If the obstacle is of a light nature, it is deflected and thrown out of the track of the car. On the other hand, should the collision be with a stationary object, the pneumatic buffer serves to take up the force of the shock and will also deflect the trajectory of the car to which it is fitted.

The application of this safety device is also being extended to power boats, for which it is well adapted. It is more efficient and safer than the type of fender ordinarily employed, and the effect of a collision with another boat would be considerably reduced in character. The danger of ramming is entirely obviated owing to the broad surface offered by the buffers.

THE ELECTROLYTIC PRODUCTION OF HYDROGEN AND OXYGEN FOR WELDING PURPOSES

BY DR. ALFRED GRADENWITZ.

Though the oxygen-hydrogen process of welding has so far given rather satisfactory results and should seem to be destined to replace the expensive familiar riveting and welding methods, the price of the oxygen and hydrogen gases, as produced by chemical methods, has been a serious drawback to its general adoption. As gases were supplied in the compressed state in steel bottles, which after being emptied had to be returned, the considerable transporting cost and renting fees were added to their own high price, due to the compression of the gases.

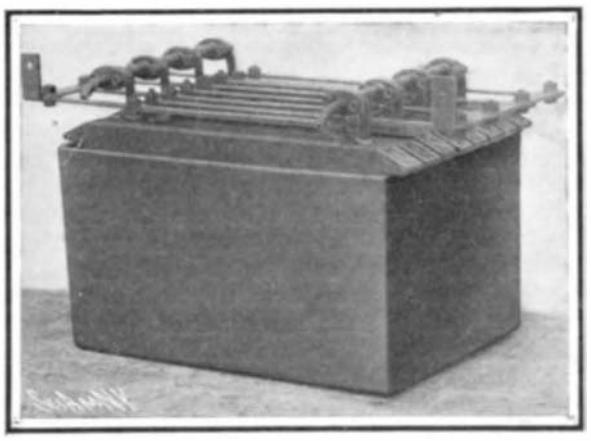
Of late years there have, however, been designed a number of outfits for the electrolytical production of the oxygen and hydrogen gases by the decomposition of water, two of which have proved fully satisfactory in working, namely, first, the Schuckert apparatus, and second, the Oerlikon electrolyzer. The latter, which has been described in detail by the writer in the SCIENTIFIC AMERICAN, No. 27, vol. 91, is being constructed also by the Siemens & Halske Company, and consists of a number of separate chambers, containing plate electrodes of cast iron, which are separated from one another by diaphragms. The gases set free at the electrodes are led through various pipe systems to separators, to be completely freed from any water, which flows back again into the electrolyzer.

In the following we wish to dwell at some length on the Schuckert type of apparatus, which is now being constructed by the Electrical Company, formerly Schuckert & Co., of Nuremberg, Germany.

These electrolyzers, photographs of which are reproduced herewith, are exceedingly safe to operate, on account of their simplicity of design. All parts of the apparatus are readily accessible, there is no material superintendence required, while a cleaning made once or twice per year is quite sufficient to keep the apparatus in working order. The electrolyzer has been designed especially with a view to its use for welding purposes, supplying the gas immediately under the pressure required for welding, so as to necessitate no compression. As gas is derived from the gasometers for the welding, the latter are being filled up by the electrolyzers, the generation of the gases occurring with perfect continuity.

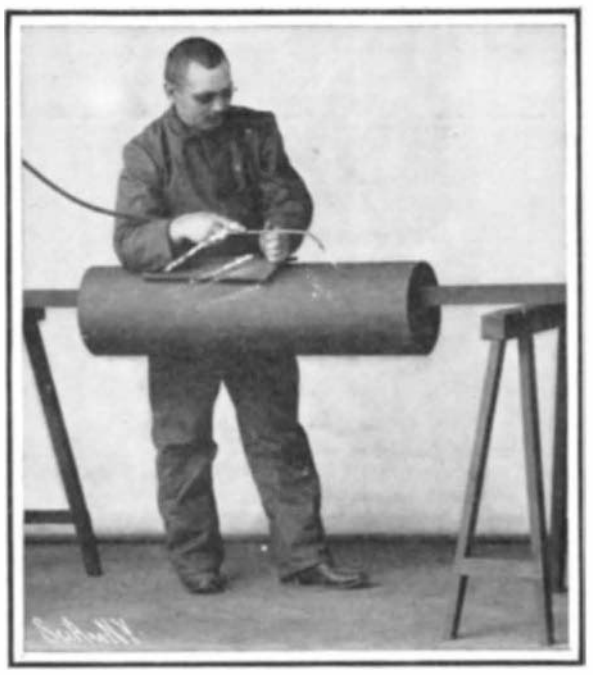
The apparatus, as can be seen above, consists of a cast iron tank, containing a number of cells, where the gases evolved on the electrodes are allowed to accumulate. Apart from the copper conductors, for supplying the current and from the insulation material, the apparatus is made up of iron throughout. A solution of 20 per cent caustic potash in water is used as electrolyte. A tension of from 2.3 to 3 volts is required for the operation of these apparatus, which are connected up either in series or in parallel, a proper amount of distilled water being filled in from time to time during operation. This is the whole of the superintendence required, in fact, no more than is necessary in the case of a storage battery of the same size.

The apparatus are protected against heat radiation by a sand layer about five centimeters in thickness, so as to maintain in the electrolyte a temperature of 70 to 75 deg. C., which is the most favorable, requiring the smallest potential difference for the decomposition of the electrolytic bath. The oxygen and hydrogen evolved by electrolysis are conducted each to a gasometer through separate pipes and thence to the neighborhood of the working place, there to be united in a burner, as they arrive in two separate



Apparatus for the Electrolytic Production of Oxygen and Hydrogen.

India rubber tubes, and to be burned in a pointed flame. This flame is carried over the sheets to be welded (which are applied to one another at an



How the Oxy-hydrogen Flame is Used in Welding.

obtuse angle) like an ordinary soldering flame, but without the agency of any special soldering matter, when the surfaces applied to one another become perfectly melted together. In order to give an idea of the cost of operation of the electrolytic process as compared with the chemical method, it should be mentioned that whereas "chemical" hydrogen as purchased in bottles will cost between 1.20 marks and 2 marks per cubic meter, and one cubic meter of oxygen works out at about 2.50 marks to 3.50 marks (apart from the cost of transport and the renting fees) the aggregate cost of producing one cubic meter of hydrogen and one-half cubic meter of oxygen by the electrolytic decomposition of water in Schuckert electrolyzers (supposing an average price of electric power) will range between 60 and 75 pfennigs, including interest and amortization of the whole plant. Under normal conditions, the cost of producing the gas mixture necessary for the welding of 1 meter of sheet iron 3 millimeters in thickness, will be about 15 to 20 pfennigs and will be effected readily in ten to fifteen minutes.

The gases supplied by the electrolyzer are of a high purity and perfectly safe against explosion; their efficiency is quite satisfactory. The operation can be discontinued and taken up again at any time without interfering with the satisfactory working of the apparatus.

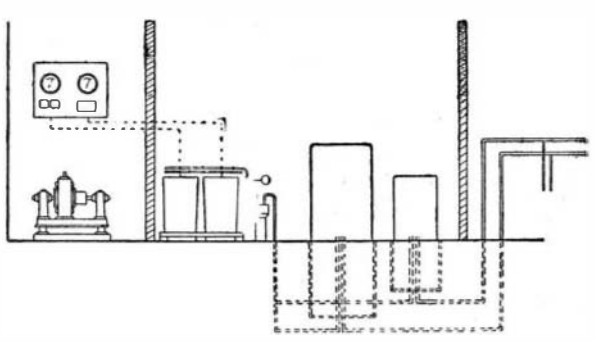


Diagram of the Plant for the Electrolytic Production of Oxygen and Hydrogen.

Large Plant for Producing by Electrolysis 42,378 Cubic Feet of Hydrogen and 21,089 Cubic Feet of Oxygen in 24 Hours.

THE ELECTROLYTIC PRODUCTION OF HYDROGEN AND OXYGEN FOR WELDING PURPOSES.

Electricity in Egypt.

The German Consul at Alexandria gives some information as to the use of electricity for various purposes in Egypt. In Cairo we find that lighting current is generated by a station which the gas company controls, but the public lighting is not developed as yet and only private lighting is operated at present. A tramway system is working in the city. It is owned by a Brussels company. Alexandria is using current for private lighting, but, like Cairo, has no public system. The tramway lines are controlled by an Egyptian company. To connect Alexandria with its eastern suburbs, a concession has been granted to the Alexandria and Ramleh Railway, which has lately adopted electric traction on the lines. The same English company are now operating the city tramway lines. Port Said now has an electric lighting system, which is newly installed, but there are no electric tramways. At Mansourah, the public and private lighting is conceded to an English company for twenty years, dating from 1899. At Suez the concession for the electric lighting in the town and also at Port Tewfik was given to H. Beyts & Co. in 1902, but has now passed into the hands of the Ismailiah Electric Company. It seems that gas engines are to be used to a considerable extent in Egypt in the future. Motive power is employed almost exclusively for irrigation. The most common type of machine is the portable locomotive, of English construction, but it takes a great quantity of coal, and this is very expensive in a country like Egypt. It seems that these machines can be very advantageously replaced by gas engines, which are much more economical, especially the latest forms, which are well adapted for use here, and consume only 1.3 pound of anthracite coal per horse-power-hour. Transport of force would be a great advantage in Egypt for operating the small irrigating machines. It will no doubt come into use soon, and a start has been made by a French engineer. He employs the engines of a cotton factory which is not always running, to operate dynamos and send current for working electric pumps to carry out the irrigation. On one plantation a Siemens-Schuckert electric plant gives power for motors. Prince Djemil Tussum has also adopted a German electric station on his property for the same purpose. It will be remembered that the gates of the celebrated Asswan dam are operated by Siemens-Schuckert electric motors. There is some question of using the cataracts of the Nile as a source of hydraulic power to operate electric plants and distribute current throughout a region which is now a desert, but which would be flourishing could the Nile water be taken through it. Thus the river would give the irrigation water and also the motive power. But this project is one which remains for the future to solve.

The Largest Flower.

Sumatra grows the largest flower in the world. It measures a yard and three inches across, and its cup will hold six quarts of water. *Rafflesia Arnoldii* is its name.—Philadelphia Bulletin.