the stresses are well within the elastic limit of the material, has on the bond between concrete and the steel that reinforces it. The work ought properly to be undertaken by some officially recognised body of experimenters; but, by whomsoever done, we think there is great need for such a work. Reinforced concrete is too valuable a material to be allowed to suffer for lack of investigation, and it cannot yet be argued that we know all that is to be learned about it.

Some very valuable experiments have lately been carried out in Australia by Professor W. H. Warren, of Sydney University, the object of which was to obtain data as to the exact amount of adhesion there is between concrete and steel. The results of these were given in a paper read before the Royal Society of New South Wales, September 6 last, and the figures given form an important addition to our knowledge of the subject. Something more than information of this kind is, however, required. It is not information about the adhesion between concrete and steel under quiet loads that is so much needed as about the effect that continued vibration may have on the adhesion. Such experiments as have so far been carried out are always welcome, but something more is desirable.—*Engineering.*

Electricity and Notes.

We learn that Mr. Francis Clarke, electrical engineer of the Christchurch Meat Co., has resigned.

* * * * * *

Mr. T. L. M. Millar, consulting and electrical engineer, of Belfast, Ireland, is on a health visit to New Zealand.

* * * * * *

The Wellington Meat Export Co. are now operating their large gas plant for the purpose of generating electricity, and the system is said to be entirely satisfactory.

* * * * * *

The new scheme for Timaru includes a three-wire, 440-volt lighting and power plant. There are to be about three hundred incandescent and twelve arc lamps, but nothing has yet been decided as to the size of the units to be installed.

* * * * * *

The Wellington Woollen Co. are extending their electrical plant, and have purchased a 33-k.w. 100-volt generator. This machine will operate in parallel with their present plant for lighting the new extensions.

* * * * * *

The New Plymouth people have in view the installation of an additional 100-k.w. turbine and generator for their power station. This will make the third set, and sufficient power will thereby be obtained for a considerable time to come.

* * * * * *

Since the appearance of the article in PROGRESS describing the Christchurch tramway power-house, a second Curtis turbine has been installed, and now it is proposed to extend the plant by adding a third machine of 500-k.w. capacity, also another Babcock and Wilcox boiler, thus making one boiler for each turbine. Great interest will be taken from time to time in the working of this plant.

* * * * * *

The proposal to raise a loan of £25,000 for the new destructer and generating plant for Auckland has now taken concrete form. Mr. W. G. T. Goodman, of Dunedin, has tended his report, and the committee have adopted his proposals. The lay-out for the engines, generators, boilers, battery, and foundations, etc., is £10,566, and for overhead feeders and distributing mains, £6,624.

* * * * * *

Suction gas-producer plants are meeting with such increased appreciation on the part of flax-millers in the Foxton district as to prompt us to suggest that a lighting set might easily be run off the respective engines without materially reducing their efficiency. Four producer plants have been installed in this district during the last three or four weeks.

* * * * * *

Borthwicks' freezing works at Hastings are now in full swing. The whole of the machinery, with the exception of the freezers, is driven by electricity, and there is little doubt that in time this motive power will be adopted by other large freezing companies in New Zealand. In the old days of steam plants hundreds of yards of belt-drive added expense and inconvenience to the cares of works proprietors. Now short belts, connected to electric motors, effect a saving in efficiency of from 15 to to 20 per cent., and cost very much less in up-keep.

* * * * * *

The Sydney City Council are to be congratulated on the figures of the electric lighting station there. In the last fifteen months the business done in supplying customers was equal to that which would have been transacted by the various private companies for the past ten years. At the end of the fifteen months the profit was shown to be £7,000. On the other hand, the Melbourne Corporation, at the end of eleven years' work, made a profit of only £10,000, though it is only fair to say that the Corporation bought out private companies, and thus increased its liability correlatively with its output.

* * * * * *

The electric lighting of our International Exhibition, which has been secured by Messrs. Scott Bros., Christchurch, is to include one unit of 120 k.w., two of 75 k.w., while about 50 k.w. will be supplied by the Christchurch Council. The illuminating of the main building will be left to gas, and we shall certainly witness keen competition between the two systems. A complete demonstration of the suitability of one over the other for this form of lighting should eventuate. The Art Gallery at the Exhibition will be lighted by arc lamps having concentric diffusers, and no doubt they will provide the required even diffusion of light.

* * * * * *

Illustrations were recently given in *La Locomotion Automobile* of a method of replacing oil lamps by small incandescent electric lamps for use in motor cars. By the employment of a special adapter, these lamps can be applied at once to the ordinary oil burners. They will burn for 200 hours and require only two accumulators, each charge lasting sixteen hours. The current expended is 2.4 watts, with an electromotive force of four volts. Zirconiumrhodium filaments are used in lieu of carbons in order to economise the current. The great advantage claimed for the electric lamp is that they are not liable to be extinguished by draughts. It is not proposed to substitute electricity for the powerful acetylene search-lights in front of the motor, but only for the small side-lamps and tail-lamp.

* * * * * *

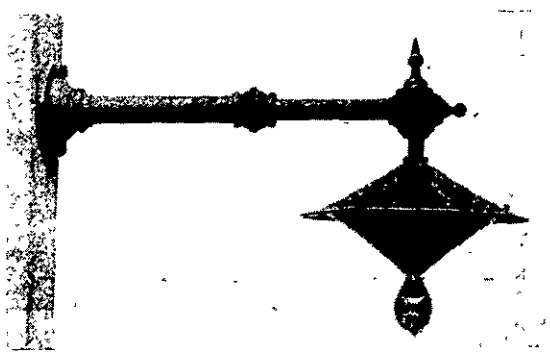
Messrs. Crompton and Co., Ltd., have just issued a pamphlet descriptive of their direct-reading electrical pyrometers, intended for determining the temperature for such processes as annealing or case hardening, or for gas plants, steam plants, furnace and flue gases. The main feature of the instrument appears to be an open scale ammeter, sufficiently sensitive for the purpose but designed for workshop use.

Electrical Undertakings in Australia.

A branch of industry open to development in Australia is that of electrical undertakings. Already electric tramways and lighting are established in several important centres. Some months ago a concession for the establishment of electric tramways in Perth was granted to a German firm. Various tramway projects have been conceived for the suburbs of Melbourne, and the Government of Victoria is now considering a scheme for electrifying the whole of the suburban railway system. The scheme emanates from an English syndicate, which has offered to provide an unlimited electricity supply at one penny per unit, and proposes to utilise for the purpose the important lignite mines situated at Newport, where the generating station would be established. The population of Melbourne (445,000 inhabitants) is scattered over numerous suburbs, some of which are ten miles from the centre of the city. The suburban railway traffic is considerable, and, by reason of the numerous stops, the adoption of electric traction would be advantageous. The network of tramways in Melbourne is very extensive, the cable system is adopted, and the cost per mile run is, it appears, practically the same as for electric traction; it is not probable, therefore, that a change will be made. However, the *Bulletin Commercial* (Brussels) considers that it would be worth while to send to Australia an engineer capable of making a thorough study of the chances of success in tramway, lighting, or other electrical enterprise in the great mining and manufacturing centres of that country.

Roslyn's New Installation of Electric Street Lighting.

The Council of the Borough of Roslyn recently invited schemes and tenders thereon from several electrical engineering firms for an installation of electric street lighting in the borough. Up to the time of doing this the borough streets had been lighted with gas; but a very favourable offer to supply electricity having been made to the Council by the Roslyn and Dunedin Tramway Co., Ltd., it was evident that a system of street lighting by incandescent electric lamps could be substituted for the existing gas lighting, with advantage both in point of cost and illuminating power. Power is supplied by the Roslyn and Dunedin Tramway Co. from the 550-volt direct-current generator, which also supplies power for the operation of the electric-car line operated by the company within the borough.



LAMP ADOPTED BY THE ROSLYN BOROUGH COUNCIL.

The street lighting incandescent lamps are arranged in groups of five 100-volt lamps in simple series, there being 13 of these groups, making 65 lamps in all. Each lamp is a carbon-filament lamp of 40 candle power. The conductors are insulated in general with double braid and weather-proof compounding, vulcanised rubber insulation being substituted in positions where telephone or telegraph lines are crossed, conductors throughout being of No. 12 hard-drawn copper wire. Each distribution circuit of five lamps is connected to the feeder or trolley wire of the electric-car line through a spring clip fuse, and a suitable resistance is also provided and inserted in all distribution circuits (except the two most remote from the generator) to absorb the small excess of voltage, the amount of this excess on any distribution circuit depending on the length of conductor in that circuit and the distance from the generator at which the circuit is connected to the supply feeder or trolley wire. A common return conductor fitted with switch gear and ammeter at the power house controls the supply to all the distribution circuits. All conductors are carried overhead on Australian ironbark poles, the average size of poles being 25 ft. long over-all by 8 in. square at base. Wood cross-arms and white porcelain double shed insulators are used for supporting the conductors.

The lamp fittings have been designed and manufactured by Messrs. A. & T. Burt, Ltd., and appear very suitable, the lower shade shown in the accompanying illustration is made of opal glass, and the efficiency of the arrangement is very good. No outer globe is used to enclose the lamp, the maximum light being therefore available for illuminating purposes. The whole system has now been in operation for over two months and is giving complete satisfaction, the chief difficulty that the Council now find is to meet the remonstrances of ratepayers resident in such parts of the borough as are yet unlighted, and there is every probability that the Council will shortly have to extend the system to complete the lighting of the borough.

Compound Gas Engine.—According to the *Iron Age*, a compound gas engine has been built with two high-pressure cylinders and a single low-pressure cylinder between them. The high-pressure cylinders work on the Otto cycle, the engine receiving one impulse from them each revolution. The exhaust from the two explosions is expanded in the low-pressure cylinder, the crank of which is 180° behind the high-pressure cranks. Thus, at every forward stroke the low-pressure cylinder takes the exhaust gases from one of the high-pressure cylinders. The total effect is thus to produce an impulse every half revolution. With a 12-h.p. engine 13 b.h.p. were obtained with the low-pressure cylinder in use, and only 8.9 h.p. without it, 46.2 per cent. being thus added to the power by the use of the low-pressure cylinder and without the expenditure of any additional fuel.—*Iron and Ore Supplies.*