

tives, and the logical result is neglect of those vital points which make the plant efficient.

In discussing the paper Prof. Geo. C. Whipple, of Harvard University, expresses his opinion to be that the safety of such plants must lie in the education of the low-salaried attendant and in the selection of such sources of supply that irregularities in operation will produce less disastrous results than in the case of larger plants where a higher grade of supervision is possible. To secure the better appreciation by the operator of the general principles of sanitation, and a better understanding of the work which a particular filter is capable of doing, the supervision of the state authorities should be not so much punitive as pedagogical.

Another remedy that has been suggested is the establishment of laboratories at convenient points to serve two or more small plants. Another is the employment of a consulting engineer in connection with operation as well as with installation. A third advocates a capable supervising engineer over several small systems on a co-operative working agreement.

The importance of efficiency in a plant of small capacity is as great to that community as it is in the case of any other plant. The question of placing water supply problems in every case in the hands of those who can deal scientifically with them has not received the attention it deserves. It is becoming more and more evident that the engineer must work in conjunction with the chemist and the bacteriologist in solving them. For small municipalities, therefore, there appears to be much of value in co-operation, each contributing toward the maintenance of such services.

### PRESERVATION OF REFERENCES.

The engineer who is seeking a new position and who is fortunate enough to possess a valuable set of creditable and convincing references should consider them in the same light as he would any other property which is of value. The man who finds himself out of employment hastens, too often, to launch applications promiscuously, enclosing with them his original testimonials, and when they thus pass out of his possession they do not always return.

There is no advantage to be derived from a transmittal of the original references with letters of application for positions. Carbon copies fully convey the desired information, and do not entail a serious loss if they are mislaid. Moreover, an employer whose custom it is to place dependence upon such evidences of ability, training, character, etc., will see to it that they are bona fide before converting the applicant into an employee.

At first thought this may appear a trivial subject, but we are prompted to impart the advice by the experience of our Employment Bureau. Letters are being received continuously with the original references enclosed. Other applicants regret inability to furnish references owing to their having been previously lost or to their being out "on duty" in connection with another application. Frequently inquiries are received as to the safe keeping of these commodities.

The Canadian Engineer Employment Bureau keeps a permanent record of the professional standing and experience of its applicants for positions. Testimonials are preserved therewith in order to render the service more complete. Carbon copies are all that are required, it being understood that the original of each is in the proper possession of the applicant in order that he may have immediate recourse to them when an employer is disposed to consider original references only.

### LETTER TO THE EDITOR.

#### THE BILLING'S BRIDGE (OTTAWA) DESIGN.

Sir,—It was not the writer's intention to enter into a controversy with anyone about the Billing's bridge at Ottawa. My only intention was to draw attention to the all too prevalent practice of building light floors on highway bridges. Mr. Henham, in his letter in *The Canadian Engineer* of February 19th, has made several statements which are so far removed from the facts that I feel obliged to correct them.

In the first place, I cannot agree with him when he uses  $\frac{wl^2}{12}$  as the formula for the bending moment. I

have never seen a specification of any authority which would permit such use. The general formula specified for continuous beams is  $\frac{wl^2}{10}$ , or, as some specifications

state, "— of the bending moment figured as a simple beam." (See clause 14, page 9, of the General Specifications for Concrete Highway Bridges of the Ontario Highway Board.)

In the second place, he states that "dividing the bending moment by the moment of resistance of the steel gives the sectional area required per ft. of width as 0.6 sq. in." I fail to understand what Mr. Henham means by this.

If the slab were designed properly, the moment of resistance of the steel would equal the moment of resistance of the concrete, and also the bending moment in the slab. This condition of design is obtained when the bending moment,  $M = 108 bd^2$  (where  $b$  = width of beam and  $d$  = effective depth), and when .78% of  $bd$  is the area of steel supplied. The above figures are only true when the compressive value of the concrete is assumed at 650 pds. per sq. in. and the tensile value of the steel is 16,000 pds. per sq. in. These are the most common values used. The deductions of these formulæ are to be found in any up-to-date text book on reinforced concrete. The bending moment as given by Mr. Henham is 3,500 ft. pds., or rather 4,200 ft. pds. when we use

the formula  $\frac{wl^2}{10}$ . For this moment we require a slab of  $6\frac{1}{4}$  inches effective depth.

In the third place, I cannot see how Mr. Henham can figure the truck load as 3,800 pds. per ft. of width. Taking his distribution of loading, i.e., 1.16 ft. x 1.83 ft. (the 1.83 dimension at right angles to stringers), this gives, in my opinion, a loading of  $\frac{8,000}{1.16} = 7,175$  pds., and

this load is uniform on the slab for width of 1.83 ft. The resulting bending moment is 4,630 ft. pds. and requires a slab of  $6\frac{1}{2}$  in. effective depth.

The loading Mr. Henham used is all right, the difficulty seeming to be in the design of the slab.

E. M. PROCTOR.

Toronto, February 24th, 1914.

#### DOMINION LAND SURVEYORS' ASSOCIATION.

The eighth annual dinner of the Association of Dominion Land Surveyors will be held at the Chateau Laurier, Ottawa, on March 3rd, at 8 p.m.