GOVERNMENT FUEL TESTS AT JAMESTOWN.

The government fuel-testing plant, which for two years was in operation at St. Louis, has been moved by the order of Congress to Norfolk, where it has been located near the main entrance to the Jamestown exposition. In the course of the work done at St. Louis, the United States Geological Survey in charge of the plant showed that by more economical methods of burning the coal, it would be possible to make a saving of ten per cent of the total coal consumption of the country each year, an amount which would represent a saving in value of $160,000,000 annually. The work now to be undertaken at the testing plant will be devoted, first, to increasing efficiency and so preventing waste of the fuel resources of the country, and secondly to the testing of coal used by the government, particularly on warships. Under the first head, the most valuable tests will be those made to determine the relative efficiency of the steam boiler and the gas producer. Already it has been demonstrated at this plant that the gas engine is capable of producing over 100 per cent more work from a pound of coal than can be secured from the average steam engine. Experiments in this connection will be continued with the 235-horse-power internal-combustion engine which forms part of the plant. It is to be supplied with gas made in two producers from the same grades of fuels that will be used in the boilers. It is proposed to make in this way comparative tests of the poorer fuels, such as slack coals, culm, lignite, and peat. Particularly valuable to steam users will be the result obtained by the engineer in charge of the steam division of the plant, Prof. L. P. Breckenridge, who has already succeeded, or practically so, in separating the results obtained in the boiler from those obtained in the furnace; and particular attention is to be paid to the efficiency of the furnace alone. Exhaustive tests will be made to determine what conditions are necessary to burn these low-grade fuels without smoke, and the lessons learned will be valuable, not only from the standpoint of economy, but also as tending to abate the ever-present smoke nuisance.

In its work of testing fuels for the navy, the testing plant will have at its service three briquetting machines; one of German make, which will be used for briquetting the lignites of Texas and the Northwest; another an English machine, which has already been in use at the plant in St. Louis; and also an American-made machine. Although the advantages of briquetting have been thoroughly understood for many years in Europe, this form of fuel has not received the attention it deserves in the United States; and it is hoped that the work of the testing bureau on American coals will prove that briquetting will give as good, if not better, results than are obtained from lump coal taken from the same mine as that from which the coal for the briquettes is secured. For the navy, the briquette should prove especially useful; for it is practically smokeless, and concealment and invisibility are most important factors in the strategy of war. It will probably be shown in the forthcoming tests, that in locomotive boilers or marine boilers using any forced draft system, the use of the coal in briquette form so largely increases its efficiency as to more than offset the cost of briquetting.

Other tests, which should yield valuable results, will be made with five 15-horse-power gasoline engines, which have been erected at the plant for the purpose of testing the relative efficiency of gasoline, kerosene, denatured alcohol, and other liquid fuels, in the production of power and light. Finally, an investigation will be made to determine the exact cause of the spontaneous combustion of stored coal, and upon the results obtained recommendations will be made as to the best methods of storing.

THE 24-HOUR AUTOMOBILE RACE ON THE BRIGHTON BEACH TRACK.

Since it has been decided that there will be no Vanderbilt Cup or other big road race this year, interest has centered chiefly in the new form of track race—the 24-hour event. Several of these races have been held on race tracks at various places, the latest and most successful one having been run off on the Brighton Beach track on the 9th and 10th instant. Fifteen machines started in this race, as follows: A 60 horse-power Thomas, 40 horse-power Lozier, Jackson, and Mitchell cars, a 50-horse-power Darracq, a 45-horse-power Delahaye, 35 and 28 horse-power Oldsmobiles, a 28-32 horse-power Pilain, a 35-horse-power Stoddard-Dayton, 40-horse-power Matheson, 50-horse-power De Dietrich, Welch, and Frayer-Miller cars, and a 60-horse-power Lozier. With two exceptions—the Thomas and the De Dietrich—two drivers were provided for each car, one to relieve the other. The race was started at 10:20 P. M. Within the first hour, several cars were obliged to stop to light their red tail lights. Much trouble was experienced from these lights going out during the night hours of the contest. The De Dietrich, after making a round on three cylinders, pulled into the center of the oval and renewed a blown-out gasket on its engine. This car had considerable trouble from this cause. The tire repair stations within the oval were early called upon. The Stoddard-Dayton was kept waiting for nearly four hours as a result of tire trouble and a demolished rim. It was finally withdrawn after 16 hours, during which it covered 216 miles.

Other cars that were soon obliged to drop out were the 60-horse-power Lozier, the Frayer-Miller, the De Dietrich, and the Pilain. The first two, owing to a sharp turn in a soft spot (which caused the tie rod connecting the front wheels to break) and the bursting of a front tire respectively, ran through the fence and were damaged sufficiently to put them out of the race; while the two French cars quit after cracking two cylinders and demolishing a front wheel. The latter accident caused the Pilain to run through the inner fence and injure a number of spectators who were sitting thereon. In less than three hours the car was running again, but on account of a cracked frame it was ruled off the track. It covered 219 miles, while the De Dietrich covered 311. Both were withdrawn at the end of the ninth hour. The Frayer-Miller (which was the sole representative of the air-cooled cars) covered 268 miles in 6 hours and was in first place at the time of its accident. The Lozier covered 104 miles in 3 hours before it dropped out. From the end of the sixth to the end of the twenty-third hour the Jackson led, with the Thomas second and the 40-horse-power Lozier third. During the last hour of the race, the Jackson had trouble with its timing gear owing to a set-screw loosening. The motor misfired badly and finally stopped. The 60-horse-power Thomas, which had been gaining gradually upon its 40-horse-power rival, then assumed the lead, and finally finished with 997 miles to its credit, while the Lozier had 972, and the Jackson 966. The 40-horse-power Mitchell, which had been doing some very consistent running after experiencing a broken fan and damaged radiator in the first hours of the race, was fourth with a score of 774 miles. Only two other machines, the French Delahaye and Darracq cars, were still in the race at the finish. These cars scored 720 and 560 miles respectively. Each of them experienced various troubles that kept them off the track for long stretches at a time, and neither of them was actually running when the finish occurred.

THE CURRENT SUPPLEMENT.

Tebessa, though not one of the largest, is one of the most interesting towns of French Algeria, chiefly because it is the Theveste of the Romans. Its archæological curiosities are interestingly described and illustrated in the opening article of the current SUPPLEMENT, No. 1651. In an article entitled "Photodynamic Phenomena," Prof. Henry von Tappeiner describes some luminous animals and plants. The first installment of a most thorough treatise by Col. C. W. Larned, of the United States Military Academy, on the history of map making and topography, is published. Heavy freight trains are historically and mechanically discussed. Every student of mechanism knows the difficulties that have been encountered in fully grasping the meaning conveyed by a textbook description of the properties of a particular mechanism, and the effect of altering its proportions. An English engineer has devised an apparatus for overcoming such difficulties. This is called the Newman kinematic apparatus for the study of mechanism, and is described in the current SUPPLEMENT. A new system for laying and fixing rails for street surface railroads is explained by the English correspondent of the SCIENTIFIC AMERICAN. Francis Elgar's excellent paper on unsolved problems in the design and propulsion of ships is concluded. Horace C. Hovey gives a picturesque account of the Mammoth Cave Cathedral. To simplify the mechanical construction of storage batteries, and at the same time to improve their operation and increase their efficiency, is the avowed object of two inventions by Thomas A. Edison, which form the subject of an article in the current SUPPLEMENT. The presidential address before the British Association for the Advancement of Science was delivered by Sir David Gill, who took as his subject the science of measurement and its application to astronomical research. An extensive abstract of this paper appears in the current SUPPLEMENT.

It is reported that President Roosevelt has approved certain suggestions as to new coinage which have been made by the American Numismatic Society, and that he has called for a report from the Secretary of the Treasury. A new coinage of the eagle and double eagle, from designs by the late Augustus St. Gaudens, is already in hand. A strong committee of the Numismatic Society recommends that Congress be petitioned to authorize an entirely new coinage of artistic design, to consist of ten denominations, and in order that the designs of the new coins be truly artistic the best talent in the country should be called upon to submit drawings. The resolutions read: "That the sum of $10,000 be appropriated for each special coin model, without regard to the monetary value of the coin to be issued, whether a cent or a twenty-dollar gold-piece, as it is important to have the smallest coins as artistic as the highest. That the six best designs received for each piece shall be awarded $1,000 each from the above sum of $10,000, and that the committee hereinafter proposed shall have the right to select the best of the six designs, and to accept the model with or without modification by the designer, paying the successful competitor an additional sum of $4,000."

SCIENCE NOTES.

The sea around Bermuda has long been noted for the wealth of its zoological life. In many of the shallow, clear waters around the coast it is possible for visitors to scan the ocean bottom, where the brilliant coloring of corals, plants, and animals can be plainly seen. A laboratory for biological research has already been established in Bermuda, and its work will probably receive an impetus from an interesting forthcoming visit. The Seventh International Zoological Congress, held in Boston August 19 to 23, has arranged for an excursion to Bermuda in order to give the members of the Congress an excellent opportunity to get a glimpse of this most interesting zoological region and to become acquainted with the manner in which the work is conducted. The local programme of the trip will include several collecting and dredging trips, so that those who go there will have an opportunity to collect and preserve much material.

Archæological work is being carried on in the island of the Nile known as Elephantine, under the auspices of the French government and directed by M. Clermont-Ganneau. This island is situated in the middle of the Nile, not far from the first cataract. Owing to the character of the ground, the work of excavation is somewhat difficult; but a number of objects, some of which are of considerable value, have been found. Among these may be mentioned two large steles of diorite, covered with inscriptions of Thotmes III. A curious kind of sanctuary decorated with miniature obelisks and covering a spot which was used for burying the bodies of sacred animals was also found. These animals proved to be rams, carefully mummified and buried in sarcophagi of granite. The wrappings of the mummies are gilded and ornamented with painted scenes of a mythological character and bear inscriptions. The ram was among the sacred animals of Egypt, and seems to have been specially consecrated to the deity Khnoum, one of the principal deities of the island. Among other finds are many fragments of texts inscribed upon pieces of pottery and known as *ostraca*. The inscriptions are in hieroglyphic, hieratic, demotic, Greek, Arab and Coptic, and there are about a hundred in all. The presence of the Aramean language shows that even as far back as the fifth century B. C. the island was inhabited by the Jews, as also the neighboring locality of Aswan. Papyrus inscriptions had already proved this fact, but now we find just what quarter of the ancient city was inhabited by the colony of Jews; as the *ostraca* are not found anywhere else. According to the records a Jewish temple must have existed in this locality, and the excavators are hopeful of finding it.

From time to time lumps of butter are dug out of the Irish bogs, and specimens of it may be seen in various museums. A chemical examination has recently been made by Messrs. Radcliffe and Maddocks of a sample of such butter, which was found four feet below the surface of a bog at Maghery, county Tyrone. The original lump, which weighed about 20 pounds, is probably some centuries old, and it is suggested that it had been put into peat water to preserve it, or to give it a flavor, and had then been forgotten. Yet so effectually had the fat been preserved by the peat water that it still retained many of the chemical characteristics of butter fat, though naturally its appearance had greatly changed. The exterior was white and granular, and the whole mass had been converted into a wax-like material. The conclusion that it had once been butter, however, was confirmed by the fact that numerous cows' hairs were present. A similar alteration of animal fats when buried in the earth for a long period has frequently been noticed, and the wax-like product is known as "adipocere." The name originated with Fourcroy, who, in 1789, communicated to the French Académie des Sciences the results of his examination of the fat of some of the bodies transferred from the church graveyards to the Catacombs of Paris. The change in the fat was most noticeable in the case of bodies that had been buried about fifteen years and originally crowded together, the bones being then coated with a gray plastic substance. Fourcroy came to the conclusion that this adipocere ("fat-wax") was formed by the slow decomposition of any animal substance, with the exception of bones, hair, and nails; but Chevreul, who studied the phenomenon in 1812, showed that only the fat originally present was affected in this way, and his conclusion was confirmed by Gay-Lussac.