SCIENTIFIC AMERICAN
ESTABLISHED 1845

MUNN & CO., - - Editors and Proprietors

Published Weekly at
No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845) ..... $3.00 a year
Scientific American Supplement (Established 1876) ..... 5.00 "
Scientific American Building Monthly (Established 1885) ..... 2.50 "
Scientific American Export Edition (Established 1878) ..... 3.00 "

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MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, NOVEMBER 8, 1902.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE ERIE CANAL QUESTION.

The most important question affecting the commercial welfare of New York city and State that will come before the Legislature is that of the enlargement of the Erie Canal—a waterway whose share in the development of the port of New York it is scarcely possible to overestimate. Not only has it carried a large proportion of the commerce which seeks the leading shipping point of the Atlantic coast, but it has played the equally important part of a regulator of freight charges by the railroads. For this last reason, if for no other, it will be to the interest of the city and State to keep the canal open, especially in view of the fact that the railroads are steadily passing into the hands of a small number of individuals. The fewer the number of owners of our railroads, the more likely they will be to get together in some form of agreement for the abolishing of competition, and in view of this contingency it is well to remember that the canal through this State must ever remain the constant regulator of freight charges.

The present situation renders necessary an immediate decision, either to abandon the canal altogether or to bring it up to a point where it can meet the modern conditions of traffic. The great improvements which have been made in recent years, both in the track and rolling stock of the railways, have resulted not only in a vastly increased capacity, but in a reduced expense of haulage, and have rendered the canal in its present condition so much out of date that it has lost, or is rapidly losing, its influence as a regulator of freight. Moreover, in order to bring the canal up to a standard at which it can compete successfully with the railroads, it will not suffice to enter upon the reconstruction in any half-hearted and parsimonious spirit. The question of the extent of reconstruction necessary was carefully gone into during President Roosevelt's term of office as Governor of this State, and the findings were expressed in a report by the committee of which Gen. Greene was chairman. The scheme proposed received the hearty indorsement of Governor Roosevelt. Briefly stated, the report proposed, at a cost of $60,000,000, to deepen and widen the canal sufficiently to admit barges of 1,000 tons capacity and to provide enlarged locks which would enable these barges to be towed in fleets of four from the Lakes to New York city. This would necessitate a uniform depth of 12 feet throughout, and to every student of the canal question it is evident that this is the smallest practicable depth on which the canal could be brought up to modern requirements. That nothing less than this will meet the case is further evident when we remember that the great canal improvement which was completed three or four years ago on the St. Lawrence River gives the Canadian territory a system of canals which provides a minimum depth of water of 14 feet from the Great Lakes to the Atlantic. A determined effort is being made to divert to the St. Lawrence route much of the wheat which hitherto has come to the port of New York, and the best answer to the Canadian canals would be the carrying through of the proposed $60,000,000 improvement. The prospects of favorable canal legislation are improved by the increasing and more intelligent interest which is manifest in the canal in the rural districts, which hitherto have been either lukewarm or strongly opposed to the whole scheme. With public attention aroused throughout the State, the prospects of successful canal legislation were never brighter. To New York city itself the canal is of most vital importance, for the reason that we are gradually losing our relative standing among the great grain ports of the Atlantic coast, because of the differential charge which the railways make against the port of New York. This is an extra charge on freight which is made on account of the easiness of access for western freight to this city as compared with the difficulties in the way of mountain ranges and heavier grades which are encountered by freight that is taken to other Atlantic ports. Not only have we the easiest approaches by rail, due to the absence of mountain grades; but New York possesses the finest harbor, is the terminal port of the speediest and largest steamers, is the great center of capital, and has all the advantages which accrue to a great metropolitan city. Hence the railroads which terminate at other ports have demanded that there shall be a higher charge on freight to New York to offset these natural advantages. This being so, it is evident that if we are to maintain the equilibrium on our side, we must see to it that these natural advantages, among which the Erie Canal is one of the greatest, be maintained in the very highest state of efficiency. Whatever may be said about the justice or injustice of differential rates, it is certain that the argument for the canal based upon them is unanswerable.

LIQUID FUEL FOR NAVAL PURPOSES

Congress at its last session made an appropriation of $20,000 to enable the Navy to carry out exhaustive trials of liquid fuel to determine its suitability for use on naval vessels. This sum, in addition to several thousand dollars which was also available, enabled the Navy Department to make a most elaborate investigation of the subject. The work was planned and carried out with characteristic thoroughness, and while the tests have not yet been completed, sufficient data have been gathered to enable the Board to make a preliminary report which will be found in the current issue of the SUPPLEMENT, that cannot fail to be of the greatest value to marine engineers throughout the world.

On reading this document one is forced to the conclusion (and this is the most important fact developed thus far in the inquiry) that there is no immediate prospect of oil fuel being immediately adopted to any extent on battleships and cruisers, although the installation of oil-burning furnaces is regarded as quite practicable on torpedo boats and, indeed, its installation is recommended in the report. The tests were carried out in Washington in a very complete experimental plant in which Beaumont oil, slightly refined and of uniform quality was used. In his review of the report submitted to the Secretary of the Navy, Rear-Admiral Melville observes that any fuel which will get rid of smoke, reduce the fireroom staff, extend the steaming radius, and assist in the realization of maximum speed at short notice, will add to the efficiency of warships. Referring to the experiments made by various naval powers with the use of oil, he points out that failure has resulted from the mistaken attempt to burn oil in the same manner as coal. It is now well understood that the oil must be atomized at the burner, since it is impossible to completely turn it into gas before ignition, and that to secure its full value in the boiler, the length of furnace, volume of the combustion chambers, and calorimetric area are factors which must be carefully considered. The experiments conducted by the Liquid Fuel Board have proved that it is possible to force the combustion of oil, and that in an oil fuel installation, where provision has been made for atomizing the fuel and heating the air and oil, it is possible to greatly exceed the highest evaporation per square foot of heating surface that have been secured with coal. Rear-Admiral Melville expresses his conviction that by further experimental work the engineering features of the problem will undoubtedly be resolved in a degree materially satisfactory to maritime or commercial interests, if not to the naval experts.

With regard to its installation on battleships and large cruisers, where the fuel would have to be stored in the double bottom, it is considered that the proximity of such a large amount of electric wiring as is found on a modern warship, to the oil tanks, which would necessarily throw off a considerable amount of vapor, might cause an explosion and set the fuel on fire, and it is pertinently suggested that the limited experience of the Navy with submarine boats may provide a lesson as to the liability of hydrocarbon gases to explode. In concluding his review of the report, Admiral Melville affirms that he has no hesitation in declaring that, in view of the results already secured with these tests, an installation should be placed at once on at least one-third of the torpedo boats and destroyers, where there would be an opportunity for further systematic study of the subject. With regard to merchant vessels, where the structural disadvantages under which warships labor are not present, it is believed that oil fuel may be used to advantage, and that the information gathered by the Board will materially increase the installation of oil-fuel plants in the merchant marine.

A NEW HYDRIDE OF SILICON.

A new hydride of silicon has been lately discovered by Messrs. Henri Moissan and S. Smiles. This body is a gas at ordinary temperature, but by using liquid air the experimenters were able to liquefy and then solidify it. The process is described in a paper read before the Academie des Sciences. The combinations of hydrogen and silicon are few in number and only two are known, one a gas discovered by Buff and Wöhler in 1857, $Si H_4$, and a solid body prepared by Ogier as a yellow deposit by the action of the electric stream upon hydrogen silicide. The gaseous hydrogen silicide was obtained by the former experimenters in decomposing water by the electric current, using aluminium electrodes rich in silica, then by Wöhler in reacting upon silicide of magnesium by hydrochloric acid. It is the latter method which has been followed here, applying the method of fractional separation. The silicide of magnesium is prepared by mixing powdered magnesium such as is used in photography with crystallized silica in fine powder, the proportions corresponding to $Si Mg_2$, and the mixture is calcined at a red heat in a tube through which is passed a current of pure hydrogen. Thus a friable and bluish mass is obtained, which is an impure silicide of magnesium, but does not seem to be a definite compound. When the bluish mass is acted upon by dilute hydrochloric acid, it gives off a gas containing hydrogen silicide, that is spontaneously inflammable. The gas is prepared by placing 5 grammes of the impure silicide of magnesium in a flask and pouring dilute hydrochloric acid upon it through a tube. The gas given off is washed and dried, then passed in a U-tube which is cooled by liquid oxygen or liquid air. The tube has a bulb below for receiving the condensed liquid. At a temperature of 80 degs., obtained by acetone and solid carbonic acid, only a trace of liquid is condensed, but with liquid air at 180 to 200 degs., the gas is condensed in the solid form and the remainder of the gas which passes through ceases to be inflammable on contact with air. This solid body becomes liquid as the temperature rises, and soon begins to boil, giving off hydrogen silicide gas, which may be collected. At last, when the tube has reached the ordinary temperature there remains a liquid whose properties have been studied. The experimenters obtain thus a liquid hydride of silicon, which when cooled in liquid air, crystallizes upon solidifying, and these crystals melt at 138 degs. The most remarkable property of this new compound is that it takes fire spontaneously in air at the ordinary temperature; it burns with explosion, producing a white and brilliant flame and giving a deposit of amorphous silicon and also silica. Its density is greater than unity, for when placed in water it falls to the bottom of the vessel and dissolves slightly. It takes fire spontaneously in chlorine gas, and at the ordinary temperature the reaction is violent. If a small quantity is vaporized in an atmosphere of hydrogen, the gas becomes spontaneously inflammable in air, while ordinary silicide of hydrogen has not this property. The analysis of this body was difficult on account of its inflammability, but the experimenters collected it in bulbs which were broken in a test-tube full of mercury and the liquid could thus be acted upon by an alkaline solution, when the hydrogen given off was measured and the silica of the alkaline silicate estimated. The reaction is as follows:

$$Si_2 H_6 + 4Na OH + 2H_2O = 2 (Na_2 Si O_3) + 7H_2.$$

The formula $Si_2 H_6$ is given from analogy with ethane, and this is to be verified by obtaining the vapor density of this body.

FRUIT PARASITES AND THEIR DESTRUCTION.

The fruit growers of California willingly acknowledge their great obligation to the entomological department of their university for the success with which the ravages of fruit pests in that State have been diminished if not totally prevented. To the scientific investigations of the faculty of that institution is due the general immunity from severe financial loss which the orchardists of the State enjoy.

No class or variety of fruit, the cultivation of which has been attempted in California, ever reached the period of successful propagation than some new species of destructive insect pest instantly appeared to prevent it. This fact is true in all localities. The orange, for instance, could not have been successfully raised in California, but for the introduction of the Australian lady bug, which feeds upon the orange scale. The plum, peach, apricot, apple, and in fact every other fruit known to the coast, each developed a natural enemy which would have destroyed it but for the successful efforts of the university entomologists in combating it. In some portions of the State, notably in Placer County, a new specimen of moth developed which proved so destructive that a loss of fifty to sixty per cent in the peach crop was suffered. Around Newcastle the direct financial loss in the peach crop alone is estimated at $1,373,000 in the past four years.

The University of California was appealed to, and Warren T. Clarke, assistant entomologist, was sent to investigate. He was successful in his search, and returned with complete data of the habits and life history of the worm and methods of propagation. Prof. Clarke, in order to learn the characteristics of the new species of insect which was doing such immense damage, fastened twigs, in which the eggs were embedded, to his underclothing and thus hatched them out.

From the knowledge thus gained, Prof. Clarke was