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VII. MISCELLANEOUS.—Insect Fungi.—Aerial Echoes. By Prof. JOSEPH HENRY.—One Solution of the Labor Problem.

THE UTILIZATION OF PETROLEUM.

In an article on the outlook in the petroleum region, a late number of the *Petroleum Reporter* says: "When we see Europe so stocked and filled with the product that the values have gone below any point heretofore reached within the history of the trade, and when, in addition to this, we see a greater activity in the producing region than has ever before been known to continue and enlarge the over-production, it is little less than absurd to hope for any result except bankruptcy to the producer."

With home and foreign markets filled to repletion; with an increasing production both here and abroad; with the price lower than it has been for sixteen years (\$1.06 per barrel, or about 2½ cents per gallon, delivered free on board), and a stock on hand in the producing region of nearly five million barrels, the prospects of the producers are so gloomy that it is with but little surprise that we learn that the proposition to decrease the amount held, in the hope of enhancing the value of that left, by emptying most of it into the river or burning it up, has been seriously advocated by some of them. Such a plan, however, would serve to stimulate increased production, and defeat the desired object.

A remedy for these conditions cannot be found in a day; they will doubtless continue for a long time.

The producers and holders of petroleum have for years been too much occupied in getting and accumulating, and have given too little attention to the possible ways of disposing of it. New applications, new uses for the product, are imperatively necessary to restore a healthy tone to this industry. Some plan must be discovered by which the consumption shall be made to keep more even pace with the production.

Already we are witnessing the beginning of a great change in the manufacture of illuminating gas, which, though in its infancy, and opposed at every step by watchful and persistent coal gas monopolies, will eventually afford a broad outlet for this oil. The consumption of three gallons or thereabouts of petroleum per one thousand feet of gas by the new processes, whose success has been fully demonstrated in Baltimore, Philadelphia, and many other places, is a matter, we should think, of sufficient importance to assure the co-operation of the oil producers in extending the benefits of the processes and defending them against the present gas monopolies.

But it is especially in the application of petroleum as fuel to metallurgical and other purposes that sufficient and permanent relief can best be secured, and it is a matter of great surprise that the oil producers have paid so little attention, have been so indifferent, to the results obtained and progress made in the use of this fuel in metallurgy, and to the accumulating evidence of the accuracy of the predictions of Rankine, Prideaux, Sainte-Claire Deville, Wurtz, and scores of other able investigators concerning it.

Of late years, in repeated instances of continuous working, the actual efficiency of petroleum in firing boilers has been shown to be from two to three times greater than that of the best solid coal, weight for weight, and in puddling and heating furnaces from four to six times greater, while in steel melting furnaces its superiority is still more manifest, its thermal effects being more decided the higher the temperature required.

Besides, it is conclusively shown by a mass of testimony that, by reason of the purity and intensity of its flame, petroleum, in iron working, removes the contaminating sulphur and phosphorus more thoroughly even than the Siemens gas process.

These advantages, then, which petroleum possesses over coal, must inevitably draw its producers and the iron manufacturers into closer relationship, where they will be mutually dependent and of mutual benefit to each other. But as iron manufacturers are at all times conservative and especially opposed, in the present condition of trade, to any change that may involve present expense, the initiative must be taken by the other party. The oil producers must exert a pressure by themselves building iron works, and demonstrate in open competition that they can manufacture and sell a better and cheaper iron than can in any other way be produced.

A petroleum furnace, to work successfully, should be so constructed as to secure intimate mixture of the gases, complete combustion in the body of the furnace, and a supply and pressure of the incandescent steam, air, and oil adjustable to the varying working conditions.

Above all others thus far brought to our notice the Eames furnace seems to possess these requisites in a superior degree; the shape of the body of the furnace differs but little from the ordinary iron furnace, but in place of the fire place and ash pit are a vapor generator, a superheater, a mixing chamber, and a combustion chamber, while in close proximity, as a very important part of the apparatus, is a small force pump. The superheater is a double casting, inclosing the fire, so chambered that the steam which enters it is brought in contact with ample heating surface before passing into the vapor generator, about 150 pounds of coal per diem being used in this.

The vapor generator is a cast iron vessel of about 18x30 inches internal dimensions, placed over the superheater, and containing a number of shelves or plates set one above another, projecting alternately from opposite sides. Next in order is the mixing chamber, where the steam and oil vapors are mingled with the proper amount of air; and beyond this, occupying the place of the usual bridge wall, is the combustion chamber, which is an indispensable part of the ap-

paratus, though it consists simply of a cellular tier of fire bricks placed on end and having a horizontal thickness of 18 inches. Within these cells the combustion begins.

From a tank placed in any convenient position the pump draws the petroleum, and forces it, at about 10 lbs. pressure, into the vapor generator in a very slender stream, where it flows downward in a thin layer, dropping from shelf to shelf. It thus meets the opposing current of superheated steam which passes upward from the superheater; thence the combined vapors or gases pass through a pipe to the mixing chamber to receive the required amount of air, and from this into the cellular combustion chamber, where begins the combustion which is completed in the furnace itself.

The experience of all users of petroleum fuel has shown that the superheating the steam, vaporizing the oil, and the mixture with air must, in order to insure complete combustion, be done before they reach the furnace; and we consider the Eames arrangement to be admirably adapted to that end.

For the purpose of guaranteeing absolute safety in the use of this fuel, the pump is fitted with what is called an equalizing valve, which absolutely regulates the flow of the oil into the generator, and, at the same time, interposes an insurmountable obstacle between the generator and oil tank to any chance reaction of gases or flame. Pressure gauges on the oil feed pipe and on the generator serve to give further security in the manipulation of the apparatus.

Success in this direction rests upon clearly defined general principles, which, in this instance, are well understood and applied; and the result offers to oil producers an extensive use for their product, and to the iron manufacturers the way to make better and cheaper iron.

A TRADE MARK DECISION.

During the four years in which the United States trade mark law has been in force, the question of its constitutionality has not been raised in the courts until quite recently. In the case of Leidersdorff & Co., tobaccoists, to enjoin Flint & Co. from the use of certain labels, the defendants demurred, and held that the court had no jurisdiction. In his decision, November 12, Judge Dyer, of the United States Court, Milwaukee, Wis., sustained the demurrer, deciding that the constitutionality of the trade mark statute cannot be sustained under the clause which gives to Congress the power to regulate commerce among the several States, nor under any other of the provisions of the Constitution prescribing the legislative power of Congress.

In case this decision is sustained by the Supreme Court, the owners of invaded trade mark rights will have to fall back upon the State courts for their defense. The actual protection against commercial piracy will be no whit lessened; yet the convenience of a national law on this point is so great, that an amendment of the United States Constitution providing for such issues would be quite justifiable, should that instrument prove to contain no provision now for such a law. The experience of all industrial nations has proved the need of some such national means for protecting trade marks. It has also become a matter of international comity; and as an industrial nation the United States cannot afford to lag behind in the protection of those who have earned an honorable and profitable reputation for their manufactures.

THE WASTAGE OF CARBON IN ELECTRIC LAMPS.

One source of failure in electric lighting by the incandescence of carbon in a vacuum, or in an atmosphere furnishing no recognized supporter of combustion, has been the gradual wasting of the carbon, due to volatilization according to received explanations.

The electrical inventor of the Sawyer-Man lamp says that this explanation is erroneous; there can be no volatilization under the circumstances, since the carbon is not fused. The wastage is due, he says, entirely to a process of decomposition and recombination, the smallest trace of any substance capable of uniting with the carbon at the high temperature of the electric light sufficing with time to destroy the incandescent carbon. Thus in a lamp globe charged with carbonic CO or CO<sub>2</sub>, the gas is decomposed, the carbon deposited on the cooler glass, and the oxygen left free to attack the carbon; and this "circular" process goes on so long as the light is kept up, the minutest trace of oxygen sufficing to destroy any mass of carbon.

In the course of extended experiments Messrs. Sawyer & Man claim to have positively ascertained that sulphur and phosphorus are equally as destructive of the carbon burner as oxygen; that chlorine is fatal to it, and hydrogen; and that any compound gas whatever, even in the smallest quantities, is sure destruction to carbon under such conditions. The only gases that will not combine with carbon are pure carbon and pure nitrogen, singly or together. The Sawyer-Man lamp is filled chiefly, Mr. Sawyer says, with pure nitrogen. Yet there is also a portion of pure carbon gas. The secret of the preparation he does not reveal.

VENTILATION OF VESSELS.

Medical Inspector, Thomas J. Turner, U. S. Navy, a member of the board appointed to consider and report a plan for the better ventilation of the vessels of the navy, has reported in favor of a modified form of the Napier system. Next to securing a larger supply of pure air, Mr. Turner insists on drier air. The unwholesomeness of the air of the berth decks is increased by its excessive humidity,