

of our machines—a feature of the greatest value in countries where skilled labor is comparatively scarce. The American locomotive bears the stamp of the practical men who have evolved it. It is essentially a "handy" machine. Moreover, the fact that its design has been modified by the requirements of the rough track and roadbed of our early railroads make it singularly well adapted to the new roads which are being built in such countries as Russia and Japan. The bar frame, the equalizing lever and the swinging truck combined give to the American locomotive a vertical and lateral flexibility which enables it to ride safely over track which would ditch a plate-frame engine before it had run a mile. It is also greatly in its favor that the generous proportions of its boiler give it a reserve capacity which must always render it popular with the superintendent and his staff of engineers.

In four years our exports of locomotives have risen from 195 to 338, and if the present rate of growth keeps up, we may hope before long to take a leading position in this important branch of the industry.

#### GUN OF NEW TYPE SUCCESSFULLY TESTED.

A very interesting and highly satisfactory preliminary test of a new type of steel gun was conducted during the latter part of January, at the Sandy Hook Proving Ground. The gun, which is of the 5-inch rapid-fire class, is so simple in construction that no drawings are needed to describe it to our readers. It is made of a single forging of steel, which, having followed the course of manufacture usual for large gun forgings, was, at a proper stage of manufacture, cooled from the interior from such temperature as to produce properly disposed initial strains of such intensity as would place the wall of the gun in the best condition to resist interior pressure.

The manufacture of the gun is due to the suggestions of Capt. F. E. Hobbs, Ordnance Department, United States army, who pointed out several years ago to the chief of ordnance the advantages that could be obtained in the manufacture of guns by applying to forgings a modification of the Rodman principle of casting guns; that the process as applied to forgings could be made to produce exactly the initial strains desired; that these strains could be easily increased or diminished at little cost and that guns so made, while quite as strong, would be much cheaper to make than those built up.

An experimental forging made under Capt. Hobbs' direction at the Bethlehem Iron Works showed such excellent results, on being cut up and carefully examined, that the chief of ordnance ordered this 5-inch gun to be manufactured.

The thickness of metal which the gun should have and the proper initial strains to be applied to give great strength were computed by Capt. R. Birnie, ordnance department, from his formulæ on the strength of guns. Capt. Birnie was an early convert to the methods of manufacture proposed, and has materially assisted Capt. Hobbs in perfecting the details of plans.

The gun is fitted with Gordon's breech mechanism, uses fixed ammunition, smokeless powder, a projectile weighing 55 pounds, can be fired from six to ten times per minute, depending upon the conditions of loading and aiming, and has a range of more than six miles. In the Sandy Hook tests a velocity of over 2,700 feet per second at the muzzle was shown, and in the special high pressure test to which the gun was subjected, pressures were registered of nearly 50,000 pounds per square inch.

The method of manufacture can be applied to forgings of any size that can be turned out by the steel-producing plants of the country; consequently, the caliber of gun which can be made of a single forging may be, to-day, set at 8-inch, but, by using this method, the number of parts in guns of larger caliber could be much reduced, while the guns themselves would be stronger.

It is probable, also, that the commercial engineering interests of the country will be found ere long following the lead of the ordnance department in this latest improvement in the treatment of steel forgings, as they did many years ago, in demanding for their structures oil-tempered and annealed steel forgings, after that department of the army had shown conclusively, by careful experimental investigation and by actual test, the safety and superiority of such metal.

#### A BRIEF REVIEW OF SOME BRANCHES OF THE WORK, SCIENTIFIC AND PRACTICAL, OF THE HEALTH DEPARTMENT OF THE CITY OF NEW YORK.

In view of the fact that the daily papers have called attention to a bill introduced in the legislature, by which it is proposed to curtail to a great extent the powers of the New York City Board of Health, it will be of interest to the readers of the SCIENTIFIC AMERICAN to know just what this board has accomplished in the last few years.

It is not the province of this article to go into an extended account of all the work of this department. Such an account can be found in the reports of the board to the Mayor. A summary statement of the most important work only can be given. The work of

the department to which we shall refer might aptly be placed in two divisions—first, scientific research, and, second, the practical application of the same in the interests of public health. The whole of this work is in charge of the sanitary superintendent, who, with the co-operation of his divisional superintendents, has been enabled to make a truly marvelous showing in the sanitary condition of the city.

The research work, which is mainly carried on by the division of pathology and bacteriology, includes the study of the cause and effect of diseases, and their prevention and cure.

Every facility has been offered for this. Competent investigators with fully equipped laboratories are at their disposal.

Careful study has been made of the more important contagious diseases, so that the department is prepared to cope with any epidemic that might occur.

This division also makes and prepares for administration to the people the following antitoxic remedies: Diphtheria antitoxin for the prevention and cure of diphtheria; tetanus antitoxin, for the prevention and cure of lockjaw; vaccine virus, for the prevention of smallpox; tuberculin, for the diagnosis of tuberculosis (consumption); mallein, for the diagnosis of glanders in horses.

Other biological products of the laboratories that are being tested with a view of ascertaining their usefulness are: Typhoid antitoxin, for the cure of typhoid fever; streptococcus antitoxin, for streptococcal infection, such as occurs in erysipelas, tuberculosis, puerperal fever, scarlet fever, septicæmia, etc.; pneumococcus antitoxin, for the cure of pneumonia; antirabic virus, for the prevention of hydrophobia.

It is in the practical application of the products of the laboratories that their effectiveness is demonstrated. This is probably best seen in the treatment of diphtheria by antitoxin. The number of deaths caused by this disease have been reduced over fifty per cent since the use of this remedy was inaugurated, and it is needless to add that it has also been robbed of many of its most appalling features.

The department has diagnosis laboratories, where the bacteriological diagnosis of diphtheria, tuberculosis and typhoid fever is made.

During the year 1896, 25,049 cultures were examined for diphtheria bacilli; 1,856 specimens of sputum from cases of suspected tuberculosis were examined for tubercle bacilli; 16,796 vials of diphtheria antitoxin were issued; 918 cases of diphtheria were treated in their homes by the medical attaches of the laboratories, and 1,214 persons were immunized.

The diagnosis laboratories are of great benefit to the physicians of the city, in confirming their diagnoses. They are utilized by the physician in the following manner: A case of diphtheria, for example, occurs in the private practice of a physician; he makes a culture from the throat of the affected person, and sends it to the laboratory for examination. The day following that on which the culture is made he receives a report from the laboratory, which states whether or not the diphtheria bacillus is present. Stations are located at convenient places throughout the city, where physicians can obtain the culture tubes and where they can leave the tubes after the culture has been made. Collections are made from these stations every afternoon. In the cases of tuberculosis and typhoid fever the suspected discharges are sent to the laboratories in the same way, and are examined there bacteriologically.

A special corps of inspectors is assigned to the administration of diphtheria antitoxin, and, on request, one of these inspectors will visit a person suffering from diphtheria in any part of the city, day or night, and administer diphtheria antitoxin, under the supervision of the attending physician.

Dwellings and tenement houses where tuberculosis exists are under sanitary supervision and, as occasion calls for, are inspected and disinfected. There were over ten thousand inspections and disinfections for this disease alone in the year 1897. A number of tenement houses which were unfit for habitation, on account of their bad sanitary condition, have been condemned and torn down.

The disinfecting plant of the department is equipped with the necessary appliances to meet the needs of a city of the importance of New York. It is provided with apparatus for disinfecting by dry heat, steam, formalin gas and sulphur. Medical supervision of the public schools is exercised to the extent of keeping contagious diseases out of them.

Food products are kept under close watch, so that, as far as possible, the people are given the benefit of only the purest and best. Milk cows in the city have been inspected, for the purpose of ascertaining the existence of tuberculosis among them, and where cows have been found affected with this disease they have been removed from the herds.

Horses suffering from glanders are also removed to places where they do not become a source of danger to other animals.

Investigations made by the department, showing that the dust in the street cars and various public places is often infectious, led to the enactment of an amend-

ment to the Sanitary Code prohibiting spitting on the floors of street cars, ferry boats and other public conveyances, and requiring that all companies should post in their cars, boats, etc., printed notices forbidding this.

It is safe to assume that New York is as jealously guarded in the matter of public health as any city in the world.

#### EXCAVATIONS AT BRANCHIDÆ.

The Archæologischer Anzeiger contains in its current number (1897.2) a letter of great architectural interest from M. Haussonllier respecting the excavations on the site of the Branchidæ Temple of Apollo at Delphi. Some account has already appeared in the Bulletin de l'Académie des Inscriptions et Belles Lettres, January 15, and M. Haussonllier's letter to the Anzeiger is supplementary to this. It is illustrated by a photographic view of the front of the temple as at present disengaged. M. Haussonllier reports as follows:

The whole of the principal façade of the temple is now laid bare. It stood on a basis of seven steps, further subdivided to form an approach of thirteen steps, extending over the five central intercolumniations. This approach was shut in north and south by two pylons placed against the thirteenth column, starting from the angle column. These pylons, therefore, stand exactly where the line of the cellar wall, if produced, would fall. They would seem to have been intended to serve as bases to sculptural groups never actually erected. The principal façade of the temple was never completely finished. Both the steps near the pylons bear mason's marks, which would have disappeared in the final process of finishing. The façade consisted of ten columns, not one of which is standing. Of the bases of these columns, two were taken to the Louvre by Rayet and Thomas in 1873; the remaining eight have now come to light.

Like the steps and pylons, none of the bases are completely finished off. The bases are richly ornamented and pure in style, but unquestionably the most interesting point is the peculiar and so far unique character of the capitals. These are decorated with two heads of divinities, each taking the place of a volute; between the two heads in the middle of the capital is the head of a bull. This last feature has, of course, appeared before in Greek capitals, but no example hitherto has been known of the head of a god as a decoration to a capital. The two gods represented in the Didymæan capitals are Apollo and Zeus; one head of a bull has also been found. All three heads are fine specimens of decorative sculpture—large and impressive in style, and recalling in some respects the Pergamene school. The frieze also was adorned with sculptures of similar character, including a series of heads of Medusa—one placed above each capital.

A number of inscriptions complete the architectural interest of the excavations, among them a record of the expenses incurred in the erection of the temple. From these inscriptions we learn the regulations in force during the building and many of the architectural terms employed, and more important still, the date of the temple; the work of building was in full course in the middle of the second century B. C. Altogether the Didymæan Temple forms now an important chapter in the history of Greek architecture.—Architecture and Building.

#### THE CURRENT SUPPLEMENT.

The current number of the SUPPLEMENT, No. 1154, contains a number of articles of prime importance. "Chief Joseph and the Nez Percé War" describes some interesting events in connection with the recent Indian wars. "The Lateen Ice Boat," by H. Percy Ashley, describes the construction of a speedy ice craft. It is accompanied by full working drawings and particulars which will enable the amateur to construct such a boat. This article is published in response to many inquiries which we have received from our readers. "The Italian Marble Mountains of Serravezza" is the subject of a most interesting and unusual article. These quarries were opened at the beginning of the sixteenth century by Michelangelo, but could not be worked in his time by reason of lack of means of transportation, but at the present time the quarries are producing marble which is superior to that of Carrara. "The Trans-Mississippi and International Exposition at Omaha" is an article which describes the new exposition which will open June 1, 1898, and will continue open for five months. It is illustrated by a bird's eye view and illustrations of some of the buildings. "The Philosophy of Hyper-Space," by Prof. Simon Newcomb, is an interesting address. "The Liquefaction of Air and the Detection of Impurities (Separation of Helium from the Gas of the King's Well, Bath)" is an article by Prof. James Dewar.

G. D. BRILL, the Cornell graduate recently appointed director of a model farm and agricultural school at Wuchang, China, by Viceroy Chang Chi Tung, has now been appointed special Commissioner of Agriculture to China by Secretary Wilson, of the United States Department of Agriculture.