WELDING IRON AND STEEL.

German engineers are now discussing eagerly a question which has seriously engaged attention in this country, and though nothing conclusive has been reached abroad, it will be profitable to review briefly the conflicting opinions offered, based upon experience and in some case upon experiments of a specific character. The last German engineer to take up the subject is Herr C. Petersen, of Eschweiler, from whose paper, read before an association of railroad engineers, we glean the following: The welding of iron is dependent upon its property to assume a pasty state within a certain range of temperature, and it may be stated in a general way that the facility with which the welding may be performed is dependent upon the duration of this peculiar condition.

Leaving out of consideration other circumstances affecting welding, it is conceded by the majority of metallurgists, that an increase in the percentage of carbon in the iron impairs the property of welding, and it is generally believed that when 2% is reached it ceases entirely. It might be concluded that therefore it is desirable to keep the carbon within the lowest limits attainable, but there is some diversity of opinion on this point, because a second important condition for good welding comes into play. It is necessary, in order to unite two pieces of iron, to make the surfaces to be welded free from any coating of oxide, a matter which is generally reached by fluxing the oxide by means of sand, borax, etc.; and some hold that a certain percentage of carbon is necessary in order to afford material for the reduction of this oxide.

Wedding, among others, maintains that such is not the case, and the silicate of iron contained in wrought iron plays an important role. These theoretical considerations have quite recently become of considerable interest, because they may offer a clue to detecting the reason why the steel produced by the open-hearth and Bessemer processes is generally inferior as regards welding power to wrought iron, an inferiority which stands in the way of the more general adoption of steel in place of wrought iron. The former, it is true, can be welded, but there are many practical difficulties. Certainly steel-headed rails show a case of good welding, and tires, tubes, etc., have been made of Bessemer steel on a large scale, but still steel cannot compare in this respect with wrought iron. It is said that hot working in the Bessemer converter or open-hearth steel furnace favorably affects the welding power, and this is explained by pointing to the fact that hot steel will contain a smaller amount of oxides mechanically mixed than that produced at lower temperatures.

Herr Petersen claims that silicon is injurious, while Herr Koehler, of Bonn, during the discussion following the reading of the paper, held that it was not alone not injurious, but actually favourable for good welding. Herr Helmuth took a different view, and stated that at Bochum, during a series of experiments in an open-hearth furnace, they tried keeping the silicon low, but reached no results, and were similarly unsuccessful by increasing the percentage of phosphorus. They then turned to the Bessemer process and commenced overblowing, which improved the welding, though not in a sufficient degree. By using oxides of iron, however, they obtained much better results, but they did not follow out the matter, because they found that pieces welded together had a yellow red fracture near the weld, and Herr Gresser, of Grafenberg, added that the same tendency to red-shortness was observed by them when making a weldable material in the open-hearth furnace. In using the Terrenoire alloy they found that a good product was obtained by adding about four times as much manganese as silicon. It was, however, abandoned on account of its high price.

Herr Petersen concludes by giving some interesting data in regard to the influences of arsenic upon the welding of iron. A lot of inch rod was rejected on account of difficulty in welding, and it was found that the heated rods had a fatty lustre, and that two rods laid one upon another slid off as though the surfaces were polished. This took place, although the balls in the puddling furnaces and the piles welded well. The cause of this anomaly was found to be that the injurious effect of the arsenic comes out strongly only after the carbon has been considerably reduced. The following analyses are given as representing the composition of the pig used in making these rods, the first being white, the second gray pig:—

Sulphur	0.774	1.843
Phosphorus	trace	trace
Copper	0.090	0.580
Arsenic	4.250	5.980
Antimony	1.145	1.068

—*Iron.*

OLEOMARGARINE.

As most of our readers will be aware, the manufacture of artificial butter from beef fat, has, within the past few years, attained to the rank of an important industry. Like every other new departure from well-worn grooves of custom, it has had to contend with much opposition, which in this case has been the more severe as the product, being designed as an article of food to take the place of natural butter, has been bitterly assailed and denounced as unwholesome, and even dangerous. The utterly baseless nature of these denunciations, coming as they did, and still to some extent do, from interested scources, has been sufficiently demonstrated by the enormous growth and extension of the manufacture of oleomargarine throughout the country, and by the almost unqualified endorsement of the entire chemical fraternity as to the wholesomeness of the product as an article of food, and as to the value of the industry in giving an enormously greater value to animal products that hitherto have been used for less important purposes. With these views we entirely concur, and from our knowledge of the subject, feel warranted in the opinion that the oleomargarine industry is worthy to rank in importance with the manufacture of sugar from the beet root, and a few other equally beneficent industries that chemistry has conferred upon us. As it may be of some interest to certain of our readers to know the grounds upon which, this opinion is based, we will give in brief a review of the process of making this new article of food.

To begin, we will refer to the fact that in the operation of fattening beef-cattle for the market, a large surplus of fat is stored away in various parts of the body—much in excess of our requirements for food, or for cooking purposes. This excess has been hitherto altogether lost as an article of food, the only uses to which it could be put being to convert it into tallow, to be used in the production of soap and candles, or to be used for lubricating and similar crude applications. The wholesomeness of beef fat as an article of food being universally admitted, it is not surprising that it occurred several years ago to M. Mége, a French chemist, to endeavor to save to the food supply a portion of the immense quantities of fat used for the crude purposes above named. He was led to this thought by the knowledge that the only essential differences between the oil of butter and the oil of suet, were that the former contained a small percentage of certain compounds (butyric) which impart to it some of its peculiar flavor, and that it contained a much smaller proportion of the solid stearine to which the hardness and granular quality of suet are due. The result of Mége's study of the interesting problem of converting the surplus fat of beef cattle into a food product, after many difficulties had been encountered, were ultimately quite satisfactory.

Mége's process is as close an imitation as possible of the process of natural butter-making. It consists substantially of three steps: 1st, The separation from the oily fat of suet of the cellular tissue and the excess of the stearine; 2nd, the addition of the necessary proportion of butyric compounds, to give the peculiar butter flavor; and 3rd, the solidifying of the butter-fat without grain, and the addition to it of the necessary proportions of water, salt and coloring matter. In this proper conduct of the Mége process, as perfected, the resulting product is a compound which is substantially the same in composition, appearance and flavor as butter churned from cream, without the addition of any deleterious substances, and without subjecting the substances handled to any process whereby its wholesomeness could be in any way injuriously affected.

The following is a description of the Mége process as carried on at the extensive works of the Commercial Manufacturing Co., at West 48th street, North River, this city. The process begins with the selected fat from abattoirs, which is received at the oleomargarine factory within a few hours after the killing. The first operation consists in thoroughly washing the fat from adhering blood and other impurities, which is done by soaking first in tepid water, then thoroughly washing in cold water. The pieces rich in oil are then carefully selected for butter-making, being severed from the pieces less rich in oil by a skilful cut, and the last named are thrown into tubs that find their way to the tallow factory. The fat selected for butter-making, after another washing, is elevated to the floor above, where it undergoes the process of hashing and melting. The hashing machine is simply an iron cylinder provided with a number of revolving knife-blades, which cut up and completely disintegrate the fat as it is fed in at one end and forced out through a perforated plate at the other. The thorough breaking up of the tissues that has here taken place, is a very important step in the operation, since the oil separates from the fat in this condition at a very low tem-