PROGRESS

With which is Incorporated

THE SCIENTIFIC NEW ZEALANDER.

VOL. IV.—No. 6. MONTHLY.] WELLINGTON, N.Z., APRIL 1, 1909. [PRICE: 6d. per copy; 6/6 per Annum posted, or in advance 5/-.

Progress

The Scientific New Zealander.

Published Monthly by Baldwin & Rayward, Patent Attorneys, (215–217) Lambton Quay, Wellington, New Zealand.

PROGRESS *will be mailed regularly every month to any address in the Dominion on prepayment of the Annual Subscription*—6/6 per annum posted, or in advance, 5/-. *To Australia or United Kingdom*, 5/6 in advance.

All communications to be addressed to "The Editor PROGRESS, New Zealand Insurance Buildings, Corner of Grey Street and Lambton Quay, Wellington. Telephone 1389.

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EDITORIAL COMMENT.

The Hector Memorial.

When Sir James Hector died the Dominion woke up to the greatness of the services he had performed during a long life of unusually industrious usefulness. But this outburst of memory was followed by a relapse into the ancient forgetfulness. Hence it is that the effort to found a memorial worthy of the man who was rightly described as the greatest scientific intellect that ever came south of the Line, is a comparative failure. This is by no means well. Vouched for by the eminent Sir Roderick Murchison, Sir James Hector made his first record, and so good was that record—in the Rocky Mountains of Canada and the Province of Otago—that one of the greatest of geologists (Sir Charles Lyell) selected him out of all the men of his time for the chair of geology which he founded in Edinburgh University. Preferring the Dominion of New Zealand, Sir James Hector accepted the position of Chief of the Geological Department of New Zealand. Presiding over the geological survey and taking strenuous part in the same, he found time to establish all the scientific departments of the country, the analytical, meteorological and the rest. In all these branches he collaborated and still he cared for the Museum, which he founded, arranged, catalogued, and brought to a high state of perfection. He moreover founded the New Zealand Institute, presided over its meetings for many years, edited its "Transactions" and was personally liable for their scientific accuracy and regular publication. He was Chancellor of the New Zealand University for twenty years, and the eminent service he rendered to that institution is admitted by all who are qualified to judge. His advice on all scientific matters was ever at the disposal of the Government, and of the local bodies: in the sanitary department nothing was ever done without reference to Sir James: the things referred to him by the public were enough to keep ordinary men going all the time. His numerous writings testify to the wide range of his knowledge as well as the accurateness of his mind; and the honours he held showed the appreciation of the scientific world consistently extended to him. The work he did, so varied and so wide, represents a service to the country simply incalculable. He was withal modest with the modesty that is never absent from true greatness. Shall the memory of such a man not live for ever in the country which he preferred to all others, and for which he did so much? Six Committees are now appealing for a favourable answer to that question. The response should be not only favourable, but generous. It should be substantial enough to both perpetuate a memory which ought to be unfading and to encourage the generations that are coming to follow a great example.

The Forests Commission.

Many things are expected of the Royal Commission that is to consider the Forest question of this Dominion in all its many aspects. Two things, however, stand out of the ruck of them with special interest. The Commission is expected to say much of the proper manner of helping the timber industry, and to remember the question of the protection of that native industry. But these are matters subsidiary. The two main points of interest are the supply of the timber of all kinds in the Dominion, how fast it is being consumed, and how long it may be reasonably expected to last: and the conservation of forests in certain areas marked by nature as especially favourable for the growth of timber. With the first is associated the question of afforestation for climatic and other reasons; and with the second is allied the question of asserting the superiority of the forest to the settlement that seeks to uproot trees in places where nothing but trees will ever grow. The neglect of these matters in the past has caused loss, and the continuation of that neglect will be the occasion of disaster. The Department of Lands has already broken ground about the timber supply, and estimated its endurance, making it no more than a century at the most, and probably less by twenty-five per cent. This point the Commission is expected by the Dominion to examine closely and report upon exhaustively. The other point, that of the destruction of forests where forests ought to be conserved, is being illustrated forcibly just now by the eruptions of the Mountain Ngaruhoe. These remind us that vast quantities of pumice are scattered over the forests round the feet of the volcanic regions of the centre of the North Island and make us suspect that when the timber gives way to the settler, the settler may be driven forth ruined by the barrenness of the soil. The point has been raised before. It is for the Commission to settle it once for all.

The Pearson Coupling.

In another column we give a description of the coupling invented and patented by Mr. Pearson of the Railway department, which absolutely guarantees the Westinghouse brake from all danger of the tampering which has caused some loss already on the railways of the Dominion. We beg to compliment the inventor on his ingenuity and skill. We hope soon also to be able to compliment the Government on having secured the invention which has been offered to them for use on the lines. We hope in addition, and all in good time, to compliment the inventor on the acceptance of his most brilliant, most useful, and most necessary invention by all railway systems of the world.

The Aeroplane in New Zealand.

An aeroplane known at present only to the inventors as the "Progress" aeroplane, but destined shortly for a wider circle of acquaintance, is being constructed in the workshops of Mr. Peter Ellis, Wellington. The work is so far advanced that trials of the machine may be expected in the open in the course of a few weeks. The inventors are Messrs. Forrester, Ellis, Baldwin, and Rayward, and many original ideas are, we understand, embodied, particularly in regard to starting from a standing position on the ground.

Our Industries: Portland Cement.

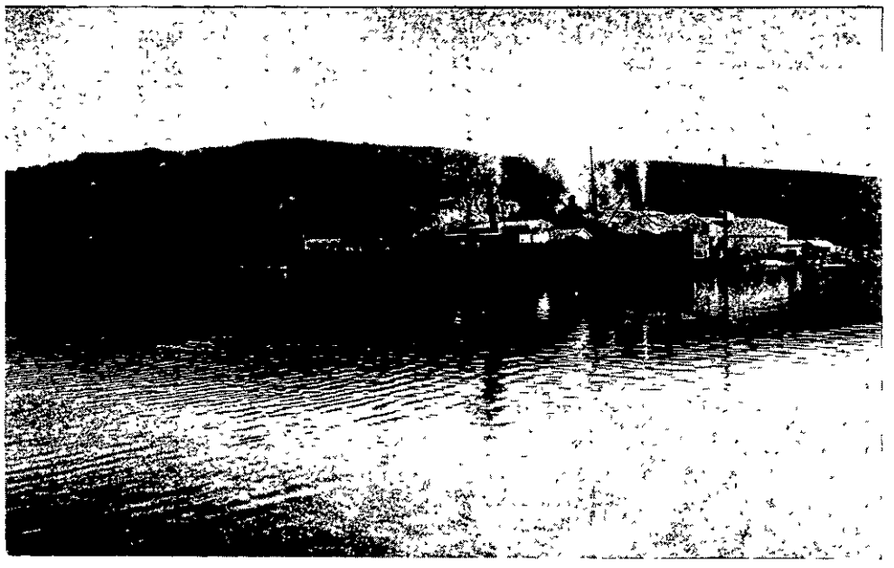
No. XXVIII.

New Zealand Portland Cement.

At the present time, when so much interest is being exhibited by the keenest men of the day in concrete construction, a short history of the development of one of the foremost cement manufacturing concerns in the Dominion will, no doubt, prove of interest to our readers.

The works of the New Zealand Portland Cement Co., Ltd., situated at Limestone Island, Whangarei, about 80 miles north of Auckland, are a striking example of what can be done by steady perseverance and care.

Some year ago, when this company first took over the limestone works, the cement industry was very far from reaching the stage of development which it has now attained.



Wharf at the N.Z. Portland Cement Co.'s Works, Limestone Island

Small works, utterly unsuitable for the modern manufacture of cement, had been installed years before, but from these small works was gradually evolved the up-to-date plant which now stands on the same site. Shortly after the present company took it over, a large fire occurred, which, although serious enough at the time, was not altogether an unmixed disaster, for it effectually disposed of the question of how to modernise the old plant. New works were at once installed, and no chance has been overlooked in keeping the plant up to date.

But the work of the management did not stop here. Some two years ago the growing demand for "Crown" brand cement forced upon the directors the necessity for doubling the plant, and so bringing the output up from 1000 to over 2000 tons per month. In this enlargement of the works, unexpected difficulties, which it is not necessary to enumerate, arose, and delayed the completion of the duplication for a long time. At last, however, the difficulties were surmounted, and to-day the Company is to be congratulated on having a model modern plant with a capacity of over 2000 tons per month output.

One would think that the directors of the company would rest contented, satisfied with the progress made. But no sooner had the duplication of the plant been completed than it was found necessary to again enlarge the works, and the company, at the present time, have under order the necessary plant to increase the output of the works to over 3600 tons per month.

In order to carry out these works of development money was needed, and in July last 40,000 new shares were placed on the market, the list being over subscribed before the day on which applications closed. The healthy position of the company's affairs at the present time is shown by the fact that these new shares are, at the time of writing, at a premium of nearly 100 per cent.

A glance at the two photographs of the works shown herewith will convey to the reader more than mere words can do, the changes that have taken place during the last few years.

The reasons for the great success that has attended the efforts of those interested in the New Zealand Portland Cement Co. may be of interest:—

Firstly, Limestone Island, which is the freehold property of the company, contains about 103 acres (or an estimate of 32,000,000 tons) above high-water mark of what has been described by experts as equal to the best natural hydraulic limestone in the world.

Secondly, this industry is self-contained to a degree that is very seldom met with. The rock limestone that is required for blending with the hydraulic stone is situated within ten minutes steam of the works. The coal supply is only twice that distance away. These facts, as anyone can see, all make for cheapness of production.

Then again, the wharf, works and quarry are all within a stone's throw. At the ferro-concrete wharf, which is the Company's own property, vessels of 3,000 or 4,000 tons can lie and load with safety, and this is another great factor in the success of the Company, as it does away, to a great extent, with the cost of shipping to Auckland and thence transhipping to Southern steamers. Such vessels as the Union Company's "Rakanoa," "Wanaka", "Flora" &c., make regular trips to the Island, and load direct for the South.

At the present time the Company is arranging to increase the wharfage accommodation so as to enable two or more steamers to load at once.

Of course the Directors recognise the fact that in order to handle a plant of this magnitude, it was essential that the man at the head of the works should be an expert in every branch of the business, so about a year ago they sent to the United States, the undoubted home of the industry, and were fortunate in securing the services of a manager who stands in the very front of his profesion. Under this gentleman's control the quality of "Crown" Brand Cement has gone ahead by leaps and bounds, and the latest tests, taken at random from the ordinary stocks, show results which have not been exceeded, and in several results not even equalled, by any other cement in the world.

Under such circumstances as the foregoing, it cannot be wondered at that the old fashioned prejudice against Colonial Cement has been entirely broken down, and that "Crown" Brand stands as a guarantee of quality throughout the cement using world.

Such concerns as the Napier Harbor Board, Wellington Harbor Board, Ferro-Concrete Company of Australasia, Ltd., all use "Crown" Brand, and among recent contracts where "Crown" Brand has been used exclusively may be mentioned the Makatote Viaduct, Hamilton Bridge, Wainui Dam (Wellington), Auckland Town Hall, Auckland Freeman's Bay Sewer, Otahuhu Saleyards, and many others.

The Public Works are using "Crown" Brand in most of their works throughout the North Island.

Correspondence.

Auckland, March 20, 1909.

(To the Editor Progress.)

Sir,—I have read with pleasure your terse and vigorous article on Phormium Tenax in Progress for this month. I beg leave to congratulate you on what I believe to be the soundness of your views of the situation and your courage in publishing them. You strike a true note in saying that Progress feels elated at the prospect of the approach at some attempt

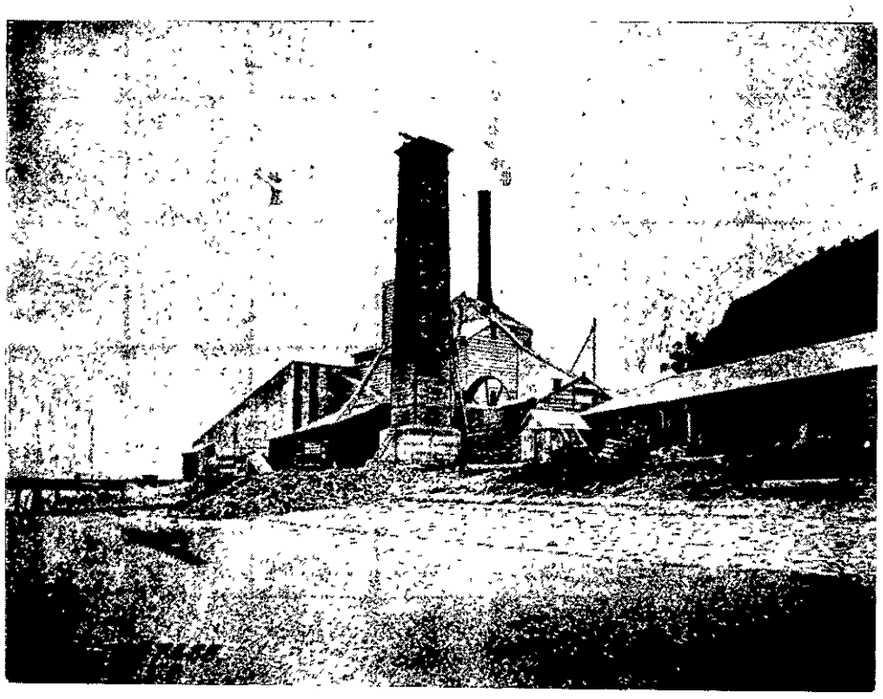
being made to get away from the bad old traditions of the past which have done so much to throttle the industry, and that any inquiry should look to the future, ignoring the mistaken past.

As Others see us.

Everybody is supposed to know that one of the weak points in New Zealand hemp's position on the Home market at present is due to the smallness of the crop, compared with that of Manila hemp; that being so, every effort must be made, by united action, to reduce this disadvantage, by extended cultivation, co-operative milling, and by producing a higher grade hemp.

The cost of production is another source of weakness, (waiving the questions of royalties and arbitration) which can also be combated by enhancing the value in every way possible, and by utilisation of the by-products; for it is only as a "superior fibre" that Phormium has a future.

If permitted to remain in a position in competition with manila and jute and similar fibres Phormium will be of comparatively little value to New Zealand.



N Z. Portland Cement Co.'s Works, Limestone Island, Whangarei.

If this fibre during the last generation had been in the hands of a people with technical knowledge of cordage and textile fibres and fibre extracting machinery, the price to-day on the Home market for Phormium would be considerably ahead of the price of Manila hemp, for naturally it is finer, cleaner and stronger. But instead, having been that time in the hands of amateurs, that time has been lost, its possibilities are still undeveloped, and the aid of fibre machinists with their specialist knowledge, must be sought to bring out the fibre's qualities.

One big stumbling-block in the way of progress with New Zealand hemp (other than insufficient area under cultivation and inclusion of unfit leaves) appears to me to lie in the fact that local millers believe that their crude, makeshift ways of handling this, their only fibre, are perfection; unfortunately, through being quite sure on this point, no effort is made to learn anything from methods in use elsewhere with other leaf fibre. On the contrary not suspecting their own shortcomings, many of them firmly believe they have in their methods a "trade secret" of national importance, to be carefully guarded from uitlanders.

This illusion they will not part with so long as they can keep it, though recurring periods of depression like the present ought to make them wonder "who threw that brick?" They suspect black labour, capitalism, royalties, arbitration, anything, except their own ignorance. However, I am persuaded that all the measures of relief of the situation, likely to be suggested at the proposed inquiry, will amount to a fraction of what can really be easily done by application of a knowledge of the methods in use elsewhere with leaf fibres instead of those clung to in New Zealand.

The palpable errors of treatment of Phormium leaf and fibre, and neglect of by-products are many, and known to many persons, and the time has apparently arrived when these are to be tackled.

"Grading" was a most important step in the right direction, and has given lasting stability to the fibre.

"Gradual stripping" must follow; with its introduction, chopped fibre will disappear.

"Wringing" the steeped fibre before paddocking will ensue a stainless fibre and quicker drying.

"Hand heckling" and "machine brushing" instead of scutching, will turn out clean, white, long, strong fibre as straight and smooth as a bank of carded flax.

This "new" New Zealand hemp, scientifically baled in a high-density press, covered in a protective wrapper, will bring a price at Home that the amateurs have never dreamed of.

The By-products.

Then the tow requires "willowing" and "carding," and such tow will fetch £10 a ton any time.

The "willow screenings" dried and curled have a value for upholstery.

The "stripper waste" dried in the sun, and passed through a chaffcutter with equal quantities of hay, is a very valuable cattle and horse food, superior to most hays, and relished by all farm animals. If consideration is given to the fact that about eight tons of stripper waste is produced to each ton of fibre, some attention is surely due to this waste: Well, assuming it to contain 75 per cent. of water (which is much too high), there remains over two tons of a highly nutritious cattle-food, fully equal to the same weight of the best hay, per ton of fibre turned out.

Now, with one ton of fibre as a base, we get:—

Increased price of Hemp due to better handling, per ton ... (Which is much too low)	£5	0	0
Value of two tons of dried stripper waste, per ton £3	6	0	0
Increased value of Tow, say ...	0	5	0
	£11	5	0

Value of Willow Screenings balanced by extra handling.

Now if £10 instead of £11 5s. be deducted from the cost of production for ton of fibre, in the manner and by the means indicated, surely it is about time to begin.

Trusting the contemplated movement may directly or indirectly rescue this most valuable industry from its degraded position.—I am, etc.,

Tom Drewet.

Phormiun Tenax.

We publish just above a letter from Mr. Drewet of Auckland, on the treatment of that grand asset of the Dominion, the Native Flax. He has attacked the question in a most illuminating manner, showing what may be done by a common sense method of working, and indicating the great value of the by-products now going to waste, and suggesting further improvements of mechanical treatment calculated to give this fibre the leading position in the economical life of the Dominion to which it is entitled. We commend the letter to the careful study of every practical man in the Dominion.

Many engineers and architects who make blue prints from their tracings experience difficulty in obtaining printing paper which will give good results.

The following description will enable Progress readers to make first-class sensitised blue print paper at a very low cost. Two solutions are required (*a*) a solution of potassium ferricyanide, 1 ounce to 5 ounces of water, and (*b*) a solution of 1 ounce of citrate of iron and ammonia in 5 ounces of water. The solutions will keep for a long period in separate bottles.

To sensitise the paper equal parts of each solution are mixed and applied to the surface of the paper by a wide, soft brush, the liquid being applied evenly all over the paper without leaving any flow lines or drip. The solutions, when mixed, are sensitive to light, and consequently after the mixture is made the rest of the work must be done by gaslight or in very feeble light. The paper, when coated, is suspended by pins or upon a line, in the dark, to dry. It is then ready for use. Printing should be done in bright sunlight, and after exposure the paper should be thoroughly washed until the white lines of the print appear thoroughly clear.

Electricity and Engineering

An Electric Barometer.

In this barometer, which is described by Robert Goldschmidt, the variations in the height of a mercury column resulting from the changes of atmospheric pressure are caused to modify the resistance of a filament of low specific conductivity inserted in an electric circuit. A thin U-shaped carbon filament is fused into the closed end of a barometer tube and its terminals are connected to two binding posts on the outside of the tube. When the tube is filled with mercury, the curved part of the filament is more or less immersed in it, according to the atmospheric pressure to which the mercury column is subjected. The parallel branches of the filament traverse the vacuum of the barometer. The current passing through the two branches of the filament and the mercury meets with more or less resistance, accordingly as the mercury column is higher or lower. It is not sufficient, however, in order to obtain an indication of the changes in atmospheric pressure, to measure the variations of the total resistance of the carbon filament, as temperature changes also influence the level of the mercury column. This cause of error may be eliminated by using a second mercury column in a tube closed at both ends, in which the mercury level is influenced only by temperature changes of the surrounding medium. In this second tube, which operates as a thermometer, a carbon filament is arranged as in the first, and its resistance is modified by changes in the height of the mercury column. Thus, while the changes of resistance in the barometric tube correspond at the same time to variations of atmospheric pressure and temperature, the indications of the thermometric tube relate to temperature changes only. If the resistances composed of the two filaments are arranged in series like two branches of a Wheatstone bridge and compensated by resistances in the lower branch of the same bridge, a galvanometer connected in the usual manner across the bridge will remain at zero, when at an equal atmospheric pressure the temperature causes a change in the height of the mercury in both tubes at the same time. The relation of the compensating resistances will evidently vary according to the thickness of the filaments used in the tubes, their relative dimensions, and the changes of the mercury level produced by the same temperature variation in each tube. In order to indicate the variation of atmospheric pressure it is only necessary to insert in that branch of the bridge containing the thermometric filament, for instance, an adjustable resistance, such as a high-resistance wire mounted over a graduated scale, which, by means of a sliding contact, may be inserted more or less in the circuit. By regulating this resistance so that the galvanometer remains at zero, one adds to or takes from it exactly the same amount of resistance that has been added to or taken from the carbon filament in the barometric tube by variations of atmospheric pressure only. These variations are thus read on the graduated scale of the adjustable resistance. It is easy, by means of the arrangement described, to read variations of one-ten-thousandth of a millimeter in the height of the barometric mercury column. Curves obtained by means of this apparatus were found to correspond always with those at the Eccles Observatory.—Translated and abstracted from *Bulletin Mensual*, Societe Belge d'Electriciens (Brussels) for *Electrical Review*.

A Pleasant Novelty.

The "electric table-cloth" is the latest addition to the "smart" dinner table. It looks harmless enough—a simple table cover of grey felt, covered with an ordinary damask table cloth. The "regulation" silver candlesticks are placed on the table—an unusual brilliance streaming from under their dainty shades, and the uninitiated may wonder how candles can produce such a dazzling light. But there is more in it than meets the eye, for running down the sides of each candlestick is an almost invisible wire with a tiny pronged end. This prong fastens into the table-cloth, and as it touches the cloth the electric connection is complete, and the electric candles are lighted. Wherever the candlesticks are placed, as soon as the prong touches the electric cloth a brilliant light streams forth. This magical cloth can only be a luxury at present, but judging from the progress of the times, it may be within the means of hostesses, who do not possess princely incomes, before very long.

Professor Ayrton.

The intelligence of the death of Professor W. E. Ayrton, F.R.S., which occurred in the early morning of the 8th December, will be deeply regretted throughout the world of electrical engineering and physical science. As Professor of Physics at the Central Technical College since the foundation of that renowned institution in 1884, Professor Ayrton was most intimately connected with the early training of a very large number of engineers, a great proportion of whom now occupy leading positions in every part of the world, and who will all receive the sad news with painful surprise, for the deceased Professor was only sixty-one years of age, and was one who always took the liveliest interest in the work and welfare of his pupils engaged in the world of business.

Educated at University College, London, Mr. Ayrton entered the Indian Government Telegraph service in 1867, and from 1873 to 1878 was Professor of Natural Philosophy and Telegraphy at the Imperial College of Engineering, Japan, where he was intimately associated with Professor J. Perry. The results of the electrical and physical researches of this collaboration are known to everyone connected with electrical matters.

Professor Ayrton was president of the mathematics and physics sections of the British Association in 1888, president of the Physical Society, 1891-92, and president of the Institution of Electrical Engineers in 1892.

The electric locomotive is fast demonstrating its superiority over its steam rival in America, more especially for tunnel work. Many of the largest tunnels are being fitted for them.

* * *

Electric generators were first adapted to be coupled to reciprocating engines, and hence were designed for comparatively slow speed. When it came to coupling the generator to a turbine it was necessary to operate it at a lower speed than was economical, so as to accommodate it to the slow-speed generator. Recently generators adapted for high-speed service have been designed and a special type of turbine, known as the double-flow turbine, is used to operate these generators. There are several 10,000-kilowatt two-pole machines now under construction adapted to operate at 1500 revolutions per minute.

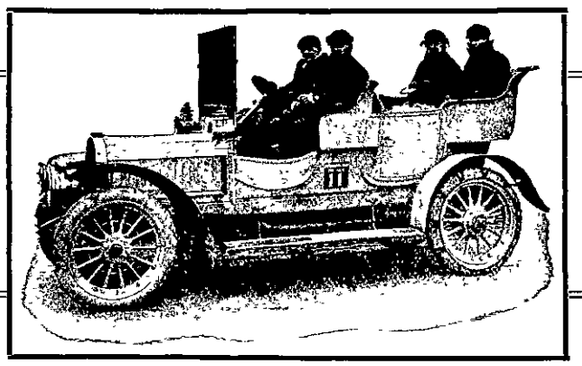
* * *

The value of electricity for heating purposes is illustrated in a new electric glue pot which has recently been placed on the market. The economy of the device lies in the fact that the maximum amount of heat may be applied instantly when needed, while the glue may be kept warm at all times by a reduced flow of current through the heating coils The glue pot consists of a cup in which the glue is placed, and which is set in a casing filled with water. The electric heater is attached to the pot immediately below the water. A hot-water receptacle is provided in which the brushes may be kept.

* * *

While a further trial is to be given to the surface contact tramway section of the London County Council, under the direction of Mr Mordey, the general future of this method of current collection appears to be much less favourable than was anticipated a year or two ago. The National Electric Construction Company, which has had experience of the Dolter system at Mexborough and Torquay, is now endeavouring to persuade the Oxford Corporation to vary the terms of its agreement for tramway construction in that city, so that instead of surface contact the conduit system shall be used in the centre of the town and the overhead elsewhere. So far the corporation is somewhat emphatically opposed to the change, and it will be interesting to observe future developments, as Oxford is certainly not a promising site for conduit construction throughout, while, on the other hand, the famous High street is probably more picturesque without trolley wires. If the proposed surface contact system is unsound, therefore, there seems to be no reasonable alternative to the company's proposal.

Motors Motoring



Motors, Motorists and Motor Matters.

Now that taxicabs are coming into Australia, it is interesting to note what the effects on the pockets of the public are likely to be. There must be a saving because the automatically fixed fare in a taxicab removes every possibility of exorbitance; but how great will the saving be? In Melbourne one writer reckons that "putting all consideration of the added comfort and convenience out of the reckoning, taxicabs are at least twenty-five per cent. cheaper than ordinary hansoms." In Birmingham the tariff fixed for motorcabs to seat five persons is almost incredibly low, —6d. for the first half-mile, and 2d. for each succeeding sixth of a mile or part thereof, no hiring by time only: if kept waiting the charge to be 2d. for each 2½ minutes; no additional fare for hiring between midnight and 6 a.m., and no additional charge for reasonable luggage.

* * *

We cannot look for any such cheapness as that in New Zealand; but if we paid on double that scale, there would be a vast reduction of the present excessive charges. It must be remembered that the drivers of taxicabs in England, despite the low fares, do very well. "We are disposed to think," says the *Commercial Motor*, "that the taxicab driver who uses a little judgment has got a far from unsatisfactory occupation."

* * *

Here are some recent charges demanded by Wellington cabmen. Willis Street to Austin Street, afternoon, 4s., 5s.; 8 p.m., 6s. Post Office to Wellington Terrace, afternoon, 7s. 6d. Wharf to Hobson Street afternoon, 10s. Railway Station to Grand Hotel, from afternoon express, 4s., 5s., 6s. Grand Hotel to Opera House, night, 5s. Of course, the theory is that the public is protected against such extortion. If you think that the fixed tariff—the tariff as fixed by the City Council—really affords any protection, try the experiment of paying a Wellington cabman his legal fare.

* * *

As to the improved convenience of the taxicab, it is easy to multiply instances. In all the cabs of the Lancashire Taxicab Company for instance, there is an electric lamp, a speaking-tube, mirrors, a foot-warmer, and the daily papers. The running is silky-smooth, and the vehicles are so snug as to be warm in any weather.

* * *

The Paris Show of Commercial Vehicles has given great stimulus to the motor-industry. It includes the first international exhibition of airships and aeroplanes. It is remarked that there is a specially extensive showing of small delivery-vans and motor-buses, although the antiquated buses of the Second Empire still rumble clumsily through Paris streets. Parisians are progressive, but by comparison with the attitude of the average French alderman, the Chinese are rampant revolutionaries. It is true that the City Council of Paris has put in a superb installation of motor fire-engines, but there is nothing but vague talk of motor-busses yet. There are hundreds of motor-waggons of all types in the show —perhaps the most remarkable of all, the single-cylinder Soller.

* * * * *

Indeed there is every reason to agree that the horse is going. "No big business," says a London expert, "dreams of putting in horse-lorries now. They are slow, cumbrous, and extravagant." That is a serious indictment. There is more to be said. Horse-feed in the great centres rises constantly in price; while motor-power for vehicles becomes constantly cheaper. A man with a motor can be out of the yard and miles away, while the man with the old-style vehicle is putting in his horses. Medical men are adopting the motor everywhere. Society women are everywhere preferring it to the old-style carriage. It combines comfort with an extraordinary possibility of speed—a possibility that is a constant astonishment to the perturbed police. Already in parts of the world, interest is as keen in motor-races as in horse-races. The noble horse has outlived his usefulness.

* * * * *

During the days of the great snow in London recently, the horses were bested, but the motor-vehicles went cheerfully about their business. "The motor-bus," says the *Daily Telegraph*, "did not suffer to any great extent; indeed, yesterday saw the triumph of mechanical locomotion, though the progress of even these busses was naturally slow all through the city."

There is a reasonable suggestion in England that medical men motoring to urgent cases should display a red cross or other device on their auto and be permitted to go at high speed unmolested. The idea is a very good and humane one; but it is not likely to be adopted, because one of those red crosses would almost assuredly form a part of every motorist's outfit. They would be so useful in emergencies.

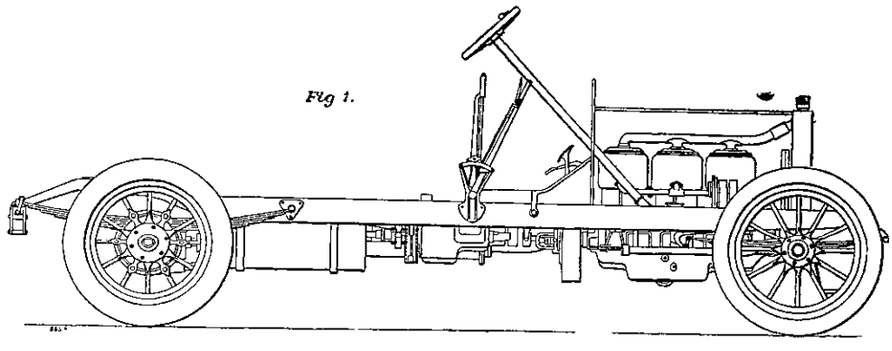
* * * * *

At the Paris Salon great interest was shown in the new light petrol aeronautical engine, designed by the Pipe Company of Brussels. It comprises eight cylinders arranged in two sets of four in the form of a V. The bore and stroke are both 100mm., and at 1,500 revolutions per minute the engine is stated to give 70 h.p. The weight is 285 lbs., or about 4 lbs. per horse power. The engine is air-cooled. The aspirator is designed to draw in air at a greater rate than is neccessary at the normal engine speed, so that the cooling shall be efficient even when the engine is running slowly.

* * *

As petrol comes into general use, it is exceedingly neccessary that people should understand how very dangerous petroleum-spirit may be when it is handled. It is a safe rule not to use benzine for any domestic purpose at all. A light many feet away is a menace when benzine is used. It freely gives off an inflammable vapour, and in comparatively still atmospheres, such as that of a room, the heavy vapour will slowly travel distances of ten, twenty or thirty feet in a direction induced by a fall of the ground or gently moving air-currents. If it touches a light, it will immediately flash back and ignite the spirit from which it has evolved. Mr. Carlyle Smythe had his thumbs blown off when he was using a little benzine with a light many feet away. Many similar and many deadlier instances

Fig 1.



6-Cylinder 20 H P. Siddeley Motor Car.

Constructed by the Wolseley Tool and Motor Company, Ltd., Addersley Park, Birmingham.

might be cited. It is far safer to clean clothes with something else.

* * * * *

"Old Hand" sends a useful tip to the *Motor Car Journal*.

It has long been a mystery to me why motorists and motor drivers almost universally use the right hand for starting the motor. As petrol engines nowadays nearly all revolve like the hands of a watch—from right to left—there is always a possibility of injuring the hand or wrist should a back-fire occur when turning the starting handle by the right hand. And, again, the position which the body must assume when the right hand is used is awkward in the extreme, and being twisted around that more force may be exerted, the balance of the body is not at all secure. Back-firing accidents may be averted by employing the left hand. In this case the motorist stands squarely in front of the car, the right hand having a firm grip on the radiator or dumb iron. The handle is grasped firmly, but loosely, with the fingers of the left hand curved around the handle. As the feet are placed widely apart, a good balance of the body is assured, and, if a back-fire should occur, the elbow is not cramped, as is the case in the right hand method, but the hand is thrown outward and upward, the loose grip permitting the fingers to fly open, and all risk of injury is done away with. More power may also be exerted, as the right hand on the radiator materially assists the other member to turn the motor over quickly and without undue effort.

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The Motor Grand Prix in France is a thing of the past. Motor manufacturers plead that the Grand Prix causes great cost and perturbation in the factories—a flimsy excuse enough. The fact is that in France, with the aviators so much in the forefront, the interest in great autocar races is steadily declining. While the public can see flying machines soaring pretty well every day within sight of some one or other of the great high roads, people are not specially enthusiastic about motorcars as spectacles. In short, the autocar is not the attraction that the aeroplane is. So the manufacturers talk of cost and pertubation, and there is to be no other Motor Grand Prix. The great makers who have boycotted the race are:—Benz, Berliet, Leon Bollee, Brasier, Clement-Bayard, Darracq, Delaunay-Belleville, Germain, Isotta-Fraschini Lorraine-Dietrich, Mercedes, Minerva, Motobloc, Panhard-Levassor, Peugeot, Pipe and Renault.

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The Torkington solid tyre, which is built in sections to bring it within the category of cushion tyres, is attracting great attention in Europe just now. Owners who have depended on pneumatic tyres, and become abundantly familiar with the pneu's occasional disadvantages, are especially hopeful. A powerful Daimler has been fitted with the new tyres for a journey which is to include some very hard and heavy going over the Italian Alps. So that the non-skidding quality of the Torkington (of which much has been said and written) will be thoroughly tested.

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In motoring, as in most other things terrestial, the small boy has his place. A few weeks ago, General Smith-Dorrien was motoring from London to a country place in Essex, and in Whitechapel Road he had to slow down in a press of traffic. Just then, a small boy seeking his amusement jumped on to the luggage-rack at the rear of the car, and was too scared to jump off when the big car resumed its average speed. The General didn't know he had a passenger, and the small boy was carried 23 miles before he was discovered. The first man to make the moon will probably find a small boy clinging to his gear somewhere.

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On Broadway, New York, a motorcar-firm has opened a branch establishment for the sale of airships. The cheapest offered is for £20,000, to seat eight persons, with a guaranteed speed of thirty miles an hour. Pretty soon, we shall have "elegant" New Yorkers enjoying musical-comedy, while their "carriages" flutter in the mist above the theatres.

* * * * *

We hear so much of Mr. G. Bernard Shaw's socialism and contempt of money that we are apt to overlook the fact that Mr. Shaw, despite his protestations of simplicity, is really a very well-to-do and comfortable man. He has recently had made to his order a 28-30 h.p De Dietrich car which is as speedy and comfortable as any millionaire need desire. However good a socialist one may be, the temptation to motor is difficult to resist.

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Motorists who suffer the irritation of squeaking cars are apt to forget that the springs require occasional lubrication between the leaves or plates of which they are composed. If your car squeaks, satisfy yourself first of all that the squeak is not mechanical. See that the universal joints and clutch-collar are well oiled and all the running parts properly lubricated. Then turn your attention to the springs and brake-rods. Oil all pins and bearings, and see that the lubricators themselves are right. Then you will probably find that there is no more squeak.

* * * * *

The motorcar is the best friend of the prosperous farmer, especially in countries like New Zealand, where many commodious homes are well removed from railways. The man with the car has the city always at his doors. That numbing sense of isolation vanishes. No place is inaccessible. so long as it is served with a passable road. The car is an agent of healthy circulation: it not only brings the city to the country, but it opens up the country to the city. A ride in a car has all the attractions that the ordinary train-ride lacks. There is no banality of station buildings and goods-sheds, no pressure of the peering crowd, no raw cuttings and suffocating tunnels. Also, the car is speedier than the train—at any rate, in this country.

* * *

A deputation of anti-motoring members of Parliament recently waited on Mr. John Burns, President of the Local Government Board, asking him to issue a general notice that when a local authority made application for the fixing of a speed-limit not exceeding ten miles an hour in any town or village, the application should be granted provisionally until good reason was shown to the contrary. Mr. Burns promised nothing, and was not at all encouraging. The fact seems to be that motorists would not object to going through a town or village at ten miles an hour; but they know quite well that if that limit were fixed, the village-constable would cheerfully swear that a car going ten miles an hour was travelling twenty. It is far beter to have the limit left at twenty, and on that risk the passage at ten.

* * *

Dr. H. W. White, of Bradford, England, has driven an 8 h.p. single-cylinder De Dion car over 70,000 miles in three years. The district covered is remarkably bad. and many of the roads are exceedingly bad. So that the record—working out at about fifty-seven miles a day—is a wonderfully good one. "Looking back over the records of the past few years," says the *Autocar*, "it must be admitted that there is nothing to surpass it as a consistent proof of reliability."

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The motor-launch for Mr. Shenley's new steam yacht was recently launched at Cowes, Isle of Wight. The launch has a guaranteed speed of twenty-five knots, is designed and built by Saunders, and is engined by a single eight-cylinder 200 h.p. Wolseley-Siddeley motor. Hung in davits, the launch will weigh a trifle over two tons.

* * *

Again from America there come some entertaining rules for motorists. These were compiled from the Wasau Chaffeurs' Club, Wisconsin:—

1. On discovering an approaching team, the automobilist must stop offside and cover his machine with a tarpaulin to correspond with the scenery.
2. In case a horse does not pass an automobile, the tarpaulin to the contrary notwithstanding, the automobilist will take his machine apart as rapidly as possible and conceal the parts in the grass.
3. The speed limit on country roads will be secret this year, and the penalty for violation will be 10 dollars for every mile an offender is caught going in excess of it.
4. On approaching a corner where he cannot command a view of the road ahead, the automobilist must stop awhile, then ring a bell, fire a revolver, halloo, and send up three bombs at intervals of five minutes.
5. Automobiles must be seasonably painted; that is, so they will harmonize with the pastoral ensemble and not be startling; thus in spring, green; in summer, golden; in autumn, red; and in winter, white.
6. Automobiles running on country roads at night must send up a red rocket every mile and wait for the road to clear. They must proceed carefully, blowing their horns and shooting roman candles.
7. In case an automobile approaches a farmer's house when the roads are dusty, it will slow down to one mile an hour, and the chaffeur will lay the dust in front of the house with a hand sprinkler worked over the dashboard.

* * *

Mr. C. J. Glidden, the wealthy round-the-world motorist who was in New Zealand some years ago, is now in Algeria, whence he proceeds by way of Tunis, Tripoli, the Sahara Desert, and Sicily. Since setting out, he has covered 46,528 miles over all sorts of roads and no roads, and seen a good deal of thirty-nine different countries. He will be quite a travelled man in a year or two.

The Mathematical Motorist.

The following amusing skit is from a legal light shining in Wellington:—

Let M be the driver of a motor car working with velocity V.

If a suffiiently high value be given to V it will eventually reach P C. In most cases V will then equal 0. For low values of V, P C may be neglected, but if V be large it will generally be necessary to square P C after which it will again assume a positive value.

By a well-known elementary equation P C × £ s. d. = P C squared. But the quadrature may sometimes be effected by substituting for £ s. d. the third power of X = XXX. This is preferable where £ s. d. is small with regard to M. If £ s. d. is made sufficiently large P C will vanish.

If J P be substituted for P C, which may happen if the difference between M and P.C. be large the solution of the problem is more difficult because no value of £ s. d. or X can be found to effect the quadrature of J P, for as is well known, J P squared is an impossible quantity.

The quantity P C is often irrational and may result in a totally arbitrary value being assigned to V differing largely from the real value. The equation may be solved by the use of logs but they must be used with care.

Note.—The value of V need not suffer diminution if a circle can be described round P C. But if you cannot get round P C then the method of least possible squares should be used especially if £ s. d. is a rapidly vanishing quantity.

Points at the Paris Show.

A correspondent wrote to the *Times* immediately after the big show, a most interesting summary of the much-discussed "Salon."

The Salon de l'Automobile is held this year in two distinct sections, at different dates. The first is strictly limited to motors for town use, for touring purposes, and for cars for luxurious travel, whilst the second, which will open about a fortnight later will be confined to motor vehicles for heavy loads and for industrial purposes, and it will also include the departments of navigation and aviation.

The general impression gained by a somewhat detailed inspection of the first portion of the exhibition is that novelties in mechanical features are rare this year. The pleasure car remains pretty much as it was during the previous year, and the only changes are in slight matters of detail. All the chief efforts of the manufacturers have been expended on the production of moderate or low-powered vehicles, ranging from 8 to 15 and up to 25 h.p. Each of the principal makers display one or more types of such vehicles, and it may even be said that this is the real novelty of the 1908 show.

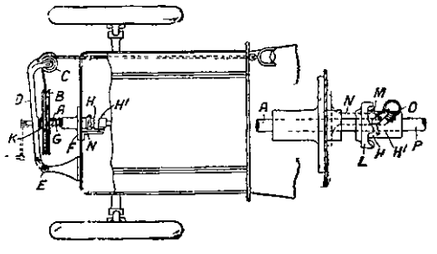
Manufacturers who have hitherto confined their attention to the building of high-class motor-cars now enter into competition with the less important firms engaged in the production of voiturettes, and there is little doubt that these latter will thereby suffer somewhat severely. Very few racing cars are shown and French manufacturers would seem to be interested no longer in vehicles of this character. This feeling prevails, moreover, to such an extent that many makers are said to have expressed their firm intention to abstain from any further participation in trials of speed.

There is at the outset a general consensus of opinion that, for cars of high power, the use of the six-cylinder motor has become general. In spite of the decrease in the number of exhibitors of such cars, the number of six-cylinder motors is greater than it was last year. For cars of average power, motors with four cylinders, two cylinders, and even a single cylinder are all favoured by manufacturers.

For powerful cars the employment of the chain still remains the most prevalent system of drive and is the favourite one, but for moderate powers the use of cardan transmission has greatly extended and has grown in a very remarkable way. Attention may also be called to the almost unanimous adoption of the high-tension magneto for ignition, and only the following firms who cling to the low-tension magneto are noticeable, viz.:—The makers of Bolee, Mercedes, Itala, Berliet, Mors, Brasier, and Cottin-Desgouttes cars. The improvements introduced for the purpose of lubrication should likewise be noted; most of the firms have adopted forced lubrication, involving the use of pumps absolutely automatic in their action.

The Mallins Engine Starting Device.

We are able to illustrate this week the simple and ingenious method of starting the petrol engines of motor-cars from the driver's seat which has been devised by Mr. C. W. Mallins, A.I.E.E., the general manager of the Liverpool Corporation Tramways. As will be seen from Fig. 1, which shows the arrangement in plan, on the starting handle shaft A is fixed a pulley



THE MALLINS ENGINE-STARTING DEVICE.

B, around the groove of which is laid one complete turn of a flexible wire cable, the end passes over a small pulley C attached to one end of a lever D, and then inside the bonnet and through the dashboard, terminating in a hand grip or stirrup J fixed at a convenient height for the driver to operate with the right hand. The pulley B is controlled by a spring G, one end being fast to the pulley and the other to some stationary part such as the bracket F. This spring always tends to wind the cable on the pulley after each operation, and also holds the couplings in the normal out-of-action position, thus performing the two operations, viz., rewinding the cable on the pulley and holding the couplings H and H¹ apart.

To start the engine the driver pulls the grip J sharply towards him; this pull, due to the cable passing around the small pulley C, swings over the lever D (which is pivoted at E). The latter abuts through suitable bearings against the starting shaft at the point K, compressing the spring G, and bringing the coupling H into mesh with the coupling H¹ on the engine crankshaft. The continued pull revolves the pulley B, and transmits through the couplings H and H¹ the initial movement or revolution to the engine.

The destructive effect of a back fire or premature explosion is guarded against by the addition of a pawl and crown cam on the starting shaft to throw the couplings out of mesh. In the operation of starting the engine, simultaneously with the couplings coming into gear, the crown cam L (Fig. 2) on the starting shaft A is brought into mesh with a round nosed pawl M, attached to the bracket N. When the starting shaft is rotated by pulling the cable the pawl slips over the teeth; should a back fire occur, and the crank shaft P be rotated in the opposite direction, the pawl M is locked against the stop O, and, due to the formation of the nose of the pawl and teeth of the crown cam, the starting shaft A is forced outwards and consequently the couplings H and H¹ separated.

The device, which is not only inexpensive but does not prevent the use of the ordinary starting handle, has proved so effective in practice that it has been decided by the Tramways and Electric Power and Lighting Committee to fit it to all the motor-cars in the service of the Liverpool Corporation.

Packing Joints for Pumps.

The least leaky packing we have yet devised for a pump consists of an asbestos string liberally smeared with ordinary blacklead. It is more efficient and lasts a great deal longer than the special washers sold at high prices by many accessory dealers.

A New Leather Automobile.

Tyre Guaranteed for 10,000 Miles.

Tyre trouble has from the first been the bugbear which has seemingly been inseparable from the lot of the automobile owner or user, and yet fully as much ingenuity has been expended upon the perfection of tyres which should answer all conditions of extremely exacting service as upon the driving mechanism itself.

With the perfection of the new mineral tanning processes for the treatment of leather, an exceedingly tough, pliable and serviceable material was developed, which was quickly levied upon for use in the composition of automobile tires. Some were made entirely of the new chrome leather or used in combination with rubber, canvas, and other materials which are ordinarily utilised in tyre construction.

Of the several leather tyres which have been offered to the motoring public as a charm against dreaded tyre troubles, there is one type which so combines the use of leather, canvas, rubber and steel in its construction, that the best possible service is obtained from each material. This tyre, suggestively called the Ke-pa-go-in, is made by the Beebe-Elliott Company, of Racine, Wis.

There are a number of features about the tyre, both in material and method of construction, which place it in a class by itself. Its makers are so well satisfied as to its re-

markable service-giving qualities, that they are not content with the usual 2,000 to 4,000 miles service life of the ordinary rubber tyre, but guarantee 10,000 miles service for their 3-inch and 3½in. tyres, 7,000 miles for the 4-inch, and 5,000 miles for the 5-inch tyres, or agree to replace tyres without question.

The result of the combination of materials used in the construction of these tyres is a puncture-proof leather tread, rendered skid-proof by the use of cold-drawn steel rivets, and reinforced by canvas and rubber carcasses of the type ordinarily used in rubber-tire construction. The leather is thoroughly water-proofed in the tanning process. There are no glued lap joints of leather to open after a short time in service. The rivets are put in to stay, being driven through two thicknesses of leather and resting against a third. Rubber is used for its adhesive qualities, and not where its strength will be taxed beyond reasonable limits, as in the ordinary tyre.

The lining next to the inner tube is of a soft, tight-fitting material, making a smooth, frictionless wall. The heat generated in the tyre casing, caused by the compression of air in the inner tube, is radiated off through the steel rivets in the casing as they travel rapidly through the outer air or come in contact with the cooler pavement.

But the unique feature of this particular tyre construction is found in the method used of building up the tread in such a manner that whole sections of it may be renewed at the factory, and new ones substituted.

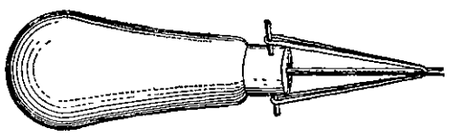
Motor Cars and the Law.

The liability of the owner of a motor car to make good the damage done by his vehicle when it skids has recently been considered by the judges of the King's Bench Division. It appeared that a motor omnibus belonging to the Vanguard Motor-Omnibus Company knocked down a lamp-post opposite the Holborn Town Hall. The accident was caused by the wheels skidding. In an action to recover the cost of repairing the lamp, Judge Woodfall, at the Westminster County Court, held that the driver had been guilty of no negligence. Nevertheless, he held that it was now so well known that these vehicles will skid on a wet day, that anyone who runs a motor-omnibus in the streets is really authorising a nuisance, and that, therefore, he must be held liable for any damage done. On appeal to the King's Bench, Lord Alverstone, in giving the judgment of the Court, said that they could not ignore the finding of fact—namely, that it is well known that these vehicles are likely to skid in certain kinds of weather. Consequently, the omnibus company was held liable. This decision does not accord with a judgment delivered by Mr Justice Bigham in 1906. In the case of King *v.* Motor-Omnibus Company an action was brought to recover damages for injuries sustained in an accident which had been caused by skidding. The plaintiff, who was sitting on the top, was injured by a collision with a lamp post. Mr. Justice Bigham told the jury that the defendants were not liable unless the plaintiff was injured in consequence of some negligence on the part of the defendants or their servants. The negligence alleged was that the omnibus skidded as the immediate consequence of excessive speed, and the jury would have to say whether the vehicle was being driven at an excessive speed, at the time of the accident. Every miscalculation of distances on the part of the driver did not amount to negligence. All persons were liable to errors in judgment. As a result of this direction, the jury found for the defendants. This decision must now be taken to be supplanted by that recently given by the King's Bench, which is likely to place the proprietor of a motor-bus in a position of some difficulty. He must invent some non-skidding device, or stop running his omnibus, if he desires to avoid liability altogether.

The application of this doctrine in the Dominion is obvious. Motorists must put skidding in the category of actionable nuisances.

Mending a Tyre.

The puncture is a common accident for which it has often been thought that there ought to be a common remedy. As a matter of fact some remedies have been supplied but they are not numerous enough to have yet become common. A very promising one is by G. F. Likne, of New York. It is handy, cheap, and has the reputation among those who know it of



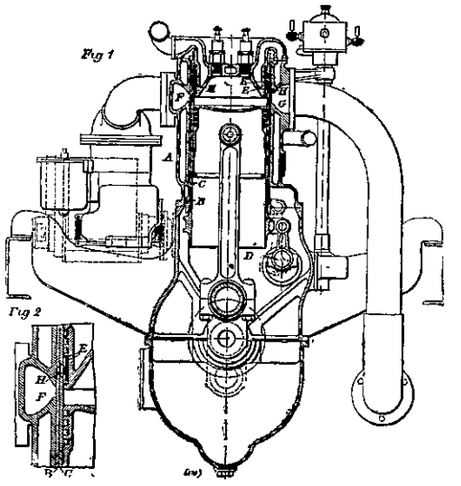
Tool for Repairing Punctures.

being effectual. It consists of a common darning needle of large size, with its point stuck into a wooden handle, say that of a brad awl. Two pins project from the neck of the handle, as may be seen from the sketch herewith, from opposite sides, and the top of the needle is cut off so as to leave half the eye, which then becomes a slot in the needle. To mend a puncture, stretch elastic rubber bands over the pins and through the slot in the end of the needle as tightly as possible until judgment shows that there is enough rubber to fill the puncture. Then insert needle rubber through puncture in tyre, throw the rubber off the pins and withdraw the needle. The rubber being tightly stretched will contract when released, filling the puncture and leaving a small lump inside and outside of tyre. This will wear off outside in a very short time. It is advisable to ream the hole smooth before applying the rubber. This can be done by heating the needle with a match and then searing the edges of the hole.

The Nizam of Hyderabad proves his modernity. He is the premier native chief of India, and about the most independent. Recently, while he was motoring to an "at home" at the British Residency, one of his vassals, the Nawab Surya Jung, overtook the royal car and rushed past it, narrowly missing a collision. The Nizam was furious. Two days later he issued a Firman, fining the Nawab a thousand rupees and confiscating all his cars. The cars are all very valuable, and the punishment is severe; but the Nizam doesn't like road-hogs. Also, as the native princes are very reckless drivers, the Nizam's action is heartily approved by most people in Hyderabad.

Car Tours.

Motor car tours have become popular with American passengers by the Cunard Company. It is only necessary for a passenger by a Cunard boat to send a Marconigram at any time during the voyage, and when he arrives at Liverpool he finds a Daimler car to take him wherever he wants to go. "We are sending two types of car to meet arrivals at Liverpool," says an official. One is a 42 h.p. open car, known as the "Rugby," which holds six persons with the driver, and carries three extra tyres, four spare tubes and a hood. The second is the "Hampton," of the same horse-power, which is a closed car splendidly upholstered in drab cloth, and carrying the same number of passengers. We charge £21 to send one of these cars to Liverpool, with a driver, to bring back passengers and luggage to London. For



The New Daimler Engine.

touring we have a regular tariff, and charge £30 a week not exceeding 500 miles, and £100 for a month not exceeding 1750 miles. The majority of our American customers appear to prefer England for tours, and more especially the Lake District, but several recent arrivals have taken our cars to Scotland." More than twenty American families were touring the country in Daimler cars on the hire system.

A gentleman who signs himself "Agreeably Surprised" writes to us after a most enjoyable trip through the country eastwards from Dannevirke to Napier and Taupo and back to Wellington. He has much to say about the country and what he saw, and he is eloquent of the causes of his enjoyment. All of which, though new to our friend, is well enough known to our readers. The special new thing that struck him was at Hastings. There he was much impressed and delighted with Sampson and Co.'s garage. It struck him as the largest country garage in the Dominion, and the most commodious. There are four pits, the best brazing plant, and a vulcanising plant. There is a large assortment of cars always on hand moreover, Stewarts, Enfield, Vauxhalls, and F.I.A.T.'s. The Sparklet tyre inflator is much in evidence, and there is an electric plant which lights the place very effectively.

Railway Workshops of the Dominion: PETONE

The Petone Workshops.

In the Dominion there are many Railway workshops. Of these four are in the North Island and three in the South. Of the Northern shops Petone is the most important. It is second, however, to Addington which possesses the best machinery and does the most difficult work. Petone is, for all that, well worth seeing. The first glance on arrival shows it to be a great hive of industry, and subsequent glances especially if you go in company with the watchful manager, Mr. Allan, or the chief of the Locomotive Department, Mr.. Pearson, show you that the industry is largely of the mechanical order. Man, that is to say, watches and controls while machines work. The place is a forest of machinery. Its extent astonishes the visitor because the extent of the buildings is not revealed until you have entered in, taking with you the impression that the grimy structures of iron are but few and insignificant. That impression you soon cast off. Foundry, moulding shop, blacksmith's shop, pattern shop, carpenter's shop, carriage shop, erecting shop—it seems incredible these should be all here, each roomy, each well ordered, well stocked with machinery, well manned, and turning out work full bore. The surprise is not so great as it used to be before the new station was built as part of the duplication scheme. The old station masked the shops huddled together on the station ground. The new station has fallen back nearer the sea and the buildings are in better evidence.

In the yard close to the rails we note a locomotive tender in course of construction, in the bare metal stage: a tender large and of strange construction. For one of the X engines we are informed, here building for the Northern Trunk line. Two thousand two hundred gallons of water, four tons of coal—that decides the point of attack. A big X engine is in that building nearest to us, which is the Erecting Shop. We want to see it and we enter the Erecting Shop.

Erecting and Machine Shops.

The erecting Shop serves more purposes than one. It is a Maternity Home and a Hospital for the Locomotive race. Here are engines of all kinds laid up over great drop pits. The engine wheel drop-pit in the Erecting Shop contains the hydraulic cylinder and ram so arranged that when it is desired to take one or more pairs of wheels from under an engine it can be done without lifting the engine from the rails. The wheels to be operated on are lowered in to the pit by the ram and swung round on to a pair of rails placed at right angles to the track on which the engine is standing. They are then run along these rails until clear of the engine, lifted out of the pit by a crane and taken to the place desired. In one part new locomotives are being ushered into the world by the builders, and in others old stagers are getting doctored, repaired, patched up, cleaned, painted, decorated, going through every process that tends to restore the engine to brilliancy, efficiency, and self-respect. There are two big engines, one the much described X variety in the hands of the builders. He is nearly finished and looks formidable in "the buff," almost ready for the painters to dress him in his uniform suit with the distinctive title and the customary devices. The other is the class E engine referred to later on.

Other engines taking a turn in the hospital are of all kinds. They range not quite from A to Z, but from E to X. E is the most powerful engine in the Dominion. X is the type for the Northern Trunk—there are eight of these. Of these one is out and about its work; another is being built here as noted; the rest are in course of construction at Addington; there is an F engine, one of the babies of the system, going through something not far removed from the "lock, stock, and barrel" process; there are some Baldwin compounds, and there are engines of many varieties all tended by the hands of cunning artificers. These engines are in many stages from the paintless dismemberment of extreme illness, to the brilliant shining paint of elaborate convalescence. The men are scattered about, some working on the engine bodies, others at the rows of benches handling chisel and file, spanner and hammer, and all the implements of their trade; while others are in the machine shop hard by, tending the numerous great machines which are pressing on the work of building and repair, making parts, shaping, drilling, planing, sawing, grinding, moving perpetually. Shafts revolve above sending down the power to the machines by lines of belting which seem to be in endless succession. Such is the Erecting and Machine shop—a long lofty building in two compartments divided down the centre by the row of benches aforesaid. In one compartment are the engines in the hospital and maternity home as before described; in the other are the machines in rows.

Half way down one side of the Machine Shop is the engine room. It is a glassed chamber of order, reclaimed from the working wilderness and stocked with the necessary motive powers. Chief of these is the engine that drives all this machinery around. A 75 h.p. "Allan Porter" type engine made at Addington. A neat compact smooth working type, daintly fashioned, a miracle of compactness, every part finished in a style worthy of the best traditions of the English workshops. This engine alone would justify the whole expense of the policy of which the Addington establishment is the leading representative

There is also a compressor for compressing the air which plays a great part in the working of the shop. It may be regulated to any pressure. When we saw it, the limit was set at 100lbs., and whenever the gauge pointed to that strength a safety valve threw the machine out of gear and there was no more increase of the pressure. When the pressure fell below the indication, the machinery was thrown into gear again and the pressure rose to the limit.

A dynamo in a corner completes the equipment giving light all over. On the whole, nothing is wanting here except a little additional room for moving about. But there is room enough for the working for all that.

A glance here is sufficient to convince the visitor that the supremacy of the Americans is a thing not acknowledged. Firstly the finish of the American engines is not equal to that of the British made or the Dominion article either. A roughness of the American surfaces under their glittering varnish proclaims the inferiority of the American work. Secondly the bulk of the machinery is English, some of it up to date, the very best of its kind. There are American machines in the plant, and very good they are. But they do not dominate and the chief part of the work is done by machines of British make, proclaiming the fact that Britain in this department of industry is easily first.

Machinery at Petone Workshops.

The following is the list of the Machines in the Petone Workshops.

MACHINE AND BOILER SHOP.

Number.	Description
(About) 21	Lathes
3	Wheel lathes
12	Drilling machines
6	Milling machines
1	Slotting machines
2	Shapers
1	Planer
3	Screwing machines
1	Buffing machine
1	Cold saw
1	Circular saw
2	Punching and shearing machines
(About) 10	Grinders
1	Plate roll, and numerous other smaller machines for various purposes

BLACKSMITHS' SHOP.

1	Bar cutting machine
4	Steam hammers

GENERAL.

2	Large overhead travelling cranes
1	75 h.p. Porter Allen high speed engine
1	Dynamo, 110 volts, 200 amp.
2	Stationary boilers
1	Air Compressor (Cap. 285 cub. ft. of free air per minute) fitted with an automatic cut off on steam cylinder, which is adjustable to cut off the steam supply when the pressure required in air reservoir is reached

IRON FOUNDRY.

In the iron foundry is a new vibrating table moulding machine, operated by compressed air; this machine is used principally for brake.

The machines are interesting to watch as they stand in their long lines at work, each with its watchful directing controlling attendant. Powerful elephants one might say, like those in the Burmese timber yards, each with his "Mahout" beside him. These are not as the machines of old, slow as well as steady. On the contrary they show the last thing in pace without diminishing the old fashioned steadiness. There is notably a turret lathe from the workshops of Herbert of Coventry, hollow spindled, with 16 reversible speeds, the very latest thing in turret lathes whether in Europe or America, working when necessary up to speeds inconceivable to the non-expert mind. There is a circular saw which cuts thick iron with the smoothness and rapidity one sees in the case of wood that is dealt with by similar tools. There are emery grinders and Sundale grinders, drills radial and drills fixed, the former really wonderful machines reaching out in a circle when called upon, liberated or fixed at will by the turn of a nut, driving great cutters through the toughest metal with rare pace. There are screwing machines and lathes, of all kinds, up to the great fellows required for dealing with locomotive driving wheels, and we recognise the work of Beyer, Peacock and Co., of Manchester—none better anywhere. Among the drillers is a fine Canadian machine (Esquith, of Halifax) very rapid and reliable, and it is among the up-to-date machines of the establishment. There are milling machines too; one catches the attention quickly with its knives arranged exactly like those of a lawn mower; the shavings thrown off are small and wiry, just like grass cut by the blades of its prototype; and the analogy is complete, as you read the name of Kendall and Gent, of Manchester. For all these the work is brought and taken away by hydraulic hoist and travelling gantry easily handled.

In various parts of the Shops are erected pneumatic air hoists and air-lifts in lieu of the old style of chain blocks, whereby a great saving in time and energy is effected.

A small shunting engine of the C type is kept constantly employed in and around the Workshops. There is also a 7-ton steam self-propelling crane in Workshops yard, built at Railway Workshops, Hillside.

Car Shop.

On the way in one sees many things lying about; ventilators of cars ready for fixing, cylinders for bending timber, by steam: templates for the shapes of the bending, such for instance as the roofs of cars, water tanks for the lavatories—these hold 118 gallons we learn; cushions, seats, panels of doors, and windows, car bodies and these arrest the attention as they stand over the pits. They are in all the stages of growth up to the last in which the finishing touch of the painters is being added. There is a pleasant odour of turpentine and resin and not a sign of the usual litter, of shavings and things pertaining to the disorder of the ordinary workshop. Not a single machine is besmirched. Neither are there as elsewhere small armies of sweepers getting rid of plentiful litter. The bell mouths of shoots gape here and there close to the floor, shavings and litter of wood are brought close up, there is an inhaling of a mighty breath and the litter disappears on its way to the furnace, leaving behind clean floors and immaculate machines. There used to be perpetual dust fog and many men were down always with dust asthma. Now there is not a single case.

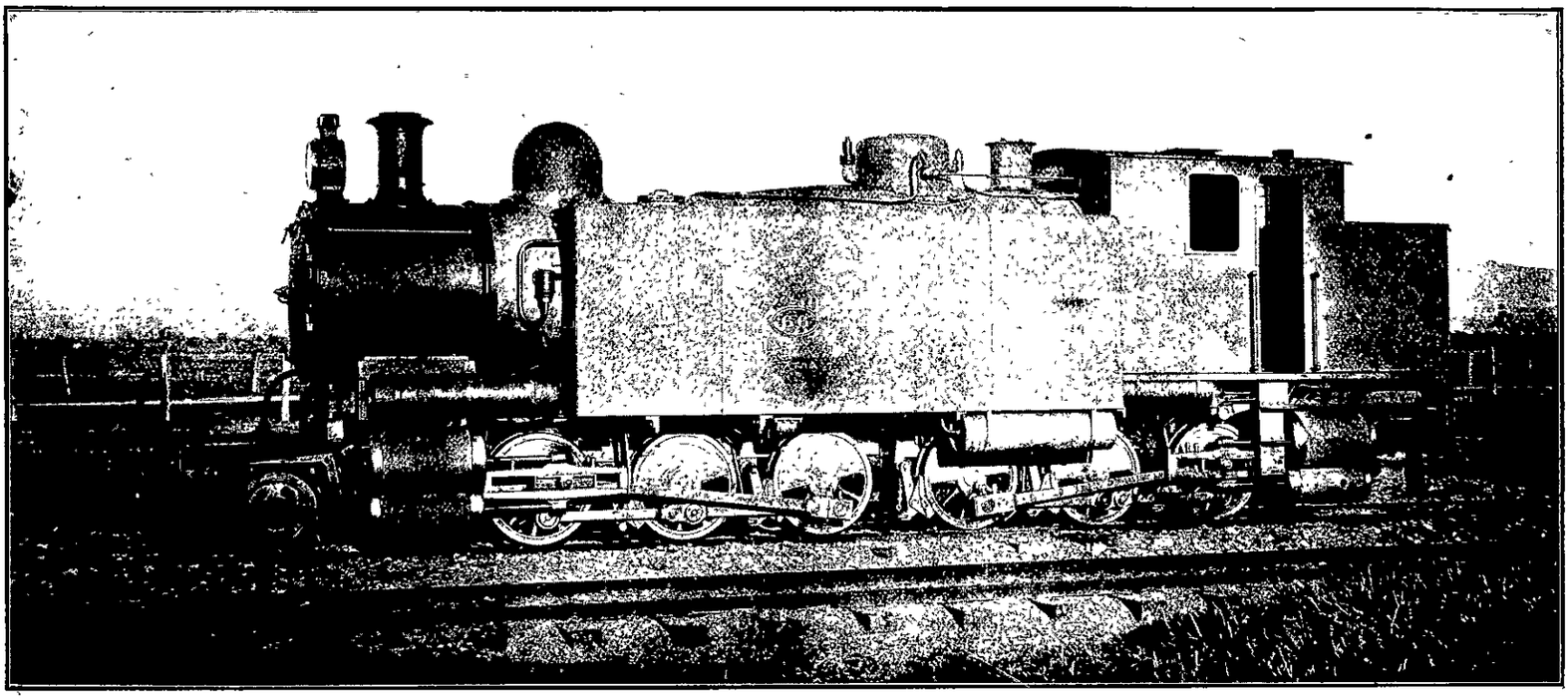
Each machine in this shop is equipped with a dust collector, an exhaust fan is situated near the engine house and exhausts the sawdust, shavings, etc., through large galvanised pipes to the boiler house where it is utilised for fuel.

Of course the fifty foot new car building for the Northern Trunk does not escape us. "What are these sleepers like?" is the constant query of an interested public. The answer is before us here. Take the ordinary "bird-cage" the object of such keen competition on the part of long distance travellers. Imagine the two seats facing one another in each compartment. Realise that the back of each seat is so fashioned as to act as a bunk, provided with the means for detaching it for lifting it into position above the ordinary seat of which it forms, when off berth duty, the back, and for keeping it in position when detached. A couple of straps adjustable at the side to prevent the tenant from falling out, and there you have your upper berth. The lower seat of corresponding methods becomes the bottom berth, and the compartment becomes a sleeping room with four berths. In every new fifty foot sleeping carriage there are four four-berth compartments and two with two berths. For the latter there is much competition among the knowing ones.

In the constructing division of the car shop there are fixed the usual wood working machines and beside them all the timbers that belong to the car industry, about to fulfil their destiny in one part or another of the anatomy of the cars. Here there is the same note of British superiority, with also a good American machine in the front with the best.

That is a chain morticer by the New Britain Company of America. It is like a bicycle chain with knives on the links, simple to look at and easy to go. It does not appear to cut the mortices, so much as just to blow them out. There is only one better in the world and in that one the cutter follows the work instead of as here the work following the cutter.

A great English machine is the sand-papering machine of Robinson of Rochdale a machine with three rollers of sand-paper of three qualities, rough, medium, and fine, with a revolving brush. Doors, frames, all things requiring a polish pass in rough and come out smooth in an incredibly short time. Where it took a door half-a-day of old to get through the hand process



Eight-Cylinder Compound Articulated Tank Locomotive, Class E, for Service on Steep Gradients.
Built in New Zealand Government Railway Workshops

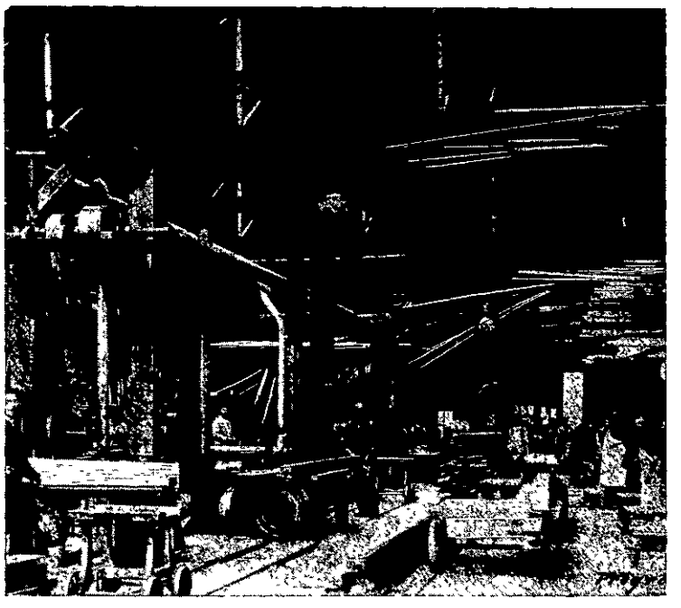
Cylinders, 9½in. and 16in. in diameter; stroke 18in.; diameter of coupled wheels, 3ft.; tractive power (at 80 per cent boiler-pressure), 28,500lb.; boiler-pressure, 200lb.; total weight in working-trim, 66 tons, Gauge, 3ft 6in. *(N.Z. Railway Dept. Print)*

PETONE WORKSHOPS

90-Ton Engine (Class X) Building for N.I. Trunk Line.

Blacksmiths' Shop.

Sleeping Cars (under Construction)



Carpenters' Shop.

Moulding Shop.

Fitters' Shop.

the machine puts one through in one act as you look.

Another notable machine is the automatic grinder of Ransome of London. The tool is set, the work inserted, and the machine is left to itself to grind away until the work is done. These machines make the machine shop most interesting to watch.

One wants to know the timbers used. They are Kauri and Rimu with a little Puriri for the upper work, Jarrah and Blue Gum for the under timbers, and Oregon is used sparingly. For ornamentation there are no importations. "Selected Rimu is the handsomest wood in the world," says the Loco. Superintendent, and PROGRESS admires his good taste as well as his patriotism. Never was a truer word; nowhere are there better corroborations than in the fine panels of selected Rimu that are so remarkable a feature of the railway cars of the Dominion.

Wheel and Axle.

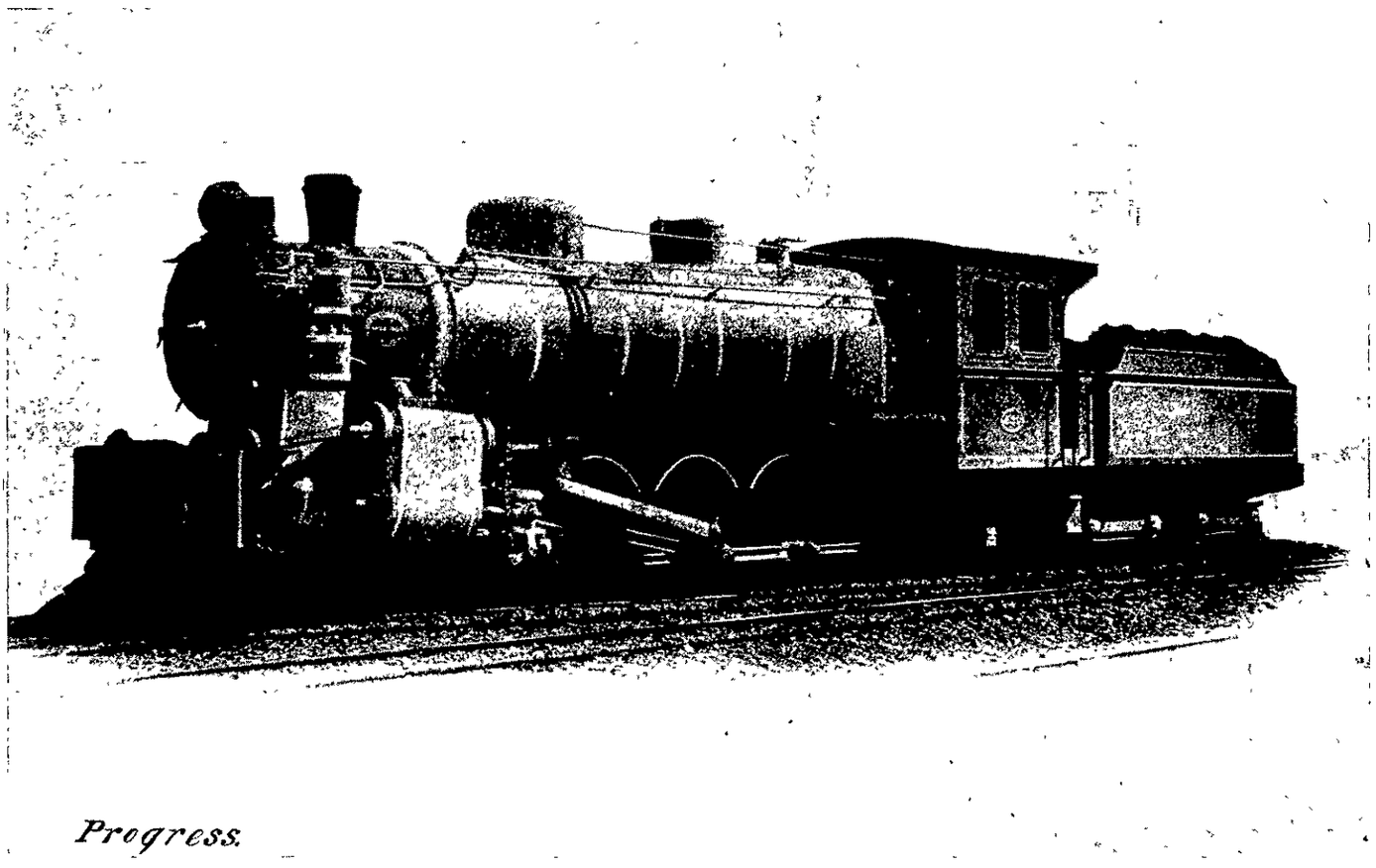
Further on is the shed where the axles are pressed into the wheels by hydraulic power. An air crane lifts the wheel and lowers it into position, the axle is also in its place; the hydraulic press exerts pressure on it, up to 10 tons for every inch of diameter; the axle gets fitted, the pressure is registered upon it, and is useful record for all the contingencies of the future, and the operation is over.

Tarpaulins.

Still further on among the buildings is the tarpaulin room where the making and mending of tarpaulins goes on apace—one looks in upon men in all the attitudes of sail-making as one remembers them in the old sailing liners and men-of-war, and one passes on impressed by the sight of industry but not of any novelties.

hammers. It was a process needing time as well as hard labour, to say nothing of a straight eye. To-day the piece is placed in the hydraulic persuader—Vertical Hydraulic Press is its official title—a handle is touched, the weight comes down with gentle but tremendous force, the iron wilts into shape in one breath, and emerges with absolute truth in every dimension. The machine does dozens for every one under the old system and does it under the control of two boys. One begins to understand the problems of labour-saving solved by the machineries of our time. In punching the holes through this solid iron there is the same contrast between the old and the new. Sixty-eight holes punched by the steady and apparently slow machine in thirteen minutes—it is a performance which leaves unaided man out of sight.

One understands a little too in this way how machinery makes for the use of ma-



THE NEW X ENGINE (90 tons), CONSTRUCTED AT ADDINGTON; ERECTED AT PETONE.
4-Cylinder Balanced Compound Locomotive, 4—8—2 type, specially designed for working heavy grades on Northern Main Trunk Railway, diameter of coupled wheels, 3ft. 9in., working steam pressure, 250lbs per square inch

Bogie Shop.

Hard by is the building in which the bogies are put together, before being taken into the erecting shop for the rolling stock to be mounted on them. Under the old system it took the men here a day to put one bogie together, so complicated was the process of squaring and building. To-day the daily capacity is five. The difference is due to the adoption of a frame on which the bogies are built. It is known in the world of work as a "Jig." There are four corner posts duly set, and the frame between them. The axle boxes are set up on the posts and the rest of the bogie is built up in the ordinary course, and when the parts are together they are riveted. There are two Jigs; so that while the riveting is being done at one, the other is the scene of a building operation. The Jig is the device of Mr. Pearson, the loco. engineer at these works of Petone.

Vertical Hydraulic.

We run against another hydraulic giant, a "multum in parvo" giant, working with great apparent slowness and much fascinating deliberation. Observation of the results, however, proves that the slowness is an assumed defect. The pace of the work is simply tremendous when you compare it with the results of previous methods. The machine straightens channel-bars, angle-irons, and all things of iron that require to be made true and fit for their duties, in the running of locomotives, passenger-cars, goods wagons, cranes, and the rest Likewise does it do all the work of punching holes. Take the straightening of angle-irons cut by a wonderful machine in the machine shop into short lengths. Of old the custom was for men to take the pieces up with tongs, place them on anvils, and move them while other men hammered them with great

chinery. The secret is well understood here at Petone, where many machines have been designed for the saving of cost and the expediting of work. In the brass finishing room, for instance, we saw a machine for stamping out the ventilator grids for operating the ventilators of the railway carriages. This machine stamps them out at the rate of 100 an hour. The old system under which they were cast turned out ten in the day.

Blacksmith's Shop.

This is the most interesting in the whole place, deriving its interest from big machinery and big men. Twenty-two forges are ranged half of them on each side with fires bright and roaring, while men are handling hot metal in masses on the anvils, hammering, turning, moving back and forth, the brilliant metal taking shape like putty, or cutting like butter, or opening

into holes faster than timber under the biggest of augers, as the case may be. Down the centre of the shop stand three steam hammers and one at one side. They are not of the phenomenal varieties that work up to large numbers of tons, the centre one is the most powerful and does not go much over one ton. But the wonder of the performances of these giants, for giants they are nevertheless, is a source of perennial astonishment. They can give slow steady blows as befits their ponderosity, or they can go with a "rat tat" worthy of lightest hammer ever used for the striking of hot iron. The hammerer just works at them with a turn of the wrist and they do all the work from the one big slog to the multitudinous rat tatting. Springs, draw-bars, brakes, every detail of the same that is forged, bolts, fittings of all sorts, iron gears of all conditions, all things forgeable are piled up here making a big output from the big furnaces under the control of the big men. For moving the heavier stuff about there is a crane. To complete the fittings there is a spring furnace for making and tempering. It is noteworthy that all the work from here goes straight to the car shed, being finished in every way.

Patterns.

Back among the buildings we are in the pattern shop. A small corner it is of the carpenters' shop hard by the carriage department. A small place it looks, for the work of the magnitude done here. But go into the pattern store hard by and you will see the output of that small place. The store is full to overflowing and the shelves positively groan with abundance and variety. Here are patterns for big cranes, steam hammers, wheels of every kind great and small, locomotive smoke-box fronts, locomotive cylinders, and all things big in the casting way. On the other hand there are all the small things down to hat racks and the little blocks that act as catches for the windows of the railway carriages. These last are made thirty in the time where it was once the custom to fashion one with much labour and infinite patience. In this store things are of the needle to anchor order. They make you realise the industry of the pattern makers working so methodically at their machines. They also help you to understand the expense of iron work and the skill of the workers as well as the cunning of the machines. Hard by is the drying furnace for the cores. We are invited to go in to sample the atmosphere, but the behaviour of the first straw hat to get inside the door is a warning and we are satisfied to take the heat for granted without going further in. The heat convinces without the spontaneous combustion of a not too cheap Panama.

Moulders, Polishers, and Brass Finishers

In the iron foundry is a new vibrating table moulding machine, operated by compressed air; this machine is used principally for brake blocks and other repetition work.

The pneumatic sand shakers are a great saving in labour for sifting and preparing the sand used in moulding.

There is also in this foundry a small machine for making cylindrical cores up to 2¾in. diameter and a circular saw for cutting off gates of brass castings.

The moulders turn out some fifty tons of castings a month. Here one sees all the iron castings, ventilators, firebars, cylinders, axle boxes, brake blocks, everything that is cast in requirement of railway work. Of the brake blocks, it appears presently that forty a day is the output here. An economic fact is worth noting. The ventilators of the carriages used to be cast in several pieces and put together after the moulding. Now they are, thanks to a mechanical invention of one of the staff, cast in one piece. The saving is five shillings per ventilator, and as there are sixteen to the car, the saving per car is four pounds sterling. The furnace stands near, notable for the coloured glass peep holes for the men to see unhurt the progress of the melting, and a few paces off is the Fettling shop where the fettling machines clean the castings, and further on is the burnishing shop where the last touches are put on the brass and other fittings, which are then ready for their appointed places in the cars.

Last Scene of All.

The car finds its way polished, painted, ready for the road to the shed, where the Westinghouse brake and the gas plants are waiting to be fitted. The cylinders, blocks, and pipes of the Westinghouse system are lying about, and the cylinders of the Pintesh gas with the lamps and the piping. We note the couplings of the former and have a talk with the inventor about the merits of the "Pearson coupling" which supplements the Westinghouse brake and a sample of the coupling is produced to illustrate the descriptions. As the subject is dealt with fully elsewhere in the present issue nothing more need be said here, except to wish the inventor the success which his ingenious invention deserves.

In this shed there are many stacks of timber drying, and fittings of various sorts are kept against the time of need.

The System of Work.

It is the rule here at Petone that all the parts of cars or wagons or locomotives to be built must be finished by the various shops and delivered before the erecting shop can begin to put them together. Thus is the pace set for the whole establishment. In addition there is close supervision. The lowest grade of supervisor is the leading hand, over him comes the shop foreman, and over him there is the workshops manager; and lastly there is the locomotive engineer. The lower grades are always with the men and the others come at odd moments without beat of drum or regular understanding of the hour of their visit. The results, especially when you have the right quality of men, ought to be good. The quality is beyond doubt as every one can testify cheerfully who has been through these shops. There need therefore be no fear as to the results.

Some interesting links with the middle century, when the South of England was a prosperous iron-smelting district, may be found to-day in Sussex. Although iron ore is found abundantly in this area, there is an entire absence of fuel for smelting purposes, and it was the close proximity of the two minerals to one another in the North of England that brought about the removal of the indsutry to that more convenient area; so that the Sussex iron trade fell into desuetude. Throughout the country now may be found scattered large expanses of water called "hammer-ponds," from the simple fact that in the iron-smelting days, the water constituted the motive power for driving the ponderous hammers by means of which the ore was pounded or the iron smelted. They are still known under their original name.

MINING

Deep Sinking and Deeply Seated Wealth

In the North the great question of the Thames goldfield is of getting the flood mine water out so that the lower deeps may repeat the fairy stories contributed by the upper levels to the history of quartz mining in the Dominion. Scheme after scheme of pumping, all based on Government subsidies, has been published and tried and for some reason has not prospered as it was expected to prosper. The fight goes on against nature, circumstances, and the speculator, who is often the greatest hindrance to true mining. In the midst of the controversy it is interesting to cast our eyes across to the Victorian goldfields, the Bendigo district of which is remarkable for the deepest mines in the world. We talk with breath almost bated of 1000 feet. There they reckon a mile as the limit possible, but not to be astonished at and likely to be one day left behind.

The history of the sinking which has reached that astounding depth in the Victorian mining centre is full of enterprise and resource beyond the common, to say nothing of faith and courage beyond the power of belief. In the beginning the gold of Bendigo was alluvial, and men got rich by scratching the surface. Gradually the gold receded into the lower regions and was followed by increasing pertinacity and by increasing rewards. The famous "Saddle" reefs were discovered, and fortunes were made. These run continuously for long distances and for the whole of these distances not a duffer has ever been encountered. Three such lines stand out prominently as profitable, but there is no reason, the experts say, for believing that many more may not be discovered in the same formation, which is very extensive.

The fear is that the policy of "Sink, sink, sink," which has done so much in the past, is approaching the end. In other words, after a history of golden yields improving directly as the depths, the time has arrived when it will not pay to take gold out of mines at these great depths. "Poor country," not "Worked out" is the cry beginning to be heard. It has driven private enterprise, which has held up its head so high in these regions, and done so much for the development of the quartz industry, to ask for Government help.

The two best mines along the runs above described are, according to the director of the Bendigo School of Mines, the New Chum Railway, and the Victoria Quartz. Of these two the Victoria is the deeper—it is now being tested at a depth of 4,525 feet, a depth at which the illustration we publish in connection with the subject was taken—and the hopes of the deep sinkers are concentrated upon its fortunes. At 150 feet this mine paid £218,000 in dividends. At depths descending to 1,000 feet nothing was got worth speaking of. At 1100, 1700, 1800, 1900 feet the yields were enormous even for Bendigo. From the last to over 2600 the miners struck nothing. At 2700 the mine paid £90,000 in dividends before it gave out. In consequence of this alternation of success and failure, the former paying off the cost of the latter and

giving riches in addition beyond the dreams of avarice, the policy of "Sink, sink, sink" was persevered with.

But now there is a change. The new reefs struck are large and imposing as ever, but they are not profitable. Depth after depth has been explored to the 4500 feet level mentioned above, without any good results. The rest of the story we will leave to be told by the expert afore mentioned (Mr. Donald Grant, M.M.E.), who has permitted us to extract from his sketch of Deep Sinking at the Bendigo Quartz Mines.

Mine Ventilaton.

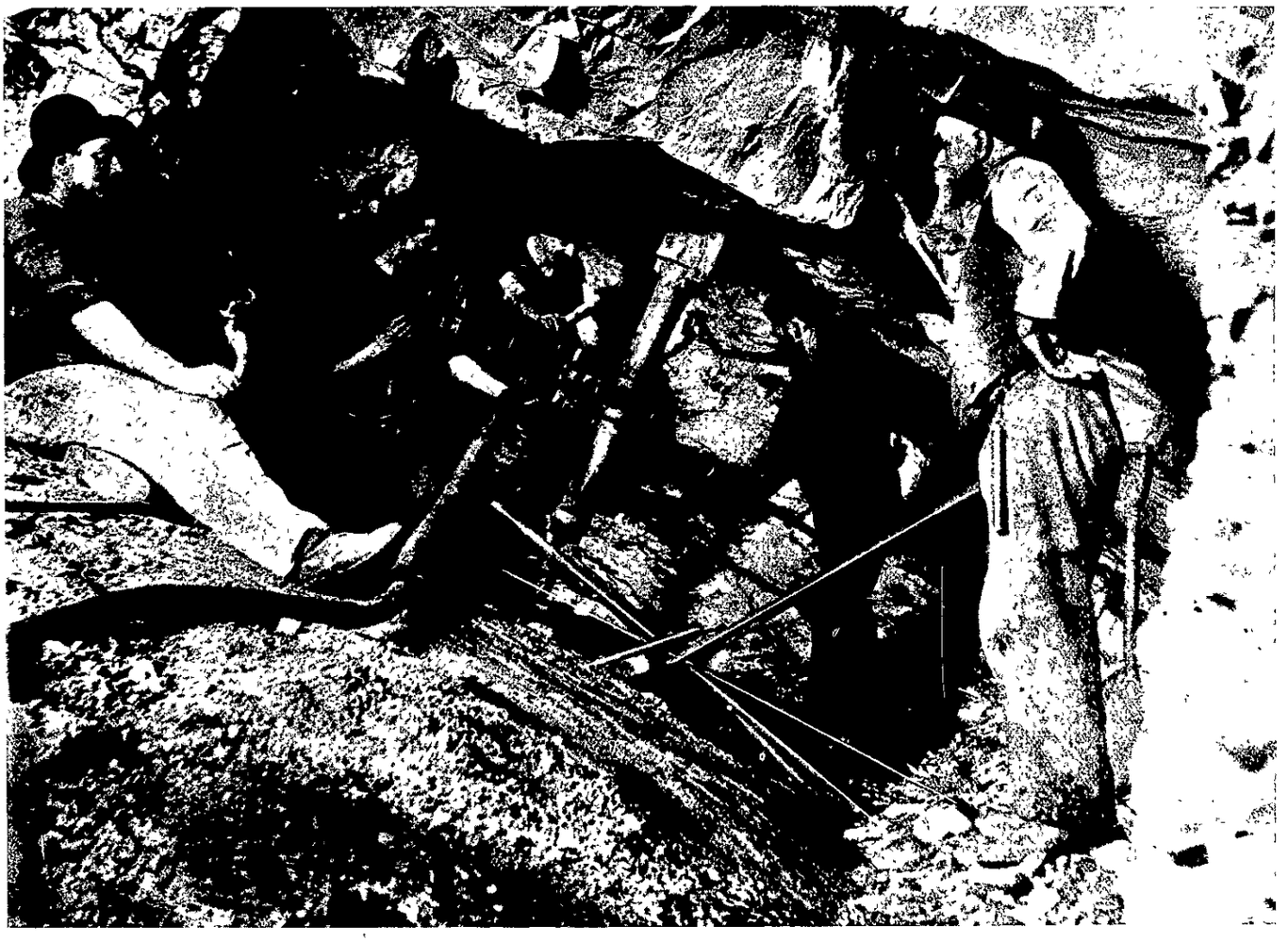
The management of the Victoria Quartz-mine is under the guidance of Mr. Wilfred Rickard, who has been in charge for seventeen years. If the present reef carries gold, Mr. Rickard can pay all expenses, and also do development work, on 5dwt. per ton—truly a great performance from a reef nearly a mile deep. It is owing to his foresight that the mine can be worked now. Years ago Mr. Rickard made it imperative that adequate ventilation should be provided for at every stage, with the result that a fine stream of air is circulated by natural means even at the lowest levels. The shaft is a downcast; the air goes to the bottom, and returns through the centre-country winzes to the 3,384ft. level, and up the 180 Mine.

Rock-Temperature.

The temperature of the water issuing from the rock at the bottom of the winze is 114° Fahr., but it cools rapidly—even in falling 3ft. after issuing from the rock the temperature falls 6° Fahr. The temperature of the rock from a hole bored for 9ft. in the face of a dead end was 112½° Fahr. It might be imagined that it would be impossible to wrok with such surrounding temperature, but the incoming air, if not saturated, soon chills down the hot rock, and leaves a cold skin on the surface, through which the heat from the interior diffuses slowly; further, the issuing water is soon cooled down. The water baled from below is only 86° to 88°, and the temperature of the air at the 425ft. level varies from 72° to 75°, the higher temperature, as a rule, depending on the temperature of the air above. For instance, when it was 75°, the shade temperature on top was 95°, and when 72° the shade temperature was below 60°. Mr. Rickard finds that the air is heated about 1° for every 100ft. of drives or crosscuts it passes through at the lower level; he also finds that he obtains better ventilation with north than with south winds—an opposite result from that obtained in shallow mines. The pressure of the air is equal to 34.75in. of mercury at the bottom, and water boils at 218.4°.

Gold at a depth of 5,000 feet.

It is felt that the future of deep sinking in Bendigo will depend on the results obtained in this mine, or its deep rival, the New Chum Railway. Very few other fields have the same conditions. In many the reefs become poor, or pinch out altogether. Here it has been proved, contrary to the opinions once expressed, that quartz bodies, just as large, exist a mile below as at the surface. It has been proved that they have been just as good at 3,000ft. as at shallow levels. It has been proved that low-grade stone would pay even at great depths; but, unless some better encouragement is obtained in opening up the reefs now disclosed at the lowest levels in both these mines, it is certain that the shareholders, who have done so much, must reluctantly abandon them. If once abandoned, then there is only the remotest chance of work being again started, for it will mean shutting down mine after mine right along the line. No better opportunity for the Government exists than to aid the industry by continuing the work so long carried on without result by the shareholders of this company. The mine is well equipped, and with a few minor alterations the present plant could sink another 1,000ft.. The cost of sinking and timbering complete at the lower levels amounts to £5 16s. per foot; the water is comparatively light; and the centre country is camparatively close to the shaft. The conditions as to ventilation are such that another 1,000ft. will not make matters worse than at present. It may be said that, owing to the pitch of the country, other mines at a lesser level are in the same formation as the Victoria Quartz; but this aspect of the question, although interesting geologically, must not be measured against the commercial nature of the undertaking. If gold is got at a depth of over 5,000ft., such as was obtained at 3,000ft., then it means a new life for many mines which are now on the point of closing down.



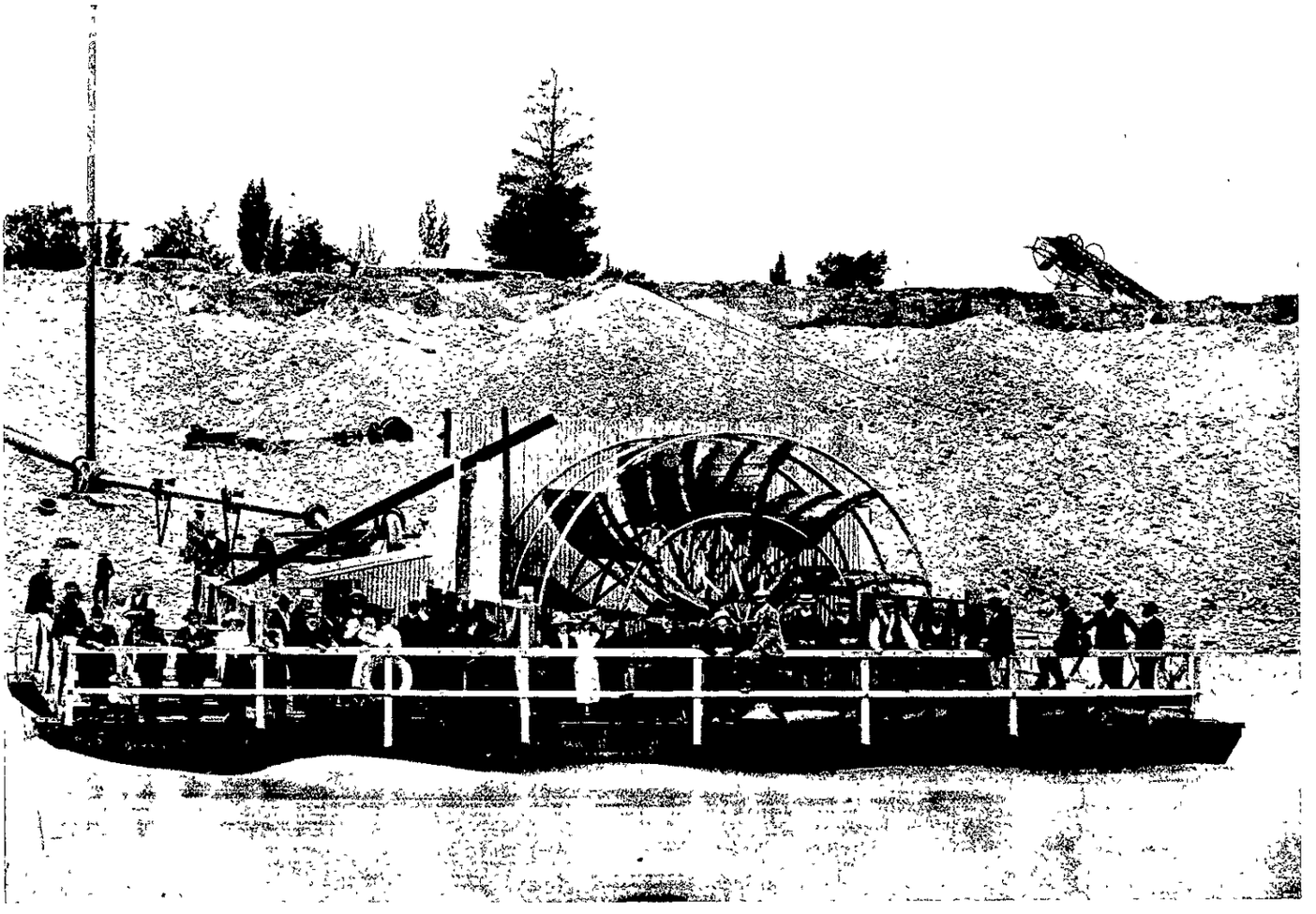
THE VICTORIA REEF QUARTZ-MINE, BENDIGO, VICTORIA—THE DEEPEST QUARTZ MINE IN THE WORLD.
Photograph showing Stoping by Rock-drill on the West Leg of the Saddle Reef at a depth of 4,156 ft from the surface On the right is Captain W Abraham Government Mining Inspector, and on the left is Mr. Rickard, Mine Manager *(Mines Record)*

Note above that ventilation is reported secure down to 6000 feet. If gold is plentiful refrigerating machinery will offer great possibilities.—Ed. P.

A Current Pump of the Clutha.

Of old the lift pump was a feature on every river, for man at a very early stage of his existence found out the secret of making rivers pump up their water for the irrigation of the soil or the supply of power for machinery. In this country there was much trust in the water wheel of old ideas in the early goldfield days. But when the dredge industry got into the big bucket stage there was an end to the old wheel. Power had to be got from outside the river and the old wheel sank out of sight. But engineers have not allowed the old idea to die. The swift current of the Clutha, water gone mad in many places it is, kept their minds on the alert for possibilities. They knew the strength of the old Molyneux, which discharges every twenty-four hours almost as much water as the Nile, and has a volume and velocity exceeded by few rivers in the world, and by none in Australasia. A drainage it has of 8000 square miles, and it discharges into the sea one million cubic feet of water per minute, in ordinary times. What it does in spate Heaven only knows. But the ordinary million is good enough.

Three Otago engineers have had the problem of this river's utilisation by the ordinary wheel in mind for many years. After much study and experimenting they have devised current wheels of great efficiency and power on scientific lines, and the air of Central Otago is full of the predictions of the glory to come to the invention from electric plants, from irrigation, and from sluicing. Naturally, for the supply of water is beyond anything that can be used if every acre of the Clutha valley were to be irrigated from the Lake to the open country of Inch Clutha. Men have talked water power for these regions and whispered of loans of a million. But here we have a cheap pump worked by the river. It is a story of the Aladdin series. One is positively afraid to speculate on the results of the universal employment of these wheels. Without going into details of thousands or millions sterling, it is pretty certain that there will be boom in mining which will make men think of the old days of Roaring Meg and Gentle Annie, when the valley was alive from Alexandra to Queenstown. Messrs. Payne, Morgan and Milne are the trio who worked on the pump which invokes thoughts like these. From the fact that the pump is called after Mr. Payne, one can see who had the chief share in the development of the new water power.



PAYNE'S PATENT CURRENT PUMPING-PLANT, ON THE CLUTHA RIVER, AT ALEXANDRA, N.Z *(Mines Record)*

PAYNE'S PATENT CURRENT WHEEL PUMPING PLANT.

The following account is from the pen of Mr. Frank Reed, mining engineer of the Mines Department. We take it from the *N.Z. Mines Record*:—

The current-wheel pumping plant recently installed by the Alexandra Lead Gold-Dredging Company (Limited) on the Clutha River, at Alexandra, by Mr. F. W. Payne, of Dunedin, is the pioneer current-pump of Australasia, and is probably the largest and most powerful unit of this class of machine ever constructed. The special features of this machine, designed for the purpose of obtaining greater efficiency than former types, are—

(*a.*) The curvature of the blades (of a somewhat similar form of Poncelet's undershot wheel) which form, it is claimed, offers increased resistance to the current, and both enters and leaves the water with less commotion than the straight floats of former types of wheel.

(*b.*) A movable shutter at the up-stream end of the wheel is operated by a hand winch, and acts as a brake by restraining the current from the wheel when required.

(*c.*) The magnitude of the wheel—viz., 19.77ft. diameter—and the depth of the floats or blades submerged. In no former machine of which there is any record has the diameter of the wheel exceeded 16.4ft. (*Vide* "Spon's Dictionary of Engineering.")

(*d.*) The reduced number of blades or floats. The current-wheel operates between two parallel pontoons, the stream flowing between them. This machine was installed for the purpose of raising water, which it efficiently does, to an elevation of 51ft. 6in. above the river-level for sluicing the auriferous gravel, river-banks, and terraces. The following is a summary of the results of a series of careful tests of this machine, together with the principal dimensions:—

Velocity of stream (8/1/09), 6.24 miles per hour.

Theoretical horse-power of stream, 69.4.

Brake horse-power of current-wheel, 35.

Horse-power in water discharged by a centrifugal pump, 14.6.

Efficiency of current wheel, 50.4 per cent.

Efficiency of centrifugal pump, 41.7 per cent.

Combined efficiency of complete plant from river current to discharge weir, 20.64 per cent.

Diameter of current-wheel, 19ft. 9½in.

Length of current-wheel (or float), 20ft. 0½in.

Area of float (or blade) submerged, 67.735 square feet.

Depth of float (or blade) submerged, 3.38ft.

Revolutions of wheel per minute at above velocity of stream, 3.96.

Number of blades in wheel. 12.

Length of pontoons, 55ft.

Height of water discharged above river-level, 51.5ft.

Quantity of water discharged, 2.5 cubic feet per second, or 1.347.840 gallons per day.

Based upon the results of the foregoing experiments, and the fact that the power increases as the cube of the velocity of the stream, the following table has been prepared by me, with a view to illustrating the capabilities of *one unit* only of the aforementioned current-pump at various velocities of the stream and at various heads or elevations above it. These results may be doubled or trebled by the installation of two or three current-wheels (units) on one pontoon, as may be required: —

Height pumped, in feet.	Velocity, 6 miles per hr. (B h p. produced, 40 97)	Velocity 7 miles per hr. (B h.p produced, 64 9)	Velocity, 8 miles per hr (B h p produced, 97 00)
	Water discharged, in Cubic Feet, per Second.		
50	3·97	6·29	9·41
100	1·97	3 11	4·66
150	1·31	2 07	3·11

(NOTE.—In these calculations a pump giving 50 per cent efficiency of the power of the current-wheel has been substituted for the inefficient centrifugal pump of the tests quoted, the B H.P. produced being that registered by a rope dynamometer at the wheel.)

It is pleasing to reflect, and a bit startling too, that the cost of these pumps is very small when compared with the cost of the old system of water-races, which has in some places broken down so completely, as the following note by an expert will show:

The cost of construction of the principal races, including their storage-dams, varies generally in Otago and Southland between £500 and £2,000 per cubic foot of water delivered per second; but in some places, including the gorge and valleys of the Clutha below Cromwell to Roxburgh, water from races is practically unobtainable. The cost of installation of one unit current-wheel plant, complete on a steel pontoon, would be about £1,800, and this would deliver at an altitude of 150ft. above the river (as based upon my recent tests) from 1.31 to 3.11 cubic feet of water per second, varying with the velocity of the current. The relative average initial cost of races and dams per cubic foot of water delivered therefrom per second is £1250, and by the current-pumping plant to an altitude of 150ft. it is £810.

The Morgan Current Pump.

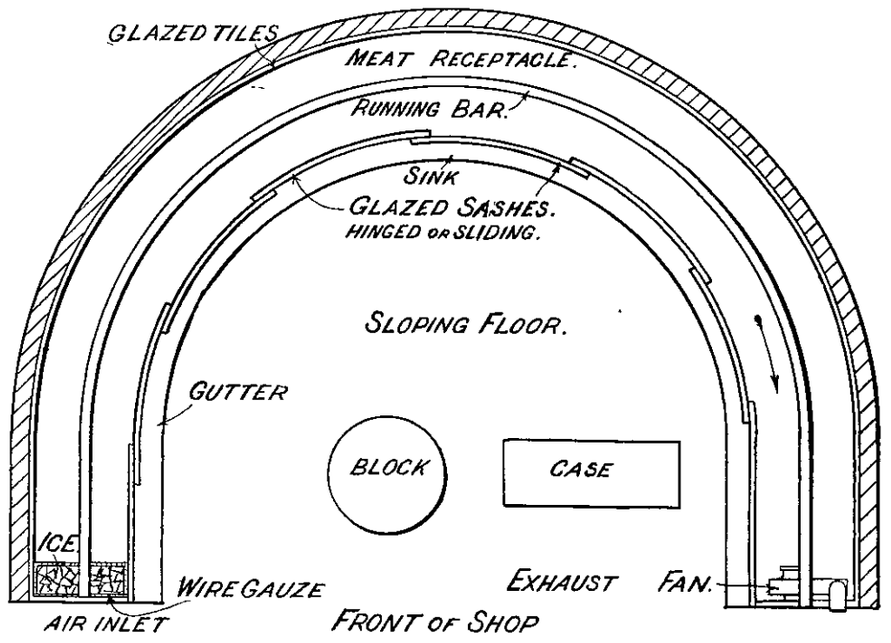
Another pump has been designed, called the Morgan and Milne Patent Current Turbine Pumping Machine. It has not got beyond the model stage as yet, but even as a model, with a turbine of only 3 feet diameter, it developed 2 brake-horse power with a current velocity only a little over five miles an hour.

The owners of the Mercedes patents—Gate Change—have announced their intention of taking action to maintain their rights.

Filth and Food.

A summer morning. One of these recent summer mornings. The morning, you understand, of genial heat, with breeze enough to keep the dust lively. The City Council has a new street-sweeper, but it doesn't seem to have been along this street this morning. There is a generous litter of horse-droppings in the road—a litter which, as the sun dessicates it, becomes one with the breeze and the dust, intent on mischievous frolic. It is not at all a comfortable thing to think about, with the day so genial and the sky so blue. Call it plain dust.

A morning, naturally, to tempt forth the ailing. Down the pavement comes a man with a hollow chest. A layman would guess that the hollow-chested man had what we call consumption; but how should a layman know. The man is a law-abiding citizen, however you take it. He does not expectorate on the pavement. He walks to the gutter, and expectorates there, as a citizen should—into a little heap or whirl of the plain litter of the road. The sun is strong.



AN IDEAL BUTCHER'S SHOP.

Another contribution to the breeze and the dust, another element in the mischievous frolic.

Over the street there is a butcher's shop, joints temptingly displayed, open to the breeze and the dust, open to the flies—a clean enough butcher's shop, as such shops go in New Zealand—white tiles, white aprons, all the rest of it. And the meat looks tempting to the housewife, who has no thought of the plain dust, and the dessicated litter, and the hollow-chested man across the way.

There is a baker's cart near by. It is open at the back. The loaves are exposed to the breeze and the dust—newly-baked loaves, warm and absorbent. The carter's hands are not immaculate. The dust whirls and eddies playfully. The hollow-chested man has turned a corner, and is keeping the law in another street. Who cares?

Generally speaking, all New Zealand butcher's shops are open to the dust like that, and all fishmongers; and bread is generally delivered in just that way, unwrapped. One or two fishmongers are showing their wares under glass; but they are finnicking people, faddists. What does the public care?

And one or two expose their wares under running water, which makes the fish sloppy and tasteless. The public does not like tasteless and sloppy fish. Naturally not. If a fellow passes coughing up tubercles, the public doesn't know. Naturally not.

There are only one or two properly fitted butcher's shops in New Zealand. A properly fitted butcher's shop should have all the meat under glass, securely kept away from dust and contamination, exposed only to a current of clean air. The sketch-plan will give you an idea. The shop would cost no more built that way than built in the ordinary way that the flies like. Why should butchers consider the public and cheat the flies, so long as the public doesn't care? Why?

All bread, meat, fish, all food supplies, should be wrapped before delivery. There should be no chance of contamination between the shop and the consumer. And the wrapping should be of clean, wholesome, new paper. No newspaper should be permitted to enter into this scheme, whatever its shade of politics. The thing may sound absurd to the conservative; but the public has every right to demand and insist that its food shall be supplied as clean as scrupulous care can keep it.

No excuse should be permitted in expiation of the offence of the butcher who serves tubercles with his chops. The remedy is really in the hands of the public; but as long as the public sleeps, the remedy will not be applied.

The milk service is very much better in Wellington than it was; but it is still very far from perfect. Here, however, there is a hopeful sign. Eighteen or nineteen of the biggest vendors have joined in paying the salary of an inspector who is entirely under the control of the Health Department. He inspects their milk just as he inspects any other person's. He is in no sense in their employ.

The milk supply should be as pure as scrupulous care can keep it. Impurity here strikes directly at the children. If the public really cares about the children, there must soon be an end of this general apathy. Filth and food should be kept apart. They have nothing in common.

Westinghouse Brakes: Pearson's Coupling.

Good Work by a New Zealand Inventor.

The travelling public is mostly composed of the inexpert, so far as engineering matters are concerned; but the average inexpert traveller has at least a vague idea of the principle on which a Westinghouse brake works. He has noticed the hose pipes hanging between the carriages of a train, and he knows that these pipes are in some way connected with the brakes. In rarer instances, he knows that the pipes are used to connect the air-brakes between the vehicles. More rarely still, he knows that if the train were accidentally divided the drawing apart of the hose pipes would cause the brakes to be applied on both sections of the severed train. Here and there among the travelling public, you may even find a man who knows of the existence of a train-cock at each end of the carriage where the hose-pipes are attached. Heretofore, that train-cock has stood for a dangerous weakness in the air-brake system.

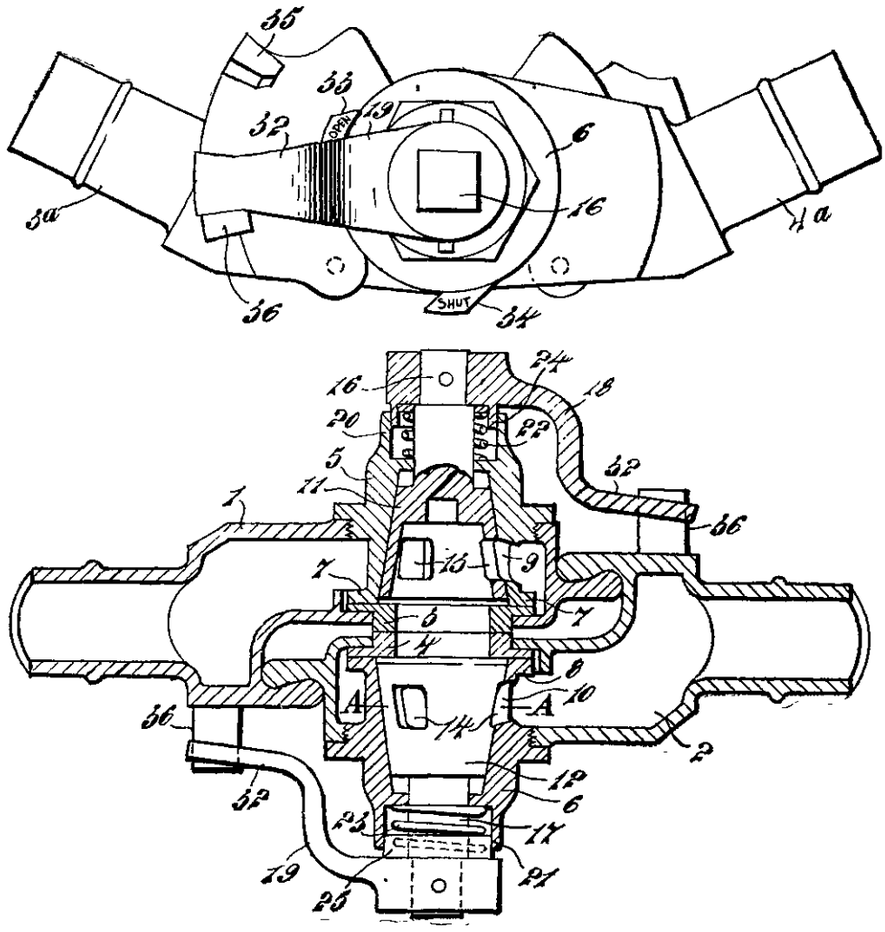
If the hose-pipes are disconnected, and the train-cocks left open, the brakes are applied throughout the train. In shunting operations, it is necessary to have an arrangement by which the carriages may be disconnected when required, without the application of the brakes. It is to meet that necessity that the train-cocks are provided.

This introduction of the train-cock is recognised as an inherent defect for several reasons; but chiefly because it provides an inlet for the dangerous element of human fallibility. On many occasions the train-cocks have been found to be closed after the hose-pipes have been coupled together, with the result that none of the brakes on the vehicles rearward of the closed train-cock could be applied. This not infrequent forgetfulness of the shunter to open the train-cocks after coupling-up the hose-pipes has caused accidents in the past, and is liable to cause accidents so long as the defect continues. The accident at Rotorua some time ago, when part of a train ran away down a sharp decline, has been attributed to a closed cock—an accident, by the way, which probably cost the Government several thousand pounds. A further risk in connection with these cocks lies in the fact that they can be tampered with by passengers. Out of eleven accidents in New Zealand, eight have been the result of somebody's negligence in leaving train-cocks closed.

Many engineers have endeavoured to overcome this difficulty and to remove this risk. The Westinghouse Brake Company was consulted, and all it could suggest was that the train-cocks should be removed to a position where they could not be tampered with by passengers. The removing of the cocks would, of course, in no way remove or reduce the danger arising from the forgetfulness of shunters. Indeed, it would rather tend to aggravate the danger. The cocks are now handy; if they were removed, it would be a case of out of sight out of mind.

Happily New Zealand engineers were not content to accept the suggestion of the Westinghouse Company as the last word in the matter. Mr. Pearson, the Locomotive Engineer of the Government Railways, being fully convinced that the difficulty could be surmounted, set earnestly to work to discover how. With his engineering training and his wide experience to help him, his efforts have resulted in complete success. The first definite conclusion he arrived at was that the train-cock in its existing form must go altogether. Next came the question—how to provide a better substitute? As chief considerations in the problem, Mr. Pearson had to devise (1) a coupler upon the hose pipes, which if separated by the accidental severance of a train, would leave the hose pipes open and apply the brakes upon both portions of the train, without injury to the coupler; (2), a coupler which cannot be separated purposely without leaving the brake pipe closed upon both portions of the train; (3) a coupler which cannot be connected together without leaving the brake pipe open. Besides fulfilling these conditions, (4) the coupler should be capable of being fitted upon existing plant, (5) a vehicle fitted with the coupler must be capable of being connected to a vehicle equipped as at present (6), the existing dummy coupler must be employed as at present; (7) the cost of equipping a vehicle should preferably not exceed that of the old system; and (8) when the hose pipes are coupled, the valve which opens the brake pipe must be locked by the action of coupling so that it cannot be interfered with.

This formidable list of requirements, Mr. Pearson has completely met in a most ingenious and comprehensive manner by the mechanism illustrated in the accompanying engravings. The heads numbered 1 and 2 are the standard pattern of the Westinghouse Brake Company, and are attached by their sockets (3a and 4a) to the usual hose pipes, which are connected to the brake pipes of the carriages direct; that is to say, without the intervention of train cocks. From the heads, Mr. Pearson removes the usual brass caps, and substitutes therefore the cocks (5 and 6), which have hollow plugs (11 and 12). The stems (17) of these plugs have sided ends (16) fitted with levers (32). Lugs (35 and 36) fixed to the heads are adapted to engage the levers (32), which are so arranged that it is impossible to couple the heads together without entering the levers between the lugs. The result is that before the heads can be coupled together, the cocks are necessarily closed and the levers engaged by the lugs (35 and 36). The action of turning the heads upon one another, while the levers are engaged by the lugs (35 and 36) causes the cocks to open, that is with the ports (13 and 14) of the plugs registering with the ports (9 and 10) in the cocks, leaving the brakes in a condition ready to be applied. The heads cannot be uncoupled in the ordinary way without the operations being reversed and the cocks left open. If the heads are accidentally pulled apart, as by the severance of a train, the cocks remain open, and the brakes are thereby applied.



PEARSON COUPLING —Side Elevation and Sectional Plan.

The invention has passed through the severest tests upon a vehicle in daily service, running continuously with ordinary traffic, and with complete success. The heads were coupled and uncoupled innumerable times, and at the end of the period are in as good condition as when first fitted.

The value of the invention may be gathered from the fact that there are two and a half millions of vehicles fitted with heads to which the invention can be applied. The cost of equipment is about £1 per vehicle, which compares favourably

with the cost of the present heads and train cocks, and with a royalty of two shillings would give a return of £250,000. Its adoption on these terms by the Railways in Australia and New Zealand would mean a return of about £10,000. The invention has a most promising future financially and should be warmly welcomed by the public, whose safety it is designed to ensure. A company has been formed by Mr. E. W. B. Hornabrook, sharebroker, for exploiting the invention.

It is explained that the new Russian battleships are to cost three million sterling instead of £2,100,000, as estimated, because they are to be built in Russia. Their principal armament is to consist of 12in. guns.

A New Departure in Street Lighting.

Los Angeles, California.

Los Angeles, the home of millionaires, as it is now generally recognised, claims to be without rival in the artistic beauty and brilliance of its street lighting. This city is certainly one of the beauty spots of the country, and is famous for its progressive and enterprising city fathers, who, backed by patriotic citizens, have succeeded in establishing a lighting system having six miles of brilliantly lighted thoroughfares, that will compare with any city in the world.

The installing of this system of lighting in Los Angeles was inaugerated in 1905, by a committee of citizens convened by F. W. Blanchard, prominent in civic enterprises, and who was elected president of the Broadway Lighting Association.

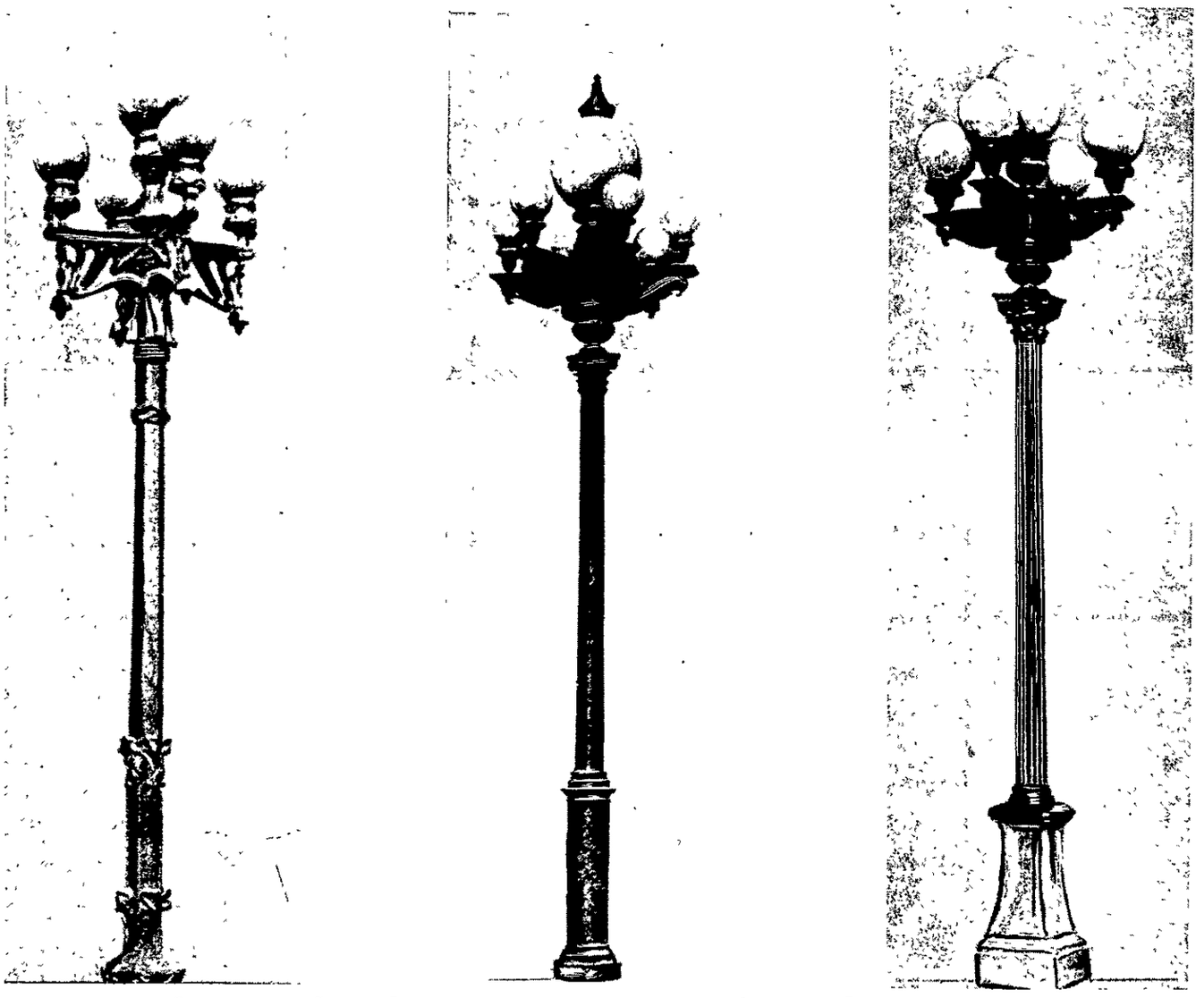
Broadway boulevard, one mile long, was selected as suitable for the new method, and was done, and the cost paid for entirely by public subscription. Great care was given to the selection of lamps that would give a truly artistic effect as well as a radiant light. A committee of twelve citizens were told off to inspect a number of ornamental posts of various designs, which were erected, wired and fixtured, for different schemes and styles of lighting, and they unanimously adopted those now installed.

These posts are erected at a distance of every one hundred feet, on each side of the street, and placed opposite each other. Each and every post contains on its summit, one centre ground glass globe, in which are installed 6-32 candle power lights; every post has also six arms, each with a 6in. ground glass globe containing 1-32 candle power light. The Broadway boulevard, therefore, has 1,620 of these new lights.

These lamps are lighted every night in the year from sundown until 12 p.m., the result being a boulevard of rare brilliancy, and having a most pleasing effect to the many thousands of people, both tourists and residents, who promenade the boulevard nightly, and their pride in their cost can be well understood.

The lights being arranged in ground glass, do not in any way cause a glare, a feature of this lighting is that while the lamps do not to any great extent light up the store fronts, they amply light the entire boulevard.

The results were so satisfactory that a demand was made by property owners in other streets for a similar lighting, which eventuated in an application to the State Legislature for a bill permitting the assessment of abutting properties similar to bills on the Statute books providing for the grading and paving of streets. The bill being passed, it was found a comparatively easy matter to complete the lighting improvement, as all the property owners involved readily foresaw the great advantage in having well lighted streets. The enhancement of the property values for the entire lighted district more than paid for the whole cost entailed. The cost of the lamps installed and fitted ready for lighting was approximately £25 each post.



Lamps of the System Installed at Los Angeles by the Broadway Lighting Association.

It is stated that the work of converting the Interoceanic Railway from its present gauge of 3ft. to standard gauge was to have started in January, 1909, and the first section undertaken that between Mexico City and Vera Cruz. Ninety-pound rails will be used. Most of the existing bridges are wide and strong enough to accommodate standard-gauge stock. Some 310 miles are to be converted, and some £6,000,000 will, it is estimated, be expended before the line is brought up to a first-class standard gauge system.

* * * * *

It is gratifying to learn that the rapid rate of construction of the Panama Canal continues. The grand total of excavation during the month of September was 3,158,886 cubic yards, all of which, except 69,035 cubic yards, was excavated from the canal prism. Of the grand total, 1,374,856 cubic yards was taken out by dredgers, and the remainder was dry excavation.

A Novel Type of Drawbridge.

(Specially Contributed by our Californian Correspondent.)

The longest one known, and the first of its kind, built west of the Rocky Mountains, is the new Salt Lake drawbridge recently built and just on completion by the Llewellyn Iron Works at Los Angeles. It is known as a Scherzer rolling lift bridge, and is being erected over the San Gabriel River at Long Beach, Calif, and connecting that part with Terminal Island, for the Southern Pacific Los Angeles and Salt Lake Rail Road.

It is a single track bridge 18 feet wide, and the longest single span roller bridge yet built. The weight of the bridge is approximately 700 tons, and it is a fine steel structure. Its draw is one that raises instead of swinging on a pivot. When open, it will leave a clear channel of 180 feet, and the highest point of the bridge when in that position will be 240 feet above high tide mark. Operation will be by electric power from the Long Beach end, furnished by the Pacific Electric Railway Company.

There are three piers designated A. B. and C. Pier C is at the Long Beach end. Piers B and C are 4 feet apart, and from B to A is the moving span of 180 feet, said to be the longest of its kind known.

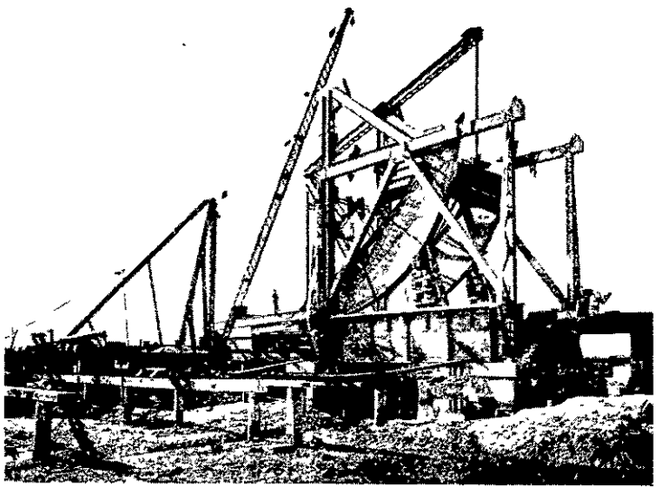
At the Long Beach end is the counterweight tower, or box, filled with concrete. So delicately is the balance fixed that this weight is exactly that of the moving span to be raised, and if the machinery gets out of order one man can raise or lower the draw by hand. This is what will be done in case of an emergency. When the draw is up, the counter-weight will go down. It is much as though one were to take a huge triangle like a carpenter's square, with a heavy base, build a huge box and place it on the top of the hypothenuse to make the latter's weight equal that of the base, fasten the right angle to a pivot, then raise the base by the weight of the box on the end of the hypothenuse, and swing the base back into place by its own weight, just setting the whole in motion by a very slight exertion of power.

In this box will be also about 25 tons of pig iron additional, so as to be able to adjust the counterweight in the event of such being required in the future, owing to a possible change of the centre of gravity of the bridge.

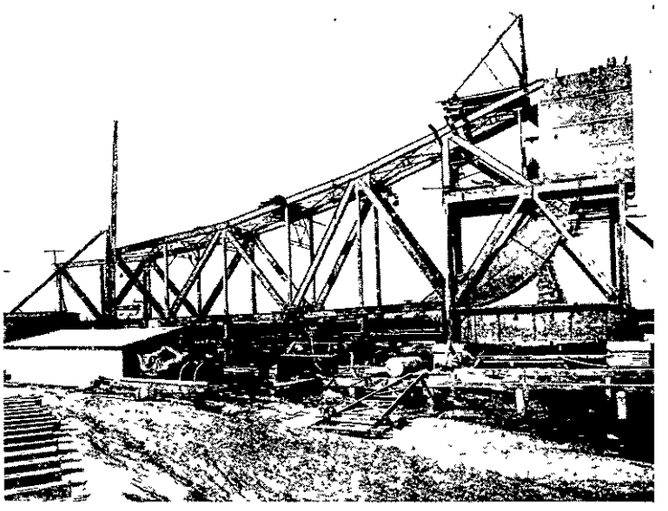
On a level with the counterweight box is a platform, known as the machinery floor, on which are placed two twenty horsepower motors. The ladder shown in the picture, like a fire escape at one side, affords access to the machinery floor and counterweight box. When lowered, the bridge is locked in place at the Terminal Island end. A set of automatic signals will notify engineers of approaching trains to stop when the draw is raised, or to go ahead with a clear bridge.

The total height from the floor of the bridge to the top of the counterweight box is 225 feet.

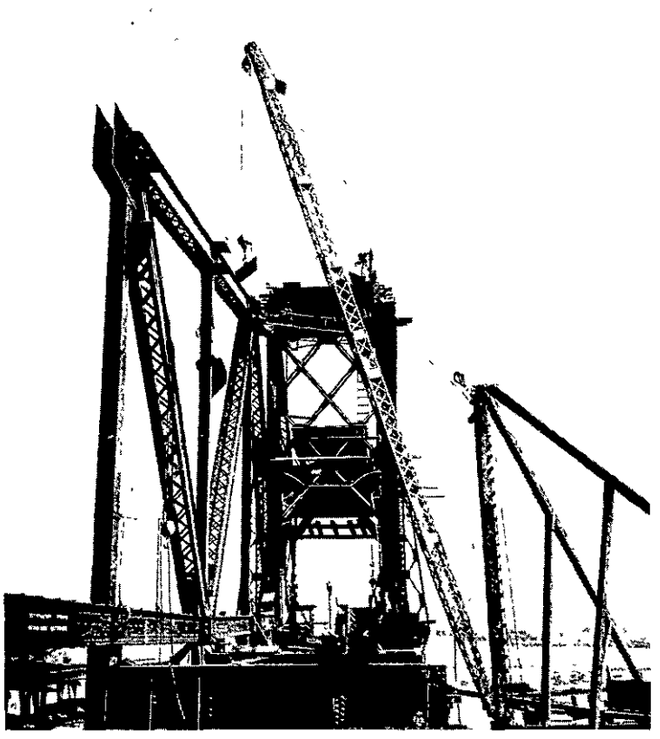
The bridge is being equipped with all the



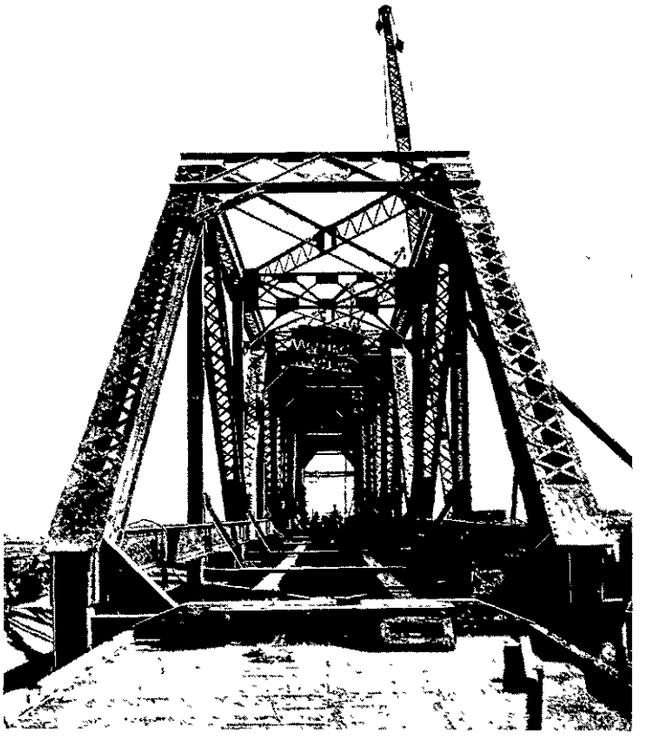
SIDE ELEVATION DURING CONSTRUCTION.



SIDE ELEVATION COMPLETE.



END OF BRIDGE DURING CONSTRUCTION.



END OF BRIDGE AFTER COMPLETION.

latest safety signals, interlocking and derailing devices, together with all necessary signals for both railroad and channel requirements. The working drawings and details were all worked out by the engineers of the Llewellyn Iron Works, and the fabricating of all the material and the erecting of same is being done by them.

All the parts were made at the local plant and brought to the ground, carefully numbered and marked, each for its exact place. The contract called for completion on December 1, but unavoidable delays have occurred, and extension of time has been allowed.

The piers of the old bridge have been used as false work. They will be taken out when the structure is finished. During the building the trains have used a temporary trestle.

At present the bridge merely crosses a dry or almost dry bed of sand. Sometimes there is water there, but very little. Inside there is water, and it is the intention to dredge it all out and make a harbour for Long Beach. For this end the Government has forced the railroad to build the drawbridge. Until the dredger is at work there will be little practical use for the draw. The site is about a quarter of a mile beyond the Pacific Electric's terminal at Seaside Park. The power for manning the huge crane that lifts the heavy girders and plates to their places is electric. The total cost of the bridge will be between £50,000 and £60,000.

Miscellaneous

On the Trend of Chemical Invention.

(By Robert Kennedy Duncan, Professor of Industrial Chemistry at the University of Kansas.)

One of the rarest and most valuable of the powers of man is "foresight," the ability to divine "the trend of things"—the trend of events, or, it may be, the trend of knowledge; its exercise, too, forms one of the most interesting and most agreeable of preoccupations. But the Patent Office is a place in whose activities one may determine this "trend of things" not by this rare power of divination, but just by the merest observation. There, there lie actually *in statu nascendi* to-morrow's ways and the implements of to-morrow's civilisation. It ought, therefore to be profitable to examine into the activities of this office during, let us say, the last year, in order to discover therein what is interesting and significant.

Now, the Commissioner of Patents may be likened to a wine merchant. He has in his office the wine of human progress of every kind and quality—wine, one may say, produced from the fermentation of the facts of the world through the yeast of human effort. Sometimes the yeast is "wild" and sometimes the "must" is poor, and while it all lies there shining with its due measure of the sparkle of divine effort, it is but occasionally that one finds a wine whose bouquet is the result of a pure culture on the true fruit of knowledge. But it is this true pure wine of discovery that is alone of lasting significance, and since it is for the most part to be found in those discoveries that are classed together as "chemical patents," I shall devote myself to them alone.

It is not the subject-matter of the patents that is of such interest; it is the fact that Fischer, the greatest living master-mind in organic chemistry; Ostwald, the giant amongst the physical chemists; Soddy who with Ramsay discovered the degradation of radium into helium—and many other men of this type and standing, should be patenting their discoveries. A few years ago the university professor who "degraded his science to utilitarian ends" became a pariah among his fellows, and to take out a patent was of all sins against the cloth, the one least forgivable. It was the duty of the man of science "to give his discoveries to the world." But things are now sweepingly different. Through the invasion of industry by science it has appeared that the scientific method is just as strictly applicable to useful as to "academic" knowledge; furthermore, it appears that the world is becoming increasingly convinced that ideas are *property*—just as truly property as homes and lands; and finally it appears that no man, however noble may be his desires, can "give his discoveries to the world." This last clause may not be obvious, but to see it one has only to reflect that a discovery can go to the people only through the industries, and that the industries inevitably place upon it all that the "trade will bear."

The necessity is laid upon the university professor of associating with the newly wealthy cultured class upon a self-respecting basis, and has led him to feel that with entire propriety he may patent his discoveries. Not only so, but the patenting of a discovery actually forwards it. This appears in a conversation which the writer recently had with Professor Lippman of Paris, the discoverer of the wonderful interference process of colour photography. Said Professor Lippman, "In order to forward the development of this process I refused to patent the fundamental idea." The result was that nobody would touch it. "If you wish to give such a discovery to the world, you should patent it." At any rate, whether it is to be deprecated or commended, the "trend" is there as an unmistakable fact, and every year we shall see an increasing number of patents taken out by the academicians of science.

First in obviousness among the patents are those which deal with the utilisation of waste. Thus with fuel: Through the gradual depletion of the fuel resources of the older countries and the conservation of our own through combinations of capital, the consequent rise in the price of fuel the world over has forced contemporary men to look for burnable material in what was the waste, of former days, in coal-dust. This coal dust is mixed with some binding material in order that it may appear as little briquettes of various shapes and sizes—mixed, it may be, with tar; plaster of paris and chromatised gelatin; cement and tar; or linseed meal, sulphur, flour, glucose, and lime. In certain cases substances are added to increase its combustibility—substances such as manganese dioxide or nitre. Not only coaldust, but turf also appears in many patents. In order to turn the turf into fuel it is dried and mixed superficially with resin for pressing, or, it may be, with naphthalene.

Artificial stone is the subject-matter of many a patent. For the most part it consists of cement mixed with asbestos, although, instead of this, sawdust and paraffin may be mixed with sand and a solution of magnesium chloride; or again, it may be made out of the mineral magnesite, mixed with zinc oxide and magnesium chloride, or silicic acid.

Many examples appear in foods. Thus with coffee: Many patents propose a coffee extract made for the most part by grinding the beans with volatile solvents and afterwards extracting the fatty and aromatic substances by water; others, again, are concerned with the removal of the noxious ingredients.

Proposals are made to pass superheated steam through tobacco with the object of removing the injurious nicotine, which is subsequently condensed and is good, we are informed through another patent, for tanning hides.

These are but trivial, though interesting, examples of a tendency which to-morrow will be an actual phase of our civilisation. Ever more and more our foods and indeed all the implements of our civilisation will be refined away of all unessential constituents and will be reduced to the pure active principles.

Attempts have been made in recent years to produce nitrogenous material out of the nitrogen of the air; it is the most unimaginative fact in the world that men must either solve this problem or starve. One promising, and, indeed, actually successful process for this purpose is that of Birkeland and Eyde of Norway, who on a large scale are now causing the nitrogen and oxygen of the air to combine under the influence of flaming electric arcs.

Another process for the fixation of nitrogen, which is to-day being used over Continental Europe and for which several factories are now being built in America, depends upon the production of calcium cyanide by pouring the nitrogen of the air over red-hot calcium carbide.

It is evident that the manufacturers of cyanide will also need to look to their laurels. Perhaps the most interesting patent in this connection is one based upon a wholly novel method of converting atmospheric nitrogen into the fixed and useful form through the metal calcium which is now obtainable at a comparatively cheap rate by the electrolysis of the fused chloride.

Still another patent interested in manufacturing products from air proceeds to make ammonia by passing the nitrogen from the air mixed with steam over hot turf. Altogether, we see that, in common with the initiators of all other processes and as typical of the course of invention, the original converters of atmospheric nitrogen are not unlikely to be drowned in the flood of new processes that take their origin from them—the invention dies, but *invention* lives.

Oftentimes it happens that a substance whose properties are supposably thoroughly understood assumes new properties through the application of a new process. Thus with graphite. Its utility through lead-pencils and stove-blacking suddenly, in recent patents, is supplemented by a supreme utility as a lubricant. Of course the fact that graphite has lubricating powers has been known and used for generations, but that it had a unique value in that respect it remained for Mr. E. G. Acheson to demonstrate through his process for the production of deflocculated graphite. The story of the way in which he was led to this discovery constitutes an interesting

chapter in the history of invention. In 1901, Mr. Acheson discovered first, that the clay which was used as a binding material for these crucibles the American manufacturers found it necessary to import from Germany, for the reason that the German clay was more plastic than the American. And he found next that a chemical analysis failed to account for the difference. Now, these German clays are what are called secondary clays—clays that have been transported from one place to another by the forces of nature, and they owe this property of plasticity apparently to this transference. Why? "Well," said Mr. Acheson, "possibly the increased plasticity is due to the solution of vegetable matter through which the clays are dragged." And so he ground his clay in an extract of straw! The result of this daring inference and consequent experiment was astonishing; the clay assumed a condition of fine division, it remained suspended in the water, and it was *plastic*. As Mr. Acheson was acquainted with the interesting record of how the Egyptians compelled the "children of Israel" to forego straw in the making of bricks, and as he believed that the benefits of the straw were due not to the fibres, but to the water extract, he called his clay so treated "Egyptianised clay," and so it took its place in the market. It turned out subsequently that the active principle in this extract of straw was tannin. Now, in 1906 he discovered a process of producing a fine, pure, unctuous graphite, which he was desirous of using in oil as a superior lubricant. But he found that the graphite so suspended in oil quickly settled out of it, and that it was only by grinding his graphite in water containing a little of this same tannin that it would remain in a homogeneous mixture. So treated, however, the graphite assumes a state of division so fine that its particles may almost be called molecular, and its suspension either in oil or in water is almost indefinite in duration. Deflocculated graphite, as this tannin-treated substance is called, has a wholly remarkable value as a lubricant, whether mixed with oil or with water. Through tests carefully carried out its remarkable power in that respect has been illustrated. Even when mixed with water to the extent of only 0.2 per cent., it has a good lubricating value, and with, also, the curious consequent effect that the water in which it lies does not rust the iron of the bearing.

"Monox" is produced by stealing the oxygen away from silica by heating it in the form of glass-maker's sand in contact with coke in an electric furnace. Under these circumstances the "silicon monoxide" flies out from the veritable volcanolike effect of the furnace reaction in the form of a voluminous brown smoke—so voluminous that when simply shovelled into a box it weighs only about two and a half pounds per cubic foot. So formed, it constitutes an extremely fine, silky-feeling, light-brown, opaque powder, whose properties bid fair to make it a new industrial agent. Thus it becomes powerfully negatively electrostatically charged on the slightest provocation, and because of this it becomes possible to collect it upon a fabric in such a fashion that while it will permit a gas to pass through the fabric unimpeded, it will definitely stop all fine particles, from tobacco smoke to germs. As a screen for sterilising air it seems, therefore, to have a broad field of application.

There exists in Germany a wide area of peat bogs that heretofore have been of little use; this for the reason that the amount of fuel required to evaporate the water in the peat is almost as large as the amount of dry peat obtained. But the discovery of the new process of electric osmosis, as it is called, suddenly raises the value of these great peat-fields to a high potential. To obtain the dry peat it is only necessary to convey the peaty water to a metallic caldron connected with one pole of a dynamo and to insert into the mater a metallic rod connected with the other terminal. Under these circumstances, the particles of peat rapidly migrate to the central rod, where they form a hard, caked mass which may be lifted out practically dry—and all this with the expenditure of an insignificant amount of energy. Recent patents by the aggressive experimenting industrial firms of Germany, such as Meister, Lucius, and Bruning of Hochst, foreshadow a wide general application of this entirely interesting phenomenon.

Ever since the dawn of the age of iron, men have desired to weld one metal with another—to weld, for example, iron and copper for the making of weapons and for the use of husbandry and building. Unable to accomplish this directly, they had to resort to the art of brazing, by which copper and iron might be joined together through a hard solder composed of brass and zinc. But such a joint was always imperfect, and sooner or later gave way to a severe stress According to Professor Simpson, of London, in order to weld a bar of iron to a sheet of copper it is only necessary to wrap the uncleaned copper closely about the bar, to bury the bar so wrapped in a crucible containing finely-ground retort-carbon containing a little sugar water to make it binding, and finally to heat the crucible in a furnace for half an hour to a temperature somewhere between the melting point of copper and iron. The result of this simple operation is a weld of extraordinary perfection and tenacity, tougher than either of the metals that constitute it.

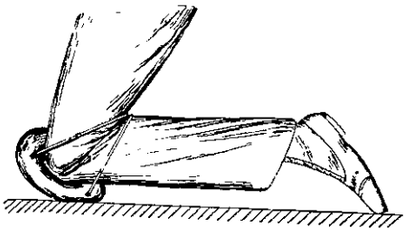
Most prominent among the oxidising patents are those concerned with the making of the peculiarly active modification of oxygen known as ozone. Since ozone when it has accomplished its work reverts to pure oxygen, it constitutes, if it could be prepared cheaply, the ideal oxidizer. It is formed from the oxygen of the air under the influence of an electric discharge, and it is in the arrangement of the circumstances under which this discharge takes place that the patent specifications are chiefly concerned. One man would pass his oxygen through hollow electrodes with fine openings into the ozonising chamber; another would employ an electrode consisting of sets of needles; and still another would discard electricity for ultraviolet light At present almost the only industrial uses for ozone are the production of vanillin from oil of cloves, as it is practised at Niagara Falls, and for the large-scale purification of water. But with the extraordinary activity of invention in this field we may easily forsee a rapid extension of the use of ozone in industry.

As for reducing agents, the new powerful sodium hydrosulphite, which, as the result of many years' work, is now appearing from the great German "Badische" firm, will percolate through numerous processes.

Altogether, outside of the significance which is integral to the subject-matter of each patent, there is the wide-sweeping significance of the application of pure science to industrial ends, and, therethrough, the entrance of efficiency into factory practice. That the one follows upon the heels of the other is best exemplified by reference to Germany. Fully three-quarters of all the patents of real chemical interest are German in origin, and it is of course in Germany that we find efficiency in factory practice the *sine qua non* to its operation. The manufacturer who does not realise in a practical way that he can no longer rely for success upon trade combinations, upon cheap raw material, upon an ultra-protective tariff, upon negligent government supervision, and so on and so on but that henceforward essentially he must stand or fall by the degree of efficiency he has obtained in his factory will bitterly rue his ignorance and his negligence

The "Gresham" Knee-Pad.

Why should not the people who have the misfortune to be obliged to scrub floors be as comfortable as those who have the happy privilege of being able to pay other people for doing the work? Some question of the sort appears to have induced Mr. Gresham to study the problem of finding relief from all the pains and aches incidental to one of the most irksome of the domestic duties.



GRESHAM KNEE-PAD.

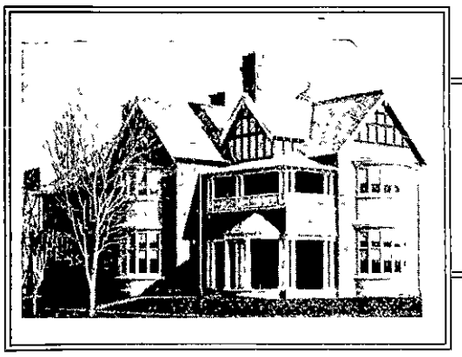
He has invented a knee-pad which is calculated to draw blessings from all slaves of the scrubbing pail. The illustration speaks for itself, proclaiming the ease and comfort to which the domestic drudge is too often a stranger. The invention is not yet on the market, the patent rights being in the hands of Hector McLeod and Co., of King's Chambers, Willis street, Wellington, for sale.

The Rogotire Company.

The secretary of this company has received word by cable from the company's representative in America that United States patent rights have just been disposed of for 50,000 dollars. The object of the invention is to prevent the leakage incidental to the puncture of pneumatic tyres.

The Portable "Sun" Typewriter.

The Portland "Sun" Typewriter described in our issue of last month among the incidentals of the Office Appliances Company's show room is a portable machine.



Architecture and Building

The Architecture of the Dominion.

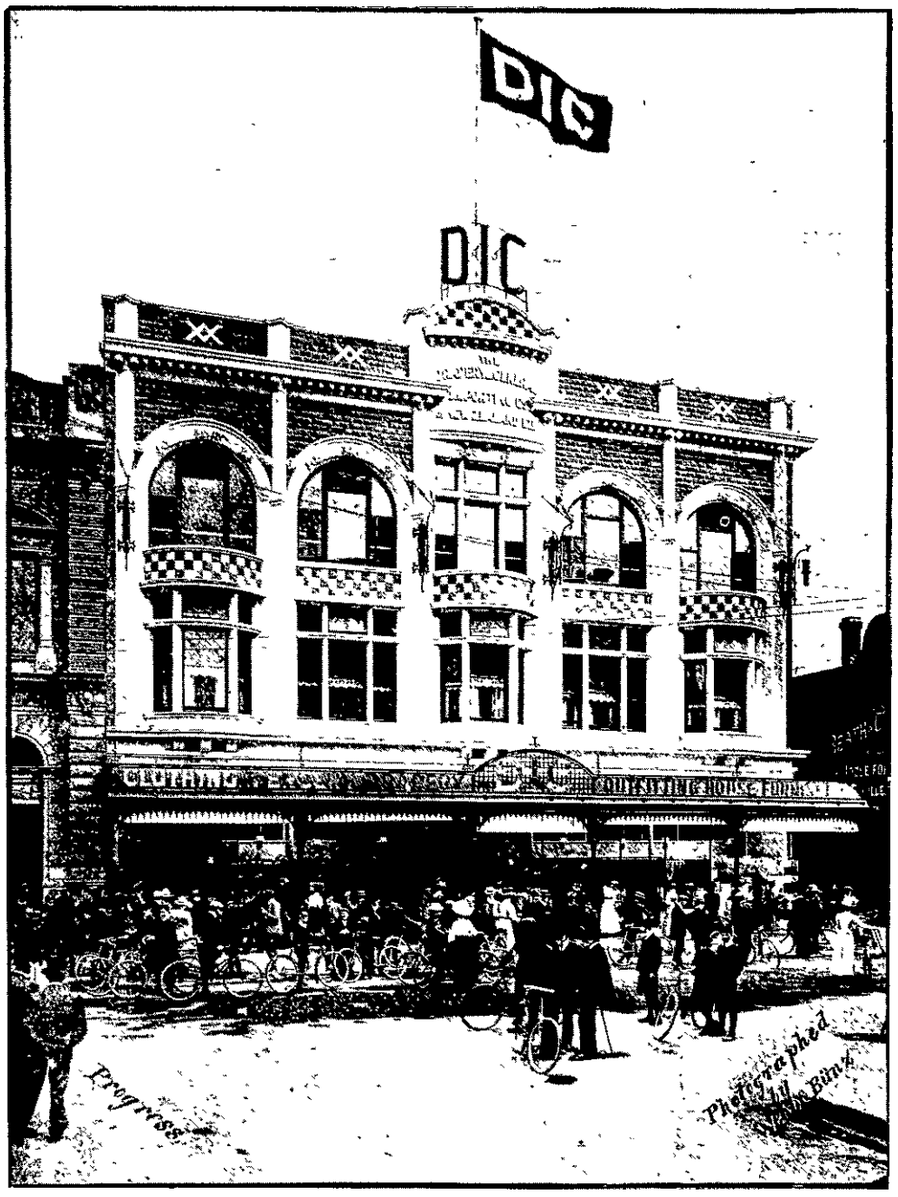
What Lord Plunket said about the architecture of the Dominion a short time ago has been discussed considerably. His criticism has now found its way into the technical papers of the Old Country, and the general impression is that the architecture of our cities and suburbs is "contemptible." This conclusion is combated by Mr. T. K. Mason in the *Empire Review* in that spirit of acquiescence which must lead most New Zealanders to pray to be saved from their friends. "New Zealand," says this authority, "has no architecture at all as yet." His meaning will be plain from the following extract:—"Many hundreds of the chief buildings," he says, "have been erected piecemeal, new wings being added as the accommodation was required. In the old Parliamentary Buildings one portion was wood in the plain gable style, and the other, of stone, contained Gothic arches. There are no traditions, and such forms as there are, are generally adaptations of English designs to achieve the greatest accommodation at the least cost—that is, plain, barn-like structures with oblong windows. Ornamentation is avoided, as a rule, on the ground of expense, for economy is a ruling factor in colonial affairs. Hence any criticism of architecture in New Zealand must be premature."

Now it is all very well to declare against adaptations, but must all architects be condemned to originality? It seems rather late in the day to insist upon new forms and fresh combinations when the world is so full of the achievements of genius.

It is worth noting here that condemnation of imitation is not confined to the works of the Dominion architects. Professor Geddes, in a late issue of the *Municipal Journal*, complains with regard to many cities of both England and America "of a too crude and hasty adoption of city plans, inspired, not by local life, but by imitation of the costly and meretricious pomposities of great Continental capitals." The result he sees "in dreary perspectives and conventional ornament, relieved only by occasional extravagances," a state of things he boldly condemns as "even uglier than the prevalent industrial squalor and garishness of our poorer quarters or even than the featureless monotony of our respectable ones." In conclusion, he protests against repetition of the mistakes of the French city improvers of the Second Empire, and the corresponding developments of Berlin, Strasburg, etc."

The ideal of the Professor is individuality. "The problem," he insists, "which every city has increasingly to face is to conserve and express its local individuality, its uniqueness and character, yet to reconcile this with a full and increasing participation in the material appliances and the immaterial advantages of other cities; in short, at once to live its own life, and this more and more intensely; yet to be also in the great world, and this more fully also." On these lines he advocates work of the co-operative order, hinting at something also in the way of official interference, say by an officer at the head of a sort of civic General Survey Department empowered to see that architects keep to certain specified lines. This is the way in which ancient cities were built, and in which the modern lines of advancement are in some cases carried on. We have mentioned the matter here to ventilate it, not to endorse the sentiments. These, however, are commendable to say the least.

To return to the "defence" of the Empire Reviewer. It strikes the most careless as somewhat too sweeping in its generalisation. One would imagine that everything in the Dominion's street architecture is patched and botched, antiquated and hideous. It is true that the old Parliamentary Buildings were patchy and very mixed. But we must not conclude that all other buildings, public as well as private, are of the same order. Speaking of Wellington alone, take the big wooden buildings for the Civil Service: surely they are



D I C Building, Christchurch, Rebuilt after the Big Fire.

homogeneous enough for any one. Hard by is the Railway headquarter building, one of the finest buildings of its size in the world; of excellent design, homogeneous, a gracious ornament to the city. Further on there is the Customs Building, a handsome characteristic, well-designed pile, as far from deserving the offence of the Empire Reviewer's defence as is the dome of St. Paul's, London. If the reviewer wrote of the Year One he might be forgiven. But writing of to-day he must be convicted of not knowing as much as he ought about what he is writing for the information of others. The evidence of the public buildings in Wellington alone is conclusive against him.

It does not stand alone, for there are public buildings in every one of our cities using the term for the four chief centres, public buildings which are an ornament to their city and a credit to the profession that designed them. Take the Railway Station of Dunedin, an exceedingly handsome building, criticised much for many things locally, but admired with unanimous decision in all quarters. Take the old University building of the same city, one of the finest in the Dominion erected forty-two years ago, but requiring no apology from any critic faint-hearted or otherwise. The Post Office of Christchurch is far above the level described by the Reviewer, so is the Supreme Court; and the old Provincial Council Building, besides being of very handsome exterior, contains the handsomest hall in the Dominion, one that would pass muster in any part of the world for imposing design and exquisiteness of detail. The Post Office and the Land Office at Auckland are standing contradictions to the reviewer, and as for the smaller towns there are public buildings in many of them which are excellent examples of what they ought to be. Moreover, the school buildings scattered all over the Dominion contain some very good examples of the school as reason would have it.

Our ecclesiastical architecture is not in a state to compare with older countries filled with master pieces as they are, representing the product of many centuries of effort. Still there are some fine examples, quite enough to redeem the Dominion from the reproach of the supercilious and the reputation of the Dominion architects from the sweeping disgrace of the reviewer who is afraid to give sympathy where he undertakes to defend. There are fine churches in Auckland, at the head of which, for beauty and correctness of form, stands the Church of St. Matthew, lately finished. Wellington has a Basilica and two churches (St. Peter's and St. Andrew's) which ought to keep critics from spending all their ink in negation, and the old pro-cathedral of St. Paul is a striking proof of how well the pioneers of colonisation understood the requisites of church building in wood. Christchurch has a Gothic cathedral (Anglican), not designed by a local architect it is true, but forming part of the Dominion architecture, and therefore not to be passed over silently by anyone undertaking to speak of the buildings erected by the people of the Dominion. That is a cathedral of magnificent design and proportion, small as cathedrals go truly, but a wonderful church for so small a community to have built. The Catholic Cathedral is also on the small side, but at the same time creditable to the community that built it, and a fine example of Italian architecture. Napier has a splendid cathedral in brick and stone. Dunedin has three fine church buildings, First Church, Knox Church, and St. Joseph's, and Invercargill has two. There are besides churches of all sizes scattered throughout the Dominion, correct in design, striking in appearance, and in the aggregate lifting the architecture of their towns from undiscriminating condemnation.

To those who know the by-ways of the Dominion, a recollection will occur in this connection readily. It is of the little parish church at Otekaike, built in the old Norman style, of Oamaru stone, solid chaste, a very gem of simplicity and elegance, correct and typical, from the design of Mr. Kane, of Christchurch, who built so many fine schools for the Provincial Council and for the Canterbury Education Board in his day.

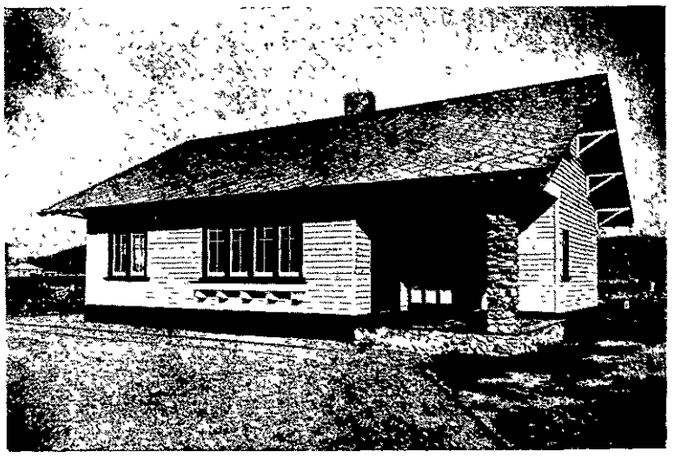
Neither do the ordinary street buildings lend themselves to a criticism which is a mere negation. In some of the cities, notably Auckland and Wellington, the chief defect of the new buildings is that they are stucco. The parsimony of the men who order the buildings shuts out all considerations of the beauty of material and of the honesty of plain brick and stone. But the defect apart, the architecture is often of an order to be treated with respect. The chief cities are at all events emerging from the old state of unconventional beginnings to a style of much pretensions and some beauty. There are some streets in no way deserving the slurs of the reviewer. Queen street and Wellesley street, Auckland, Princes street, Dunedin, together with the streets by the railway station, Hereford street, and Cathedral square, Christchurch; Lambton quay and the reclaimed ground, where the big warehouses are, Wellington. These are good to look at, and the beginnings of a state of things of which the next generation will be proud.

Take Lambton quay between Woodward street and the foot of Willis street. Along that stretch the fine buildings are the rule, some of them very elegant, and all designed with considerable taste and regard to their positions and purposes. The same applies to the neighbourhood where are the National and Australasian Banks, Nathan's Building, and a good many others; part of a list they are comprising for its highest examples the Bank of New Zealand, King's Buildings, the Bank of New South Wales, and others too well known to require recapitulation. Among all these one can pick out many examples which give the contradiction emphatic to the generalities of banality which the reviewer of the Empire mistakes for sound criticism. Their style and materials, together with the workmanship in their construction, will stand examination of the most searching order, and have nothing to fear from comparison, no matter how close. Of course there are mean buildings still in the streets named, and more of them in the other streets, and as you get outwards towards the outskirts of the city the state of things architectural is deplorable. This is paralleled in all the cities and towns of the Dominion—it is but another way of saying that the Dominion is yet young. That, however, is not a reason for unreasoning comprehensiveness of hostile criticism, neither is it for faint-hearted negations of defence.

As to the advice of the man who wants the individuality of a city to be preserved, the first thing needed is the individuality. If there is no individuality it can not be preserved. Each architect can have his own individuality, and a murrain on those who would do anything to stifle it. On the other hand, the suggestion is not bad that some check should be put upon exuberance, so that there may be secured a certain homogeneity of style, so far as is compatible with all the conditions surrounding.

For the present, however, let us, above all things, learn to respect our own so far as it can be respected worthily. There can be no better foundation for greatness—architectural as of other kinds—than honest appreciation of modest worth, just as there can be none worse for the builder than the exaggeration of modesty into genius.

Living Room of Bungalow. Hoggard & Prouse, Architects.



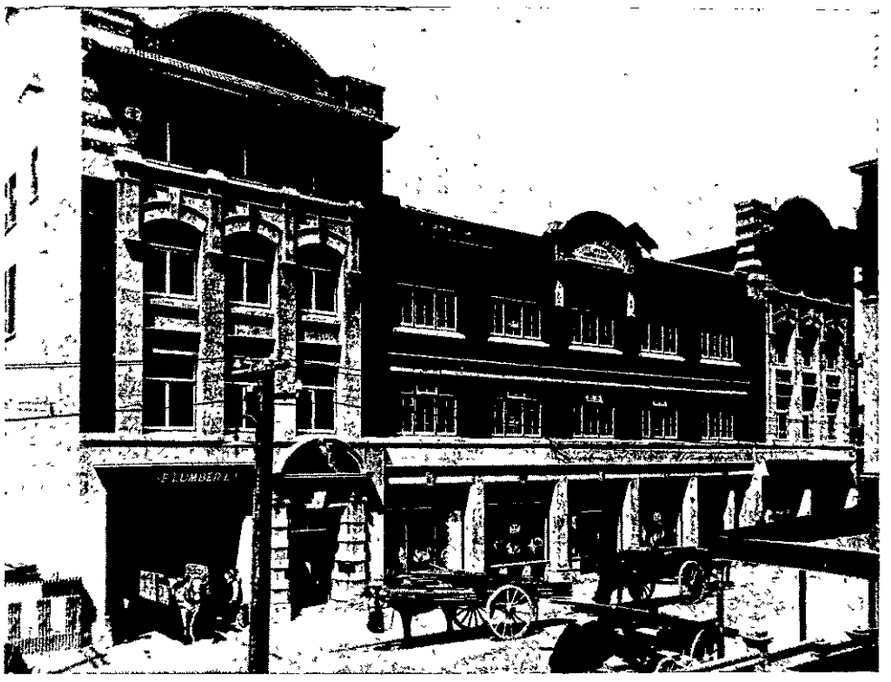
Mr McCosh Clark's Week-end Bungalow, Trentham

A Great Architect.

Sir Christopher Wren.

Reading in the life recently published of Sir Christopher Wren, we came across many reasons for the suggestion that an architect is made by combination of many qualities; but that with all the qualities present he can not, without opportunity, be made at all. Wren had genius, and application. He was so many-sided that he quickly attained to Doctorship of Laws and of Medicine, besides taking high rank early as an engineer, astronomer, surveyor, and mathematician. He was, in addition, a rather noted inventor. When the genius of the man had combined the development of all the qualities required for the above extensive list of achievement, there came to Wren two opportunities. The King—Charles II.—appointed him to be Surveyor-General of the Kingdom, and the Great Fire of London gave scope to his enterprising genius to do great things. The effect of the appointment ought to be to modify the hard jibe that King Charles "never said a foolish thing and never did a wise one," for this appointment of Wren's was as eminently wise a thing as was ever done by King or Commoner. It was patronage, and as such may be spoken of as vicious in principle. But, however vicious, the appointment can only be described at worst as good fruit of a bad system. The result of the first was chiefly St. Paul's, and much more of architecture which lives and is of noble example, and a suggestion which, had it been carried out, for the rebuilding of the city would have antedated the modern improvements of London Embankment, Victoria street, and the rest, by two centuries, and saved more money in the process than the cost of a dozen Boer wars. Ruskin did not approve of Wren's work for the most part. Which only proves that even the greatest men are not immune from the attacks of the mosquitoes of criticism, who, as critics, do nothing but sting. The criticism of Ruskin, however, does not prevent Wren's St. Paul's from being one of the great churches of the world. Wherein lies a lesson for all critics and all men criticised.

It is true that lines must be laid down at the outset before there can be criticism at all. Ruskin laid down the false lines that every thing must be what it seems in architecture, and therefore we are to believe because the visible dome is carried by a brick inner structure, and because the lantern which seems to rest on the outer dome rests really on the inner one, that therefore the lantern is not a miracle of beauty and that the dome's evidence convicts the cathedral of being a hideous fraud and unjustifiable pretence. Wren, on the other hand, exalted the ideal of strength of construction and beauty of appearance, and by that standard his cathedral comes out in the judgment of all reasonable men a master piece. Let us be thankful for the work that Wren did, and let us regret that he was unable, on account of the limitation of the intelligence of his contemporaries, to do more. From both what he did and what he suggested there is much to be learnt by the architect. Genius can not be commanded by every one who wants to be an architect. But it is possible for all men to widen the circle of their effort—be it in architecture or ought else—in order that later on a concentration of accomplishments may help to build them up high in the profession of their choice. If Wren only became an architect after he had succeeded in many things, it ought not to be difficult for men who are architects to widen their knowledge of the arts and sciences so as to be useful to them in the work of design and construction. The opportunity may never come to them as opportunity came to Wren. But to men who work there always come many opportunities for useful achievement.



PROUSE LUMBER CO.'S BUILDING. Hoggard & Prouse, Architects. *See below*

The new offices and warehouse for Prouse Lumber, Limited, Taranaki street, are an illustration of a serviceable type of modern building. With a frontage of 132ft. by a depth of 54ft., it is four-story, with a flat roof and large basement. An automatic electric lift connects the basement with the flat roof. The contract was carried out by Messrs. Campbell & Burke, at a cost of £7800. Hoggard & Prouse, architects.

W. Gray Young, architect, has prepared plans for a residence in Hawke's Bay, for which tenders are being invited.

The same architect is preparing plans for a residence at Featherston.

Messrs. Hoggard & Prouse, architects, have prepared plans and specifications for Mr. H. Brittain, chemist, for new premises to replace the very old buildings on the corner of Manners street and Herbert street. This will be a skeleton steel frame building similar to the one erected for Cadbury Bros. in Ghuznee street by the same architects. Tenders will be called shortly for its erection.

A week-end bungalow has just been completed at Trentham for Mr. McCosh Clark. H. E. Manning, contractor; Hoggard and Prouse, architects. (*Illus. page* 209.)

Alterations have been effected in Milner and Thompson's music warehouse, Manchester street, Christchurch. F. E. Shaw, builder; architects, Clarkson and Ballantyne.

The same architects have in course of preparation plans for a residence in Armagh street, Christchurch, for Dr. W. Fox.

New offices on Customhouse quay for the Union Steamship Company of New Zealand. Messrs Mitchell and King, Wellington, Contractors, £42,339. Messrs. Crichton and McKay, FF.R.I.B.A., Architects, Wellington.

Takapau.—Two-story brick hotel (just completed). Ceilings by Carrara Ceiling Co., Wellington. Builder, W. Ward. Cost, £4000. Architect, D. B. Frame, Napier.

Napier (just completed). Block of two-storey buildings, comprising four shops, dwellings, etc., at a cost of £5000. Messrs. Bull Bros., Napier, builders; Messrs. W. B. Finch and D. B. Frame, joint architects, Napier.

The building recently erected in Heretaunga street, Hastings, for the Bank of New Zealand, is one of the finest of its kind, we are assured, out of the four centres. The architect was Mr. D. B. Frame, of Napier; the builders were

Messrs Bull Bros., of Napier, and the cost was £5000.

* * * * *

A striking example of the usefulness of asbestos roofing and walling sheets is shown in the bungalow house recently erected in Keppel street, New Brighton. The whole of the outside and inside walls have been covered with Calmon's asbestos slates, with strappings over the joints. The effect is very quaint. The joints in the interior of the bungalow have been covered with chamfered Rimu batons oiled and worked out in the form of panelling. Here the effect is artistic and pleasant. The roof is of Calmon red slates, the ridging being finished with the ordinary baked clay tiles. The bungalow is on the whole an ideal seaside place. The architects are Messrs. England Brothers, and the contractors Harris and McGillvray.

* * *

The new premises erected in George street, Dunedin, from the designs of Mr. Basil Hooper, architect, are a great addition to the architecture of the street. They comprise basement, ground and first floor, each of which are 80 feet deep. The ceilings of all the rooms are of fibrous plaster,

enriched in Bankart style, and the lighting of the whole is electric. The front, fairly handsome, as our illustration shows, is finished in pressed brickwork, with Oamaru stone facings, and Marseilles tiles are the covering of the front roofs. Contractor, George France.

* * *

The latest architectural sensation in New York has been provided by the proprietor of the Waldorf-Astoria Hotel, who has constructed a main wall of plate glass in a new suite of four rooms. The suite is on the second floor near the royal apartments and through the plate which forms the eastern wall it is possible to obtain a fine view of Fifth Avenue. Only one main wall in this suite is of glass. The others are covered with tapestry. At one end of the suite there is a morning room, one room of which opens into the sitting-room, the other three walls of which are made of glass. A door leads directly from this room to the corridor outside, so that waiters who serve meals in the suite need not be seen by the occupants as they bring in or take out dishes. Two of the rooms are bedrooms. There is a telephone in each room. The furniture is of Circassian walnut, and the decorations are principally in pink, gold and white.

How do good trained architects earn the fees paid them?—A case in point is in a letter recently received. We make the extract:—A friend of mine proposed to make an extension of one of his rooms, and consulted a builder, who suggested an arrangement for which he gave an estimated price of about £60. My friend, not being prepared to expend so much on his alteration, dropped the matter for a time. but subsequently consulted an architect, who was able to suggest another plan, giving more room and greater convenience, and this was ultimately carried out, including the architect's fee, for under £45. *Verb. Sap!*

Tenders for the Month.

Correspondents would in all cases oblige by giving the names and addresses of all the parties tendering, or at any rate of the accepted tender.

AUCKLAND.

Town Hall. Contractors, Ferguson & Malcolm, Auckland. Price £87,565. Architect in charge for Messrs. H. J & E. J. Clarke of Melbourne Mr. J. Biddle. Clerk of Works, Mr. D. M'Laren. Foundation stone laid by Mr. A. A. Meyers, February 24th, 1909.

Whangarei—Wharf at Grahamtown for the Public Works Department. Donald M'Lean & Co., Wellington (accepted). £17,675. M. O'Connor, Wellington, £18,652 5s. G. Nicol, Auckland, £19,354 1s. 11d. R B. Martin & Co., Auckland £20,631. FitzGerald & Bignell, Greymouth, £21,684. G. M. Fraser, Hamilton, £21,752 9s 7d. Howie & Matthews, Wellington. £24,988 7s. Watson, Rhodes & Son, Dunedin, £26,054 19s. 3d A. Watson, Auckland, £27,448.

* * *

WELLINGTON.

Roseneath—Alterations and additions. J. W. Fossett (accepted). £350. John S. Swan, Architect.

Victoria College—Gymnasium and Debating Room. M. Broman. £1,400 (accepted). F. Penty and E. M. Blake, FF.R.I B.A., Architects.

Karori—Residence. J. Mackenzie. £698 (accepted). Humphries Bros., £850. M'Lean & Gray, £745. W. Weston, £809 8s. 6d. Fletcher Bros., £950. H. E. Manning, £959 10s.

Shelter accommodation at the Ohiro Home.—A. Seamer, £800 (accepted). Messrs. F. Penty & Blake, Architects.

Colway Estate, Crofton—Residence. Builders, Muir & Rose. Architect, W. Gray Young

Porirua Bridge for the Makara County Council. F. Greer, £255 (accepted).

Riddiford Street, Newtown—Erection of a bakehouse. A. Cooper & Sons, £799 (accepted). Crichton & M'Kay, Architects.

Coromandel Street. Newtown—Residence. H. H. Knight, £987 (accepted). Crichton & M'Kay, Architects.

Messrs Lowin and Bull have just completed the new Commercial Club buildings at Petone. Contract price about £600 They are at present erecting premises for the Bank of New Zealand branch, Petone. Contract price, £1,864. Thos. Turnbull and Son, Architects.

Up. Hutt—Cottage for Mr. J. Burns.—J. Bowen (accepted). £449; Hewat & Jamieson, £472; T A. Swaziland, £475; Job Harrison £483 9s 6d; Wildsmith & Young, £486 15s.; Riddler & Firth, £494; Fletcher Bros., £497 10s.; A. G. Gellert, £499 10s.; Humphries Bros., £500; Pearce & Chatfield. £535 7s ; W. G. Shearer, £544; Pinney & Co., £545 7s.; H E Manning. £548; A. Heaton, £560. John S. Swan, M.R S.A., Architect.

Bolton Street.—Residence for Mr. G W. Frier. —J. W. Fossett (accepted), £884; H. H. Knight, £944; Stewart and Scott, £949 10s.; Martin Williams, £950; Humphries Bros., £954 7s 6d. ; Fletcher Bros., £960 ; W. D James, £973 10s.; Hunt and McDonald, £975 10s.; C H. Dryden, £994; Lowrie and Keels, £1003 11s ; H. M. Davis, £1007; W. G. MacFarlane, £1025; W. G. Shearer, £1059; McLean and Gray, £1093; H. E. Manning, £1099; Watts Bros. £1131; Meyer and Illingworth £1297. John S Swan, M.R S.A., architect.

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MASTERTON.

New Municipal Gasworks (in course of construction). Corodine & Whittaker, Builders. £3,300. Varnham & Rose, Architects.

Additions and extensive alterations to Mr. C. F. Vallance's residence. F Bacon, Contractor. £2,300. Varnham & Rose. Architects.

Tupurupuru—2 Cottages and stables for Mr J. Buchanan. Rose & Mason (accepted). £500 Varnham & Rose, Architects.

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CHRISTCHURCH.

Addington, Selwyn Street—6 roomed house for Mrs. Cunningham. J. P. Nolan (accepted). £650. England Bros., Architects.

Lincoln—8 roomed house for Mr. T. Henley. Beanland & Keates (accepted). £1069. England Bros., Architects.

Papanui Road—8 roomed house for Mr. E B. Sealey. Tullock & Benjamins (accepted). £997. England Bros., Architects.

Auslebrook's Factory. Additions and alterations. J. & W. Jamieson (accepted). £439 England Bros., Architects.

Moorehouse Avenue—Vacuum Oil Co.'s Store. C. H. Cox (accepted). £1,474 England Bros., Architects.

Lyttelton—Alterations and additions to Forges & Co's Ironmongery warehouse. Thos. Bagrie (accepted). Luttrell Bros., Architects

Colombo Street—Three story brick and stone shop for Mr. T. Kincaid. D. Scott and Son, Builders. Clarkson & Bannatyne, Architects

During February 38 building permits were issued by the Christchurch City Surveyor, representing a building value of £14,846.

Asphalt.

Mr. Woolf of the Neuchatel Asphalte Company writes to our contemporary "Building" of Sydney on the subject of an article on Asphalts published by it in a recent issue, excerpts from which were reproduced in "Progress," objecting to some of the statements in the article. He says first that Asphalt is not as described in the article, a semi-liquid substance with sometimes mixtures of earth. His definition of Asphalt is "a pure mineral limestone rock naturally impregnated with bitumen"? which, if it had the least suspicion of earth in its composition, or of refuse, would be useless for commercial purposes.

Referring to the geographical distribution of asphalt, he says that Trinidad contains no asphalt, but plenty of bitumen, of which its famous lake is composed: that Switzerland is not "noted for its hard asphalt," as the Swiss asphalt is recognised by all experts as being of a particularly elastic nature, and of a consistency of quality which has achieved for it the fame it enjoys: that the American asphalt referred to in the article is only bitumen.

Coming to the methods of treatment, Mr. Woolf declares that nobody who knows anything about asphalt would dream of adding fat under any conditions, or of using Stockholm Tar for the purpose of mixing; the chemical nature of the bitumen contained in asphalt being such as to render such additions disastrous instead of beneficial.

Regarding the statement that bitumen makes a very good roofing or damp course, he points out that the subjection of bitumen to atmospheric conditions is such that if used vertically on big areas there is a great risk of "creeping" a thing impossible in the case of **real asphalt.**

Here and There.

To get the most out of the headlights—now a most expensive item, see that the forks of the lamp brackets are absolutely perpendicular to the horizontal plane of the car.

In Switzerland they are making clocks which do not need hands and faces. The clock merely stands in the hall, and you press a button in its stomach, when, by means of the phonographic internal arrangements, it calls out "Half-past six" or "Twenty-three minutes to eleven," as the case may be.

The man to whom the Panama Canal owes the most is William Nelson Cromwell, who was the life and soul of the agitation for the undertaking of the work by the United States, and has worked for it unceasingly ever since. His motto is. "Look upon your work as your first duty, and attend to it unflinchingly."

Vaccination is becoming the recognised treatment for typhoid, anthrax, rabies, cholera and bubonic plague. Tuberculosis, however, still defies it. Here the dead bacillus is an aggravation. In the others it is protection.

APPLICATIONS FOR PATENTS.

The following list of applications for Patents, filed in New Zealand during the month ending March 11th, has been specially prepared for PORGRESS.

25489—H. H. Oxley, Auckland: Brooch-pin attachment.
25490—A Hodgkinson, Greymouth: Wire-strainer.
25491—D. Honeywood, Battersea, Eng, and G. Payne, Chiswick, Eng.: Ore-rock, &c., crusher or grinder.
25492—W. W. Boyes, Otahuhu: Ship-propelling.
25493—United Shoe Machinery Company, Paterson, U.S A.: Dieing-out press for upper-leather, &c.
25494—United Shoe Machinery Company, Paterson, U.S.A.: Dieing-out press for upper-leather, &c
25495—A. Goding, Surry Hills, Vic.: Steam-generator for motor-car, &c.
25496—E. Schwer, Sydney, N.S.W.: Sheet-metal bath.
25497—A. Edmond, Dunedin: Spectacles.
25498—G H. Hicks, Ravensbourne: Fastener for awnings. tarpaulins, &c.
25499—A. E. Whitelaw, Clifton Hill, Vic.: Boot, &c., upper forming machine.
25500—H. Hadida, London, Eng.: Coin-freed machine.
25501—F. J. Easther, Dunedin: Window and blind attachment.
25502—T. and H. Vivian, Dunedin: Hair-curler
25503—F. H. Trevellian, Christchurch: Document-file.
25504—J. Coutts and A. H Davies, Dunedin: Electric-cable connector.
25505—E. Brandon, Fendalton: Laundry-iron heater.
25506—A. Lyell, Wellington: Non-refillable bottle.
25507—A. P Carlyle, Wellington: Clothes-washing machine.
25508—T W. Mayson and H. A. Cornes, Auckland: Insect and dust-proof screen for window.
25509—Ransome International Conduit Company, New York, U.S A.: Construction of concrete work.
25510—J. F. Ross, Toronto, Canada: Self-sealing can.
25511—International Typewriter Company, Chicago, U.S.A : Typewriter.
25512—J. F. Studholme, Ruanui: Rotary engine.
25513—A. J. Bedford, Melbourne, Vic.: Gas-lamp lighter and extinguisher
25514—A. J. Bedford, Melbourne, Vic: Gas-lamp lighter and extinguisher.
25515—G. Clayton, Christchurch: Flax-stripper.
25516—G. S. Marley, Wellington: Embrocation.
25517—J. P Carmine, Westport: Automatic coupling.
25518—Craddock and Co., Christchurch: Flooring cramp.
25519—H. G. Freeman and G. R. Warren, Sydney, N.S.W : Bowl-testing device.
25520—G. B. Johnson, London, Eng.: Sheet-metal shearing machine.
25521—J. G. Henrich, London, Eng.: Valve stopper for siphon bottle.
25522—E. B. Killen, London, Eng.: Wooden wheel.
25523—E. B. Killen, London, Eng.: Tyre and attaching device.
25524—W. Painter, Ruapuna: Grass-stripper.
25525—Monotype machine (Colonial Patents Syndicate) Limited, London, Eng: Justifying mechanism for composing machine.
25526—W. White, Chicago, U S.A.: Washing and filling locomotive, &c., boilers.
25527—A. Martin, Ngatimoti: Door-check.
25528—A. K. W. Rissel, Stratford: Ship's course recorder, &c.
25529—C. Craig. Broken River: Recovering valuables from sunken ships.
25530—L. G. Grace, Hawera: Power device.
25531—A. Reeves, Kingston, Tas: Chimney-top.
25532—J. E. Tatham, Balmain, N.S.W : Needle-holder.
25533—Victor Automatic Carriers, Limited, Montreal, Canada: Newspaper-carrier.
25534—T. S. Philpott, Wellington: Voting-machine.
25535—J. O. Suckling, A. H. Herbert, and E. Page, Eketahuna: Flushing mechanism
25536—L. N. Dyhrberg, Ashburton, N.Z.: Fireplace front.
25537—S. D. McMiken, Komata: Steel and iron protecting in reinforced concrete.
25538—E. N J. Germeau. Jumet, Belgium, and A. N. G. Bouton, Ixelles-Bruxelles, Belgium: Boiler-seating
25539—T. Jackson, Opawhanga: Scrub cutter.
25540—H. P. Evans, Auckland: Process for preserving fish.
25541—J. Geary, Christchurch: Joint for railway rails
25542—F. M. Norris, Kilbirnie: Preventing refilling of bottles.
25543—Monk and Maguire, Atherton, N.Q.: Railway vehicle axle.
25544—M Mederer, Bloemfontein, Orange River Colony: Cooling chamber.
25545—D. A. Lane, Oamaru: Shaft-block.
25546—A. A. Lockwood and M. R. A Samuel, London, Eng.: Treatment of ores.
25547—A. A Lockwood and M. R A. Samuel, London, Eng.: Treatment of ores.
25548—H R. Gerrie, Montreal, Canada, and W. Pender, Montreal aforesaid: Tobacco leaf stripper.
25549—W. Seifert, Palmerston North: Washing flax.
25550—R. Adams, London, Eng: Filter.
25551—J. McKay, Bendigo, Vic.: Bed.
25552—W Scott, Christchurch: Flooring cramp.
25553—A. T. C. Firth, Auckland: Lifting clothes from washing boiler.
25554—E. J. Chilton, Masterton: Extension dining table.
25555—L. G. Grace, Hawera: A pendulum power and vacuum creating device
25556—C. W. Symons, Christchurch: Dress protector for vehicles.
25557—J. H. Adams, Auckland: Internal combustion engine.
25558—W. Morton, Dunedin: Float for current or paddle wheels.
25559—H. W. Downing, Christchurch: Saddle tree.
25560—National Wrapping-machine Company, Charleston, U.S.A.: Wrapping machine.
25561—A. Jensen, Eureka, U.S.A.: Pasteurising process and apparatus.
25562—L. Joseph, Pyrmont, N S.W.: Bedstead.
25563—M. Barraclough, Hawera: Horse-kicking preventer.
25564—T. A. Dudley, Auckland: Air-gas generator.
25565—H. Allan, Auckland: Venetian blind.
25566—A. Findlay, Dunedin: Device for drawing off beer.
25567—T. Edwards, Ballarat, Vic.: Treatment of auriferous matter by solvents.
25568—D. Donald, Masterton: Appliances for holding wool in packs.
25569—Haines Thermo Dynamic Motor Company, Pittsburg, U.S A.: Thermo dynamic motor.
25570—C. Reed, Auckland: Window sash and frame.
25571—J. Parker, Auckland: Wire-strainer attachment.
25572—J. B. Kelly, Johnsonville: Water-strainer, &c.
25573—K. Matthews, New Plymouth: Pocket knife
25574—W. Lewis, Wellington: Door or window fastener.
25575—F. Walton, London, Eng: Road vehicle suspension arrangement.
25576—The Konomax Rock Drill Syndicate, Limited, Johannesburg, Transvaal: Valveless engine.
25577—J. C Clancy, New York, U.S.A : Treatment of ores.
25578—W. Duggan, jun., Dunedin: Door and gate closing apparatus.
25579—C. M. Beattie, New York, U.S.A : Telephone apparatus.
25580—John Chambers and Son, Limited, Auckland: Safety mechanism for mining cages
25581—E. Brazenall, Stanthorpe, Q: Lower tumbler gear of dredging machines.
25582—W. Turnbull, Wellington: Flusher for water closet.
25583—F. Newth and C. Hawkins, Wellington: Horse-pan for vehicles.
25584—C. R. Macdonald, Auckland: Marine engine governor.
25585—C. R. Macdonald, Auckland: Thrust bearing
25586—A. Ross, Ellerslie: Heating and circulating boiler.
25587—W. Richardson, Wyndham: Bolt.
25588—E. Andreae, London, Eng.: Suspending curtains
25589—G. Bradley, Wellington: Weather-shield of motor-car.
25590—W. J. Rawling, Adelaide, S.A : Sanitary pan.
25591—Malkemaskinecompagniet, Patent Gandil, Limited, Copenhagen, Denmark: Milking-machine.
25592—J. J. Wilton, Masterton: Appliance for picking fruit.
25593—T. McEwen, Longburn: Preparing flax from the blade.
25594—J. Kirkwood, Wellington: Suspension of electric lamps.
25595—A. J. Arbuckle and A. Osborne, Belgravia, Transvaal: Separating crushed-ore products.
25596—J. S. Douglas, Dunedin: Trolley-pole controller.
25597—C. Edenfeldt and H. Pearson, Wellington: Cash-receiver.
25598—D McLean, Auckland: Level.
25599—M. Christopherson, Mangatera: Auger.
25600—C. A. Curnow, Rockville: Weighing and delivering liquids in pre-determined quantities.
25601—J H. Jenkins and A. H. Baker, Sydney, N.S.W.: Stereoscopic pictorial and panoramic advertising machine.
25602—A Cowell, Rockhampton, Queensland, and J. Phillips, Tapungah, Queensland: Fencing-dropper.
25603—H. Haugh, Johannesburg, Transvaal: Filter-press.
25604—S H. Donkin, Wellington: Safe and rest for hot plate.
25605—S. Bendle, D. I. Smith, and T. B. H. Thorne, London, England: Nourishing-wine.
25606—W. Aston, Blenheim: Manure-distributor.
25607—F. Davison, Caulfield, Victoria: Screen for windows.
25608—D. F. B. Brown, Auckland: Tramway-car brake.
25609—A Tyree and Co., Limited, Christchurch: Football-boot.
25610—E. E. Kennedy, Melbourne, Australia: Displaying advertising-matter.

Full particulars and copies of the drawings and specifications in connection with the above applications, which have been completed and accepted, can be obtained from Baldwin and Rayward, Patent Attorneys, Wellington, Auckland, Christchurch, Dunedin, etc.