Scientific American.

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN. S. H. WALES. A. E. BEACH.

☞ "The American News Company," Agents, 121 Nassau street, New York.

☞ Messrs. Sampson Low, Son & Co., Booksellers, 47 Ludgate Hill, London, England, are the Agents to receive European subscriptions or advertisements for the SCIENTIFIC AMERICAN. Orders sent to them will be promptly attended to.

☞ Messrs. Trubner & Co., 60 Paternoster Row London, are also Agents for the SCIENTIFIC AMERICAN.

VOL. XVII., No. 9....[NEW SERIES.] ....*Twenty-first Year.*

NEW YORK, SATURDAY, AUGUST 31, 1867.

Contents:

(Illustrated articles are marked with an asterisk.)

PETROLEUM FOR FUEL.

Some of the best inventive talent of the world has recently been employed zealously and hopefully on devices for using petroleum as fuel. Experiments have been conducted on the most liberal scale and the projectors have received the encouragement and applause of the public. Governments also have come to the assistance of private enterprise. In the United States, two independent series of experiments, lasting many months, are going on night and day, quite regardless of cost, under the patronage of the Naval Department. When the authentic records of these labors are brought together and studied, it will be found that the subject has been very thoroughly explored.

We are right, then, in assuming that the practical difficulties pertaining to the construction and management of petroleum furnaces, are fairly met and obviated. We assume that petroleum fuel is safe, that the petroleum furnace may be automatic. For the moment, we admit, all the conveniences fairly claimed for petroleum fuel in order that we may more directly fix attention on a single other consideration which is generally overlooked or misrepresented. We allude to the cost of the heat which petroleum can produce.

The question of the cost of petroleum heat seems to us vital and fundamental. The answer to this modifies every other consideration; it should be the starting point of all our reasoning. When we know precisely what can come out of petroleum, we are ready to discuss, intelligently what may be done with it.

Fortunately the question can have no doubtful answer. The methods of estimating the heat of combustion are constantly subjected to the scrutiny of scientific and practical observers. The figures which are agreed upon are known to be so accurate that no error can ever be discoverable when they are adopted as a guide in practice. The total heating power of petroleum may be variously stated according to the standards of measurement adopted, but for our purpose it is most convenient to reckon it in terms of pounds of water at 212° it can evaporate by its complete combustion. It has been ascertained that the heat from the combustion of one pound of petroleum can evaporate from twenty to twenty-two pounds of water, the water being taken at 212°. The variation of 20 to 22 is due to the fact that the composition of petroleum is not constant; for convenience we take 21 to represent the heating power. For comparison it is necessary to understand that the heating power of pure carbon is the evaporation of fifteen pounds of water at 212°. The heat-values of petroleum and carbon are therefore as 21 is to 15.

The petroleum and coal of commerce are, however, not the pure substances on which the above figures are based. The ratio of 21 to 14 or 3 to 2, probably, very nearly represents the relative heating power of the petroleum and coal which are actually in use. Petroleum then gives fifty per cent more heating power than coal, and taking nothing else into the question, we can afford to give in money fifty per cent more for petroleum than for coal. If we go into the market to-day we find that we can buy crude petroleum for 21 cents per gallon, and coal for $6 per tun. Reducing to cost per pound we find that a pound of petroleum costs three cents and a pound of coal one third of a cent. Weight for weight petroleum costs nine times more than coal; and taking into account that the petroleum has a fifty per cent greater value, we find that the relative costs of the heat of petroleum and coal are as six to one. We repeat: petroleum heat costs six times more than coal heat.

There are objections, however, to such a putting of the case. It is said, for example, that the ratio of 21 to 14 is not shown to be true in actual practice; instead of a pound of coal evaporating fourteen pounds of water, the number of pounds in actual good practice is seven, and with our improved petroleum burners we hope to reach twenty-one. Let the ratio of 21 to 7 or 3 to 1 be assumed as possible, and then at the prices—21 cents per gallon and $6 per tun—petroleum heat would cost three times more than coal heat. But there is no ground for the hope that one pound of petroleum will ever, in practice, evaporate twenty-one pounds of water; in fact, the most authentic experiments thus far indicate that the ratio of 3 to 2 is sufficiently generous towards petroleum. We need more data than are at present at our command to determine precisely the most truthful expression for the ratio of practice; but we are quite willing to believe that it will be somewhat more favorable to petroleum than 3 to 2.

It is objected that our prices are not a criterion for other times and places. It is quite true that the relative prices are often more favorable to petroleum. At the oil wells, petroleum has been sold at a lower rate by weight than coal. If the ratio 3 to 2, representing the relative heat values, be kept in mind, it will be a simple thing to compute any question of cost. For example: If coal cost $6 per tun, what must be the price per gallon of petroleum, to furnish heat at the same rate as the coal? Answer: Three and one-half cents.

It is our purpose in future, taking the above as a starting point, to show where petroleum fuel is economical and practicable.

ORIGINAL INVENTORS AND MECHANICAL IMPROVERS.

Comparing the present style of inventions for which patents are granted, with some of those in the past whose use and reputation are universal, the superficial observer may conclude that either the period for great inventions is gone, or that the race of inventors has deteriorated. A little consideration will probably show that this view of the situation is erroneous; and to arrive at this conclusion it is not necessary to belittle the work of those who have gone before us. In many instances their success seems to have been achieved by inspiration rather than reached by persevering and patient effort.

Take the greatest of Watt's inventions—the steam engine. While it cannot be disputed that many very useful improvements have been made in the tools for its manufacture and in the perfection of its parts, consequently in its value as a motor, the steam engine of Watt is in all essential respects the steam engine of the present day. Indeed, engines of his manufacture are still running in England and doing good service. So with the forming lathe of Blanchard; it has received no really radical improvement since his first successful machine went into operation. Whitney's cotton gin is the gin now built, altered, perhaps, in form, proportion of parts, and rapidity and perfection of execution, but still Whitney's gin in all essential points. The tack and nail-cutting machine of Read remains nearly the same as when first invented. Howe still receives a royalty from the various manufacturers of sewing machines.

But while these facts are incontrovertible, it is no less true that, although the principle of the primary invention may remain the same, improvements have been made in its application which wonderfully enhance the value of the machine to which they are applied, If an inventor improves a machine which, in its crude state, was itself only an improvement on the hand labor it was intended to supersede, and makes it doubly or trebly valuable, shall he not have the credit and reward as well as the original projector? There are cases where the value of these improvements has alone popularized and made remunerative the original invention. Let the machinist of twenty-five years' experience remember the rude lathe with wooden shears and slide rest for screw cutting, and then look upon the perfect specimens of the machine as turned out by the best makers at the present day, and he will be convinced that the inventor of improvements is worthy a place among the discoverers in mechanics. Surely if Sterne's aphorism, "he who makes two blades of grass grow where only one grew before, is a benefactor of his race" is correct, the inventor of improvements can fairly claim that honor.

DO METALS GROW.

It is supposed by some that the metals were formed or deposited in some past age of the world by the agency either of heat or water, during some great convulsions of nature such as have not been witnessed in the period embraced by written history or tradition. There are reasons for doubting the reliability of this opinion. That various mineral substances are now in process of formation or development is certain. For instance, the formation of stone is as apparent as its disintegration. On the beach at Lynn, Mass., may be seen a conglomerate of clay and silicious sand impregnated with ferrous oxide, in all stages, from the separated particles to the layers of hardened rock. These rocks are merely the particles of sand, cohered and agglutinated by means of the clay and the oxide of iron, the salt water acting as a solvent of the softer particles and the sun's rays compacting and baking all together in one mass. So, also, we know that coal is being formed from peat. The intermediate stage is lignite or "brown coal" which in turn becomes coal.

It is morally certain that gold, silver, copper, and some other metals are now in process of formation or deposition. Abandoned silver mines in Peru have been found rich in arborescent deposits of the metal on the walls of galleries unused for many years. A gold-bearing region after having been cleaned of the precious metal gives good results after the lapse of only a few years. So with copper. In the Siberian mines not only the precious carbonate known as malachite but the metal itself, in a state of almost absolute purity is deposited on the walls, roofs, and floors of galleries run under the earth's surface. In some places it appears in masses and in others as tree-like formations, with trunk and branches similar to a delicate moss.

What becomes of all the gold and silver unavoidably wasted in the process of manufacture and the wear of transmission from hand to hand as currency? It is well known that with all the care exercised in the manufacture of these precious metals, and notwithstanding their specific gravity, an appreciable portion of them is utterly wasted; at least so distributed as to be incapable of being collected and used again. Is it annihilated? The teachings of science prove this to be impossible. Nothing is ever wasted. If the particles are thrown into the atmosphere they must in time seek the earth's surface. Are they attracted by some unknown power to certain localities, and if not, why should not the streets of a busy city become in time deposits of the precious metals?

Perhaps, after all, the old alchemists had an inspiration of what may yet become *un fait accompli*. When we understand the wonderful processes of nature's laboratory we may possibly imitate her and grow our own metals as we now do our own vegetables; or we may find the philosopher's stone and actually collect the particles of metals, if we cannot transmute a base mineral into one of the precious metals.

A GREAT NEWSPAPER ESTABLISHMENT.

Although the rich white marble front of the new *Herald* building had towered over Broadway as one of its most striking landmarks for the best part of a year, it was not until about the middle of May, that the machinery of the new establishment commenced turning out newspapers, nor is it even yet at its mature complement.

The top and bottom extremes of this building, devoted to the mechanical departments, are its most extraordinary and interesting parts. Each of these—the basement and the Mansard upper story—is a magnificent hall, twenty-four feet in hight, one hundred feet long, and from fifty to sixty feet wide: the rear end of the upper story, however, being partitioned off for the stereotyping department. Probably there is nothing like this establishment devoted to printing a newspaper, elsewhere in the world. Few princes and great men do their work, such as it is, in halls so lofty, airy, and salubrious as that occupied by the *Herald's* compositors. Both light and air, on that unobstructed hight, far above the city chimneys, have all the freshness and amplitude of open day, yet agreeably tempered to every variation of weather by capacious ventilators in the iron roof and sides, steam coils, lofty windows, and the glass bulls eyes that thickly stud the roof. The stands in use accommodate 70 compositors, and hundreds of gas burners stand ready, with intervals of only a few inches, to illuminate instantly any spot upon which light is wanted. Of course the conveniences for making up the forms, for the accommodation of standing type, etc., are very ample and perfect. In the stereotyping room stand the heavy presses for stamping the type forms into sheets of soft paper; the melting furnace, surrounded by iron flasks in which the paper molds are placed for casting, hung by trunions on iron carriages; and cutting machines that gage and trim the edges of the plates instantly and to a hair. On one side is the minor elevator, with its donkey engine a hundred feet below, by which the plates descend to the press room and return. Near this is the great elevator, with its more powerful engine and machinery in the basement, which a person on any floor of the building may operate by a cord, ascending or descending at will, with the heaviest loads.

The machinery hall in the basement—of which a fine view is presented in the engraving—has its imposing appearance somewhat broken up by a broad gallery running all around and between the printing machines for the accommodation of the pressmen and feeders, and almost dividing it into two stories. Two rows of tall iron columns support the floor above, and massive piers of masonry sustain the walls at the sides on Broadway, Park Row, and Ann street. Beyond these piers, beneath the sidewalks, are arranged the boiler rooms, coal and paper storage, and vats for dampening the huge piles of paper required for every day's edition. The coal chute from the street conducts to a boiler iron reservoir balanced on a platform scale which shows the weight of the load as soon as dumped, and a hinged bottom in the reservoir then opens and drops the fuel at the feet of the fireman below.

The engines, of 60-horse power each, are of the favorite style known as the "beam engine," built by R. Hoe & Co., the builders also of the immense presses, and are models of strength and beauty, combined with simplicity, compactness and good workmanship. They are connected one at either end of the fly-wheel shaft, so that they can be run together if required, although ordinarily run separately. The cylinders are fitted with the simple long-lap slide-valve, arranged to cut off the admission of the steam at two-thirds of the stroke. The governor is of the well-known Judson patent, and regulates the speed to perfection. The shafting consists of a single line placed beneath the floor and runs along by, and drives, each press.

The publication office, on the street floor, is the most sumptuously furnished room we have ever seen opened to the public for business; the counters being composed of fine variegated marble, polished and paneled, and surmounted with desks and railings of carved and inlaid walnut, with plate glass windows and doors for transacting business, in the fashion of first class banking houses.

The editorial establishment is mainly on the second floor,