SOME FACTS IN RELATION TO IRON.

From a lecture recently delivered before the Society of Arts, England, by Dr. F. Grace Calvert, F. R. S., T. C. S., we give the following extracts:—

IRON AND MANGANESE.

As far as our present day's knowledge extends, no metal is more influenced than iron, either for good or for bad, by the presence in it of a minute quantity of another element; thus a few thousandths of carbon transforms it into steel, and a few per cent of the same element converts it into cast iron; a few thousandths of sulphur, or a few per cent of silicium, renders iron "red-short," that is to say, brittle at a red heat, while the same quantity (thousandths) of phosphorus makes it "cold-short," or brittle at natural temperature. These facts explain why iron smelters and manufacturers do all in their power to use ores as free as possible from these impurities. or apply all their skill to remove them from the ores or metal when present. I am, therefore, satisfied that all iron smelters will appreciate the value of the following facts, published by M. Caron, in the *Comptes Rendus* of the Academy of Science of 1863, on the influence of manganese when used on the blast furnace to remove silicium from cast iron. The following table shows the relative quantity of manganese and silicium existing in the cast iron thus produced:—

	Manganese.	Silicium.	
No. 1	7·93	0·05	
No. 2	6·32	0·08	
No. 3	4·70	0·30	
No. 4	3·81	0·55	
No. 5	2·25	0·76	
No. 6	3·90	0.50	cold blast.
No. 7	2·10	0·75	hot blast.

This table shows that as the quantity of manganese decreases in the pig iron, the quantity of silicium increases; further, that the higher the temperature (all the rest of the operation being conducted in the same manner), the quantity of silicium increases and the maganese decreases.

M. Caron has further made the important remark, that it is the interest of the iron-smelter to use as much lime in the blast furnace as practicable when manganiferous ores are employed, for not only does lime facilitate the introduction of manganese into the iron, but also helps in a degree to remove the excess of silicium.

Eight or nine years ago, I made the observation that if manganese had not the property of removing phosphorus from iron, it had the one of hiding or of counteracting the bad influence of that element on iron; in fact, I found that cast iron, containing as much as one or two per cent of phosphorus, would yield good mercantile iron if the pig iron contained at the same time five or six per cent of manganese, and I have lately heard that manganiferous ores have been used with great advantage by the Cleveland iron smelters to overcome the "cold shortness" of their cast iron, which is due, as is well known, to the presence of phosphorus compounds in the Cleveland iron ore.

It is highly probable that the advantages which have been derived from the employment of spiegeleisen iron, in improving the quality of steel produced by Bessemer's process, is owing, not only to the fact that this peculiar iron contains a large quantity of carbon, which it yields to the molten iron contained in the large crucible used in Bessemer's process, but that the manganese it contains contributes also to hide the influence of the phosphorus or to overcome the detrimental properties which a trace of phosphorus would impart to the steel produced by this process. I say hide, because the phosphorus is still present, since that substance cannot be removed by the above process from any pig iron in which it may be present.

LIME IN IRON.

M. Caron has published in the *Technologiste* for 1864, a paper in which he shows that no amount of lime on the blast will remove phosphorus from any ore which may contain it; and that tin-plate manufacturers and others who employ charcoal iron should pay the greatest attention to the quantity of phosphorus contained in the charcoal they employ for refining ordinary iron; thus some charcoals are susceptible of yielding as much as one per cent of phosphorus to iron, while others only 0·12 per cent, and, lastly, some only a trace.

TUNGSTEN IN IRON

If phosphorus, sulphur, and silicium are injurious to the quality of iron, the metal called tungsten, on the contrary, appears to improve in a marked degree its quality, especially when in the state of steel. This fact has not only been demonstrated beyond all doubt by Mr. Mushet, but also recently by some scientific researches due to M. Caron, who has proved that steel containing tungsten presents greater tenacity, and can be used with great advantage for many purposes; in fact, he thinks that tungsten can be used instead of carbon as a converter of iron into steel. There can be no doubt that the employment of tungsten in connection with the hardening of steel, and other various applications which that metal is susceptible of, will be greatly enhanced if the fact stated in the *Chemical News*, of August 25th, is brought to bear, viz., that a Swedish chemist has found a simple and practical method of extracting tungsten from its ore so as to reduce its cost of production to a few shillings per pound.

PRESERVING IRON FROM RUST.

It is easy to preserve small articles made of iron from rust, either by plunging them into a weak solution of caustic alkali (whether the iron is preserved by a peculiar action of the alkali, or because it prevents the action of the carbonic acid of the atmosphere in conjunction with oxygen and moisture, are points to be determined), or covering them with a varnish made of india-rubber, gutta-percha, and a small amount of fatty matter. As to the preservation of ships' bottoms from corrosion, without entering here into the various methods that have been proposed of late to effect this important object, still I deem it my duty to call your attention to one or two methods that have been tried with apparent success; thus, Mr. Leach has applied on the iron surface of ships' bottoms, a coating of gutta-percha or other cement, and fastening by it sheets of glass of about one-fourth of an inch in thickness. The glass is previously bent to the shape of the ship, and pierced for the reception of the screws or bolts, which are preserved from immediate contact with the metal bolts by coating them with a little of the fastening mixture.

IRON IN BRASS.

Without occupying your time with further instances, let me call your attention to an important fact that Dr. Matthiessen, Mr. Johnson, and myself have observed, viz., that the addition of a small quantity of a metal which may be considered as an impurity, completely modifies, in many instances, its properties; and the most important example that I am acquainted with is, the influence which the addition of 1 or 2 per cent of iron exercises on the properties of brass. If a brass be composed of 60 per cent copper and 40 per cent zinc, it will be susceptible of being drawn or bent when cold, but cannot be forged or worked when heated; while if 1·75 or 2·0 per cent of iron be substituted for the same quantity of zinc, then a most valuable brass is obtained, for not only is this brass capable of being forged at a red heat, like iron, but its tenacity is increased in an enormous proportion, for each square inch of surface is able to support a "breaking weight" of from twenty-seven to twenty-eight tuns, a tenacity nearly equal to that of iron.

Messrs. Beyer and Peacock, of Manchester, who experimented with bolts made of this alloy, in the hope of substituting them for iron ones in the fireboxes of locomotives, found that these bolts would support a strain equal to those of iron, and that the threads of the screw were not stripped with more facility than those of iron when exposed to the same strain.

There is no doubt that when this alloy becomes more generally known, many valuable applications of it will be made in the arts and manufactures.

We understand that by order of the Emperor the use of gun cotton by the Austrian artillery and corps of engineers is prohibited. A few years ago forty batteries of eight guns were made, all of which were to be charged with gun cotton instead of powder, and now they must be recast. There is a large quantity of gun cotton on hand which if not soon sold will be destroyed.

NOTES ON NEW DISCOVERIES AND NEW APPLICATIONS OF SCIENCE.

EXTRACTION OF VEGETABLE OILS BY MEANS OF VOLATILE HYDROCARBONS.

It is found that all the more common vegetable oils, including palm oil, olive oil, colza oil, linseed oil, rape-seed oil, and cotton-seed oil, may be extracted with great economy by means of some of the volatile hydrocarbons obtainable from petroleum, or by the distillation of coal, chist, or bitumen. The hydrocarbons which answer best for this purpose are those which are volatile at a little above the boiling point of water. The seeds or fruits from which the oil is to be extracted, having first been crushed or ground in the usual way, are digested with the hydrocarbon in tightly-closed vessels. The hydrocarbon gradually dissolves out all the oil contained in the crushed seeds or fruits, and from the resulting solution of vegetable oil in mineral spirit the volatile solvent is driven off by evaporation. The solvent is of course condensed for use over again, and with careful management, the loss of hydrocarbon per operation is found to be exceedingly slight, while the yield of oil obtained in this way is from 40 to 50 per cent greater than is obtainable by the ordinary method—that of mechanical pressure. By this process of digestion with a volatile mineral solvent there could be obtained from the olives which are pressed every year in the neighborhood of Marseilles alone not less than six millions of pounds more oil than is at present obtained from them.

ABSORBENT POWER OF COCOA-NUT SHELL CHARCOAL.

The property of absorbing lagre quantities of gases which is possessed by wood charcoal and other porous forms of carbon—a property which has received several valuable practical applications, and is probably susceptible of others—has hitherto been supposed to be presented in largest measure by the charcoal made from boxwood. Mr. John Hunter, however, has found that the absorbent power, for gases and vapors, of charcoal made from the shell of the cocoa nut, is between two and three times greater than that of boxwood charcoal. Cocoa-nut shell charcoal, after having all the air expelled from its pores by strong ignition in a nearly closed vessel, will absorb, at about the temperature of boiling water, one hundred and fifty-five times its own bulk of the vapor of methylic alcohol.

PASSAGE OF THE EARTH THROUGH THE TAIL OF A COMET.

Early in the month of June, 1861, M. Liais, the celebrated astronomer, wrote from Rio Janeiro to the Academy of Sciences of Paris, to the effect that the observations which he had made of the great comet of that year, which had not as yet become visible in Europe, had convinced him that there was a great likelihood that the earth would come in contact with one of the tails of that body. M. Liais, who is now in Paris, attended the sitting of the Academy and submitted elaborate calculations proving beyond question that on the 19th of June, 1861, the earth really did pass through one of the comet's tails. The moment of contact was twelve minutes past six a.m., Rio Janerio time, and, according to the calculation of its dimensions made by M. Liais, the earth must have been wholly immersed in the tail for about four hours! This immersion in the tail of a comet had no perceptible influence upon the weather, a very remarkable fact, adding one more to the many reasons there were already for supposing that cometary matter is some million of times rarer than our atmosphere. Not the least curious consideration suggested by the phenomenon is, that it was one which had perhaps never occurred before—for, according to Arago, the chances against the contact of the earth with a comet are more than two hundred and fifty millions to one.—*Mechanics' Magazine.*

Model from Freeport, Ill., Destroyed.

Charles Fargo, superintendent of the American Express Company, at Detroit, informs us that a box to our address, from Freeport, Ill., is supposed to have been destroyed in a collision on the Michigan Central Railroad on Nov. 14th, and that upon receipt at his office of proper evidence of contents and value of the box, the contents will be forwarded or paid for at once. Having no information in our possession upon this matter we publish the above for the benefit of whom it may concern.

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