THE CASSEUIL DRAWBRIDGE.

Drawbridges were in common use in the middle ages, and even the smallest castle was provided with one. The use of them was seemingly falling into desuetude, but for some little time past the exigences of modern communications have been leading engineers to bring them to the front again. In order to render the maneuver easy, an endeavor has been made to balance the flooring in all its positions. In the bridges of the middle ages that we have just alluded to, this condition was rarely fulfilled, and, more correctly speaking, never was so absolutely.

Poncelet, the celebrated bridge builder, occupied himself with this question. In 1810, Derche, another investigator, devised a counterpoise winding around a grooved wheel in spiral form. We may mention, further, a system due to Belidor. All these bridges were of wood. Since iron has entered into the construction of bridges, the system has become developed. In 1856, a drawbridge with a compensating balance frame was established upon the Haute Marne Canal in order to allow passage to a railway. This work is known as the Marneval drawbridge. More recently, analogous drawbridges have been constructed over the Charleroi Canal, at Brussels.

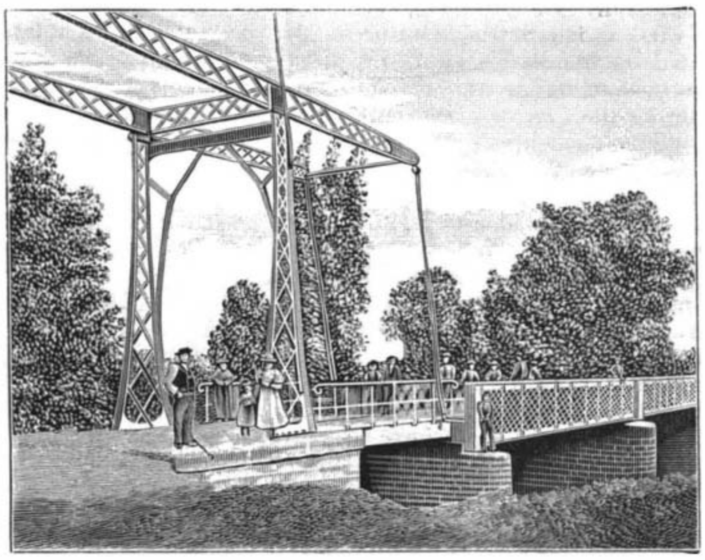


Fig. 1.—THE CASSEUIL DRAWBRIDGE CLOSED.

The drawbridge that we are about to describe is constructed over the lower arm of the Drop, a tributary of the Garonne, near Caudrot (Gironde). The Drop, through its division into two arms, forms a very fertile island, whose various portions belong to persons who do not inhabit it on account of its low position, which renders it very easily inundated. The upper arm of the river, which alone is navigable in ordinary times, flows into the Garonne through a lock that no longer operates when the water reaches a height of 15 feet above low water mark. The boats then take the lower arm, where they consequently navigate only very accidentally and at high water. Under such circumstances the bridge to be constructed would have had to be very high and would have required inclined approaches, whose cost would have taxed the fund disposable out of all proportion.

Mr. Clavel, government engineer, who has been at the head of the vicinal service of the Gironde for some years, and who, during his administration, has endowed the department with several remarkable works, thought that the economical and practical solution of the problem resided in the use of a drawbridge.

A project was drawn up in this direction which met with approval on every side. The work is now constructed and is operating to the entire satisfaction of all interested.

After this expose, and with a reproduction of two photographs that show the bridge open and closed (Figs. 1 and 2), a technical description does not appear to us to be necessary. Let us merely add that the bridge has three spans, and that it is the one of the right bank that is movable.

The boatmen themselves do the maneuvering when they wish to give passage to their vessel. Such maneuvering, however, is exceedingly easy, it being possible for one man to lift the flooring by acting upon a chain attached to the free extremity of the balance frame.

In this way the expenses of surveillance have been saved. Let us repeat that in many cases similar bridges will find a practical and economical application.—La Nature.

The Draught of Chimneys.

Some chimneys are made smaller at the top than at the base of the flue; others are larger at the top; and still others are of uniform size throughout, according to the fancy of those who designed them, writes W. H. Wakeman in Power and Transmission. Those who advocate the first, claim that it is the most natural way to build a chimney, and as the products of combustion ascend they become cooler, consequently contract, and do not need as much space as when they commenced their ascent. Advocates of the second, while they admit that the gases contract on cooling, call attention to the fact that as the chimney is higher, the friction of the contents increases rapidly, and so deem it advisable to enlarge area of the chimney or stack, as the draught is materially increased thereby. Those who are in favor of the third tell us that the contraction of the gases and other products of combustion counterbalances the friction, and so a flue of uniform size is correct. Each can show chimneys built according to their ideas which are doing good work, but it is a hard matter to show that the same draught could not be obtained with a chimney built according to another design, and until this is done the matter of which is the best must remain an open question.

THE ANNEALING OF ARMOR PLATES BY ELECTRICITY.

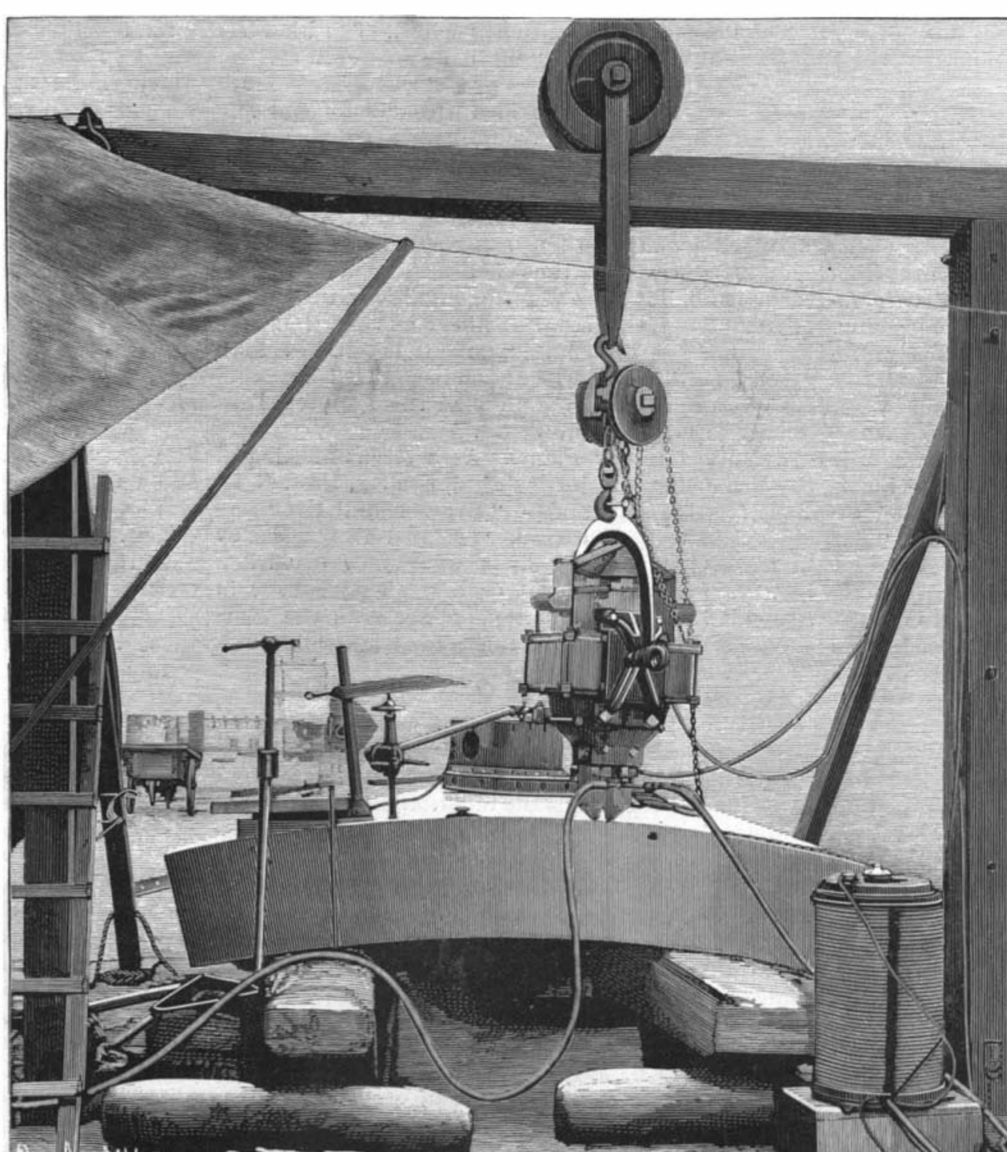
BY W. W. HANSCOM, CHIEF ELECTRICIAN, UNION IRON WORKS.

The nickel steel armor plates, as furnished the later vessels of the United States navy, are by the Harvey process hardened on the face to a depth varying from one-half inch to three-fourths inch. This face is such that it successfully resists the hardest steel drill that can be made, and as it is required in the final location of the plate to drill and tap numerous holes in it, it was necessary during the hardening process to protect the desired places by preventing the carbonizing material from coming in contact with them. The operation was not entirely successful, however, as it was found upon trial that although a number of the places were sufficiently soft to be worked, others immediately alongside were as hard as the unprotected portions. A number of attempts were made to locally anneal these hard spots by means of the oxyhydrogen blowpipe and other apparatus, the most successful being that offered by the Thomson Welding Company, of Lynn, Mass. It was found impossible by all other means than electricity to apply sufficient heat in a concentrated form to attain the desired results, as the large mass of metal surrounding conveyed the heat away as fast as it was supplied. One of the electric welding company's annealing equipments has recently been installed at the Union Iron Works, San Francisco, for annealing the armor plates of the battle ship Oregon, and the following is a description of the plant and its operation:

Fig. 2.—THE DRAWBRIDGE OPEN.

The apparatus in general consists of an alternator, with its exciter, a regulating rheostat, a transformer annealer, and the engine for driving the same. The engine develops at 450 revolutions per minute 55 horse power. The alternator and exciter are of the well known commercial type; the former, of 40 k. w. capacity, has six coils on as many pole pieces, the windings being in two series of three in multiple. The armature is of the toothed type, with six coils, connected in a multiple of three series of two. It is wound for an output of 135 amperes at 300 volts, when making 1,000 revolutions per minute. A pulley on the end of the armature shaft drives the exciter, a D type shunt wound generator of 100 volts, at 2,000 revolutions per minute. Its terminals are connected to alternator fields through the regulating rheostat, a cylindrical frame, having German silver coils cut into or out of circuit by a contact arm on top. The coils are protected from mechanical injury by the wire gauze covering, which arrangement permits of a constant circulation of air.

The transformer annealer is of the shell type, and consists of an outer core of laminated iron surrounding both primary and secondary coils, the former being wound on a form, and incased inside the latter, which is a hollow copper casting made in halves to receive it, and then bolted together, after which the remaining space is filled with oil for insulation and as an assistance in conducting away the heat generated in the primary. The secondary coil has but a single turn, U-shaped, to the ends of which are bolted various shaped copper



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