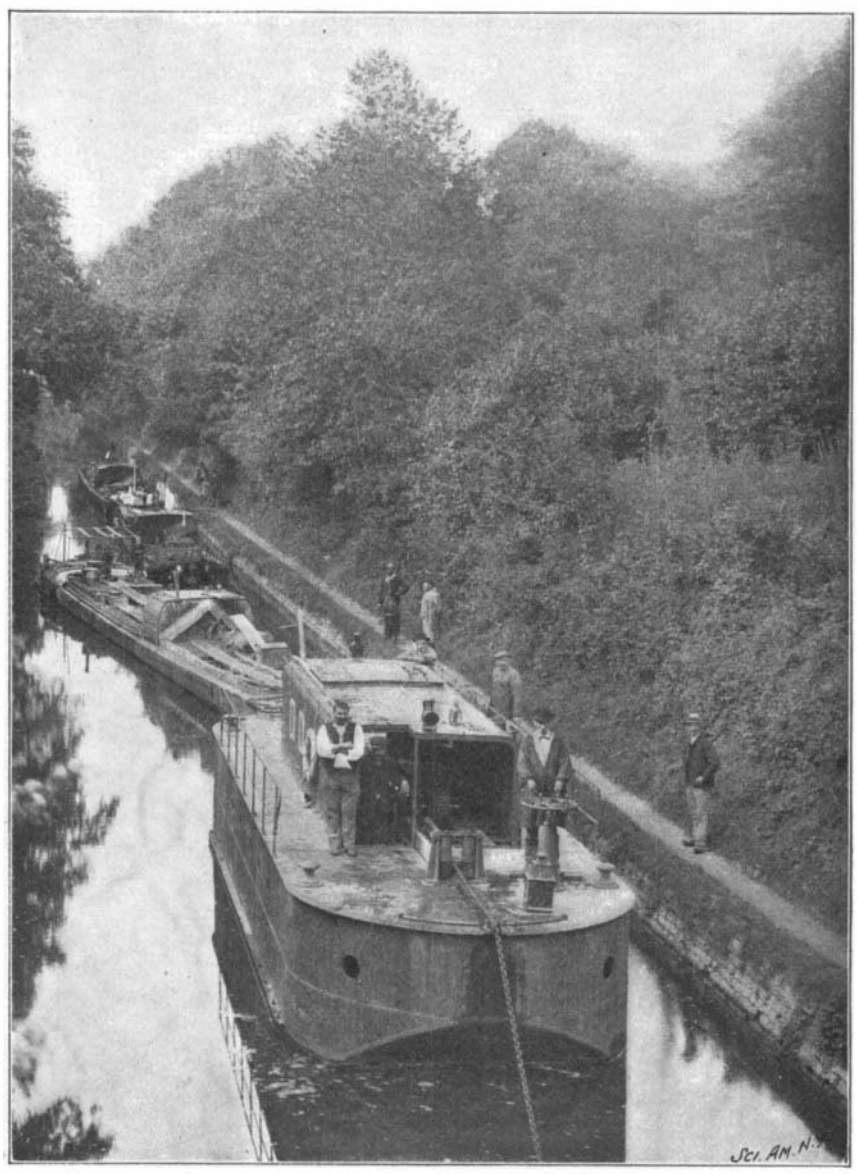
TRACTOR-BARGES ON THE NIVERNAIS CANAL.

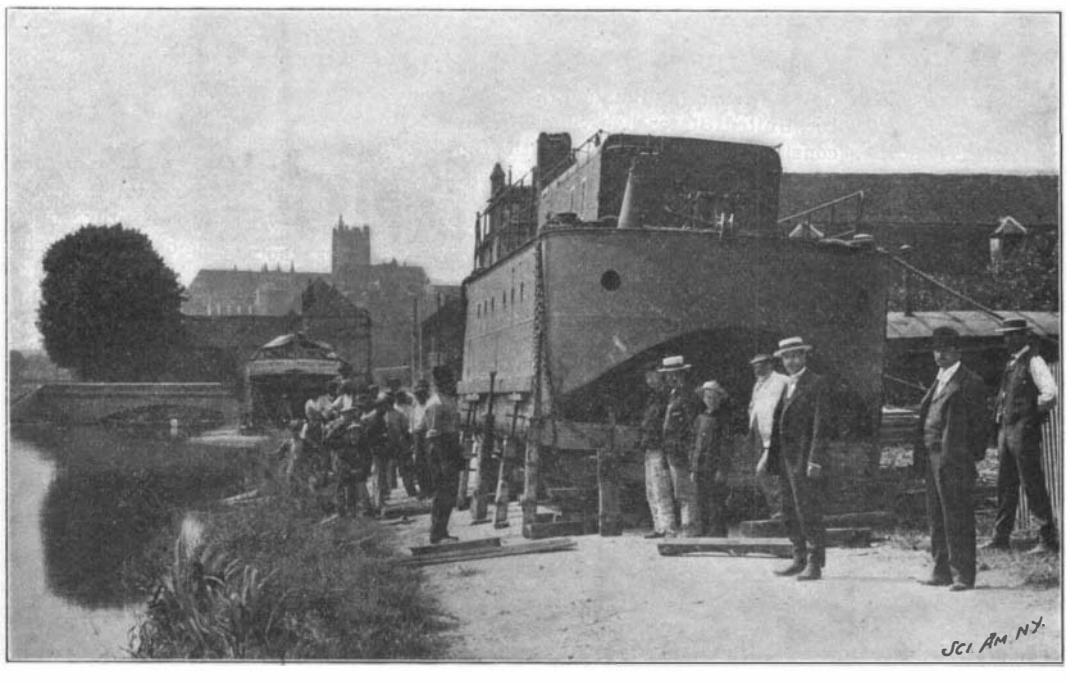
In the very heart of France, extending over 111 miles between the Loire and the Yonne, one of the Seine's tributaries, is the picturesque Nivernais Canal. The summit level of the canal is to be found between the Baye and Port Brûlé, 28 miles as the bird flies, north of the junction of the canal with the Loire. Such is the peculiar section of the canal, and so insufficient is the width of the towpath at its summit, that it has been impossible to utilize the customary tow horses, and it was therefore necessary to resort to towing by men. Since the canal at its summit lies partly in tunnel and partly in a deep cutting, it could not manifestly be readily widened. The plan was hence adopted of employing mechanically-driven barges. Through the courtesy of M. Mazoyer, of Nevers, the engineer of the canal, we are enabled to present illustrations and full particulars of this interesting experiment.

Mechanical haulage is accomplished by means of an immersed chain. The chain was laid last August, in which month the towboat was tested in actual service. The engine with which the boat is equipped is a four-cycle petroleum Foret motor of sufficient power to enable the boat to tow three barges over the 2½ miles of the summit level in one hour and four minutes.

Every day the boat makes two journeys each way. For these four trips the consumption of fuel varies between 5 and 6 gallons, or about 10½ pints per barge hauled. At the rate of 41 centimes per liter the cost of fuel per barge hauled over the 2½ miles is about 2 francs and 46 centimes. Empty boats are towed free of charge.



TRACTOR CANAL-BOAT ON THE NIVERNAIS CANAL.



A GENERAL VIEW OF THE TRACTOR CANAL-BOAT.

A National Physical Laboratory of Great Britain.

A national physical laboratory has been established in Great Britain which will prove of inestimable benefit to the various industries of the country. The scope of the institution is similar to that of the Imperial Physical Technical Institute of Berlin, which has enabled the Germans to absorb more than trade, such as the manufacture of scientific instruments, optical glass, aniline dyes, etc., which a few years ago were regarded as English monopolies.

The necessity of such an institution has been felt in Great Britain for many years past. It was Dr. Oliver Lodge, the eminent electrician and scientist, who first suggested the idea, and in 1896 Sir Douglas Galton made it the principal subject of his presidential address to the British Association. The result of Sir Douglas Galton's efforts was that a Parliamentary committee was formed five years ago to investigate and to ascertain the advisability of founding such a laboratory. At first it was contemplated to inaugurate the undertaking at Kew in connection with the observatory there, but after careful consideration it was decided that such a step might interfere with the work of the observatory, so it was resolved to establish the institution at Bushy House, Teddington. The government supported the scheme by a grant of $100,000, and several manufacturers throughout the country extended financial assistance. The late Queen Victoria presented Bushy House, a former royal residence, to the society for conversion into workshops and laboratories.

The work of the institution will exercise a great influence upon the scientific and industrial prosperity of the country. The work will be divided into two principal ramifications—physics and engineering. There will also be an observatory department, which will be carried on at Kew Observatory as heretofore. One of the first and most important aims of the institution will be the foundation of accurate standards. This has long been regarded as absolutely imperative by British manufacturers in view of the success of the system in this country, but the object has never been accomplished owing to the absence of a central agency by which it might be carried out.

The work of the British Alloys Research Committee, commenced by the Institution of Mechanical Engineers, will be continued by the society. This work is of the greatest assistance to those manufacturers who use iron and steel under varying conditions. It affords them an exact standard for combining iron with various alloys, and for heating in the most effectual way to get the best results. Another important research will be in connection with the foundation of a wind pressure standard for bridges. At present the Board of Trade, which is responsible for the safety of such structures, insists upon a maximum wind pressure of 56 pounds per square foot. The determination of the wind pressure is a difficult and intricate process, and an ideal wind gage can only be obtained after the expenditure of considerable engineering skill, patience and time. But it is generally conceded that the Board of Trade maximum pressure of 56 pounds per square foot is excessive, the result of which is that unnecessary expense is incurred in the erection of such structures. The laboratory, therefore, intends to discover the exact wind pressure required in a bridge to insure safety.

The testing of steam gages for boilers will be another important feature of the institution. Electrical and mechanical instruments, thermometers, metals, lenses, etc., will be tested, and the standardization of weights and measures of a kind necessary for laboratory purposes will be carried out. The main object of the tests will be the improvement of materials, and for this purpose the highest standard will be established as the ideal.

The Institute of Naval Architects has decided to erect, equip and maintain a testing tank after the design of the late M. Froude, and similar to that in use at the navy yard at Washington, for the determination of data relating to vessels. At the present moment there is only one shipyard in the world, outside of the naval departments of various nations, which possesses a testing tank, replete with every modern appliance. This is Messrs. Denny & Co., the eminent firm on the Clyde, Scotland, and this firm has found such an acquisition invaluable in connection with its shipbuilding work.

The laboratory will be under the directorship of Mr. R. T. Glazebrook, former principal of the University College, Liverpool, with an experienced staff of assistants. The maintenance of the institution will be largely dependent upon manufacturers, although the government is extending its support. Salaries will alone represent an item of $20,000 per annum, which sum will increase as the work of the laboratory develops.

Nature Study.

Prof. Bailey, of Cornell University, gives a weighty answer to the question: "What is nature study?" It is, he says, a point of view, the acquirement of sympathy with and interest in the natural world around us. We live in this world, and the better we fit it the better for us. It is for this reason that nature study deserves a place in the school studies of children. Primarily, the object of nature study is not the acquisition of mere information. Nature study is not "method" in the sense that the word is used in pedagogy. In another sense scientific method is of the very essence of nature study, it would seem. A child asks: "How old is the world? How long have men lived on it? Why has a tiger stripes? Why do certain flowers have exactly such shapes and no others?" To answer these questions the child must be made to comprehend the methods at the base of geology, zoology, botany. And in this sense it would seem that method is of the very essence of nature study.

The object of such studies is not to make the child a specialist or a scientist. It is to make him a citizen of the world he lives in—to interest him in plants and birds and insects and running brooks. The crop of scientists will take care of itself. Much is often unwisely sacrificed to a so-called "thoroughness"—which, in many cases takes the form of a perfunctory drill in mere acts. Accuracy is, of course, a prime requisite of all good teaching, but it is necessary, first of all, to awaken genuine interest. The first essential is direct, discriminating, accurate observation. The next is to understand why, and the third is the desire to know more. The final result should be the development of a keen personal interest in every natural object and phenomenon.

A new railroad bridge which is to be constructed over the river Tyne at Newcastle, England, will be the largest bridge-building undertaking in the United Kingdom since the completion of the famous Forth Bridge. The work has been designed by Mr. Clark [illegible]. Harrison, the chief engineer of the North-Eastern Railroad Company, and its cost will approximate $2,350,000. The new bridge will carry three lines of railroad, there being a length of over half a mile of viaduct. There will be three large spans of steelwork, the abutments and masonry supporting which will be of gray granite. The foundations of the piers will be constructed by the aid of large cofferdams and steel caissons. The rail level above high water will be 110 feet. There will be some 8,000 tons of steel used in the structure. The work, it is computed, will occupy two years to complete.