

November the arches were ready to concrete. It was at this point that the regrettable trouble ensued which culminated in the contractor going ahead contrary to the engineer's orders and concreting the arch ribs on centreing which was not sufficiently braced. An injunction and law suit followed, but meanwhile the arch ribs had been finished.

An investigation followed and showed up a considerable number of defects in the arches as erected. Also the weight of concrete was found to have been too great for the centreing, which had shifted and thrown the centre line of the ribs out of a vertical plane to the extent of about three inches at places. Probably no one of the faults in itself would have been sufficient to condemn the arches, but when all were summed up the engineers did not feel that they could stand behind the structure as it then was, and recommended rebuilding them.

An adjustment was finally arranged and the original contract cancelled. Work was not resumed till the spring, when another contractor undertook to complete the job for the county on a cost plus 10 per cent. basis. Work recommenced the end of June, since when good progress has been made.

The council finally decided to blow out the old arches, and accordingly all preparations were made. The concrete

From a military standpoint it might be interesting to note the ease with which such a structure as this could be destroyed by dynamite if so desired. One heavy charge, favorably placed, would be sufficient to preclude the passage of a stream that was not in itself readily fordable. However, it should be remembered that it took over a week for two men to cut the rods, in order that there should be as little damage done as possible to the skewbacks and piers.

ALUMINUM AND ELECTRO-METALLURGY IN FRANCE.

From a recent consular report we learn that the French manufacturers have formed themselves into a company called L'Aluminium français, with a share and debenture capital amounting to 17,000,000 fr. (\$3,400,000). The most interesting part of this combination lies in the fact that the new company has acquired the exclusive rights all over the world in the Serpeck process of aluminum manufacture, hitherto vested in the Nitride Company (Société des Nitrures), who had in 1910 bought up the rights and plant (at Mulhausen) of the Swiss holders of the patent, and had established experimental work in the valley of the Arc, near

St. Jean de Maurienne. The Serpeck process, by which the production of nitrates forms part of the manufacture of aluminum, consists in the treatment of bauxite, the raw material of aluminum, in the electric furnace with air and coke, so as to fix the nitrogen, thus producing a nitride of aluminum. This product is then treated with a solution of caustic soda, which produces aluminate of soda and ammonia gas. From the aluminate of soda is extracted pure alumina, from which aluminum is obtained by the usual electrical process; while the ammonia gas is treated with sulphuric acid and produces sulphate of ammonia, largely used as artificial manure. The process is thus closely allied with that in use for the production of nitric acid and nitrates by the union of oxygen, nitrogen and steam in the electric furnace, dealt with under the heading of electro-chemical industries. Large works, utilizing 40,000 horse-power, are about to be established

by the Aluminum Combine for the purpose of manufacturing ing under this process. The alumina thus obtained will be used by the various aluminum works grouped together in the new organization, and it is intended to carry on the production of the metal on a larger scale than ever, and to extend its use by all possible means. The company is also said to contemplate the erection of rolling and drawing works near Chambéry. It is calculated that, given sufficient water-power, the cost of the manufacture of alumina will be reduced, thanks to the valuable by-product of sulphate of ammonia, from 200 fr. to 50 fr. per ton, a net saving of 150 fr. per ton, or 300 fr. per ton of aluminum. The United States rights are stated to have been conceded to a subsidiary company with large financial resources, and licenses will probably be granted by the parent company for working the patent in other foreign countries.

The production of ferro-alloys and patent steels in the electric furnace grows apace in Savoy, there now being twelve factories engaged in this branch of the industry. The well-known works at Ugines (Savoie) for working the Paul Girod processes of producing electric steels of great resistance have lately turned their attention to armaments, and have supplied shells to the French and Russian navies.

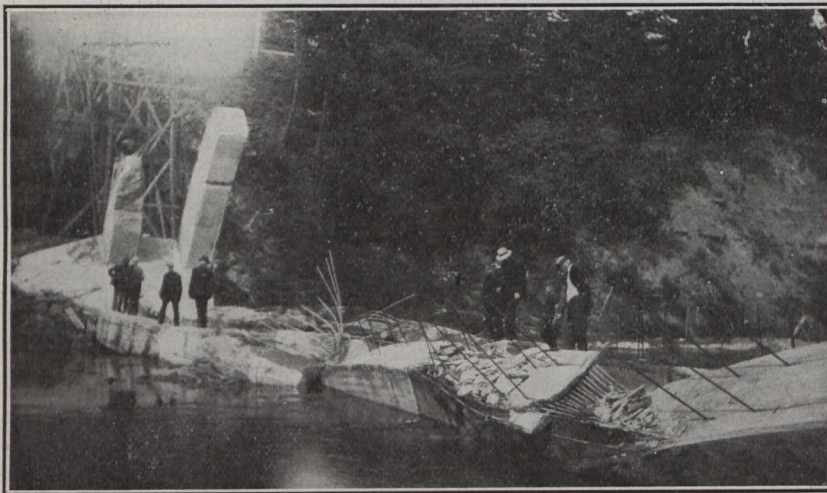


Fig. 3.—The Arches Blown Out and Lying in the Stream.

Note the grillage of rods shown at the break.

outside of the reinforcing, which consisted of 16 bars $\frac{3}{4}$ inch diameter along the intrados and extrados, was chipped away and the rods themselves cut at two places near each end haunch. There was but one connecting strut between the two ribs, situated at the crown. This was also severed and the ribs were blown out separately.

Charges were placed in the crowns and near each haunch. Dynamite was used and fired by the electric spark to ensure simultaneous explosions, although any one charge would have sufficed to destroy the arch.

The south rib was dynamited first, after which the charges were placed in the north rib. No mishap occurred whatever, and the skewbacks on the main piers were left unharmed. The photographs here reproduced will show the appearance of the arch before, during, and after the explosions. The reinforcing rods kept the concrete from breaking up to a considerable extent, and it will require a great deal of extra work to clear the stream bed in order to place the new centreing.

The steel rods, wherever they were exposed by the splitting of the concrete, were noticeably clean and entirely free from dust. Although these rods were simple rounds having no corrugations or other means of creating a mechanical bond, evidences of a very considerable bond were very plain.