

laboratory for examination as to the per cent. of bitumen contained in them, the mesh composition and character of the mineral aggregate and the physical and chemical characteristics of the asphaltic cement or bituminous binder used in the pavement. Wherever these samples are cut out, careful note should be made of the depth of the pavement at this point. In many instances it will also be necessary to cut through the foundation to determine its character and thickness. Laboratory examinations of concrete foundations are usually not very valuable in determining the amount of cement which has been used in them, but a combination of physical and chemical tests of the foundation will often establish satisfactorily whether or not they have been defective. The method of examination used will, of course, have to be varied depending upon circumstances and the character of the defects which have been developed. The reasons for these defects have been fully covered by a previous lecture delivered by the speaker to which he would refer you for more detailed information on this point.

### PANAMA-PACIFIC EXPOSITION CONSTRUCTION.

Rapid progress is being made on the construction work in connection with the numerous large wooden buildings for the Panama-Pacific International Exposition at San Francisco. Among the principal buildings already erected are the Palace of Machinery, covering three acres, the Fire House, the Education Building, the passenger station, and warehouses, ferry slips and oil houses. The framework has been started for the buildings for Mines and Metallurgy, Various Industries, Manufactures, Liberal Arts, Food Products and Agriculture.

Thirty-five states and territories and certain of the foreign governments have announced their intentions to secure space; 177 congresses and conventions have been arranged to meet in San Francisco during the fair, and an attendance of from 10,000,000 to 18,000,000 is anticipated for the exposition. It is said that neither Germany nor England will take exhibit space.

The cost of the exposition is estimated at \$80,000,000, of which the state of California and the city of San Francisco will each pay \$5,000,000, San Francisco subscribes \$7,500,000 and individual exhibitors \$25,000,000.

The Toronto Suburban Railway Company has just closed a contract with the Canadian General Electric Company, Limited, for substation apparatus and car equipments, for the new line which will run west from Toronto through Georgetown, Guelph and Berlin. A very interesting feature is that this will be the first interurban line in Canada to operate at 1,500-volts D.C. The catenary type of overhead construction will be used, and there will be three substations, viz., at Islington, Georgetown, and Guelph. 1,500-volt rotary converters, each of 500-k.w. capacity, will be used, power being transmitted to the substations at 25,000 volts. Provision will be made for the supply of power from a separate bank of transformers in each substation for distribution along the line for miscellaneous power and lighting purposes. The cars will be equipped with four 85-h.p. motors of the latest type, and fully ventilated. The control will be of the multiple-unit type. The cars will operate on 600-volt line at approximately half normal speed; and changing from 1,500-volt to 600-volt trolley, or vice-versa, will involve no loss of time in adjustment of control apparatus. The line with 1,500 volt operation will be about 62 miles long.

### EFFICIENT WATER PURIFICATION IN SMALL PLANTS.

SEVERAL interesting papers and reports have recently appeared dealing with the operation of sewage disposal plants and emphasizing the necessity for more careful supervision of this kind of municipal work. It is well known to all who have investigated the matter that small sewage disposal plants receive as a rule little or no attention, and that their effluents could be greatly improved under proper operation.

As an instance of the application of this reasoning to water purification plants, one of our smaller cities operates a filter plant at an average efficiency of 79 per cent., and which was at one period as low as 50 per cent., whereas, according to a report just received from a consulting engineer, who has made a thorough examination of the system, an efficiency of 95 per cent. could be maintained if the plant was placed under proper scientific supervision.

Mr. H. P. Letton read a valuable paper on the subject, at a meeting of the New England Water Works Association recently. Mr. Letton was for some years in the employ of the New Jersey State Board of Health, engaged mainly in the supervision of the public water supplies of the state. He is now sanitary engineer to the United States Public Health Service. In his former position about 30 water purification plants were under constant inspection.

According to his paper, the main difference between the operation of sewage disposal plants and small water purification plants is that the former are usually built, not because there is a concerted demand for them, but for the eradication of a local nuisance, or by order of some higher authority. Because of this fact, and because the terms "sewage" and "sewage disposal" are distasteful to the average layman, the plant is generally put in an out-of-the-way place, and either forgotten entirely or placed in the charge of an underpaid, superannuated caretaker, who knows nothing of the principles upon which the design of the plant is based; while a water purification plant is generally installed as a result of a popular demand, and the consumer is directly interested in its operation in so far as furnishing a clear, colorless, and palatable water is concerned. These are the qualities that to the majority of people determine the purity of the water, and as long as they are maintained there is little or no question as to the efficiency of the plant in other ways. As a matter of fact, however, there are many plants which will usually meet the above conditions, but which are inefficient, both from an economic and a sanitary standpoint.

It is only on rare occasions that a filtration plant has been constructed at the time of the installation of the water works system. In most cases, when the purification plant is added to an existing system, the operation of it is intrusted to the engineer of the old plant. This man may be, and in many cases is, a stationary engineer who thoroughly understands the operation of boilers, engines, and pumps, but who has absolutely no idea of the principles which underlie the process of water purification.

There is also another point which in many cases affects the results obtained. When it is decided that some form of purification is advisable in connection with a small water plant, it is very rare, indeed, that a consulting engineer is called in for advice. Instead, the matter is taken up with one or more companies engaged in the business of installing purification apparatus. While