A New Illuminating Material Discovered.

An important discovery has been made by the well-known German chemist Hermann Blau, of Bavaria. His method is to separate, by a process of rectification, the methane and hydrogen from the other constituents of oil gas, collecting the same in steel receivers subject to a pressure of 40 atmospheres, whereby he converts it into liquid form.

With the liquid gas made according to Blau's method, the cost is reduced to 6.3 pfennigs (1.5 cents), including freight.

This new illuminating material compares very favorably in cost with all others. The ease with which it can be handled and the beauty of its light should make it preferable where a lighting material is wanted as a substitute for petroleum, alcohol, or acetylene.

On the 24th of December, 1902, a test was made for the first time to produce the liquid gas. The trial showed how practical and very simple the process of preparation was. It has since been decided to erect an oil-gas furnace and to reconstruct the rectifying apparatus in accordance with the practical observations obtained by the experiments of last December.

A new test has recently been made and shows a most marked improvement and a remarkable productive power in every respect. It was also found that by the addition of a considerable amount of tar, which is in no wise detrimental, a beautiful yellow color was given to the gas.

A test tube filled with the liquid gas needed only the warmth of the hand to cause it to effervesce. It also effervesced when poured upon a metallic plate and on water. In the latter case a crust of ice was formed.

Its odor is pyroligneous aromatic. The concentration amounted to 537 grammes instead of 550 grammes per liter under a pressure of 40 atmospheres. The specific gravity, when in a gaseous state, was 1.26 (taking air at 1.0); absolute weight, 1.03.

The Approach of Borelly's Comet.

Since the time of its discovery, Borelly's comet has rapidly increased in brightness, until it is now easily visible as a star of the fourth magnitude. It should be easily detected one or two degrees southwest of the bright star Alpha Cygni. Its daily motion is about 5 degrees southwest. Prof. Perrine has computed the orbit of the comet, and finds that its nearest approach to the sun will occur on August 27, at a distance of about 3,000,000 miles. At present its distance from the sun is about 100,000,000 miles, and from the earth 20,000,000 miles. To the naked eye it will appear as a hazy patch of light. Photographs taken at the Lick Observatory indicate two prominent tails several degrees in length.

Prof. Langley's New Aerodrome.

According to newspaper reports, Prof. Langley's new aerodrome is to be tested somewhere on the Potomac River. The machine was recently towed on top of a large houseboat down-stream and anchored at tide water. Several years ago Prof. Langley demonstrated by means of a model the correctness of his principle of soaring flight. Ever since that time he has been ceaselessly engaged in the same work. In his investigations he was compelled to spend an appropriation of $50,000 by Congress, an allotment from the Army Board of Ordnance of $25,000, and a very large sum privately contributed. The successful trials made May 6 and November 28, 1896, have been fully described in the columns of the SCIENTIFIC AMERICAN SUPPLEMENT.

A Prize Offered to Stamp Out Boll Weevil.

Governor Lanham of Texas, on July 11, issued an official proclamation offering a reward of $50,000 to any person who would devise or discover a practical method or remedy for eradicating the cotton-boll weevil. The reward is to be paid out of the State treasury. The cotton belt of Texas has suffered much from the ravages of the boll weevil.

Large quantities of hydrogen being required for certain researches, it occurred to M. d'Arsonval that this hydrogen might be supplied from coal gas, of which hydrogen constitutes usually about 50 per cent, the remainder being principally methane. M. d'Arsonval has separated the hydrogen by condensing the methane by means of liquid air, using a very simple apparatus for the purpose. More recently he has dispensed with the use of liquid air entirely, and simply passes the gas, previously cooled to —80 deg. Centigrade, through a Linde liquid air machine, and in this way is able to obtain 3,500 cubic feet of hydrogen per hour at an expenditure of from 12 to 15 horse power. By a modification of the process, pure methane can be furnished as well as hydrogen. This is accomplished by dividing the process into two stages. In the first stage the gas is cooled to the temperature of solid CO_2, causing the condensation of CO_2, benzine and similar hydrocarbons. In the next stage the methane is condensed, and carries with it in suspension the carbon monoxide, which can be filtered off.

THE STUDY OF GASES AND METALS AT VERY HIGH TEMPERATURES.

BY PROF. JOHN TROWBRIDGE.

The electric furnace has told us much in regard to the behavior of the vapor of metals at extremely high temperatures. Probably these temperatures are much lower than that of the sun. Still, we are learning something of the chemical reactions which occur when such highly refractory substances as carbon and silicon are submitted to the heat of the electric arc in furnaces lined with infusible matter. The information which has been obtained is practically applied in great industries such as the manufacture of acetylene gas and of carborundum. Doubtless many more useful substances will result from the use of the heat of the electric arc. The electrical furnace, however, cannot be used to advantage in studying the reactions which occur, except through the final product. The spectroscope, for instance, cannot be used to study the extremely interesting spectra which arise when the vapor of metals is formed at high temperatures in closed chambers, such as are in commercial use.

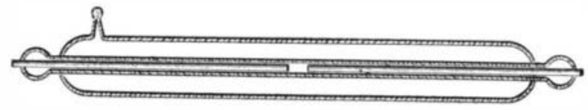


Fig. 1.

A scientific electric furnace, however, can be constructed as follows: Amorphous silica is made according to the method which I described in the SCIENTIFIC AMERICAN of March 28. It is then drawn into capillary tubes of suitable diameter; and electrodes of different metals are inserted in such capillaries. These electrodes, in my experiments, were one-half an inch apart, and, being four inches long, could be luted to the quartz capillary at this distance from the discharge end. The capillaries were then exhausted and filled with rarefied oxygen or hydrogen.

Fig. 1 represents one of these capillary spectrum tubes. The ends of the metallic terminals, between which powerful electric discharges were passed, were separated half an inch and sometimes less. When the discharges occurred between easily volatilized metal terminals, such as cadmium, tin, calcium, the lines which are peculiar to the spectrum of these metals, when the spectrum is obtained between these terminals in air, are in some cases very much broadened. Certain lines are also reversed; that is, they appear dark instead of bright. This darkening is due to a reversal which occurs on the photographic plate, and is not due to any phenomenon in the furnace.

In order to study these spectra a peculiar camera was employed which allowed the spectra produced by successive electric discharges to be obtained on the same photographic plate. This is desirable in order that the photographs can be subjected to the same development. Fig. 2 shows a set of spectra of what are supposed to be the lines peculiar to silicon. The spectra were obtained by electric discharges from a large glass condenser of .3 microfarad capacity charged to 20,000 volts by a storage battery. The discharges run from 1 to 5 and the photographs are seen to increase in brightness progressively, but not proportionally. It is interesting to notice no satisfactory estimate of the intensity of light can be made by photography. A photographic photometer is not reliable. In Fig. 2 we see reversed lines and also bright lines. One of the reversed lines occurs on a broad bright band which extends more in one direction with reference to the dark line than in the other direction, that is, more toward the red end of the spectrum.

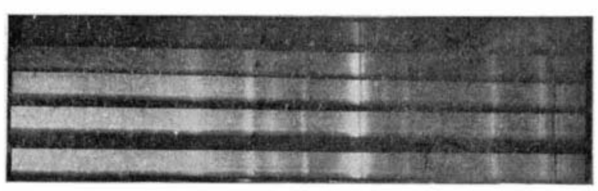


Fig. 2.

When iron terminals were employed in the capillaries no iron lines were obtained, even when the distance between these terminals was only a quarter of an inch. This was the case in rarefied hydrogen and rarefied air. In air at atmospheric pressure a vivid iron spectrum was obtained. This experiment throws doubt on some of the conclusions which have been entertained in regard to types of stars—types which have been supposed to indicate age and composition. The experiment shows that certain metals or gases may be present; but their presence may be masked by the reactions which occur at high temperatures.

The method of taking successive photographs of gases on the same photographic plate with known amounts of electrical energy is, I am convinced, the proper method to be pursued in studying the spectra of gases and of the vapor of metals. By this method one can compare the effect of increasing electromotive force in breaking up combinations of gases and forming new combinations. One of the most striking illustrations of this exhibition of change of combination is to be found in the case of water vapor introduced into a tube containing rarefied air and a trace of carbonic acid. With comparatively feeble amounts of electrical energy the peculiar bands due to hydrocarbons are obtained; as the electrical energy increases, these bands break up, and an entirely new spectrum appears, with no trace of the bands of hydrocarbons, or, indeed, no trace of hydrocarbons, although one knows that hydrocarbons are present.

In this case we have increased the temperature and have masked the presence of a compound. In the previous case we have kept the temperature the same and have brought different substances of different melting or vaporization points together in our scientific furnace. Electro-chemistry will gain much from the study of the spectra of gases and metals obtained with definite amounts of electrical energy.

Harvard University.

The Results of the International Kite-Flying Contest.

The international kite-flying contest arranged under the auspices of the Aeronautical Society of Great Britain was carried out on June 25 upon the Sussex Downs, near Worthing, and was attended with but mediocre success, a result due to the paucity in the number of the competing apparatus and the atmospheric conditions. The primary object of the competition was to encourage the utilization of kites as a means of obtaining meteorological knowledge of the higher regions of the atmosphere, and as a scheme for solving aerial navigation or at any rate the obtaining of some valuable data which might prove useful in achieving flight, and the best type of kites adaptable for this purpose. The Aeronautical Society had prepared a silver medal to be presented to the inventor of the kite which in the opinion of the jury appointed for the purpose, proved the most efficient, the only stipulation being that the kite qualifying for the award must exceed a minimum height of 3,000 feet and remain in the air for one hour. The jury was composed of Dr. William Shaw, F.R.S., secretary to the Royal Meteorological Council of Great Britain, Prof. C. V. Boys, F.R.S., Mr. E. P. Frost, Sir Hiram Maxim, Dr. Hugh Robert Mill, F.R.G.S., secretary to the Royal Meteorological Society, Mr. E. A. Reeves, curator of maps of the Royal Geographical Society, and Mr. Eric Bruce, secretary of the Aeronautical Society, so that the jury was representative of the scientists interested in the problem of flight and the value of kites for scientific investigation and research.

Eight competitors entered for the contest, including Major Baden-Powell, the president of the Aeronautical Society, who has been interested for several years past in the development of a kite capable of lifting a man, Mr. S. F. Cody, and Mr. L. Cody. Owing to a mishap which befell Major Baden-Powell's apparatus upon the ground just prior to the competition, he was unable to compete, while three other competitors failed to enter the contest, so that the number of contestants was reduced to four.

The most interesting apparatus was that of Mr. S. F. Cody, which was identical in design with that which he utilized for his experiments before the officials of the British Admiralty a short while ago.

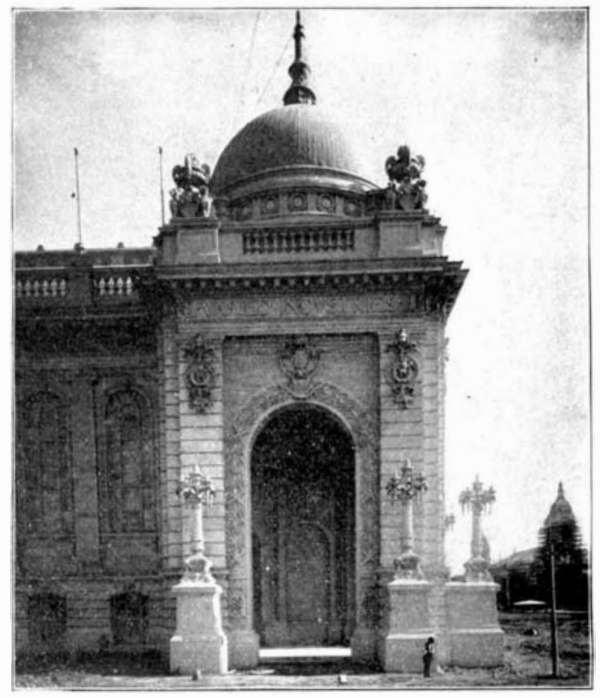
The atmospheric conditions which reigned at the time were not the best adapted for successful kite flying owing to the capricious nature of the wind. Trouble was experienced in starting the kites, but once they were sent into the air a short distance above the ground, they became steadier in their motion. The heights of the kites during their hour in the air was not only determined by the length of the cable paid out, but they were further observed at their altitudes by means of theodolites. Two of these instruments were placed on the ground at different stations in telephonic communication with one another. One theodolite was in charge of Mr. J. E. Dallas and the other of Mr. N. F. Mackenzie, both of the Royal Engineering College, while the duties of computer were fulfilled by Mr. W. Mason, demonstrator at the engineering laboratory of King's College, London. Four observations were taken by each theodolite during the hour the kites were afloat in the air, and their results were checked by the computer with the length of cable paid out, so that absolute accuracy was assured. The results, however, were rather disappointing, since no remarkable altitudes were attained by the kites. The greatest height reached was only a little above 3,000 feet, notwithstanding that in one case 4,000 feet of cable was paid out. Owing to the fact that only four types of kites were flown the contest was not successful and did not afford much conclusive data as to the best type of kite adapted for the purposes for which the contest was arranged, but certainly the apparatus of Mr. S. F. Cody behaved the most efficiently.

The Swedish government has contributed $20,000 to the publication of Sven Hedin's Asiatic maps and two volumes of travels, to be translated into English.

The Electricity Palace.

Finished Portion of Machinery Palace.

One of the Towers of the Palace of Varied Industries.



One of the Corner Entrances to the Palace of Varied Industries.

View from the Roof of the Palace of Varied Industries, showing the Palaces of Electricity, Education, Mines and Metallurgy, Manufactures and Liberal Arts, with the Lagoons and Walks.

THE PROGRESS OF THE LOUISIANA PURCHASE EXPOSITION.