Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

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

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VOL. XXXIX., No. 20. [NEW SERIES.] *Thirty-third Year.*

NEW YORK, SATURDAY, NOVEMBER 16, 1878.

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 150,

For the Week ending November 16, 1878.

Price 10 cents. For sale by all newsdealers.

STEAM FROM PETROLEUM.

A recent article in one of our daily papers, entitled "Steam from Petroleum," evidently the production of an over-sanguine inventor or an imaginative reporter, has brought us a number of inquiries concerning the use of petroleum as a fuel.

The theoretic calorific power of ordinary petroleum is about 16, of anthracite coal 13, of bituminous coal 15; that is to say, a pound of petroleum, with perfect combustion, will raise 16,000 lbs. of water 1° Fah., a pound of anthracite coal 13,000° lbs. water 1°, etc., but the heating effects depend so largely upon the methods of combustion that, in ordinary practice, these theoretic values are but little considered, the estimation in which they are held as working agents being determined by the practical economies resulting from their use.

The extreme wastefulness of the methods of using coals has long exercised ingenious and scientific minds in endeavors to find some remedy; but the best results thus far obtained by the improved Siemens and Ponsard gas furnaces and the pulverized fuel process show a utilization of but 20 to 25 per cent of the total heat of the fuel—a great gain certainly over the 7 to 8 per cent utilization in the ordinary reverberatory furnace, but still far short of the object aimed at.

On the discovery of petroleum in America the attention of metallurgists was at once directed to it in the hope of finding a fuel possessing important advantages over coal, and in every direction methods were devised for its application to metallurgic purposes; but its constitution and character were so little understood, so little known of the peculiar treatment demanded for the development of its powers as a fuel, that most of the proposed methods proved worthless.

After the elimination of the majority of these, several remained which possessed, in a greater or less degree, certain points of value. It had been determined, for instance, that the oil should be reduced to a fine spray or atomized, as it is called; that a jet of steam impinging upon a drip of the oil and conveying it into the furnace was the most effectual agent for this purpose; and that an exceedingly large amount of air was required to combine with the gases to insure complete combustion.

These points were thought to cover all the requirements, and various styles of apparatus were designed to carry them into effect, and were experimented with in various places. The results of some of the most favorable workings, as reported by Boards of Naval Engineers, showed economies of from 38 to 68 per cent over the use of anthracite coal in the generation of steam, and the further advantages of great reduction in weight and bulk of the fuel, in labor of firing, and in quick attainment of high temperatures.

As might be expected, however, of these early attempts, the apparatus was, in all cases, imperfect, the conditions necessary to complete combustion not yet understood, nor the dangerous character of the fuel fully provided against; therefore, notwithstanding the economies shown, the incomplete combustion with its accompanying offense, the difficulty of controlling the temperatures, and the occasional explosions and fires which alarmed both owners and insurance companies, led, on all sides, to the temporary abandonment of the new fuel.

Further investigations, however, here, as well as in England and France, determined that the steam jet as used, though apparently indispensable for atomizing or scattering the oil into spray, greatly interfered with its combustion by abstracting heat from the flame, and that, to be effective, to permit perfect combustion, it should be superheated to so high a degree that it would vaporize the oil on contact. The amount of air required for smokeless combustion—52 volumes to 1 of petroleum vapor—and the fact that they should be thoroughly mingled, were also ascertained.

Within the past few years so good an account has been made of this knowledge that all indications strongly point to the general substitution, in no very distant future, of petroleum for coal in the manufacture of glass, of iron, steel, and other metals, and for the formation of steam.

Prolonged workings in puddling and heating furnaces have demonstrated that by its use double the number of heats, as compared with coal results, can readily be obtained in a given time and with an economy of full 50 per cent with coal at $5 per ton and oil at $10 per barrel. In crucible furnaces, wherein a higher temperature is required and less of the calorific value of coal is utilized than in any other metallurgic operations, the advantages of the new fuel, as demonstrated in Pittsburg in the manufacture of steel for the East River bridge, are still more decided.

Under boilers an average evaporation of 14·98 pounds of water from 212° Fah. has been obtained from 1 pound of the oil, which had a theoretic efficiency of 17·5; and another instance is given of an evaporation of 16·77 pounds of water from 212° by a pound of oil, 17·52 theoretic value.

The great disparity between the practical effects of oil and coal—so much in excess of the difference in their calorific powers—is explained by the wasteful consumption of the solid coal, as above noted; while the combustion of the oil is very nearly or quite perfect, and is completed within the furnace, thus securing for the work from 85 to 90 per cent of its total heat.

The intensity of the oil flame, too, is a most important factor in the economy, assuring a temperature of nearly 3,500° Fah., in a properly-constructed furnace. This heat and the exceptional purity of the flame—there being no residual ashes or sulphurous gases—also insure purer iron in the puddling and melting, and better welding in the heating furnace, and the present unusual advantages to workers of glass.

The dangers ordinarily attending the use of this new fuel have been overcome, in one instance at least, by an ingenious and simple device that has been approved by those underwriters who have had it brought to their notice, thus removing an objection which has operated seriously against the earlier adoption of the process.

Coal tar and the residuum of petroleum are also utilized in this manner by liquefying them by heat or mixture with the oil, so that they will flow readily, but the residuum of ashes from their combustion is objectionable in some cases. Coal oils also are capable of being used with good results by this method, but the supply of petroleum will not, for a long while at least, be likely to become so limited or its price so high that economy will require any of these substitutes.

It is not, by any means, to be supposed that science and ingenuity have been exhausted in bringing the petroleum fuel process to its present strong position; it is yet in its infancy, and, as attention is drawn to it, will be improved in many respects. Because of its youth and the little experience with it, and its former unsatisfactory performance, it has been slighted by manufacturers; and because it will revolutionize the present methods of furnace-firing, it will for a considerable time be successfully opposed by the workmen, who like not to be forced out of their well-worn ruts, and who usually control such matters in the majority of iron works.

There are many rival inventors in this field striving to pass one another in the race, but most of them seem to be almost hopelessly out with their crude and unpractical appliances and ideas; and to this class, judging from inspection of the furnace, etc., at the Brooklyn Navy Yard, and from general observation, belongs, in our esteem, their designer.

Quite recently the inventor of perhaps the most perfect system for using this fuel has applied it to the manufacture of polished sheet iron, with results superior to any before attained in this country.

It would be difficult, we think, to name any process which, even at its present stage of development, is more worthy of the attention of all those manufacturers to whom cheaper fuel is a matter of any importance.

ANOTHER NEW ELECTRIC LIGHT.

During the past week the Electro-Dynamic Light Company of New York have exhibited an electric light which is, to say the least, very promising. The apparatus employed was the Sawyer-Man electric lamp, the joint invention of William E. Sawyer, a well known and successful electrical inventor of this city, and Albon Man, of Brooklyn. As we hope soon to lay before our readers a complete description of the lamp, with illustrations of its mechanism, we will merely remark in this connection that the lamp is inclosed in a hermetically sealed globe of glass, filled with nitrogen, and appears to differ from the common mode of exhibiting the electric light in non-supporters of combustion, mainly in the addition of a slender pencil of carbon, which completes the circuit between what would otherwise be the two carbon poles, and by its incandescence furnishes light, in the place of the ordinary voltaic arc. An essential feature of the invention is an ingenious device for dividing the current, and for maintaining a constant uniform resistance in the circuit, whether the lamps are on or off. The light exhibited was steady and brilliant.

A REMARKABLE BANK ROBBERY.—SCIENTIFIC SAFEGUARDS NEGLECTED.

The robbery of the Manhattan Savings Institution, Sunday morning, October 27, was one of the most daring and successful burglaries ever effected in this city. By some means unknown the burglars entered the bank building after the departure of the night watchman, at 6 o'clock, compelled the janitor to surrender the keys to the vault and secret of the combination of the lock, opened the vault, and spent nearly three hours of broad daylight in breaking open the inner safes and rifling them of their contents. They carried away something like three million dollars' worth of bonds, chiefly registered, and perhaps a hundred thousand dollars in negotiable paper and cash.

The most remarkable feature of the affair was the circumstance that an institution having the reputation of being one of the soundest in the country should prove to have its treasures so poorly guarded. The fact that the combination of the outer lock of the vault was intrusted to a feeble old man living in the same building is scarcely less astonishing than that the directors of the institution should have availed themselves of none of the well known electrical and mechanical appliances for defending their safes, not only from the assaults of burglars, but even the unauthorized entrance of those who had them in charge, except during banking hours. It is but another evidence of the amazing indifference of most men not scientifically educated to the scientific aspects of modern life, and the means which science provides for extending the scope and security of life and property. Here were men of reputed culture and sagacity intrusted with the care of the savings of thousands, who must have known of the existence of chronometer locks, by means of which the vault would have been closed against even the over trusted janitor who held the combination, during all hours not devoted to regular business. They must have known also of electrical appliances, by means of which