, by drawing it to specified sizes and annealing it so that it will work more freely, are all carried on here, and are of a similar nature to the same work elsewhere. After the wire is annealed it is straightened by machinery, cut off to suitable lengths for the different numbers, and then headed up cold. In this condition the screw is merely a rivet. The next step is to trim or shape the head and nick it for the screw-driver, which is done on a machine, and afterward to cut the thread and pack up the finished article for transportation.

All this looks like a very simple affair; but if the reader could see hundreds of machines, all of one kind, in an apartment, and as many of another sort in other rooms: if he stood by and saw the heading machines closing up on the wire with an unexampled rapidity, or witnessed the nimble machinery further on in the works turning out the completed screws as often as one draws breath, he would not wonder that we raised the question "What becomes of all the screws?"

The appended statistics relative to the consumption of material may aid in arriving at some idea of the enormous quantity of wood screws made annually in the city mentioned. The American Screw Company has three factories, all of the largest size, two of which are in Providence, and the other in Taunton, Mass. At these factories are used from 12 to 13 tuns of iron per day, from 60 to 70 tuns of brass per year, and about the same amount of wrapping paper; other statistics are not important. Thirteen tuns of iron wire ¼ inch in diameter would reach a distance of 4,333½ feet. If all the wire was of the same size this would be a small item; but screws of an infinitesimal diameter, and from ¼ of an inch to 6 inches length are made here, and consequently there must be miles of wire consumed each day. These screws all go to supply the home market; a few go abroad, and some to the Canadas, but the amounts are not large. About 700 hands are employed, of whom two-thirds are females; and they presented a very interesting sight as they were busily engaged in packing up the screws. Each individual has a quantity of screws at hand, from which she scoops out a number and places them in the scale before her. This scale has been previously balanced for a gross, and consequently there is always that amount in the scale when the balance is even; thus all counting is saved, and the work proceeds with despatch. The goods are sold direct from the factory, the Company employing no agents. The capital stock is sold for 8 times its par value, and the amount of capital was stated to us at $1,000,000. The utmost cleanliness and order was visible throughout the entire place.

MECHANICS IN OUR ARMY AND NAVY.

While philosophers, savans, and scientists in general reap the reward of their efforts in merited honor and fame, too often the world loses sight of the labors of practical men, or individuals who have nothing but their willing hands, stout arms, and indomitable energies to lend to the duty of the hour. Of such as these are the soldier-mechanics of the war. The highest honors of the trench, the picket, the sap and mine; the mounting of guns, the tedious construction of forts, the repairing of broken engines and machinery, and the building of pontoons in the face of a furious cannonade—these perils are all encountered and borne daily without a murmur. We have known many instances of personal heroism during the present struggle, none the less brilliant and noble because the heroes belonged to the so-called humble walks of life, and were without a thread of bullion upon their shoulders to blazon forth their titles to the world. Nature stamped her mark upon these brave men, and they have in all their unblushing acts of heroism proved themselves worthy. The very first victim of the war was a machinist—a young man from Lowell, Mass., named Ladd; he fell when the Massachusetts regiment was attacked in Baltimore, and as if inspired by his example and fate, from that day until the present hour no peril has proven too great, or any hardship too severe for the endurance of mechanics. Facts speak for themselves; we have no disposition to laud one class of men over another; but the future historian of the war for the Union will fail in an important matter if he overlook the services, the indomitable courage, and the unflagging, unswerving loyalty of the sons of labor. Both in the field and on the sea are they present; and those who are familiar with cotemporaneous history can recal many instances where important operations would have halted, or limped slowly to success, without the mighty impetus lent them by the mechanics in the army of the Union.

Steam Frigate "Niagara."

The late George Steers, who was esteemed one of the most skillful modelers and constructors in the world of fast-sailing vessels, designed and built the frigate *Niagara*, the largest in the American navy. Her model is held to be faultless for securing speed; but with naval men she has never been a favorite, and under steam her speed has been only moderate. Her engines have been held to be deficient in power; and for about a year past, when her services might have been most valuable on the southern coast, she has been laid up at the Charlestown (Mass.) Navy Yard, undergoing extensive repairs. Her old engines have been taken out and more powerful ones substituted; and it is now expected that her speed will be greatly increased. The new armament of this frigate surpasses that of any other vessel in the world for weight of metal. It consists of twelve 200-pounder Parrott rifled guns on the spar deck, and twenty-four 11-inch smooth-bore guns for throwing hollow shot and shell, on the main deck. The old system of arming war vessels was based upon furnishing them with the greatest number of guns possible; the modern method consists in supplying a much smaller number, but of much greater caliber.