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Table listing various articles such as Academy of Science, Aerated bread, Alkali test, American locomotives, etc., with page numbers.

TABLE OF CONTENTS OF THE SCIENTIFIC AMERICAN SUPPLEMENT No. 105.

Price 10 cents. To be had at this office and of all newsdealers.

Table listing contents of the supplement, categorized by I. ENGINEERING AND MECHANICS, II. LESSONS IN MECHANICAL DRAWING, III. TECHNOLOGY, etc.

CURIOUS HYDRAULIC EXPERIMENTS.

A disagreement recently occurred in Germany between the Government and a number of manufacturers relative to the classification of certain water courses used by the latter for power purposes. Among other questions was one which involved the determination of the source of the waters of the Aach, the settlement of which was important as affecting the interests of the manufacturers and also from a purely scientific point of view.

The Danube River, proceeding from the Black Forest, flows nearly directly from west to east, while the waters of the Rhine move in parallel direction, but inversely, from Lake Constance to Bâle. The altitude of the two streams differs, the relative difference being about 800 feet, and the Danube, in the region referred to, being some 2,000 feet above the sea level. The distance separating the rivers is about 18 miles.

For many years it has been noticed that the Danube loses a portion of its water in this region, and that during dry seasons even the greater part of its flow disappears in crevices or veritable holes in its bed. The owners of factories situated on the Danube, in order to retain their water supply, stopped up these leaks, but in so doing they were at once opposed by the manufacturers whose works were located on the Aach, the latter claiming that the water lost by the Danube fed the Aach, and to check the waste from one river to the other was to interfere with their just enjoyment of the smaller stream.

The first plan suggested was to make the Danube water salt. This was proposed by Professor Knop of Karlsruhe, and accordingly 22,000 lbs. of salt were placed in a hole in the bed of the great river. Then water from the source of the Aach was obtained every hour for several days, and this on being analyzed revealed the presence of the salt.

In order to get still better proof, M. Ten Brink decided to take advantage of the wonderful coloring power of fluorescein. This substance is the phtaline of the resorcine obtained by treating at 374° Fah. a mixture of phtalic acid and resorcine. Its formula is C20 H12 O5, according to the equation of its formation C8 H4 O6 (phtalic acid) + 2 (C6 H6 O2) (resorcine) = C20 H12 O5 (fluorescein).

On the 9th of October last, at 5 o'clock in the afternoon, fifteen gallons of a solution of fluorescein were thrown into one of the orifices in the bed of the Danube. On October 12, the observers stationed at the source of the Aach observed the coloration of the water. It had, therefore, taken about 60 hours for the colored water to traverse the soil and reappear. It is stated that the Aach as it gushed from its springs presented a magnificent intense green, which in the sun exhibited more or less fluorescent reflections ranging from light green to brilliant yellow.

The experiment was certainly a most remarkable one. Its repetition in other localities may prove of great value in the study of subterranean water courses, while it offers a new method of geological investigation worthy of general attention.

THE PARIS EXPOSITION.

The bill appropriating \$150,000 for the purposes of our representation at the Paris Exposition, and providing for the appointment of twenty assistant commissioners at \$1,200 each, in addition to the Commissioner General, has at length, after amendment by the Senate, passed the House of Representatives. Our participation in the show thus being secured, the work of official preparation and organization is now being rapidly pushed forward.

Offices of the American Commission will soon be opened in New York, Philadelphia, and Washington. Three United States vessels will transport the goods for exhibition, namely, the Supply, 750 tons freight capacity, to sail from New York February 1; the Constitution, 1,200 tons, to sail February 15; and the Wyoming, of 250 tons, to sail March 1. We are informed that some 800 cases of American goods are all ready for shipment. The French Minister at Washington has also given assurance that the time fixed by the regulations of the Exposition for the allotment of space will be extended in favor of American exhibitors.

RUBIES AND SAPPHIRES, ARTIFICIALLY PRODUCED.

MM. Freymy and Feil have recently exhibited to the French Academy of Sciences some magnificent specimens of crystallized silicates, and of corundum, which substances form the basis of the so-called oriental gems, notably rubies and sapphires. The process consists in heating to a red heat for a long period a mixture of aluminate of lead and of silicic acid. Some sixty pounds of these ingredients were treated for twenty days in a glass furnace. The aluminum disengaged little by little, and thus colorless corundum was produced. To this was added 2 or 3 per cent. of bichromate of potash, the material then assuming the color of the ruby, while the addition of oxide of cobalt produced the sapphire.

THE EDUCATION OF A CIVIL ENGINEER.

In an address on the education of a civil engineer Mr. C. Graham-Smith, of Edinburgh, gives much valuable advice, which by slight changes can be made of much use in this country. The term engineer has a very extended application; it includes, among others, men who drive locomotives, attend to the engines of steamboats, look after gas and water arrangements, design and put together mill gearing and machinery of every description, besides those who study it more particularly as a science.

Ambition and hope, combined with a strict sense of duty, are necessary antidotes to the self-denial and hardships required to be gone through in endeavoring to overcome all difficulties to be met with in the engineering world; for it must be borne in mind that the word impossible has long been banished from the engineer's vocabulary. Engineers may at any moment be called upon to carry out any of the following works: Railways, roads, canals, docks, piers, breakwaters, landing stages and other harbor works, water, sewage, and gas works. Numerous others of equal importance might be given. In the first instance the engineer will probably be required to report on the project, looking at it from an engineering, and perhaps financial, point of view, and generally to prepare preliminary plans and estimates. More accurate plans, levels and estimates must afterwards be made, to be in turn superseded by the working plans and sections. In performing the foregoing, it will be necessary to have:

First, A sound constitution, proper mastery of his own language; the power of dealing with all classes of men, both individually and collectively, and the tact of readily ascertaining the merits and abilities of those whom it is thought of employing in various capacities in the carrying out of an undertaking.

Second, Command of those theoretical and practical sciences which bear on or affect his profession.

Third, A good mechanical training.

Fourth, A general knowledge of engineering works and special information for the carrying out of each class.

Fifth, The tact of ascertaining and arranging facts, as well as surveying, mapping, and calculations of all kinds.

Parents should fully consider the following questions before allowing a boy to think of becoming a civil engineer.

Is he physically and intellectually capable of undertaking the studies?

Is he possessed of the necessary foresight, self-denial, self-reliance, and indomitable perseverance?

After going through the ordinary high school system of education, he must be sent forthwith to a good mechanical works, to go through a regular pupilage, for it is a delusion to suppose that the requisite mechanical knowledge can be