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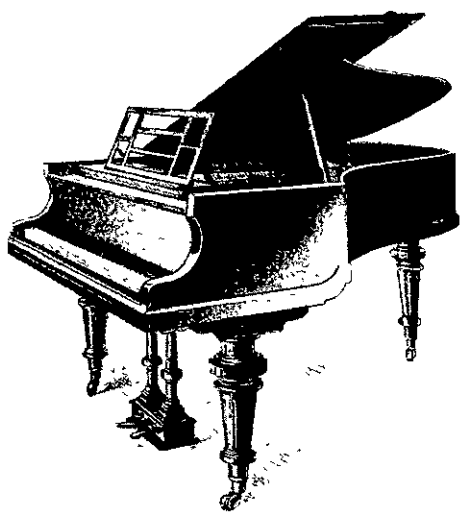

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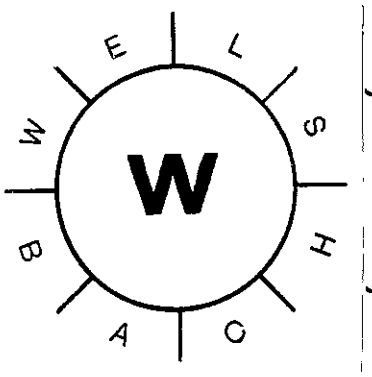

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BRIEF FOREWORD.

THE contents bill of the current number announces many carefully selected articles, and we believe our readers will vote February PROGRESS the best yet produced. Next month this journal will expand to the extent of an additional eight pages, in order to deal completely with Motors and Motoring in New Zealand. Further particulars will be found on another page in this issue.

VALE! LABOUR PARLIAMENT.

THE proposed gathering of the various forces representing Capital and Labour in New Zealand, which was to have eventuated under the above somewhat misleading title on the 20th inst., has been abandoned.

While applauding the conciliatory *motif* of the Labour Parliament we cannot altogether arrive at a satisfactory deduction regarding the possible conclusiveness of its work. The idea of bringing such parties together to discuss leading questions, whose contentious nature must exist until the end of all things, was certainly a very high and meritorious one. At first sight, it appeared to mark a trend in the direction of the substitution of the self-interest of a group of individuals for the self-interest of the whole community, and which, taking concrete form, was to give promise of the regulation of our commercial policy by those immediately concerned in its success. In short, the unparalleled situation presented in law-makers discussing a *via legis* with the representatives of the business public provoked a feeling that the industrial peace of the future was to be assured. But ideals were shattered : the quibblings of parties turned predestined harmony into discord ; equal representation became a difficulty ; nomination, to the satisfaction of both parties, an impossibility. The industrial employers wished to know the degree of weight that would attach to the resolutions of the conference, and in many directions they held that, though good might come from the meeting, the issue was problematical. The New Zealand Farmers' Union stubbornly refused to join the Parliament, for the simple and happy reason that they had nothing to discuss ; while representatives of the Labour division capped all by demanding expenses and fifteen shillings a day for attending that which, as the Premier stated, was for their own good.

Perhaps the chief cause for regret in the failure of the Labour Parliament lies in the shelving of matters which have no connection with party. Much was expected of the discussion that would have kept the doings of the International Harvester Company before the people. This concern, be it remembered, continues to trade in the midst of reputedly advanced legislation, promenading in business guise, plus cajolery and dissimulation, as it unerringly fights its way into absolute monopoly of the implement trade of New Zealand. Tariff reform, too, needs considerable attention on economic grounds. Anomalies abound ; and there is none greater than that pictures, paintings, drawings, engravings, and photographs, which so materially assist the technical and artistic bent of the community, should have to bear the imposition of twenty per cent. duty. Of the other questions, we have to mention the need for a discussion on our Labour laws, and in giving preference to trade unionists, to stipulate for the minimising of the unprofitableness of unskilled labour by instituting classes, or degrees, whereby a man will only receive a wage commensurate with his ability. And so on, *ad infinitum*, could the Labour Parliament have deliberated. Perhaps, when the diametrical opposition of parties ceases, such a gathering will be possible. Until then, the best medium of redress is the press of the colony, for it at least reflects the opinion of the people, who seldom err on questions of national importance.

AGRICULTURAL MACHINERY AND COMPETITION.

WHAT is fair competition and what is unfair ? If this question could be settled, the trade and commerce of many countries would be benefited. But much must depend on circumstances. There is such a thing as "healthy" competition, which conduces to industrial progress, and brings the best to the front, both as to man and as to methods. Given a fair field and no favour, reasonable trade rivalry is not altogether a bad thing, but when some of the competitors are hopelessly handicapped from the start, then the contest cannot assuredly be called equitable. That the contest between British and American agricultural machinery in the colonies is hardly being carried on upon reasonable lines, evidences continue to accumulate. We have received from Mr. P. H. Evans, the secretary of the South Australian Chamber of Manufactures, Incorporated, cuttings from one of the Australian dailies—the *Advertiser*—dealing with the importations of harvesting machinery and other mechanism into that State. As far back as nearly a year ago that paper made special enquiries upon this matter, and the information then received in special interviews is worth recalling at the present time. Mr. C. D. Lennon, a prominent member of the Melbourne Chamber of Manufactures, stated some time back that "at every port of the Commonwealth foreign-made goods were arriving in shiploads. In Adelaide he had seen 250 copies of Australian-invented harvesters landed from New York, the freight on which was less than the freight from Melbourne to Adelaide." Australian agricultural machinery manufacturers have pointed out that there has never been a really high tariff on machinery in South Australia. Probably 15 per cent. has been the highest, but in Victoria it went up to 60 per cent. on some lines. The protective tariff in South Australia has given way to a revenue tariff, and the outside duty is now about 15 per cent. They consider that the duty should be at least 25 per cent on certain lines to assist them to fight against the inrush of American goods.

What (it is asked) can Australian manufacturers—who work under the eight hours' system, and don't believe in making slaves of their men—do against such competition ? With reference to the season before this the number of harvesters imported into South Australia from various outside sources was decidedly heavy. Reports make the total from 250 to 500 by one firm. The duty is 12½ per cent. on the invoice, but at what price are these invoiced ? From official information received it appears that harvesters have been invoiced at £38 2s 6d., plus 10 per cent., a total of £41 18s 9d. The retail price to farmers in South Australia is about £80. Seed and manure drills are invoiced at from £12 10s to £16 16s 8d, and £18 15s plus 10 per cent. These drills are sold in South Australia at from £36 to £40. Another line which will affect the trade in South Australia is the importation of stump-jump ploughs. We understand that some were imported from Canada, and were exhibited at the last Adelaide show. Up to the present the effects are not greatly felt, but if these ploughs are invoiced on the same basis as harvesters and drills they would come into South Australia at £10. These ploughs weigh about 8½ to 10 cwt., and are sold at £20 to £22 in South Australia. The outcome of the agitation in the Australian Commonwealth will be awaited with much interest by New Zealand and British machinery manufacturers alike, for the latter are no strangers to keen competition from Transatlantic sources, and, therefore, have sympathy with the former.

Paragrams.

Mr. G. W. Leadley, of Ashburton, one of the most prominent of South Island farmers, and vice-president of the New Zealand Farmers' Union, stated a few days ago that during a few years frozen meat, to the value of £22,000,000, had been exported from the colony.

* * * * * *

Wellington has accepted the tender of Messrs. Turnbull and Jones, agents for the Westinghouse Company, for the electrical plant for the power-house extensions. The figure is £1375 7s. The unsuccessful tenderers were:—Mather and Platt, £2322; Brush Company, £2688; Electric Construction Company, £2700; General Electric Company, £2736; Dick, Kerr and Co., £3175.

* * * * * *

A successful flotation of the Ironsand Company is said to be expected very shortly. Mr. Witheford has been in constant cable communication with those in New Zealand interested in the project, and (according to the Taranaki Herald) the latest advices are couched in very confident terms. The public may expect definite announcement at an early date, and previous disappointments are likely to be sunk in the assistance of a good future for the potential industry.

* * * * * *

The Labour Department has of late been sending a large number of men to various public works throughout the colony, especially to the North Island Main Trunk line. The steamers every week are bringing over many men seeking employment, attracted here, no doubt, owing to the prosperous state of the colony. Some are first-class labourers for pick and shovel work, but others, again, are altogether unsuitable as clerical vacancies are limited.

* * * * * *

The improved trolley-head for electric tramways, invented by Mr. Garnet Holmes, of Wellington, is highly spoken of by all the electrical engineers to whom it has been shown.. The patent has been taken out in the names of Messrs. Holmes and Allen, who are fellow employees in the Corporation tram service; and it is not unlikely that Mr. Holmes may at an early date go to London with a view to bringing the improved device under the notice of electricians and tramway experts at Home.

* * * * * *

There are forty-three electric tram cars running in Wellington. Three of these (combination cars) were built locally,and two more, of the Hongkong pattern, are in course of construction in Wellington. It is likely that the Corporation will build its own cars in the near future. Machinery is being procured, and preparations for such work are being made. Of course, the under gear will, as at present, have to be imported, but with this exception the cars will be the product of municipal industry.

* * * * * *

Reports received by the Minister for Public Works indicate that very satisfactory progress generally is being made on all three sections of the North Island Main Trunk railway There are at the present time about 1500 men employed on these works which it is intended to push on with all expedition during the summer months. Bad weather has been experienced at the southern end of the line, between Taihape and Waiouru, one of the difficulties of the department of the railway construction being the excessive rainfall in that locality.

* * * * * *

That the improvement in trade is becoming widespread is deducible from the better position of nearly all the world's commercial markets. This is shown by the summary table which has been prepared by the Board of Trade, showing the total imports and exports of merchandise of the principal countries for which the particulars can be given, up to June, 1905, inclusive, and referring in all cases to the same period, viz., the six months ended June. It is worthy of note that the United Kingdom heads the list of thirteen countries as regards the magnitude of the imports and exports respectively, and in this particular Great Britain is even beyond the United States, notwithstanding the vastness of that country's area. British domestic exports are returned broadly as 155 millions sterling, against 144 in 1904, and 142 in 1903. The newest total is four millions in front of the United States. The same pleasing tale of trade expansions is told by the Board of Trade return relating to British railways, which shows that the net receipts amounted to £42,066,000 in 1904, as against £42,327,000 the year before.

In speaking of his experiments, Tesla said: "These experiments are my private business. I will say, however, that we are doing very much more than solving the problem of wireless telegraphy. In fact, I am satisfied of the practicability of taking wireless photographs. Very much more important things even than these will, I am convinced, be accomplished in the near future."

* * * * * *

A scheme has been mooted to utilise the Victoria Falls for the transmission of power to the Witwatersrand mines (west of Johannesburg). Expert opinion is favourable. It is estimated there would be a minimum supply of half a million horse power in the driest season. The Rand now consumes 150,000 horse power, costing three million pounds per annum. The cutting of a canal at a point below the falls would increase the supply to a million horse power.

* * * * * *

Dr. Chapple, who intends reading a paper on "Human Progress" before the Socialist Party, is collecting statistics showing the physical development of Wellington State School children, for the purpose of comparing them with data which he has received from various parts of the world. He states that the measurements, weights, etc., which he has so far taken in Wellington show that the figures as to the physical development of our children compare with those relating to the children in many other countries.

* * * * * *

The Christchurch Tramway Board has decided to use some of its old rails and material, and construct a branch line from the Victoria street line to Park terrace, to rejoin the main line higher up. The estimated cost is £1,700 to £1,800, including new material, estimated to be worth from £400 to £500 at the end of the term. The Exhibition Commissioners are to provide funds for the total cost, the Board to take over the new materials at valuation. A five minutes' service from the railway to the Exhibition is proposed during busy parts of the day and evening, the fare to be 2d, of which ½d, by way of royalty, be paid to the Commissioners.

* * * * * *

The new flagship of the Australasian station, the "Powerful" does not seem to mark a new era in the defence of our shores, for she has the distinction of being one of the most obsolete cruisers that ever carried the flag in southern waters. The "Marine Engineer" of November 1st, 1905, says:—"Considerable surprise was occasioned by the decision to send the "Powerful" as flagship to the Australian station. She has always been a heavy burden on the naval votes, and if the Admiral of the Australian station does as much cruising as usual he will be astonished at his enormous coal bill. The "Powerful" cost over £700,000 before she was completed, and since then nearly half as much again has been spent on her in repairs and refits."

* * * * * *

When George Westinghouse, as a young inventor, was trying to interest capitalists in his automatic brake, the device which now plays so important a part in the operation of railroad trains, he wrote a letter to Commodore Cornelius Vanderbilt, president of the New York Central Railroad Company, carefully explaining the details of the invention. Very promptly his letter came back to him endorsed in big, scrawling letters, in the hand of Commodore Vanderbilt—"I have no time to waste on fools."

Afterwards, when the Pennsylvania Railway had taken up the automatic brake, and it was proving very successful, Commodore Vanderbilt sent young Mr. Westinghouse a request to call on him. The inventor returned the letter, endorsed on the bottom as follows:—"I have no time to waste on fools."

* * * * * *

The *Lyttelton Times* thinks New Zealand might take a "wrinkle" from Italy in the matter of the International Exhibition to be held this year in Christchurch In connection with the Milan Exhibition of 1906, his Majesty the King of Italy will offer prizes to the extent of £1,600 to exhibitors. This amount will be divided as follows:—(1) A prize of £200 for automatic safety couplings for railways; (2) a prize of £200 for the best method of testing high voltage electric currents without danger to the operator, (3) a prize of £400 for the best and most original exhibit of machinery or manufacturing process; (4) a prize of £200 for the best established method of distributing healthy and pure milk in centres of population; (5) a prize of £400 for the best type of popular dwelling adapted to the climate of Northern Italy, (6) a prize of £200 for motor boats. In addition to the foregoing there will be a national prize of £200 to the public institution or private society which, during the last ten years, has been most successful in the work of reclaiming waste lands in mountainous districts and in improvements of pasturage.

From returns supplied by the secretary of the Timaru Harbour Board, it is evident that the South Canterbury port is making steady progress. The imports last year amounted to 76,901 tons, valued at £227,224, while the exports totalled 78,926 tons, valued at £1,042,463. The imports show a large advance over those of 1904, both in weight and value, showing that the spending power of South Canterbury has undergone a considerable expansion. Combining the tonnage of the imports and exports, we get a total which is the highest in the history of the port, and which was approached only in 1901, when the heavy shipments of produce to South Africa were largely responsible for the encouraging amount of 150,091 tons. The exports for last year showed a slight decrease as compared with 1904, which is partly accounted for by the potato blight, that caused a drop of over 75 per cent. in the export of potatoes.

* * * * * *

In a new trunk-type air compressor, described by the *American Machinist*, the discharge valve is of the full diameter of the cylinder, and seats itself on the cylinder end. The inlet valve—a trifle less in diameter—seats on the outlet valve, and air is admitted between the two valves and enters the cylinder round the edge of the inlet disc. The piston end accurately fits the face of the inlet valve, and the clearance is nil, for the piston may come right home and even lift the two valves off their seats. The cylinder cover encloses both valves, and a flexible diaphragm separates the discharge space beyond the inlet valve from the air-inlet central tube which admits air between the valves. As the valves are so large, their lift is small, and the principle of construction seems good, especially for high pressures, for there should be an efficiency of delivery of 100 per cent. of the volume generated by the piston.

* * * * * *

Artificial moisture in the atmosphere is a necessity when a building is heated by the air which issues from registers connected with hot-air furnaces. Where for any reason the outdoor air is abnormally dry, and in passing through a hot-air furnace it expands and has a capacity for a greater quantity of moisture, the room which it warms may be raised to an unusually high temperature, say 80° F. or more, and yet feel comfortable to the occupants. When the air is in this condition it absorbs moisture from the body rapidly without a chilling effect. This is a recognised fact, and to overcome the drawback, inventors are engaged in devising different kinds of humidifiers. This should suggest to progressive furnace manufacturers the desirability of developing some vapour-supplying device for use in connection with their furnaces that will satisfy the needs which they formally attempted to supply by the provision of a water pan, and which the public is being educated to feel and will eventually demand.

NOTICES.

We have received a copy of the *Australian Photographic Journal*. This publication is conspicuous for the valuable nature of its hints to photographers, both amateur and professional, and is distinctly a credit to the publishers.

* * * * * *

The Australasian Accountant and Business Man's Journal, Dunedin, says:—Progress is splendidly got up, plentifully illustrated, and reflects credit on the publishers. It more than compares with the *Scientific American*, and that is saying a good deal."

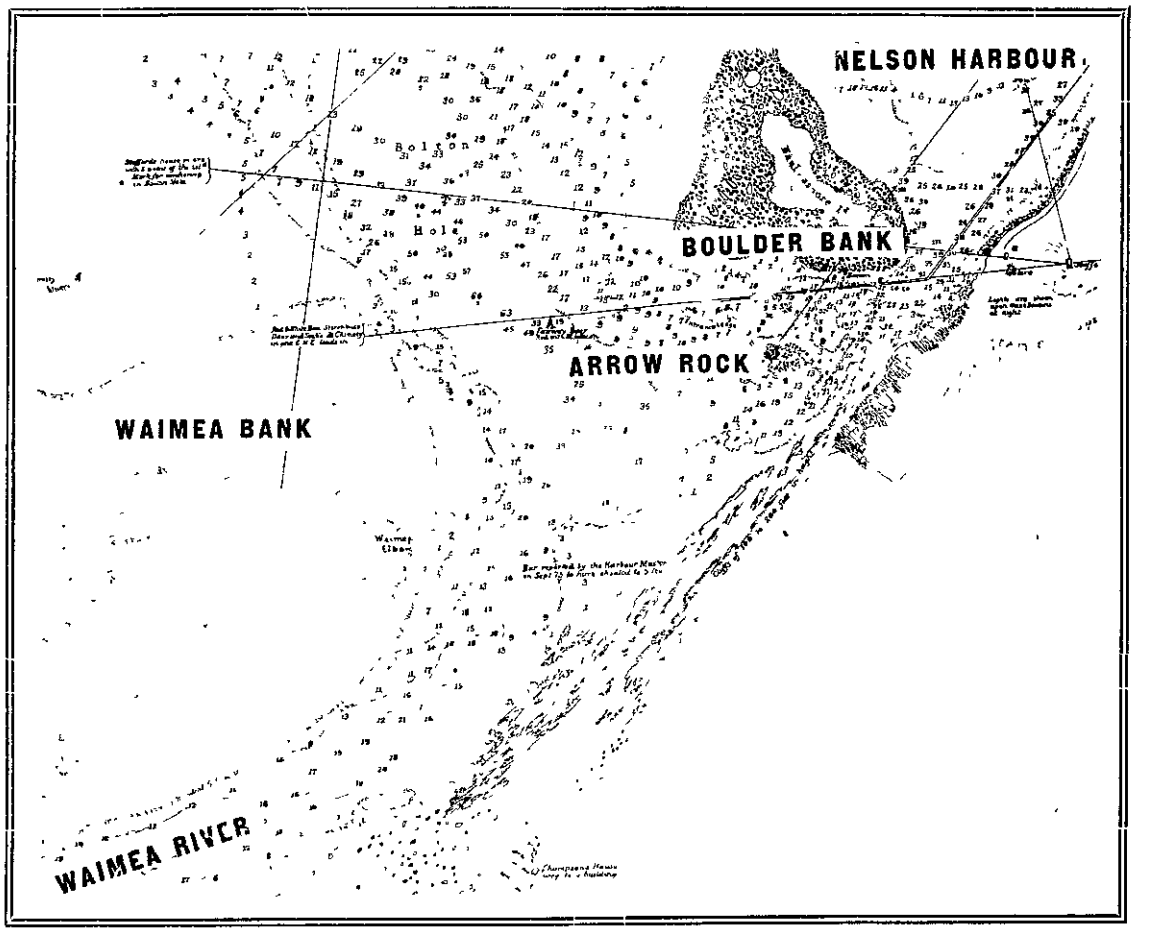
... Nelson ...
Harbour Improvements.

PROGRESS OF THE UNDERTAKING.

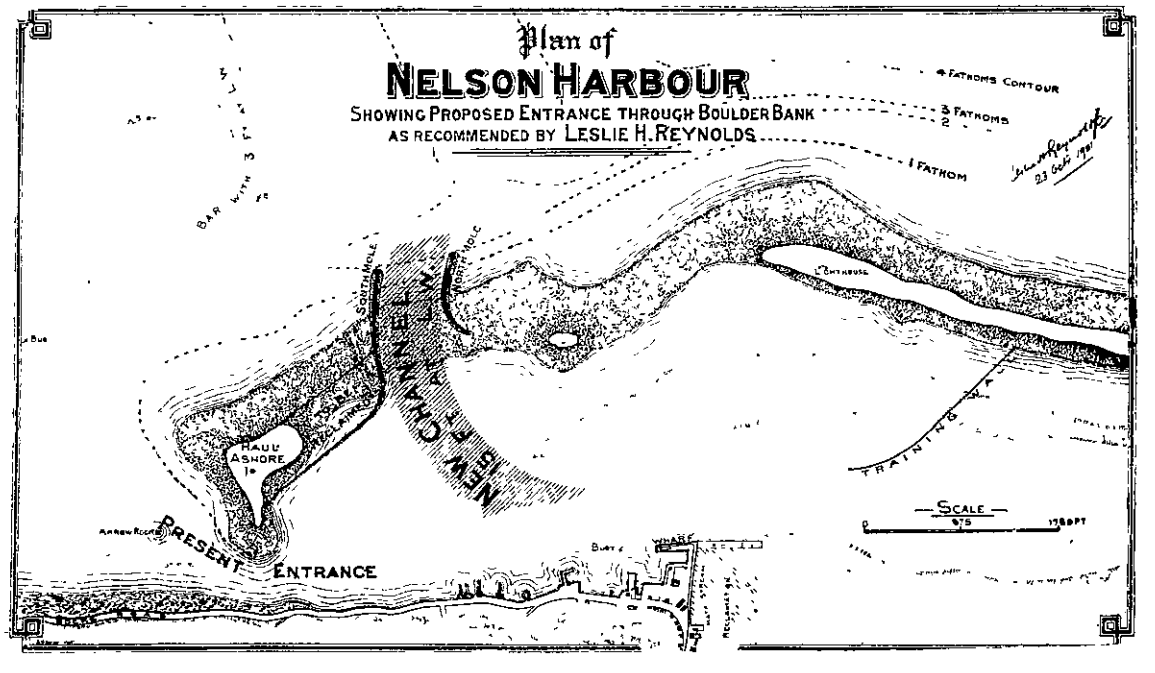
Written for PROGRESS.

THE Nelson harbour works now in progress embrace the cutting of a new entrance to the harbour through what is known as the boulder bank. The suggestion to open a new channel through the boulder bank emanated from Mr. Leslie H. Reynolds, in 1889, when he was called in by the Government to suggest the best method of improving the entrance to the harbour. Mr. Reynold's idea was considered at the time a fairly bold move, especially as the previously expressed opinion concerning the formation of the boulder bank presupposed a rock core. As it happens, subsequent operations in dredging through the cut have practically disproved such conclusions. For some years prior to 1899 the navigable depth on the bar lay well beyond the entrance proper; and, as it continued to seriously decrease, it became absolutely necessary for the harbour authorities to move in the matter. The first investigations were made for the Admiralty by Captain J. L. Stoke R.N., in 1850, at which time the Waimea river discharged the bulk of its tidal and river waters through its eastern outlet shown upon plan No. 1, in a volume somewhat in excess of the outflow of the Nelson harbour. The combined flow of the Waimea river and haven waters made seaward in an almost northerly direction, and was sufficient to maintain a minimum depth of from nine to ten feet at low water.

It appears that about the year 1875 the eastern outlet of the Waimea river commenced to shoal, and shortly following became entirely blocked, thus leaving the haven outflow to alone contend against the heaving-up action of the sea, with the result that the wave forces speedily acted upon the seaward slope of the shoal, particularly to depths extending to 12 or 15 feet below low water, and drove the sand inshore, forming a crest, or bar, having a depth of 6 feet at low water, as shown on the chart prepared by the late Capt. Johnson in 1882. Since that date the sea forces have driven the bar in a direction inshore towards the boulder bank some 900 feet, and the two fathoms contour line an average distance of 700 feet, with the result that the low water depth on the bar crest has been reduced to about 5 feet during favourable conditions, and to 4 feet following north-west seas. This inshore travel of the bar has seriously interfered with the sailing course, and has made the incoming or outgoing of vessels a difficulty, to say nothing of the delay occasioned through waiting for the tides, as it is only towards high water that the larger vessels can negotiate the bar. Mr. Reynold's scheme of cutting a new channel through the boulder bank was favourably received by the Marine Department, but to make doubly sure the Nelson Chamber of Commerce, a few months later, obtained a report from the late Mr. Napier Bell, who was supplied with Mr. Reynold's plans and data; and Mr. Bell evolved a scheme somewhat similar to that of Mr. Reynolds, the estimated cost of whose design was £63,000. Up to this time the harbour was in the hands of the Marine Department, but in 1901 the Nelson Harbour Board was formed, with the object of taking over the harbour and prosecuting the proposed work. The first of the contracts for machinery and plant were let in June, 1902, and the work of excavating the new cut was put in hand early in 1903. The works, as designed by Mr. Reynolds, embrace the construction of north and south moles, as shown on No. 2 plan, flanking a cut seaward through the boulder bank and harbour shoals, which would give an entrance of 600 feet in width, and a depth of 15 feet at low water spring tides, and at high water spring tides a total depth of 27 feet—the average rise of the spring tide in Nelson being 12 feet. With this depth the port could be worked by the largest vessels now trading there at any state of the tides. The Harbour Board, in carrying out the scheme, have for the present decided to construct the south mole only, and dredge the channel in the first instance some 600 feet in width; but whether they are wise in omitting the north mole and narrowing the channel remains to be seen. The dredging is a fairly heavy work, especially through the boulder bank, which is composed almost entirely of grey syenite, ranging from sand and shingle overlain for some 10 or 12 feet by boulders up to nearly half a ton in weight, and operations are being carried out by a dredge of the combine type, with ladder and buckets, and centrifugal-pump discharge. The buckets empty the dredged material into a revolving screen, which is perforated with holes of about 2¼ inches diameter, through which the finer material passes to the pump and is discharged on to the reclamation area shown on plan; the heavier material being delivered from the screen into barges, and utilised in the formation of the walls. The dredge, designed by Mr. Reynolds, was constructed by the Otago Foundry, Dunedin, and is a fairly heavy machine. The engines are compound condensing, and are capable of developing 375 h.p., while the boilers, of which there are two of the dry-back marine type, are designed to give the full head of steam required by the main engine, the winch engines and the electric light plant, with which the dredge is supplied. The boulder bank extends from what is known as Mackay's bluff for a distance of some twelve or fourteen miles, without a break, and it has always been an interesting feature in connection with Nelson haven, many theories having been advanced regarding the manner in which it was formed. Hochstetter, commenting on the matter, says:—"The boulders are entirely of syenite, and the same rock is found on the precipitous bluff which abuts upon the sea beyond Drumduan. The source is thus explained: fragments are constantly falling from the cliffs, and the action of the heavy northerly swell, combined with a strong current, takes them towards the south. The reason of their being deposited on the existing line is that in all probability a submarine reef underlies them, of which the Arrow rock, in the entrance of the Nelson harbour, may be regarded as the southern termination. This supposition is strengthened by the fact of the Arrow rock being of the same altered schists as occur immediately to the south of the syenite." Others again have maintained that a reef underlies the bank, and is the nucleus of its formation. Mr. Reynold's theory, which, as already explained, so far appears to be correct was given by him in his report of 1899, wherein he says:—"The question of the presence of a reef formation underlying the boulder bank was mentioned to me during my inspection of the port but I can see nothing which



PLAN NO 1: THE WAIMEA RIVER AND APPROACH TO NELSON HARBOUR AS THEY EXISTED 30 YEARS AGO.



PLAN NO. 2: THE WORKS AS THEY ARE TO BE COMPLETED.

points to or supports such a theory. After inspecting the boulder bank and Mackay's bluffs, it appears to me that it was formed in a manner similar to the sand spits which, as a rule, are to be found at the entrance of the harbours on the New Zealand coasts. There is no question, to my mind, that the material forming the bank came from the vast slips which have fallen from the bluffs, and that the harder portions have been driven along by the rip of the heavy seas, which, in the past, have been probably more frequent and of longer duration than at present. The direction of the prevailing seas in Tasman bay is from N.N.W, magnetic, and the general trend of the boulder bank is, approximately, S S.W., so that the seas impinge upon it at an angle of about 45 degrees, but the resulting rip or deflected force would be in a direction towards S.S.W., which corresponds to the general line of the bank. In nearly all the bays on the New Zealand coasts sand spits will be found extending from one of the flanking bluffs to the entrance, which is usually close to, or hugging, the other, and in many cases the seas impinge more at right angles to the axis of the spit than occurs in the case under consideration. A very good example of the formation of a bank against what might appear to be the forces of the sea is to be found in the Farewell Spit, and a similar action to that taking place there has, I consider, formed the bank at Nelson."

Considerable interest has been aroused in the colony as to whether the cut will attain the object for which it was designed. Should it do so the benefit conferred upon Nelson and the travelling public will be inestimable.

THE DREDGE AT WORK, NELSON HARBOUR IMPROVEMENTS.

Rival Motive Powers.

One frequently hears the opinion given, and more often than not by persons innocent of motor experience, that the internal combustion engine has already relegated the steam engine to second place in commercial motoring. The fact that the petroleum spirit engine is first, and the rest nowhere, in the field of pleasure or touring cars, is largely accountable for this prevalent view. A genuine conviction on this subject is engendered, too, as regards even the most superficial observer of events, by the great preponderance of the newer method of deriving power which is found in the prime movers upon the popular motor omnibuses of today; and this last fact, more than all the rest put together, is calculated to boom the explosion motor at the expense of the steam engine. But it is early in the contest to accept present experience as indicating any finality in respect of the ultimate ratios between steam-propelled and petrol-engined vehicles. Further some account will have to be taken of accumulator propulsion, for example, the wide employment of secondary batteries in New York City, as the portative source of motive power for large observation cars, has already led to valuable improvements. We find that systematised methods of re-charging and suspending the boxes coupled with more careful supervision and examination, have resulted in a greatly increased life for the cells which, under such favourable treatment, retain eighty per cent. of their original capacity after twelve month's use. But the best results obtained to date in this direction exhibit costs for power which are much above those of either steam or internal combustion engines. The one other system which falls within the range of practical politics is that colloquially termed the "petrol-electric," in which an internal combustion engine is employed in conjunction with a dynamo and one or more electric motors. The huge and unwieldy proportions of the earlier petrol-electric chassis have gradually been replaced by more graceful and compact combinations, until we find a great city like Vienna on the point of condemning practically the whole of its municipal fire brigade horsed vehicles and arranging for the immediate adopton of petrol-electric vehicles. Given the absence of necessity for cells, which are now almost universally supplied as an essential part of any such system, we look upon the prospects of these vehicles as being exceptionally bright. We have before us the confidential details of a petrol-electric system from which all cells are eliminated, suitable and effective provision for starting being made without necessity for recourse to their aid. In this arrangement, one sees that the internal combustion engine is, indeed, supreme, and that the electric elements are made dependent upon and subsidiary to it.

Any examination into the relative merits of steam, petrol, accumulator or petrol-electric propulsion reveals the fact that each has its spheres of application. Where the guiding consideration is commercial efficiency, it is imperative that users should be ever on the alert to apply the system or systems best adapted to the demands of their customers and the circumstances of the particular routes to be covered. Accepting these conditions as sound, we can discover no evidence to support the somewhat wild claims that the petrol engine *per se* will become universal. Manufacturers themselves, better than any, know the difficulties which arise when petrol engines are mounted in frames carried on non-resilient tyres, and how the advantages of regular service and economy in tare weight are jeopardised by such ambition. It so happens that the specification for a double-deck omnibus approaches the limits which govern the successful use of the petrol engine, for when rubber tyres have to be discarded, and when a 40 or 50-h.p. engine has to be fitted in order to cope with the increased demands which are consequent upon steel tyres, greater tare, and heavier loads it is better to rely upon steam power as a rule. The exceptions are where difficulties over water and fuel supply outweigh the advantage of a more flexible engine and transmission. On the other hand, to quote one instance of many, steam may be preferable in certain parts of the world, however difficult it may be to obtain water, if a sand-laden atmosphere renders the essential draughts of air a source of scored cylinders. The fact that water provides a pure medium to work inside the engine must often cause a preference to be accorded it over the internal combustion engine which is dependent for its working upon an external medium as well as the fuel proper.

The petrol engine will prove best for loads below 3½ tons, but steam will have a material share within that range. For heavier loads, steam is superior. Accumulator propulsion will always be limited to charging centres but in the petrol electric system the greatest possibilities of development lie.

The German Quick-Step.

The alertness and receptivity of the Germans, writes Mr. J. H. Yoxall, M.P., in the *Magazine of Commerce*, do not arise from a better equipment of brains than the English, but from a better

MR. LESLIE H. REYNOLDS,

Engineer, Nelson Harbour Improvements.

equipment of education. Upon that topic I will only here say that, class for class, every class of the German population is better educated and better trained for its work than the corresponding class in this country.

I have mentioned the lavish expense and yet the buoyant confidence manifest in the new Germany; combine these with mental alertness and business and professional training, and you get the incentive and the activity needful to produce "push." Let me show, by one contrast with ourselves alone, *how* they push.

In the year 1904 no less than 3,848 commercial travellers representing German firms visited Switzerland on business, many of them three or four times in the course of the year. In the same year no more than 34 British commercial travellers visited Switzerland at all.

I think it all comes round to that; the German quick-step in trading, amassing money, distributing it evenly, and using it in splendid civic and pleasant private ways results, I think, from the German quick-step in education.

Canada's Industrial Future.

A GREAT expansion of commerce and a considerable growth of manufactures are being looked forward to by those who have Canada's best interests at heart, including, among others, the Hon. Clifford Sifton, ex-Minister of the Interior, who has lately been attempting to outline what will be the industrial history of that country within as short a time as the next five years. He prophesies a great commercial development, basing his opinion upon the completion of new railway systems, of an increase of from one to two millions in population, the opening up to development and trade of the northern regions, the perfecting of the system of waterways, and the strengthening of the corps of consular commercial agents aboard. Heartily we trust that this pleasing forecast will be completely realised. Undoubtedly this authority is right also when he emphasises the necessity that exists for improving the waterways. While great strides are, he admits, being made in the development of systems of transportations by land, Canadians, he considers, have not yet succeeded in making the outlet to the seaboard what it ought to be for the purposes of commerce. Canada is, he declares, and must continue to be, an exporting nation, and the channels of its exports must be the cheapest, freest, and most economical possible. It should be a national sentiment, he further urges, that the route of their commerce to the sea should be made as perfect as the latest developments of science would enable money to make it. He had said to his former colleagues, and would say to them again on every possible occasion, that one thing the people of Canada would justify them in doing was "the spending of sufficient money on the St. Lawrence to make it as safe as the ocean route to New York and Boston." If British engineers and machinists can give Canada any assistance in the great work of improving the St. Lawrence, which scheme is now engaging the attention of a Canadian Commission, they will be only too pleased to render what help they can. To perfect the water route, and especially to thoroughly equip the different ports on the great lakes, will mean large sums laid out upon machinery and plant of various kinds, some of which might, we should think, very well come from the Mother Country. And, even if Canada supplies her own requirements in this respect, there is another way in which English machinery interests will benefit, for does not the improvement of Canada's exporting facilities mean a larger export of wheat, and does not a larger export of Canadian wheat mean more work for British-made flour-mill machinery, wherewith to grind it into flour? Assuredly it does.

THE GAS ENGINE: ITS POSSIBLE USE FOR MARINE PROPULSION.

BY CAPT. SANKEY, R.E. (Ret.), M.Inst. C.E.

IN his presidential address to the Institution of Civil Engineers, Sir William White said . "the progress made in recent years with gas engines of increasing power naturally raises the question whether they may not take the place of steam engines, even in large ships. It may be that Sir Frederick Bramwell's prediction is correct, and that in less than thirty years the use of gas engines will be almost universal. Enthusiasts dream of a time when gas turbines, instead of reciprocating engines, shall be brought into use. Those more competent to judge than myself appear disposed to think that very serious, if not insuperable, difficulties, lie in the way of this system of utilising power. However this may be, no initial steps seem to have been taken to practically realise the idea."

As though in answer to the last sentence, a small gas engine with producer has been constructed by Messrs. John I. Thornycroft and Co., Limited, and has been fitted to a vessel 60ft. long; the engines are capable of developing 75 b.h p at 300 revolutions per minute. Preliminary tests are said to have given satisfactory results, and it is not in the least improbable that extended experience will prove the suitability of such gas plants for somewhat larger sizes. Such success, however, would not justify the conclusion that gas engines were suitable, or even possible, for large ships, if only for the reason that in the small plant referred to above, the producer is arranged to work with anthracite, and before any practical success can be claimed for large marine engines it would be necessary to be able to use bituminous coal The question has, however, reached a stage in which a short discussion of the matter in general terms, will, we believe, be of interest to PROGRESS readers.

The first question naturally arising is Why are gas engines desired for this purpose? And the answer is simply the far greater possibilities of economy in coal consumption, approximately in the proportion of 1.8 to 1. It will be agreed that so great a saving is worth striving after. The problem divides itself into two main sections, namely, the gas producer and the gas engine itself. As regards the former, as already stated, and for obvious reasons it must be capable of producing a gas suitable for gas engines from bituminous coals, and it is more than doubtful whether at the present moment such a producer has yet been devised for land work, and, *a fortiori*, for marine work. The difficulty lies in dealing with the tars that result from the distillation of the coal, the bulk can be got rid of either by separating or reburning (" fixing," as it is termed) but the residual tar gets into the gas engine with very injurious results. It is said that the Mond and other similar processes effectually get rid of the tars, and that the by-products are worth as much or more than the coal consumed, so that the user in reality gets his fuel for nothing; it may almost be said that chemical works are established, and that the power produced is, so to speak, the by-product. Such arrangements are, however, inadmissable on board ship owing to the space occupied by the recovery apparatus The solution of the problem must therefore be sought by " fixing " the tars, that is, by converting them into gas, and although the method is at present not really practically successful there is no reason to suppose that it cannot be made so, possibly at an early date. The space occupied by producers and their accessories, and their weight in comparison with boilers, are matters of great importance—they will probably occupy more room and will weigh more than boilers; but, on the other hand, it must be remembered that less coal would have to be carried for a given voyage, and the saving of space and weight thus effected would compensate for the increased weight and space taken up. Gas producers require a considerable amount of steam, roughly in the proportion of 1lb of steam to 3lb of coal, and this steam must be obtained by evaporating sea water, so that provision will have to be made to deal with the salt that will accumulate on the heating surfaces and render them inoperative.It might mean, for instance, a duplication of the evaporative plant, so that one set might be cleaned whilst the other is at work, or else some form of scrapers, as now used with economisers, might be applied. The weight of salt thus deposited is not considerable, amounting to about one ton per day for engines of 10,000 h.p.; but the important point is that the thickness of the film of salt would increase on the heating surfaces at the rate of about ½in. per day.

The evaporation of the water is usually effected in existing producers by means of a subsidiary boiler, and such an arrangement would obviously cause difficulty in dealing with the salt; but it may not be impossible to utilise the heat in the exhaust of the engine for the purpose, together with that in the jacket water. The amount of heat thus available is amply sufficient, and with suitable fan arrangements the steam can be evaporated at atmospheric pressure.

In many producers a water seal is used around the ashpit, and, obviously, special provisions would have to be made to prevent splashing and breaking of the seal in a sea way. Probably it would be necessary to devise some other form of seal.

Special arrangements will have to be made for thoroughly ventilating the producer's stokehole, to avoid the danger of poisoning by carbonic oxide, especially when battened down in heavy weather. The " poking " of the producers would be more difficult to carry out than on land, owing to the confined space. In this connection it may be stated that fewer men would be needed for attending to the producers than are required for stoking the boilers. On the other hand, the coal would have to be lifted from the bunkers to the top of the producers, and some form of mechanically driven coal-conveyer would have to be schemed for the purpose. The above comprise, so far as is known, the main difficulties to be overcome, and it does not appear that any of them are insurmountable

We must next deal with the engine. At the present there are many designs of large gas engines, which are running satisfactorily up to 2,000 h.p. or over, and it is understood that the makers are prepared to build up to at least 5 000 h p So far, however, all such engines have been of the horizontal type, which is clearly inadmissable for marine work There is also another important point to be considered, namely, that the majority of these large gas engines are working with blast furnace gas, and it is well understood that the same successful design of engine, when working with producer gas, has given great trouble owing principally to pre-ignitions which are more likely to occur with producer gas than with blast furnace gas. A few vertical gas engines of small power are running satisfactorily, but, so far, no real attempt has been made to build large gas engines of this type. It may be said, therefore, without fear of contradiction, that a great deal remains to be done before it can be hoped to apply the gas engine for the propulsion of even moderate sized ships, let alone really large ones. There is, therefore, no object gained in comparing the present gas engine as regards space occupied and weight with the marine steam engine; the comparison would be entirely in favour of the latter.

As there does not appear to be any gas engine at present suitable, it may be interesting to form some idea of what the marine gas engine may be like, and to state some of the requirements it will have to fulfil. It will clearly have to be of the vertical type, and in order to obviate pre-ignitions, but also,and more particularly, to obtain an even turning effort without the use of a large fly-wheel a great many cylinders would be needed, each working on its own crank. In this way the weight of the moving parts would be reduced, allowing of higher speed, and thus helping to keep the weight of the engine within reasonable limits; the engine, however, would be a very long one. A further advantage of this design would be to materially assist in balancing the engine so as to prevent vibration. In the case of gas engines for driving dynamos, very large fly-wheels are necessary, especially if the dynamo is of the alternating type, and has to run in parallel with others when a coefficient of fluctuation of speed of at least 1/200 is needed. For marine work so small a coefficient is unnecessary; nevertheless, a considerable fly-wheel would be required, even with the large number of cylinders referred to above, and difficulty may be experienced in housing this fly-wheel, and at the same time keep the propeller shaft sufficiently low in the ship Obviously, also, the presence of a fly-wheel would make it much more difficult to start, stop, and reverse the engine. Possibly some gear may be devised admitting of the engine running constantly in one direction, but it does not follow that it would be reliable when the power to be transmitted is large; and, in any case, such a gear would probably be cumbersome and noisy. It has been suggested, in order to obviate the manœuvring difficulty, to make the gas engine drive a dynamo, which, in its turn, would actuate electric motors coupled to propeller shafts. The engine would run continuously at a constant speed in one direction, but all, or any of the motors can be stopped or reversed by the simple manipulation of a switch. The arrangement is complicated and expensive, but has the merit of great flexibility.

Enough has been said to show that many difficulties will have to be surmounted before the gas engine will be able to compete with the steam engine for the propulsion of ships of any size; none of the difficulties mentioned appear, however, to be insurmountable, but they will have to be conquered step by step, and with much patient effort and the expenditure of large capital. The above remarks refer to reciprocating engines; there is, however, another possibility, namely, the gas turbine. This form of motor is too little advanced to be able to form any opinion, but clearly such a form of engine would obviate many of the greatest difficulties referred to above, and would probably compete favourably with the steam turbine. The producer, also, would be simplified, inasmuch as the presence of tars in the gas would probably not be injurious to a gas turbine.

A promising arrangement is the combination of a water turbine driven by a water jet, produced by continual explosions of a gas mixture in a chamber into which the water is continuously pumped back, in accordance with Mr. Voigt's patent.

Lastly, there is the possibility of using the Diesel engine with coal dust. Such an arrangement would do away with the producer, but there are great practical difficulties to be overcome.

Labour in Germany.

DISPUTES ON THE INCREASE.

German labour statistics for the year 1904, as issued by the imperial statistical office, show that, in all, 2040 strikes and lockouts took place, the trades affected being as follows:—

Buildings	796
Woodworking	417
Metal	153
Stonemasons and kindred trades	119
Engineering	81
Food (sic)	78
Clothing	76
Transportation	57
Commerce	48
Leather	38
Textiles	31
Chemicals	25
Printing	23
Paper	21
Mining	20
Art trades	4
Soap and candle making	3

Unfortunately, the figures do not give the number of working days lost to the operatives in each trade, nor the number of workmen affected. They do, however, indicate how long the disputes lasted numerically. Thus we are told that—

168 disputes lasted 1 day or less; 687, from 1 to 5 days; 271, from 6 to 10 days; 298, from 11 to 20 days; 185, from 21 to 30 days; 149, from 31 to 50 days; 130, from 51 to 100 days; and 102, over 100 days.

A further analysis of the disputes shows that 1870 were strikes, and 175 lockouts. Of the total, 1457 concerned demands as to wages, 613 related to hours of working, and 884 concerned political and other troubles. The outcome of the 1870 strikes is summarised thus.—

Successful	449
Partly successful	688
Unsuccessful	733
	1870

The outcome of the lockout is thus indicated:—

Fully successful	44
Partly successful	43
Unsuccessful	44
Unsuccessful	44
Total	175

Comparing the number of disputes in 1904 with those in former years, it is seen that last year's record is the highest since 1899, when the compilation of labour statistics was first undertaken by the German Government:—

1899	1364	1902	1135
1900	1500	1903	1501
1901	1109	1904	2040

The Textile of the Future.

Certain advantages of ramie as the textile of the future are set forth in the *Indian Textile Journal*, which claims that ramie has the following advantages:—that it is many times stronger than cotton, flax, hemp, and the like; that it has a very strong staple, from 3 in. to 9 in.; and that it is easily grown, as it acclimatises itself in almost any zone where agriculture is possible. It crops in some latitudes as many as four times per year. Further, it is beautifully lustrous, more after the nature of silk in appearance, and it does not rot, giving it great advantages for many purposes, such as fishing lines, nets, sail-cloths, boot and saddlery thread, tarpaulins, rick-cloths, tents, hose, shop blinds, boot linings, and other requirements necessitating exposure to damp. It is non-elastic, and therefore is invaluable for machinery tapes; mixed with wool, it imparts non-shrinking possibilities to that article.

Our... Industries

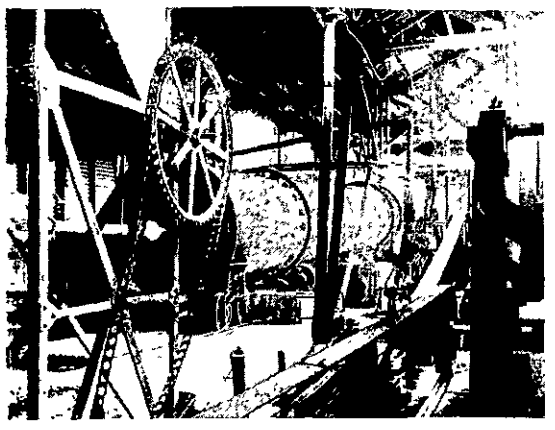
Written for Progress

Dunedin Works of the Milburn Lime and Cement Co., Limited.

There are very few industries connected with building materials or engineering construction which have undergone such a rapid development during recent years as Portland cement. A generation ago it was almost unknown, and it was applied to very few of the uses which are now closely associated with the very name of the material. The immense utility of the product has led to a close study of the methods of manufacture, and enormous capital has been employed throughout the world in making improvements, both as to process and plant. The net result is that Portland cement is now looked upon by engineers and architects as one of the most important articles in building construction, more especially since the advent of re-inforced concrete, i.e. a combination of iron or steel with Portland cement concrete.

The quality of the product has been vastly improved. A few years ago a tensile strength of 200lb. per square inch was looked upon as satisfactory. At the present day 600 to 800lb. is frequently imposed by engineers. It is interesting to review how this change has taken place, and we have an evidence of step-by-step advancement at the Dunedin Cement Works.

A brief history of this company is worthy of note. In 1888 the valuable and well-known lime deposit at Milburn, together with a small cement works, was acquired by a syndicate of Dunedin gentlemen. This syndicate at once formed a powerful company with a capital of £30,000, registered as



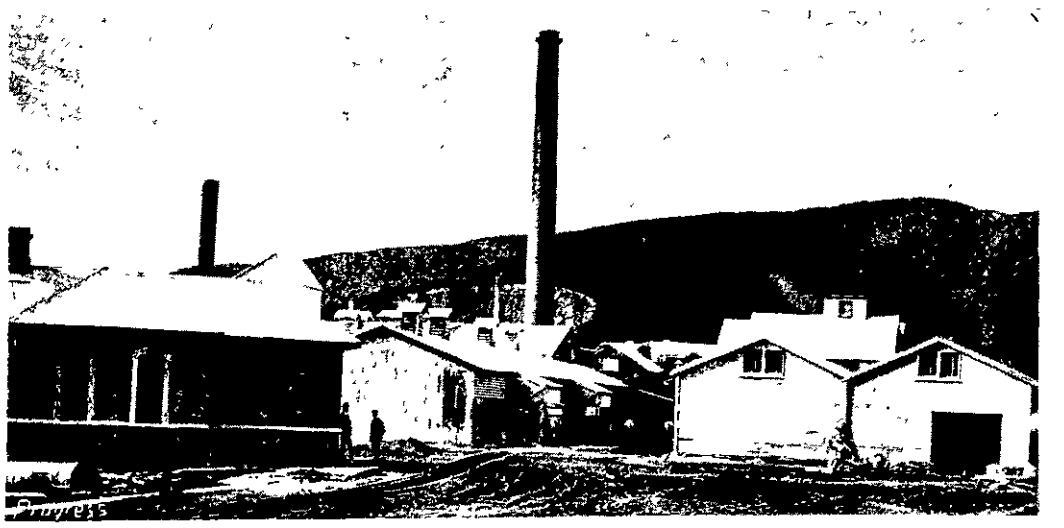
ROTARY KILNS.

the Milburn Lime & Cement Company, Ltd. The quality of the lime was too widely known to cause the directors any anxiety, and from the start a satisfactory business was done; but with the other branch, viz., cement making, difficulties came.

The works were then situated at Walton Park, about five miles from Dunedin, a site that seemed to possess every disadvantage, involving costly carriage of clay, lime, coke, general stores, and finished cement, combined with unsuitable machinery. After a few months' working the directors recognised the gravity of the position and called a special meeting of shareholders to decide whether the company should retire from cement making, or acquire a new sight and erect modern works. The "modern" works then erected were designed after the English practice, viz., Johnson kilns, with chambers, millstones for grinding both wet and dry, the process adopted being known as the semi-wet process. The materials, lime and clay, were mixed together in a wash-mill, thence ground in a wet state and pumped on to chamber floors. The burning off of the previously loaded kiln supplied the necessary heat to dry the mixture for the following kiln. At that time this was considered to be a most economical method of manufacture.

The next step was to produce a finer ground cement to meet the requirements of better work demanded by the engineers The millstones were thrown out and a complete plant known as Askham's pulverising plant was adopted.

This was a distinct improvement on the old process, but costly in wear and tear. It was run with more or less success until 1897, when, after a visit to America, the Old Country, and the Continent, the manager elected to replace this grinding plant with a newer process of ball and tube mills, the great advantage of these machines being that the whole product is ground up and reduced to the necessary fineness without sifting. The Milburn Company were the first cement makers south of the Line to adopt the tube mills, which are still in vogue and looked upon by cement experts as the best method of grinding



DUNEDIN WORKS OF THE MILBURN LIME AND CEMENT CO.

To meet the increasing demands for Milburn cement further additions and improvements became necessary in the burning department. In 1900 the manager was sent to America to report on the American process of manufacture by the rotary kiln, with instructions that if he was satisfied to order a plant without delay The advantages of the rotary process of burning were so apparent that a kiln was installed that year. The Milburn Coy. was again the first company south of the Line to adopt this modern process, and the experience of the past few years has demonstrated the wisdom and efficiency of the selection.

As there appears to be no finality in the progress of the industry, the company is again compelled by the increasing demand to lay down more plant for dry grinding, and mills of the most powerful and successful type made are now on the water and will be shortly installed.

A description of the processes at the works at the present time will be of interest to Progress readers.

The lime, which is obtained from Milburn, and clay, dredged from the harbour in close proximity to the works, are mixed together in a manner protected by Letters Patent. The usual method of supplying heat to evaporate the moisture from the clay is avoided. Thence the raw materials are ground successively in pan and tube mills, thence elevated to a storage bin (24 hours capacity) and conveyed, after being slightly damped, into the kiln. As this revloves it gradually forces it from the back to the front, getting hotter and hotter until it reaches the calcining stage. From there it is discharged in the form of small clinkers. It is picked up by an elevator and conveyed automatically to the clinker store where it is allowed to cool and cure. It is then ground practically to an impalpable powder in ball and tube mills, the discharge of the tube mill being in the bulk store.

The power is obtained from compound jet condensing engines of 250 h.p. In addition there are auxiliary engines for electrically lighting rotary kiln drive.

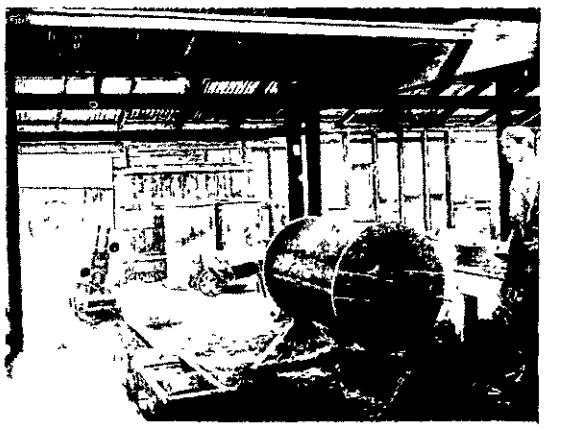
KIELBERG FACTORY

The company owns a dredge and complete equipment for clay dredging, and the works are well served with a siding from the main trunk line directly into the warehouse.

The coal used for rotary burning is Westport slack, which is dried and ground to a powder before being injected into the kiln. The site of the works comprises upwards of four acres, one-half of this being occupied by the various factory buildings.

This company has always made a point of storing its cement for some weeks before being sent out, which is considered prudent and in the interests of the consumer. The volume of business has steadily increased from 10,000 to 150,000 bags per annum. The works are fully employed, the Company having large and important contracts with the Drainage Board, Dunedin Corporation Tramways, Public Works and Railways, Otago Dock Trust, Water Supply, etc. In addition to the cement-making business the company has a large lime business, two pipe factories (Monier & Kielberg) and phosphate deposits.

We hope on a future occasion to describe these industries.



MONIER FACTORY.

PATENT ORE CRUSHER.

Messrs. A. & T. Burt, Limited, engineers, have recently turned out of their Dunedin workshops a very powerful ore crusher, designed by Mr. G. Calder, proprietor of the Valley quarries. The crusher is a distinct advance on any type of stone breaker at work in New Zealand. The design embodies the best features of imported machines, with improvements which Mr. Calder has carefully thought out in his long and extensive experience with ore-crushing machines

The most important improvements consist of the double-acting cam motion, giving two crushing strokes to each revolution in place of one, as in other reciprocating machines, also the lever operated by the cam shaft is of great length, which the design readily permits, thus giving a very low and economical horse power to drive the crusher at full capacity.

In daily work the machine puts through 15 tons of road metal per hour, the mouth opening being 12in by 18in. Generally, the machine is well proportioned in all details, first-class materials and workmanship characterising its construction. The main frame is a massive casting weighing over 4 tons, which, being self-contained, does not require expensive foundations This new crusher should commend itself to all users of this class of machinery.

Messrs A & T. Burt, Limited, who are the sole agents for this patent crusher, would be pleased to arrange for those interested to inspect and view the machine at work in Mr. Calder's quarry.

THE NEW KNOWLEDGE.

One of the most interesting of modern popular science books is Professor Duncan's "The New Knowledge" which gives a lucid account of the recent work of Professor Thomson and the staff of the Cavendish Laboratory, of Becquerel, the Curies, Ramsay, Rutherford, Soddy Lockyer, and others in its bearing on the electrical nature of matter, the facts of radioactivity, the evolution and inter-relations of the so-called chemical elements and the meteoritic hypothesis Here and there it is decorated somewhat gaudily by passages of "fine writing," for example

What a phantasmagoric dance it is this dance of atoms! And what a task for the master of the ceremonies For mark you, the mutabilities of things These same atoms, maybe, or others like them come together again, vibrating, clustering, interlocking, combining, and there results a woman a flower, a blackbird, or a locust, as the case may be But to-morrow again the dance is ended and the atoms are far away; some of them are in the fever germs that broke up in the dance, others are "the green hair of the grave," and others are blown about the antipodes on the winds of the ocean The mutabilities of things and likewise the tears of things for one thing after another,

"Like snow upon the desert's dusty face
Lighting a little hour or two—is gone"

and the eternal, ever-changing dance goes on But these "purple patches" are easily separable from the texture of the book: they are in it but not really of it. When he sets himself resolutely to his task of exposition, the author can be as plain in his neatness as the dignity of the subject demands. He expects nothing from his reader but "a high-school education and a love of contemporary natural knowledge" He avoids the merely historical method and builds up his account of the new science from the standpoint of simplicity of apprehension The new facts and the vistas they open up to the trained imagination are consecutively set forth in the order which best brings out their mutual relations The reader is lead on over rough places where he will need all his high-school algebra and dynamics and chemistry to make sure of his footing, with growing confidence that his guide knows the way, and that the goal is worth reaching. From the three entities—matter, ether and energy—he passes to molecules and atoms, to the periodic law with its baffling suggestions and brilliant forecasts; thence to the ions that conduct electricity and its corpuscular carriers or electrons Next he reaches radioactivity and the mystery of radium with its rays and emanations, its prodigious stores of end-atomic energy its growth, and its decay into inert and elemental helium. If one metal may thus "transmute" itself, why may not all? The alchemist may have been right in his aim though his methods were futile. *Are* the "elements" elementary and simple, or are they but complex arrangements of one primitive matter? Questions like these are not merely posed and left they are faced and the reader is helped to answer them in the latter half of the book. What if the distinction between *matter* and electricity is superfluous? Hitherto the corpuscles of which matter is built have been conceived as "*carriers*" of electricity: what if the carrier and the charge be one? A charge moving with sufficient speed would have the property we assign, as fundamental and characteristic, to the carrying mass, namely, the property of *inertia*. The principle of economy suggests that we dispense with the notion of matter as unnecessary, and thus lightened we are brought with a bound to the electronic theory (not *electrolonic*, as the author repeatedly calls it) namely, that particles of matter are but particles of negative electricity in swift motion through the ether. Leaving the earth, where the meagreness of our laboratory resources hinders our quest, we are next directed to the sun and stars By spectrum analysis we are able to to test our conclusions, under conditions of scale and temperature that have no parallel on this cold and narrow planet. The evidence that the elements *are* dissolved by fervent heat, that from hot star to cold they increase in complexity and in variety, that there is a rhythmic process of inorganic evolution and involution, is cumulative consistent, irrefutable Professor Duncan skilfully turns the new light backward over the way he has traversed, and shows that it was straight and wisely chosen He throws it forward and thereby illumines in part the untrodden path ahead The sources of the sun's heat, the earth's age the phenomena of the aurora, the zodiacal light and the nebulæ the decay and rebirth of the cosmos, all come within the sweep of his holophote And he leaves us with the conviction that we are not toiling on a fool's chase, but have in our hands a clue that will bring us nearer to the ultimate reality of things.

The book is one to be digested by the thoughtful man who has *heard* of the new discoveries and wants to *know*. Not for its information merely, though that is in the main both accurate and full but for its suggestion for its call upon the thinking powers of its readers the book deserves a cordial welcome from "laymen in science."

Improvements in Gold Dredges in America.

The development of the gold dredge is one of the most important features of modern mining and its effect upon the world's output of the precious metal is important (says a writer in the New York "*Engineering and Mining Journal*") The efficiency of the dredge of large electrical power has been demonstrated so successfully that the demand for the machines is now very large There is hardly a concern making these gold dredges which is not working overtime trying to catch up with orders, a considerable proportion of which are for export.

The gold dredge has developed rapidly in the past ten years the type once established, inventors and manufacturers have tried to increase the size and capacity Improvements in these directions are characteristic of the newest machines A number of big dredges are now in course of completion for the Klondyke, where they will be operated in connection with a power plant established at Dawson City These will average a total of 500 horse power for each machine, divided into separate units of from 7 to 100 horse power induction motors These dredges will be among the largest in use, and they will be equipped with the most recent improvements. The power house at Dawson City will contain a kilowatt turbo-generator, driven by a 600-h.p steam turbine This will represent one of the first instances of a steam turbine used for mining purposes in the Klondyke.

Similar gold dredges are being built in this country for operation in Australia South Africa South America and different parts of our Pacific Coast Five large dredges are now in course of construction for a Californian mining company These will have 75 buckets in line, with a capacity of 7 cubic feet each; the total weight of the machines, exclusive of framework and hull, will aggregate 2000 tons Heretofore, the largest dredges constructed have had only 65 buckets, with a capacity of 6 cubic feet each The tendency to build larger and more powerful boats is noteworthy.

The earliest forms of gold dredges in use were operated by steam, but it was found that they could be used profitably only where the ore was rich The work of developing the dredge was retarded for a time and it was not until cheap electric power was supplied that the present movement assumed great headway California has been among the first in the field, both in developing long-distance electrical transmission and also in the utilisation of current for extensive mining purposes. Starting with boats that would dig 20,00 cubic yards of earth per month, they have gradually increased in size and capacity until the largest in operation to-day dig from 50,000 to 75,000 cubic yards of material per month But even this is not considered the limit Several that are now in course of construction will be capable of handling upwards of *100,000 cubic yards of earth* a month The 5ft bucket has been considered the standard for these machines in the past few years, but, as remarked, a few have been in operation with 6ft. buckets and now a number will shortly be launched in California with 7ft. buckets

With increase in the size of buckets, and with more of these on the endless chain, a corresponding increase in the size of the motors and hulls of the ship follows The standard hull of the larger class of boats is 36ft by 90ft., but the newer craft will reach 50ft to 120ft and some are talking of launching craft 60ft by 150ft. On the latter boats 150-h p *motors will be required for digging, and* 75-h p motors for driving the centrifugal pumps Corresponding increase in the size of the motors for operating the deck winches, stackers, deck pumps, and screens will follow.

The size of the boat and its general outlines must be proportioned carefully to the number and size of the motors, for the strain of handling the gravel and screening is tremendous The harmonising of all parts of the boat has been a problem worked out by engineers and inventors, so that all parts now balance well Of the more than half a hundred boats now in operation in California most of them are of the bucket type

A recent report of a machine expert showed that the gold boats were being manufactured in a score of different shops throughout the country, and that the output was about one machine a week This limit was due entirely to lack of facilities for increasing the manufacture. Provision is being made to increase the output. Orders have been placed for enough machines to keep the present shops busy for the next five years.

Electricity Notes.

The lengths of electric waves measured by Herz and named after him were found to be 150 ft. from the top of one wave to the top of the next. The waves used by Marconi in telegraphing across the Atlantic are much longer, being 600 ft or more. They travel at the same speed as light at the incredible and almost inconceivable rate of 184 000 miles per second *But a wave of light measures* only a few millionths of an inch.

* * * * * *

The combination of oxygen and hydrogen, when a mixture of these gases is exploded, is believed to generate a large amount of electricity. The results are very irregular, probably owing to the action of moisture. At least 10,000,000 molecules of water vapour are formed for every pair of ions produced. The energy set free by the explosion is very great compared with the amount required to form the ions so that their formation may only be a secondary *effect*

* * * * * *

Electrically driven ploughs and farm machinery constructed by an Italian firm need for their operation two power cars stationed at each side of the field, between which are stretched cables attached to the plough. Electric current of about 500 volts is taken from a trolley line. The plough is pulled by the cables from one side of the field to the other, and when it reaches the end of the furrow it stops automatically, current being cut off It can be run backwards or forwards with ease

* * * * * *

A broken overhead trolley wire is a source of danger, and more than one device for cutting off the current and so rendering the wire harmless has been suggested The latest invention for this purpose is fitted to each section of the wire, and consists of an ordinary connecting ear, held in its proper position by the stram on the trolley wire. Directly this tension is released, as by the breaking of the wire, the current is cut off from the broken section without any sparks whatever caused by short circuits

* * * * * *

ELECTRICAL PUMPS IN COLLIERIES.—Speaking before the Manchester Geological and Mining Society recently Mr G. K. Hooghwinkl M I M E, M.I.E.E., expressed the opinion that the pump destined to supercede all others—and first of all steam-driven pumps—was the electrically driven high-pressure centrifugal pump. This, he says, is an ideal mining pump, on account of its various and valuable qualties, including cheapness, compactness, strong construction, and absolute security from break down

* * * * * *

The invention of the incandescent electric lamp has been celebrated by founding a Thomas A Edison medal which has been entrusted to the American Society of Electrical Engineers

The circular issued by the Edison Medal Association announces that it is the intention that the medal shall be awarded each year to the graduating student who shall present the best thesis on some original subject from the universities and colleges of the United States and Canada which have regular courses in electrical engineering It is quite possible that if the Institute of Electrical Engineers was approached, the field of the competition might be enlarged to embrace students of *New Zealand colleges and universities*

* * * * *

Two years ago the use of windmill power for generating electricity was successfully tried in Europe. At Hamburg, and near Leipsic, there are electrically driven plants which derive their power entirely from the wind. Considerable attention has lately been given to this question in the western districts of the United States. So great is the variety there of home made and commercial windmills that a special bulletin describing them has been issued by the Department of Agriculture At first the windmills were to generate electricity for lighting the barns and homes; but to-day a good many of them operate small electric motors. The windmills used are of the ordinary types, built to transmit the full power of the moving air currents to the generator located at the bottom of the structure. A single large windmill, of the home-made type or of modern commercial form, will, it is said, run a two, three, four, or even five horse-power motor.

ELECTRIC TRAMWAYS
OF NEW ZEALAND.
No. 4. - - - Auckland.

Written for Progress.

The Auckland Electric Tramways Company, Limited, was formed in March, 1899, to take over the existing horse tramways, with a view to their extension and conversion to electric traction. Under the laws of New Zealand no private promoter can apply direct for tramway powers; so, after protracted negotiations, the Auckland City Council applied for and obtained the City of Auckland Electric Tramways Order (No. 1), subsequently delegating their powers to the Company by a deed dated June 28th, 1900. In due course, the suburban authorities, ten in number, followed suit. The concession is for 32 years, after which time the local authorities may purchase the undertaking as a going concern, and confers upon the Company the exclusive right to construct and work tramways in the district.

The British Electric Traction Company, Limited, were appointed consulting engineers, and in July, 1901, contracts were placed with Messrs. J. G. White & Company, Limited, for the whole of the traction construction, overhead line, feeder system, and power station and plant. Subsequent contracts have been made with the same firms for the cars and the condensing system. The consulting engineers kept the construction and equipping of the car depots in their own hands. The track construction included in the present contract, and completed, consists of twenty route miles laid to standard gauge; and the Company was enabled to instal double track throughout the routes where heavy traffic was to be expected. Furthermore, the clearway between the tracks is everywhere six feet, enabling centre poles to be used to a very large extent.

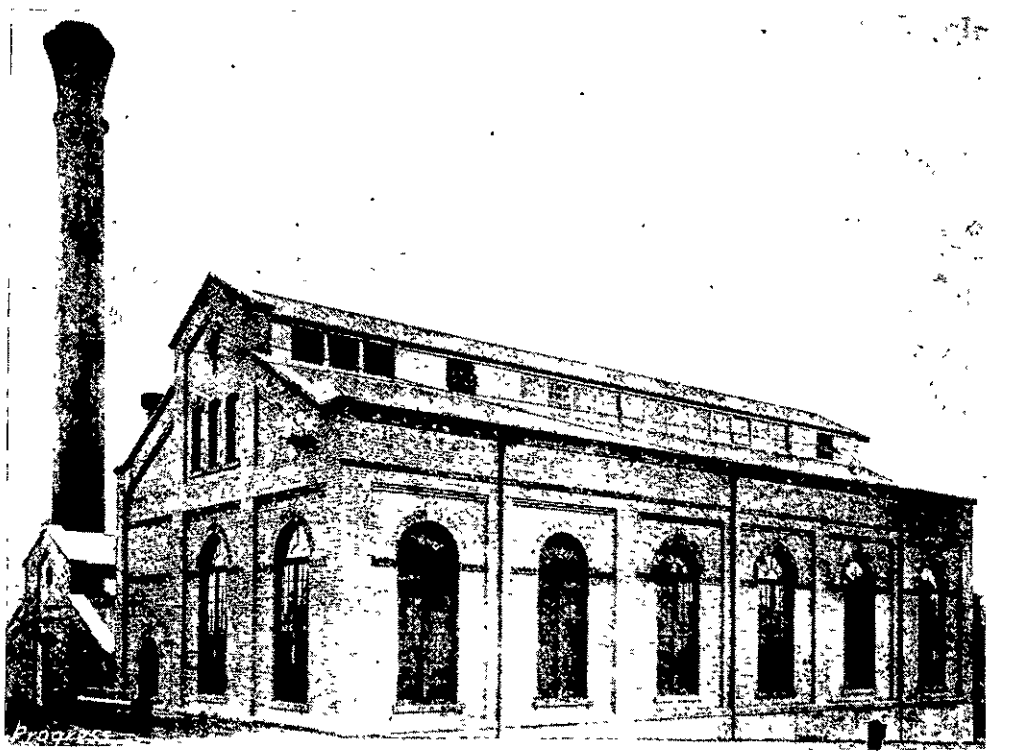
The rails used on the straight weigh 92lb. per yard. For the inner rail of each track, on curves of less than 300ft. radius a section weighing 95lb. per yard is employed. It was ascertained that 37ft. was the greatest length that could be conveniently shipped, and that was accordingly fixed upon as the standard length for rolling. The fishplates are 24in. long, weigh 52lb. per pair, and are fixed with six bolts. The rails and fishplates were manufactured by the Lorain Steel Company, the specified proportions of foreign elements in the rails being as follows :-

Carbon	·45 to ·55 per cent.
Silicon	·04 to ·08 per cent.
Phosphorus	Not more than ·10 per cent
Sulphur	Not more than ·085 per cent.
Manganese	·80 to 1·0 per cent.

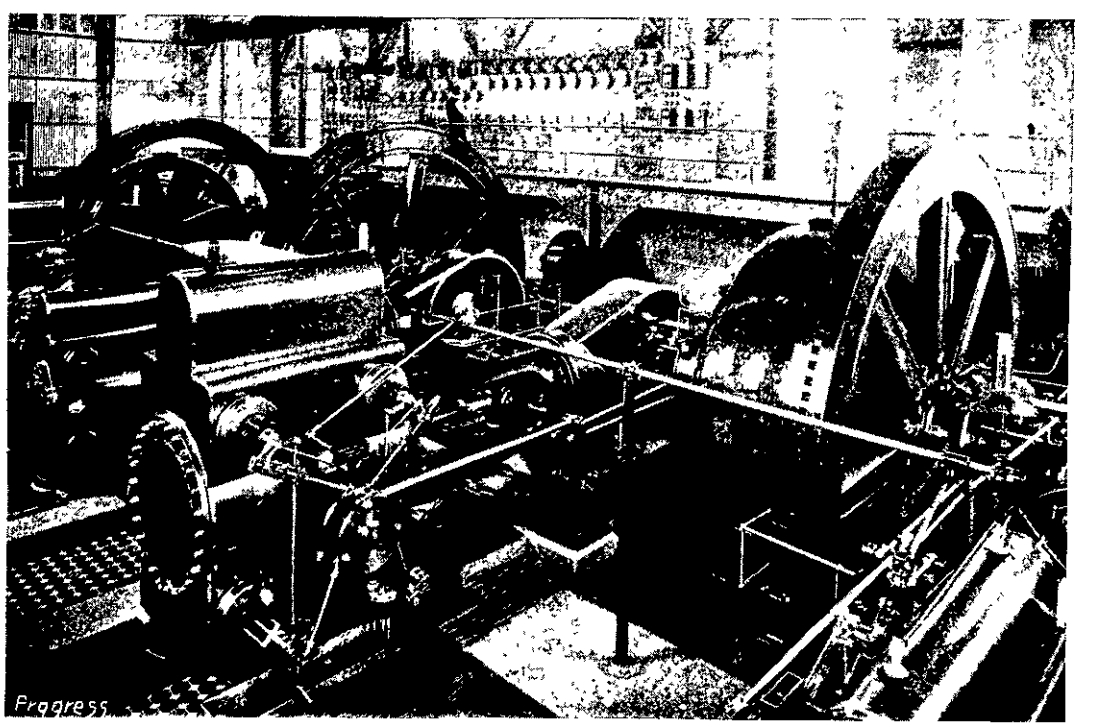
The standard permanent way construction is as follows:—the rails are bedded about 11in. in longitudinal concrete sleepers, 18in wide by 9in. deep, and are edged on each side with one row of the local bluestone setts, laid serrated, or " hit and miss " fashion. Between the sleepers the road is excavated 9in. deep and filled in with macadam well rammed down.

Another matter, of which mention may be made is the system of draining the track. As the rainfall at Auckland amounts to about 60in. a year it was felt that the drain boxes which have answered satisfactorily in England would not be adequate under these conditions, especially as the surface is macadam, and not setts. Accordingly, not only the rail groove, but also the whole width of the double or single track is drained. A narrow culvert with concrete bottom and brick walls is run across the full width of the track or tracks, a slot being cut out of the bottom of the groove of each rail to open into it, and is suitably connected with the nearest surface water drain or gully. The covers consist of stout iron grids,and an edging of setts is laid round the framework. One of these arrangements is placed at the bottom of each grade, the average distance apart being about three-quarters of a mile. All points and special work are also drained.

Coming to the overhead equipment, it has already been noted that centre poles predominate. Span-wire construction is used at curves and junctions, and in certain districts where the use of centre poles was objected to, as also on one or two branch lines. Side poles and brackets are employed to a limited extent. In fact, every variety of construction is to be seen, both with iron and wood poles, the latter being permitted in outlying districts. Swivel trollies are used on the cars, and the overhead work is arranged for maximum outreach of the trolley arm of 4ft. 6in., it not being considered advisable to exceed this amount with the speed of 10 to 18 miles an hour at which the cars run. All centre poles are provided with cast-iron wheel guards to prevent accidents to vehicular traffic, and, as an additional precaution, are painted white for six feet above ground. In the principal street the poles have ornamental bases. All poles, both iron and wood, are 32ft. long overall. Three grades of iron poles are used, weighing 905lbs., 1295lbs. and 1,435lbs. respectively. The wood poles are of totara, and are square in form, and tapered 11in. side at bottom to 8in. at the top. All wood poles are thoroughly tarred at the bottom seven feet.



THE POWER STATION: SHOWING SELF-SUPPORTING STACK.



THE POWER HOUSE: SHOWING CORLISS ENGINES AND GENERAL ELECTRIC CO.'S GENERATORS.

The trolley wire is No. S.C. B.S.G., and flexible suspension is used throughout. The hangers are of galvanised malleable iron. The same regulations as to guard wires apply as in England, but, in addition, the Company was required to insulate all telegraph and telephone wires crossing its lines. The work in carrying out this proviso, and in raising the telegraph and telephone wires along the routes where centre poles were not permitted, has been considerable. Outside the central quarter, where cables have been laid underground, the feeders, consisting of 3,4, and 6 bare copper wires of No. 4/0 B.S.G., are carried overhead on wooden cross arms affixed to the poles. The test and telephone wires are carried overhead on little brackets. The configuration and extent of the lines, and the heavy traffic, have made necessary an elaborate system of feeders. As far as possible, these have been carried overhead, but elsewhere cables insulated with vulcanised bitumen and manufactured by Callender's Cable and Construction Company, Limited, have been drawn into earthenware ducts. The ducts are all single way and octagonal externally, measuring about 4½in. across, and having 3¼in. diameter bore. They are supplied in 18in. lengths and have been laid in what is known as the " Camp " system. The ducts are grouped together with a thin film of cement mortar between each, and the whole is surrounded with concrete uniformly 4in. thick, making a very strong and watertight construction.

The manholes are placed on the average 90 yards apart, and are of two sizes, 4ft. by 4ft. internally by 5ft. deep, and 2ft. 5in. by 3ft.5in. internally

DOUBLE-BOGIE CAR BUILT BY THE BRUSH ELECTRICAL ENGINEERING CO.

by 3ft. 6in. deep respectively. Only one size of iron frame and cover is used, however, the upper brickwork of the large manholes being racked in to the required extent. The cover is recessed and filled with asphalt to a depth of 2in. The ducts are laid with a slight fall so as to drain into the manholes, and, where the accumulation of water would be likely to be considerable, a connection is made between the manhole and the nearest sewer.

Four boosters, each consisting of a shunt-wound motor direct coupled to a series-wound generator, manufactured by the General Electric Company, of Schenectady, U.S.A., are provided in the power station. It was calculated that there would be required on the negative side one booster to give 20 volts at 400 amperes, and two giving approximately 110 volts at 330 amperes, and on the positive side one booster to give 105 volts at 250 amperes. It was desirable to make the last three machines interchangeable, and this was accomplished by selecting generators of capacity of 125 volts at 330 amperes, which would give at a lower load 105 volts at 250 amperes. Shunts across the fields of two of the machines reduce the pressure at 330 amperes to 110 volts. The specified maximum variation at any load from the straight line characteristics required for the generators is 8 per cent. of the voltage at that load. The power station is in two bays, each roughly 53ft. wide and 104ft. long, and is of the usual construction—brick walls over a steel framework. The roof is of corrugated iron, laid over 1¼in. boards.

The plant at present comprises :—

Four Babcock and Wilcox boilers, each of 2,100 sq. ft. heating surface, provided with Babcock and Wilcox chain-grate stokers.

One Green's economiser of 360 tubes.

Three engines, made by Cole, Marchent and Morley, Limited, of the horizontal cross-compound Corliss type, each capable of 475 i.h.p. normal and 700 i.h.p. maximum output, running at 100 r.p.m., with steam pressure at the stop valve of 150 lbs. per square inch. The specified maximum steam consumption at full rated load, working condensing, is 14½lbs. per i.h.p. hour, and the minimum mechanical efficiency at the same load 90 per cent. The permanent speed variation from the mean speed does not exceed 2½ per cent., or the temporary variation 4 per cent., when the load is altered under working conditions.

Three 300-k.w., 8-pole, direct-connected, continuous-current, compound-wound railway generators constructed by the General Electric Company, and capable of 50 per cent. overload. The specified efficiency at full load is not less than 93½ per cent. These generators are without shaft or bearings, the armature being pressed on to the engine shaft.

One 600-k.w. set constructed by the British Electrical Engineering Company ; the engine, made by the same Company, being capable of 1000 i.h.p.

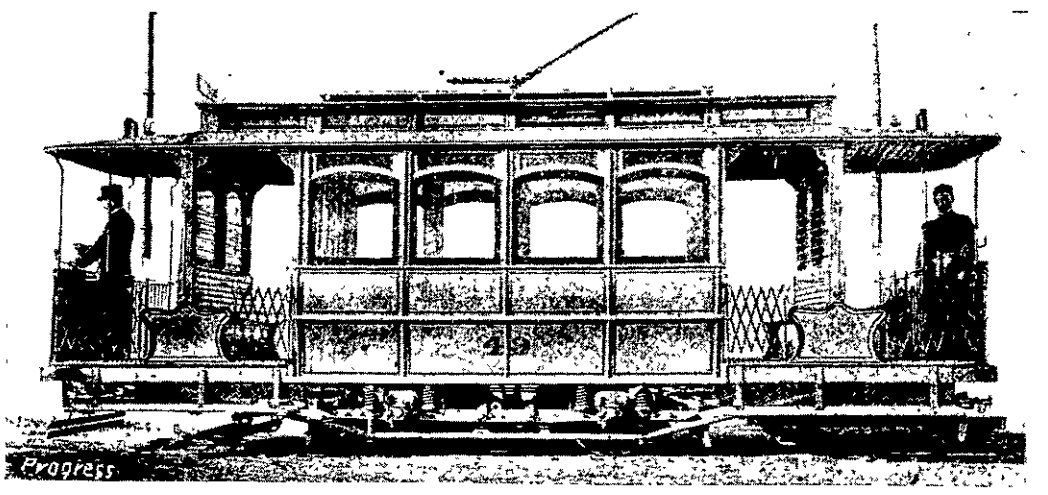
One 25-k.w. auxiliary unit, manufactured by the General Electric Company.

Four boosters already mentioned.

Switchboard, consisting of three generator panels, one load panel, one Board of Trade panel, four booster panels, six feeder panels, one lighting panel, and spare panel, made by the General Electric Company. The panels are of blue Vermont marble, held in a riveted steel frame. The board is of the flat pattern, with back connections.

One 20-ton overhead travelling crane, operated by hand from the ground, constructed by Higginbottom and Mannock. Piping, feed pumps, injectors, filters, hot well, tank, etc. etc. The feed pumps and economiser scrapers are electrically driven.

The rolling stock consists of : 55 passenger and one freight cars, all constructed by the Brush Electrical Company, Limited, with the exception of one built



SINGLE-TRUCK COMBINATION CAR BUILT BY MESSRS. COUSINS AND ATKIN, AUCKLAND.

by Messrs. Cousins and Atkin, Auckland. The single-deck bogie cars are of the combination type with closed centre and open ends, and are designed to accommodate 48 passengers ; the double-deck cars have reversed staircases and four motor equipments, and will seat 80 ; and the four-wheeled cars are divided into two compartments (one intended for smoking) with seats for 32. The bogie trucks are all equal-wheel, with wheel base of 4ft. In the double-deck cars each truck carries two motors, and in the single-deck bogie cars one motor, provision being made in the latter case for a second motor being added at any time. The wheel base of the single truck is 6ft. 6in., and it is, of course, fitted with two motors. The radius of the sharpest curve is 40ft. to the inner rail.

The wheels are of 30in. diameter. In view of the high speed at which the cars run at times, it may be suggested that 33in. wheels would have been more suitable, but, on going carefully into the question, it was found that the use of 33in. wheels would entail the platform step being inconveniently high, and this idea was accordingly abandoned.

Each car is fitted with a hand brake, a track brake, and an electrical emergency brake. The track brake is of the Spencer pattern, two slippers being fitted on each truck, and is so designed that a pressure of 4000 lbs. can be readily applied to each slipper without undue exertion on the part of the operator. The grades are very severe on some of the routes, the steepest about 200 yards in length, averaging 1–8.8, and there are longer grades of 1–11. Efficient brakes and ample motor power are, therefore, both necessary.

One standard size of motor, rated at 40 b.h.p., has been adopted. The maximum tractive effort specified was 1700lbs. at the wheel tread, and the maximum car speed 18 miles an hour, the gear ratio being 14.68.

Each car is fitted with two life-guards of the "trigger" type. The trigger is a hinged frame under the front end of the platform, which, struck by anybody, releases the catch by which the guard is normally held up clear of the track, and allows it to drop down to receive the body and carry it along until the car can be stopped.

The Company owns two car depots, conveniently situated, which have been reconstructed and electrically equipped to accommodate 44 and 30 cars respectively.

The principal building is in two bays, 354ft. and 328ft. long respectively, and each 39ft. wide, containing the car-shed, paint shop and erecting shop, There are six lines of track in the car shed, all with pits under their whole length A third and smaller bay contains the machines, wood-machine, and blacksmith's shops, winding-room, stores, etc. A cross-pit connects the machine shop with the car-shed. Light rails are laid along the floor of all the pits ; with turntables at the junctions with the cross-pit : and, with the aid of wheeled hydraulic jacks parts requiring repair can thus be transported from under the cars to the shops with the greatest facility. The tools, etc., in the repair shops include a 30-cwt. overhead travelling crane, 15in. and 8in. lathes, one heavy and one light drilling machine, a 150-ton hydraulic wheel press and an Allday's patent "Climax" hearth and blower. The lathes and drilling machines are electrically driven For lifting the cars bodily a car-lifting appliance of 15 tons capacity is provided, consisting of two pairs of screw jacks on wheels and two girders.

In concluding this article mention should be made of the fact that the 1904 profits handed to the Auckland City Council by the Tramways Company amounted to £2,300, in addition to £1,200 paid in street rents and rates.

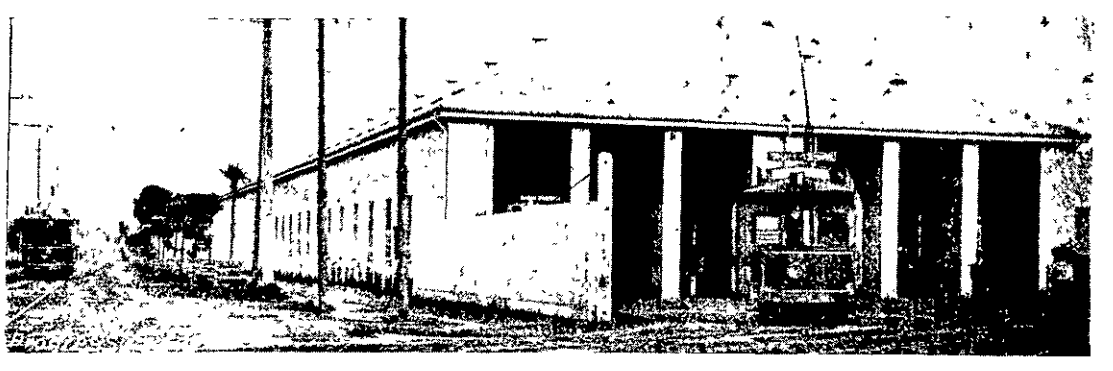
The results of the first and second years' workings are as follows :—

1903.

Total car mileage run	1,318,469
Number of passengers carried	13,535,611
Total receipts	£82,929
Dividend	4½%

1904.

Total car mileage run	1,702,173
Number of passengers carried	18,045,703
Total receipts	£112,429 9 7
Dividend	6%



THE CAR SHEDS AT PONSONBY.

The drainage, water supply, and street improvement works, which are to be carried out in the borough of Lower Hutt, Wellington, at a cost of £52,000, was on the 10th ult. formally commenced.

Millions Lost in Wages.

DISPLACED LABOUR.

The following article appeared in a recent edition of the "Boot and Shoe Trades Journal";—

Sir Howard Vincent, M.P., has issued a manifesto to his constituents in Central Sheffield, showing the increase in the importation of foreign goods and the consequent enormous loss in wages suffered by British working men.

The figures are taken from the Official Statistical Abstract for last year, and they show that foreign manufactured goods have increased from £9,000,000 in 1851 to £135,000,000 in 1904, although we double the number of mouths to feed.

In an appended table, Sir Howard quotes a list of 37 classes of finished goods, made by foreign labour, imported last year free of all tax or toll, and shows that the approximate wages thereby lost to British artisans were no less than £31,606,000.

All these goods, says Sir Howard Vincent, could have been better made in the United Kingdom, and many of them in Sheffield and the West Riding.

The following is the list, and it gives the principal finished articles (other than food and drink) displacing British labour; the official value in round numbers—the value is really greater, as it is given by the importer, and there is no penalty or check. and the approximate wages lost to British artisans in 1904:—

Finished articles.	Official value. £	Wages lost
Brooms and brushes	344,000	172 000
Buttons and studs	280,000	140,000
Boots and shoes	973,000	486,000
Carriages and motor cars	2,638,000	1,319,000
Cotton manufactures ..	4,668,000	2,334,000
Cutlery and hardware ..	1,194,000	600,000
Cement	393,000	196,000
Cork manufactures ..	728,000	182,000
Cycles	82,000	41,000
Electrical apparatus ..	845,000	422,500
Embroidery and needlework	1,259,000	629,000
Flowers (artificial) ..	772,000	386,000
Fancy goods	1,375,000	687,500
Glass manufactures ..	3,379,000	1,689,000
Hair manufactures ..	114,000	57,000
Implements and tools ..	547,000	273,500
Joiners' and turners' work	2,000,000	1,000,000
Jute manufactures ..	2,207,000	1,103,000
Gloves	1,506,000	753,000
Linen wares	678,000	339,000
Matches	465,000	232,500
Brass	325,000	162,500
Copper	895,000	447,500
Cotton manufactures ..	4,668,000	2,334,000
Girders, etc.	776,000	388,000
Iron and steel (wrought)	684,000	342,000
Rails	243,000	121,000
Various metal manufactures	728,000	364,000
Zinc	562,000	281,000
Mouldings	248,000	124,000
Paper	4,669,000	2,334,500
Sewing machines ..	374,000	187,000
Silk manufactures .	12,700,000	6,350,000
Stationery(other than paper)	287,000	143,000
Toys and games	1,102,000	551,000
Watches	838,000	419,000
Woollen manufactures ..	8,900,000	4,450,000
Other Articles	3,434,000	1,717,000
Total	£63,212,000	£31,606,000

The woollen and worsted imports come largely from the Yorkshire firms who have moved their factories to Roubaix, Rheims, and other places, so as to command two markets,and not employ British labour. Is the Bradford district, asks Sir Howard, wise to permit this unfair trade, which is now extending to Sheffield?

Had these £63,000,000 worth of goods been made in the United Kingdom, as would have been the case sixty years ago, over £31,000,000 would have been paid last year in wages in Great Britain and Ireland. This would have given a wage of 30/- a week to more than 397,000 persons—chiefly heads of families.

Would there, in that case, concludes Sir Howard Vincent, have been any unemployed problem? Probably not, and especially if simultaneously the 3,000,000 acres lost to arable cultivation in the last thirty years, and displacing four rural labourers for every 100 acres, could have been retained in cultivation.

Workshop Items.

RULE FOR THE WEIGHT OF PIPES.

D = Outside diameter of pipe in inches.
d = Inside diameter.
w = Weight of lineal foot of pipe in lbs.
$w = k\,(D2—d2)$.
k = 2.45 for cast iron.
= 2.64 for wrought iron.
= 2.82 for brass.
= 3.03 for copper.
= 3 86 for lead

HEAT.—The British standard unit of heat is the amount necessary to raise 1lb. of water 1 degree Fahr., and one gallon of water weighs 10 lbs. The specific heat of a body is the ratio of the quantity of heat required to raise that body 1 degree to the quantity required to raise an equal weight of water 1 degree. Example: Water is the standard = 1. The specific heat of mercury is .03332, therefore the quantity of heat required to heat 1lb. of mercury 1 degree F. would heat 1lb. of water 03332 degree F., or the quantity of heat required to heat 1lb. of water 1 degree F would heat 30lb of mercury 1 degree F. 1lb. of carbon burning to CO generates 4,451 units of heat, while the CO from 1lb. of carbon burning to CO_2 generates 10,092 units of heat. The mechanical equivalent of heat is the amount of heat generated by a body weighi g 1lb. when suddenly arrested after falling from a height of 772 feet. The calorific power of a fuel (or its heat units) represents the number of lbs. of water which can be raised through 1 degree F. by the combustion of 1lb. of that fuel. Specific heat of water 1, specific heat of air at constant pressure .2377, the specific heat of water thus being 4.1733 times greater, under ordinary circumstances, than that of air. The volume of one pound of air at the ordinary atmospheric pressure, and a temperature of—

20 degree Fahr. is 11.58 cubic feet.
32 degrees Fahr. is 12.39 cubic feet.
62 degrees Fahr. is 13.14 cubic feet.
72 degrees Fahr. is 13.34 cubic feet.
80 degrees Fahr. is 13.59 cubic feet.

A pound of water losing 1 degree of heat, or 1 thermal unit, will raise the temperature of 4.17 pounds, or, at ordinary temperatures, say 59 cubic feet of air, 1 degree. A pound of steam at atmospheric pressure, having a temperature of 212 degrees Fahr. in condensing to water at 212 degrees Fahr., yields 965.7 thermal units, which, if utilised, would raise the temperature of 50 x 965.7 = 48,285 cubic feet of air one degree, or 690 cubic feet from 0 degree to 70 degrees Fahr In ordinary steam heating probably not over $7\frac{1}{2}$ pounds of water is converted into steam from the temperature of the return. Thus the combustion of one pound of good coal would suffice to raise the temperature of 5,175 cubic feet of air 70 degrees.

Keep Going.

WHEN one task is finished, jump into another. Don't hesitate. Don't falter. Don't waver. Don't wait. Keep going.

Keep going. Doing something is always better than doing nothing.

For activity breeds ambition, energy, progress, power. And inactivity breeds idleness, laziness, shiftlessness, sloth.

Don't dawdle in the hope that inspiration will strike you Inspiration is more likely to strike a busy man than an idle one.

Save the half hours that are wasted in waiting. That is the secret of system Keep going.

The best gas fire is obtained by a large number of small jets so arranged that each jet will be fed with pure air and that the burned gas from one jet cannot become mixed with the fresh gas issuing from another. A gas fire should have a supply of air in addition to that which is supplied through the mixer It is impossible to supply enough air through the mixer to secure complete combustion, and one of the most common errors in setting gas-burners is the attempt to exclude all other air. On the other hand, if an excess of air is supplied it will unduly reduce the temperature of the products of combustion. It is a mistake to attempt to "hold the heat back," by tightly closing the damper in the smoke pipe. When this is too tightly closed, the poisonous products of combustion are retained too long in the furnace, and poison the fresh gas issuing from the burner.

The Slowly Receding Moon.

LUNAR BODY MAY HAVE BEEN BORN OF OUR EARTH MILLIONS OF YEARS AGO.

"Looking back through the mists of time we see the moon ever drawing nearer and nearer to the earth. Our satellite now revolves at a distance of 240,000 miles, but there was a time when that distance was no more than 200,000 miles. There was a time millions of years ago, no doubt, when the moon was but 100,000 miles away; and as we look further and further back we see the moon ever drawing closer and closer to the earth, until at last we discern the critical period in earth-moon history when our globe was spinning round in a period of five or six hours," writes Sir Robert Ball, in Book lovers' Magazine. "The moon, instead of revolving where we now find it, was actually close to the earth; earlier still it was, in fact, touching our globe, and the moon and the earth were revolving each around the other, like a football and a tennis ball actually fastened together."

"It is impossible to resist taking one step further. We know that the earth was, at an early period, a soft molten mass of matter, spinning round rapidly. The speed seems to have been so great that a rupture took place, a portion of the molten matter broke away from the parent globe, and the fragments coalesced into a small globe. That the moon was thus born of our earth uncounted millions of years ago is the lesson which mathematicians declare they learn from the murmur of the tides.

New Iron Hardening Process.

Phosphorus, as is well known, has the property of imparting a certain degree of surface hardening to iron, but not without producing brittleness. The iron is made to assume a course structure, in which the crystals are comparatively loosely bound together. This effect of phosphorus of loosening the coherence of the molecules of the iron greatly facilitates the absorption of the carbon by the iron. The carbon rapidly penetrates the iron to a considerable depth, imparting great toughness to the core and nullifying the comparatively slight defect constituted by the inconsiderable brittleness of the surface. Two Prussian inventors apply this principle in their process for hardening iron by heating the same in a tempering powder, consisting of organic nitrogenous substances containing a high percentage of fusable ash, and employing phosphorus as the medium for the introducing of carbon into the iron. Without prejudicially affecting the welding properties of the iron, it imparts such a degree of hardness thereto that it can neither be cut nor chipped by the best steel used. In order to harden the surface of about 200 kilograms (441 pounds) of iron to a depth of 1 millimeter (.0394 inch) by means of this process, the pieces should be embedded in a added a mixture of 300 grains of yellow prussiate, 250 grains of cyanide of potassium, and 400 grains of phosphorus. The receptacle is well closed, luted with clay, etc., and raised to a clear red or white heat, whereupon the material treated is immersed in a glowing condition in a water or other bath.

It will be surprising if the primitive and slow street-sweeping machines now in general use are not supplanted by the steam sweeper devised by the Hartford Motor Manufacturing Co., of Connecticut, U.S.A. Each of these is equipped with a water-tube boiler and engine at the rear, and will traverse any surface at the rate of four miles an hour. No inconvenience is caused to passers-by, as not a particle of dust is scattered. In the centre of the machine is a rotary brush, upon which hot steam is constantly directed. As the dust is taken up it is damped by the steam, and so prevented from rising into the air. The broom throws the street sweepings into a large dirt-box, which can be quickly emptied. With what is termed an eight-foot sweeper, 18,000 square yards of road surface of any description can be dealt with in one hour, at a cost of four shillings. The machine is wheel steered, with rubber tyres on artillery wheels, and will pick up anything, from the finest dust to half bricks.

An instance of what the milking industry does for Taranaki is given by the "Daily News." During December nearly £16,000 was distributed amongst the factory suppliers near Manaia. The five companies doing business around Eltham—Ngaire, Mangatoki, Lowgarth, and Kaponga—distributed over £21,000.

Inventions.

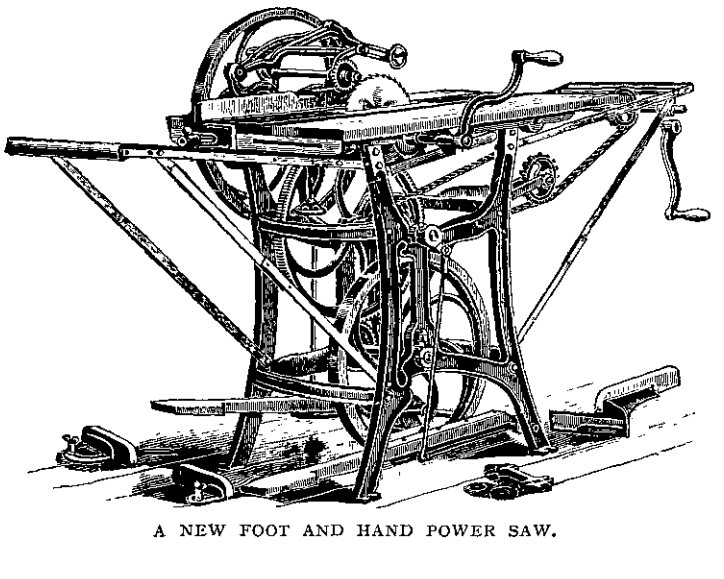
[This page is reserved for the use of inventors who desire to bring their inventions before the notice of manufacturers and others. For information apply to the Editor.]

A New Foot and Hand Power Saw.

THE Seneca Falls Mfg. Co., 567 Water Street, Seneca Falls, N.Y., U.S.A., are introducing a new "Union" combination rip and crosscut saw (No. 5), of which the accompanying is an illustration. These are built in large numbers by special machinery, and are designed to meet requirements of carpenters, builders, cabinetmakers, and woodworkers generally. The iron frame, which is strong and rigid, has cold-rolled steel shafts, with hand-scraped babbitt metal-lined boxes, adjustable to take up the wear. The table top is of wood and iron, 28in. wide by 36 in., long, the centre part, 10 in. by 36 in. being of iron, planed perfectly true. This is hinged at the back, and can be moved upwards or backwards, by means of a hand-screw in front, for rabbeting, grooving, dadoing, etc. The self-feed ripping device—which has three changes of speed—is self-adjusting for all thicknesses of wood, and is positive in its action, the power being transmitted by gears. It is easily detached when the table is required for crosscutting, etc. By means of the extension rolls, the length of the table may be increased to 7 feet long when long stuff has to be cut; but when not required, they may be immediately folded down out of the way. The machine has two hand powers, in employing either of which the operator is able to maintain a natural upright, and, therefore, easy position. That at the rear (for one or two cranks) leaves the table entirely free for crosscutting. The foot power is, the manufacturers claim, as perfect as can be, power being transmitted entirely by automatic, machine-cut chain gears and chain belts, doing away with slip and lost motion. It is stated that, with this machine, one man can, with ease, rip soft wood up to 3½ in. thick, and hard wood up to 2 in. in thickness, doing as much work in the same time as would be got through by four men with hand saws. It is also useful for crosscutting, mitreing, etc., and, with attachments, may be employed for boring, scroll-sawing, edge-moulding, beading grooving, etc. The fullest particulars as to price, etc., of this and many other foot-and-hand-power woodworking machines may be obtained by addressing the Seneca Falls Mfg. Co.

A method of measuring turbine power has been invented by Mr. Johnson, of Messrs. Denny and Brothers, Dumbarton, builders of the bulk of the Union Company's fleet. All that can yet be done is to specify power equivalent to so much horse power as developed by reciprocating machinery, though horsepower of the turbine is not capable of exact measurement in the same way. The new instrument measures by electrical means the torsion of the shaft over a certain length. The Admiralty has been recently trying the instrument on a turbine destroyer, and if the results promise well it may be tried on the Amethyst, the turbine third-class cruiser.

NEW PROCESS OF CUTTING METALS.—A demonstration was given daily in the Pavilion of the Société Anonyme l'Oxy Hydrique at the Liege Exhibition, of the Jottrand process for cutting metals by a jet of oxygen. The apparatus consists essentially of a tube with two branches, terminating in blow pipes, moved along a guide in front of the metal plate or part to be cut, at the rate of about 6 in. per minute. One of the blow pipes delivers an oxy-hydrogen flame, which raises the metal, where it is to be cut, to a temperature corresponding with dark red. The following blow pipe delivers a jet of pure oxygen, which enters into combustion with the hot metal, thus producing a clear channel, like a saw cut, about ⅛ in. thick, the remainder of the metal being unaffected by the operation.



A NEW FOOT AND HAND POWER SAW.

No. 17,961, dated August 18th, 1905.—Clerk and Others.—The Piston (r) of the low pressure cylinder is connected to a piston (p) working in

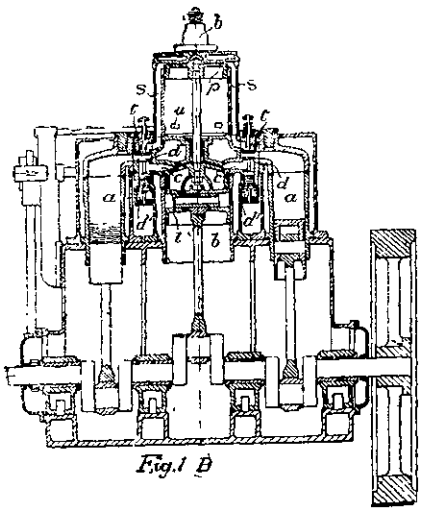


Fig. 1.

an air compression cylinder. Air is admitted by ports (u) at the base of the cylinder, and a weak mixture is drawn into the cylinder from a conduit (y) controlled by a valve (w). The charge is compressed into the high pressure cylinders (a) through

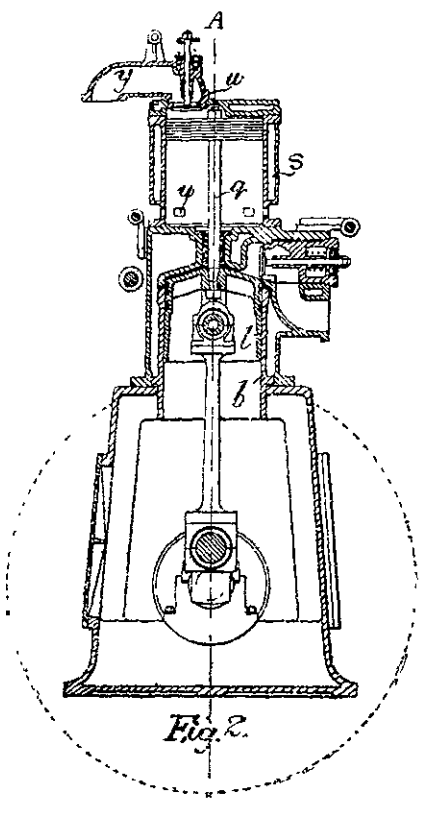


Fig. 2.

passages (s) controlled by valves (t), one of these valves always being closed by the pressure of gas within that particular cylinder which will perform its working stroke at the moment when the other cylinder is being charged. The exhaust gases pass by valves (d) into the low pressure cylinder (b). The stems of the valve (d) are made gas-tight by packing rings (d1). The high pressure cylinders are charged at a pressure considerably above that of the atmosphere with a weak mixture, so that very high average pressure is obtained in the high pressure cylinders, together with a low terminal temperature for transference of the exhaust to the low pressure cylinder, whilst at the same time the high pressure exhaust is kept at a pressure sufficiently high to enable the power to be nearly equally divided between the cylinders.

No. 18,044, dated August 19th, 1905.—Radiator.—Hamilton.—The gills for the radiator tubes are formed from a strip of metal (B), which is first perforated as shown at B2, Fig. 3, projections (B3) being formed which extend into the perforations.

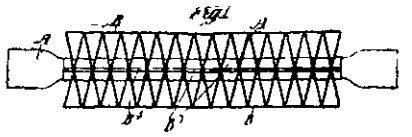


Fig. 3.

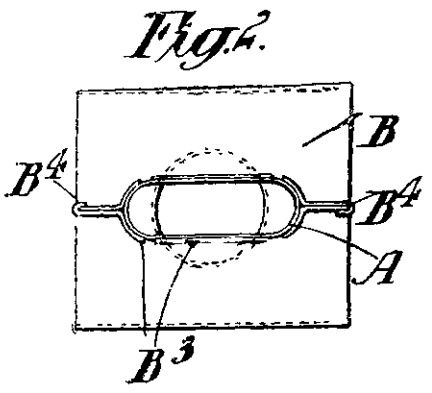


Fig. 4.

The perforations are of uniform distances apart, these distances being equal to the pitch or depth of the corrugations. The strip (B) is then pressed between dies, which bring it to the shape shown in Fig. 4, the projections (B3) being bent out from

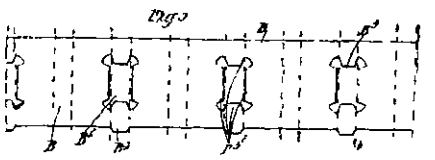


Fig. 5.

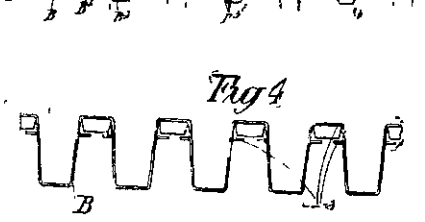


Fig. 4.

the body of the strip in such manner as to form recesses (B1, Fig. 5) adapted to receive the radiator tube (A). Before fixing the gills in position upon a tube the strip is compressed longitudinally so that it is made to assume the shape shown in

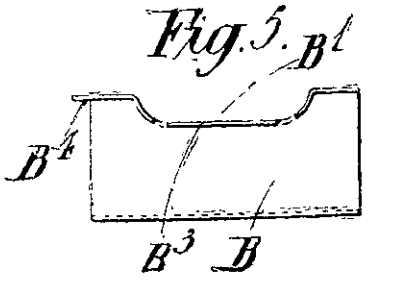


Fig. 5.

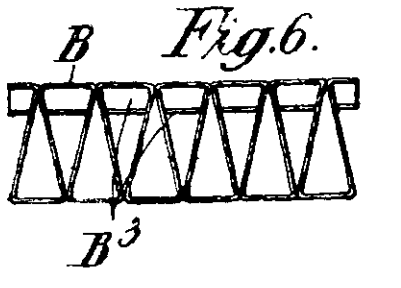


Fig. 6.

Fig. 6. The projections (B3) are thus brought close together, and make good contact with the tube. Two such strips are placed on opposite sides of the tube and connected together by tongues (B4) and are bent over to connect the strips as shown in Fig. 2.

THE FUTURE OF THE GAS PRODUCER.—Speaking recently before the American Institute of Mining Engineers, Mr. S. S. Wiger expressed the belief that the time is not far distant when gas-producer locomotives for railway road service, gas-producer portable engines, and gas-producer power plants for marine service will be in common use.

The.... ...Motor.

Written for Progress.

The "Ivel" Agricultural Motor.

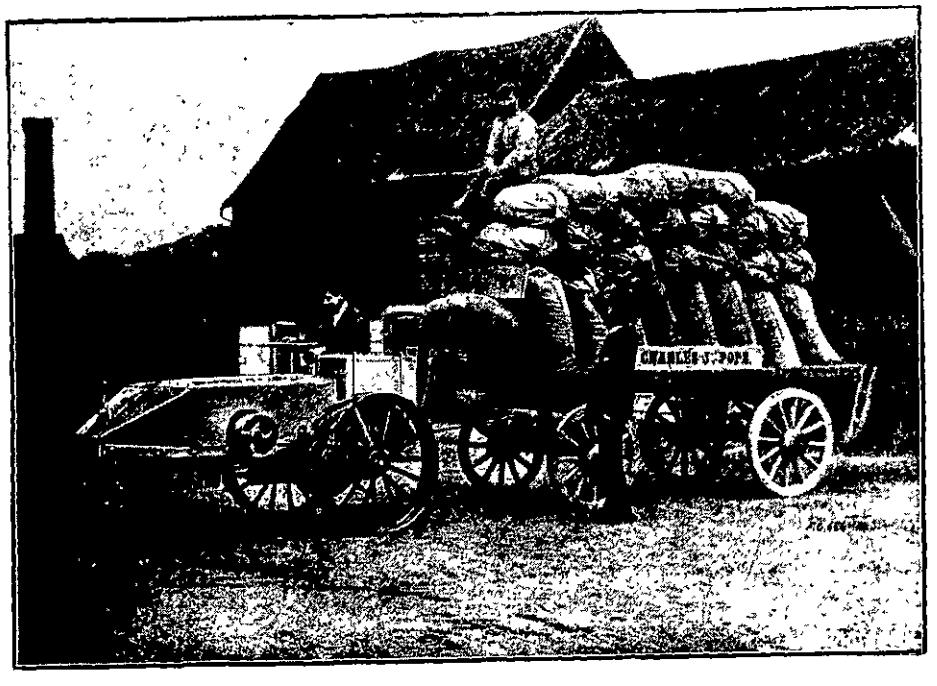
There can be no doubt that motors are of supreme interest at the present time, and they are surely destined to become a great factor in the locomotive and tractive work of the future. Such a possibility must have presented itself very vividly to Mr. Dan Albone, of the Ivel Cycle Works, Biggleswade, England, the constructor of the "Ivel" agricultural motor, who has shown an intimate knowledge of what is wanted in an agricultural tractor, and provided a machine adapted to rough handling and management by unskilled hands. The problem of making a motor suitable for both field and road work is a difficult one, and can only be solved by a compromise, for weight on the driving wheels is essential on the hard road, and lightness is an absolute necessity on the farm, particularly when the land is wet In fixing the weight, the endeavour has been to strike the mean between these two extremes. The "Ivel" is driven by a twin-cylinder horizontal petrol engine of 14 b.h.p. The crank shaft is parallel to the axle of the driving wheels, and the revolutions are approximately 800 per minute. The first reduction from the clutch shaft to the intermediate shaft for going ahead is by a Reynold's silent chain gear, and for going astern by pinion and spur wheels, both gears being always in mesh. The drive from the intermediate shaft to the differential gear on the main driving wheel axle is by sprocket wheels and roller chains. The driving wheels are 41½ inches in diameter, with 9 inch treads. The wheels are fitted with grips, making it almost impossible to skid, even if the ground is wet. For work on the hard road these grips may be removed very simply and quickly.

The nominal speed is about four miles an hour, which can be varied by changing the sprocket pinion on the intermediate shaft, and for which provision is made. The motor is fitted with one speed ahead and one astern, each driven by a separate cone clutch, and both operated by one and the same lever. The ahead clutch is held into gear by springs, and out of gear by the lever; the astern clutch has no springs, but is forced into gear by the lever, thus the change is as simple and positive as could be desired. There are no cogged wheels to be brought into or out of mesh, and there is no possibility of both gears being in action at the same moment. The engine shaft is continued through the side casing and carries a pulley for use in driving stationary machinery by belt. The "Ivel" runs on three wheels—two driving wheels, one steering wheel in front. The total weight with tank full of water is 30 cwt., the weight on the driving wheels being 22½ cwt. It is unnecessary to set out the innumerable advantages which must accrue, particularly to the agriculturist and farmer, in being able to dispense with horses, their expense of up-keep, sickness, the necessity for having reserves, and the slow manner in which work is accomplished where horses are employed; all these tend to make their use an expensive and burdensome item in the cultivation of land. An absolutely reliable machine, which will accomplish all haulage work more economically, more cheaply and more satisfactorily, is bound to appeal to every agriculturist and farmer; and in the "Ivel" agricultural motor we have a machine which is easy to control, simple in construction, and applicable to every form of implement at present drawn by horses, and every type of machine such as chaff-cutters, threshing machines, etc., where engine power has now to be employed. The "Ivel" motor is capable of hauling two or three furrow ploughs, reapers and binders, mowing machines, or, in fact, any agricultural implement used for the cultivation of the land. It can also be used as a tractor for pulling loads on the road. Any existing agricultural machine can be attached, the connection being made by taking out the poles usually fitted when horses are employed, and a small spring coupling, which is supplied with the motor, substituted. Apart from working in the field the capabilities of the "Ivel" are invaluable on the farm, for it can be utilised for cutting chaff, pulping roots, grinding corn, pumping, sawing wood, driving a dynamo, and any work at present accomplished by the ordinary stationary engine. In the various trials that have been held, the motor has demonstrated that in practical work it has even succeeded its constructor's most sanguine expectations.

Drawing a 3-furrow plough it has ploughed 11 acres. 1 rood, 13 perches of wet loam land in 17 hours, 28 minutes, at a total cost of 5/- per acre—this including petrol, lubricating oil, men's time, etc. With a reaper and binder attached it has cut 19 acres of wheat in 10 hours at a total cost of 1/9 per acre. Its record in chaff-cutting, driving a 5-knife cutter is 1 ton, 1½ cwt. cut to a gauge of ⅜ inch long, in 47 minutes, and at a cost of 2/6. The above are the results of actual trials carried out under ordinary conditions and certified to by eye-witnesses. One of these motors is at present at work on Mr. Isaac Lupton's farm at Waverley, Taranaki. The "Ivel" was exhibited at the Christchurch Show, held in November, 1904, and its first appearance was greeted by the award of a special gold medal for general excellence.

THE "IVEL" AS AN AGRICULTURAL MOTOR.

The speed of motor cars is a subject of considerable discussion throughout the colony at the present time, and complaints regarding excess of reasonable pace are frequent and free. Country people particularly object to fast travelling by motorists, and local bodies are cudgelling their brains to discover a means of checking the evil. The matter was briefly discussed at a recent meeting of the Hutt County Council, and it was stated there that it was impossible to fix a minimum rate of speed. In support of this an opinion given by Mr. T. F. Martin, counsel to the New Zealand Counties' Association, to the Waitotara County Council was read. It stated that "as the Motor Cars Act defines the speed as a reasonable speed, the local authority cannot by a by-law fix any maximum rate of speed By reasonable speed is meant a speed reasonable under the circumstances of traffic through which the car is for the time being passing." Notice was given of a motion for next meeting that the Council's solicitors be asked to draft by-laws to regulate the motor car traffic.



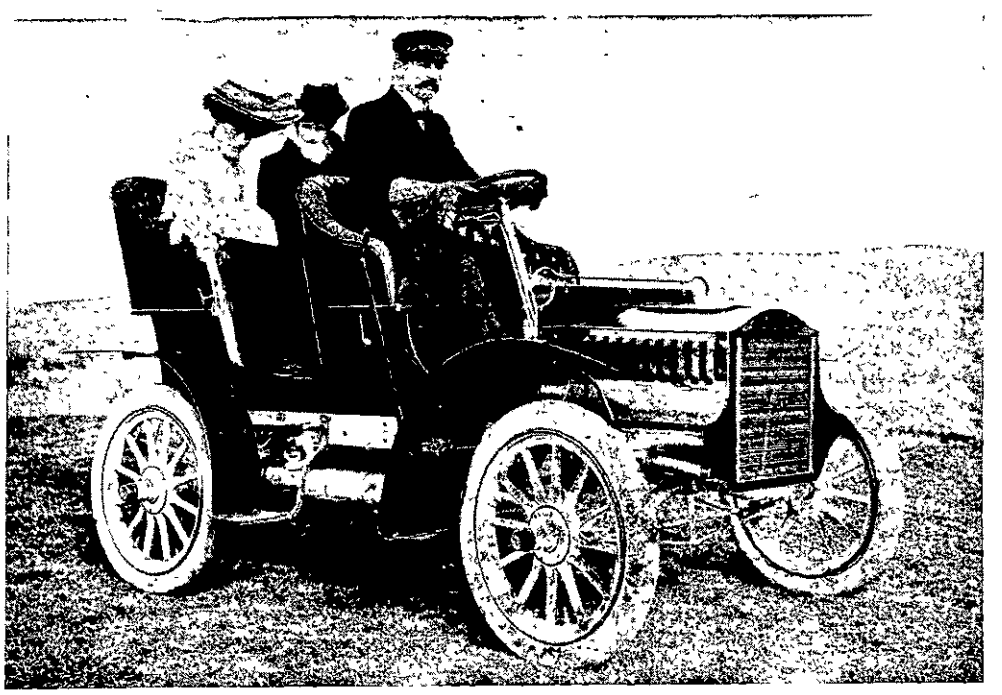
THE "IVEL" AS A TRACTOR.

A vast show of motor vehicles has just been opened at Olympia, in West London, and is pronounced by far the best exhibition of the kind ever seen. It is specially interesting, as showing the remarkable progress which the last few years have brought in the acceptance of mechanical motors for road use. This is not the place in which to enter into descriptions of the exhibits. That would amount simply to an advertisement, as, in truth, does the exhibition itself. But the indisputable fact of the progress which this demonstrates is well worthy of record in this column. There is one point, however, in which not only the exhibition, but the industry itself, undoubtedly lies open to criticism. Splendid and costly motor-vehicles, running into a cost of thousands sterling, are to be seen in crowds, but as yet there is *no symptom of any movement* in the direction of cheapening these costly luxuries to such an extent as to bring them within the reach of people of moderate means, or, indeed, of anyone not possessed of considerable wealth. In view of the large demand which undoubtedly exists and is rapidly increasing for road motors of moderate cost, it would be worth while, one would imagine, for some manufacturers to devote their attention towards supplying this want. That the first one who does so effectively will command a vast fortune as a reward, there can be no doubt whatever. But in view of past experience in connection with this industry, one cannot help fearing that our dilatory Britishers, instead of leading the way as they ought to do, will be content merely to follow in the rear when Europe and America have shown them the road That is what they have done so far as regards road motors: that is what appears to be their probable course in the future.

Mr. Cecil A. Whitney, of Auckland, has a new launch. As soon as the New Year holidays were over Mr. Whitney arranged with Messrs. Lane and Sons, the builders, to take the launch out of the water and finish the work they were unable to complete owing to the launch being required for cruising purposes during the Christmas and New Year holidays. The launch would have been finished according to contract time but that the engine (which is a 50-b.h.p. Monarch) was shut out on two occasions from the San Francisco mail steamer. Recently the launch came up to Auckland from Howick Wharf with a party of seventeen on board, and towing a dinghy, in 6¼min. under the hour, the launch being driven not over three-quarter speed, as the owner considers it desirable not to run her at full speed until she has been in commission a short time. The launch was to have been placed in the water again about the middle of last month and duly christened the Grey Witch. Mr. Whitney intends entering her for the speed launch race at the annual Auckland regatta. The Grey Witch has a water line of 42½ft, and a beam of 6ft. 8in.

A Producer-Gas Motor Boat.

Messrs. Thornycroft and Co., of Chiswick, are the builders of a new departure in motor boats, as up to the present gas plant has been considered too heavy for use except in boats where weight is

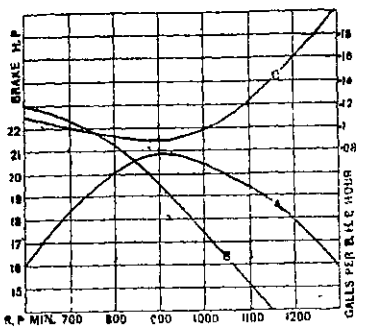


10-H P. CADILLAC.

not of great importance. The gas motor is a cheap one, the cost working out at 1-10d. per horse power per hour. The boat is sixty feet overall, with a ten foot beam, constructed of steel, and is of the yacht design. She is fitted with four cylinders and engines of the internal combustion type, capable of making three hundred revolutions per minute. The plant consists of a generator, a cooler and scrubber, and a motor. The coal is consumed in the generator by means of air blown through it. The gas that is given off is collected and cooled, and then admitted to the engine and consumed in the same way as petrol.

The Power of Petrol Motors.

A CONVENIENT rule for finding the approximate horse-power of petrol motors is "square the diameter of one cylinder in centimeters, and divide by five," for a four-cylinder motor; or, in other words, b.h.p. of one cylinder = (diameter in centimeters) 2/20. For example, take an engine with



Curves showing connection between speed of petrol motor and (A) B.H.P.; (B) H.P. per revolution multiplied by normal revolutions, and (C) petrol consumption in gallons per B H.P. hour

four cylinders 100 millimeters bore, and 140 millimeters stroke, 10 2/5 = 20 b.h.p.—a very simple mental calculation which is just about correct, being based, of course, on assumed constant piston speed and volumetric efficiency. As a matter of fact, within limits, as the piston speed increases, the volumetric efficiency drops, so that an engine will give practically the same horse-power over a considerable range of speed, although the fuel economy will vary considerably. A glance at diagram, which refers to an engine of the size mentioned, will show these points clearly. In the diagram, A shows the total b.h.p. developed at the various speeds; B is the horse-power at unit speed, or, in other words, the b.h.p. per revolution, multiplied by the normal revolutions (in this case 850), and shows the fall in volumetric efficiency; C shows the petrol consumption in terms of gallons per brake horse-power per hour. It will be noticed that, within 5 per cent. the horse-power developed is constant from 740 to 1130 revolutions per minute, but that in this range, the consumption increases from 0.09 to 0.13 gallons per horse-power hour due, mostly, to loss of volumetric efficiency and carburetter error.

The above illustration represents the motor car that seems to be coming to the front with rapid strides. For a single-cylinder engine of 10 h.p. to accomplish the feats performed by the Cadillac stamps it as a work of engineering art. One of the Cadillac's main features is that all joints are metal to metal, not a bit of packing or a washer of any description being allowed in the construction of the mechanism.

The Cadillac has earned distinction as the "car that climbs," Its performances in the neighbourhood of Wellington being the easy negotiation of the following hills:—Bolton street, with a full load; Woodward street, with eight men on board. This last gradient was actually backed on the reversed gear, taking the hill in the ordinary way. Furthermore, a load of four was taken up Glenbervie terrace—a seemingly impossible place for car or vehicle of any description to climb. Mr. F. C. Matthews, who represents the Cadillac Car Company in Wellington and Wairarapa districts, collected the mails from the various pillar and receiving boxes for the General Post Office, being accompanied by some of the officials on the rounds who expressed surprise at the manner in which the car negotiated the various steep hills encountered en route

The Motor Yacht "Vanora."

This beautiful little vessel, which is the property of Mr M A. Jenny, of Nelson, is 45ft. 6in. long, with 11ft beam Elaborate accommodation is provided for twelve guests, there being both dining and sleeping saloons, with panellings in polished New Zealand woods, and with handsomely upholstered settees, pantry, lavatories, and all modern conveniences have likewise been supplied. The engine is a 30-h.p. Gardner, having three cylinders, and fitted with the Hele-Shaw friction clutch and Meissner reversible propeller gear. The "Vanora" is used by Mr. Jenny as a private cruising yacht, and, in addition to excellent seagoing qualities, she has a cruising speed of 10 knots, and sails well under canvas

The engine was fitted by Messrs. Greenshields and Co., who are the New Zealand representatives for the Gardner Company.

The "Vanora" is offered for sale. Full particulars will be found in our advertising columns

Motor 'Buses.

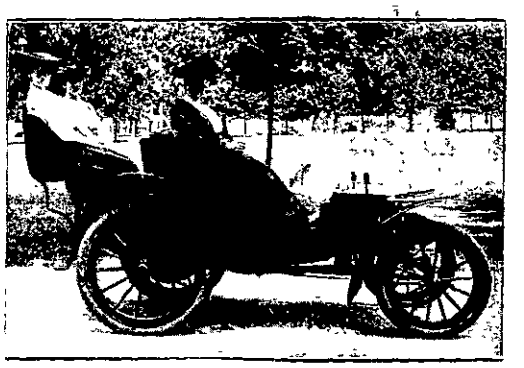
THE TRACTION OF THE FUTURE.

The year 1906, we are assured, will witness the triumph of the motor 'bus at Home. Motor 'buses are now a common feature of the London street traffic and so popular have they proved that the large omnibus companies are replacing their horse vehicles by motors as fast as they can. The London Motor Omnibus Company has contracted to deliver over 300 petrol 'buses before the end of 1906, and in view of some local experiments, it is interesting to learn that motor 'buses are faster, quieter, and more comfortable than the old-style omnibus, with its top-heavy body, rattling windows, and overworked horses. And now further developments are foreshadowed of a kind that suggest a return, under new and vastly improved conditions, to the good old coaching days of bygone generations.

A motor omnibus is now running daily from London to Brighton and back, leaving Northumberland avenue at 9 a.m., and arriving back at 9 p.m. the same day. Passengers are allowed to take 40lb of luggage free, and are charged 7s. 6d. for the return journey. Small parcels are taken anywhere on the route for 6d., and regular stoppages are made at various places. The speed limit at present is twelve miles, but when trunk roads for motor traffic only are built the trip will always be done at under three hours, at an average speed of twenty miles an hour. The 'buses each hold thirty-four people, and can be hired privately for the journey to Brighton and back for ten guineas in summer, and £9 in winter.

The hiring of motor 'buses by private parties is already a feature of the new regime, and one of the companies has been asked to quote a price for hiring one of its 'buses for a thirty days' tour in Great Britain. A similar idea has been adopted abroad. A party of twenty travellers has been arranged to be taken for a thirty days' tour in the south of France in a motor coach. The travellers will be met at Rouen, and taken by way of various old towns to Lyons, where the coach will visit places of interest in the district. From Lyons the journey will be to the Riviera, where the party will be allowed a week's stay. There the return journey will be made by a different route. The possibilities of this form of "tripping" are enormous.

Motor cars are steadily going up in number, and coming down in price. The recently opened Olympia Motor Car Show gives an idea of the astonishing progress of the trade since the first motor car was introduced into Great Britian. Of recent years English manufacturers have been steadily overhauling their French competitors, and have built up a great and flourishing industry. Within the last five years motor factories have sprung up in the great engineering centres of the United Kingdom, many of which produce cars in no way inferior to the foreign article. And, wonderful as the expansion of the trade has been in the last five years, it promises to be even greater in the future. Besides supplying the constantly growing demand in this country, British manufacturers are doing a thriving trade with foreign countries and with the colonies. The colonial connection is developing rapidly, and one well-known company makes the significant statement that their popularity overseas is increasing to such an extent that



5-H.P. DURYEA RUNABOUT.

they will shortly be doing more business in the colonies than they are in England itself. Already they have their own agencies in India and all the colonies, and their most recent orders include a consignment of twenty-four cars for South Africa and twelve for New Zealand. The great reduction in price caused by competition and improved methods of manufacture is one of the chief factors in the growing popularity of the motor car. A 7-h.p. two-cylinder car, to carry two people, can now be had for £185, and this type of car has achieved tremendous vogue. Some of the makers of large cars, moreover, have made a considerable reduction in price for the coming year The 28-36-h.p. Daimler, for example, has been reduced from £700 to £590 for the chassis, the 30-h.p. from £828 to £690; and the 35-h.p. from £1050 to £890

ACCORDING to *La Revue Mineralurgique*, the number of water-power installations for the production of electric power in Switzerland is increasing considerably. A gigantic plant of this nature is about to be erected in the canton of Schwyz. It is proposed to dam the river Sihl, thus forming an artificial lake in a valley. The superficial area of the lake will be 11.6 square kiloms., with a capacity of 96,500,000 cubic metres of water. The dam will be 26 metres high and nearly 100 metres long. The horse-power produced will be 28,000 for 24 hours, or 60,000 for 11 hours.

PROGRESS IN ILLUMINATION.

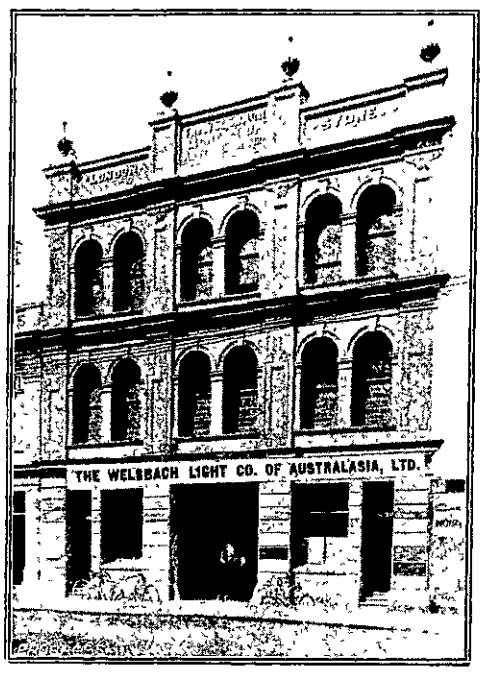
WELSBACH FACTORY IN NEW ZEALAND.

Written for PROGRESS.

A new industry has sprung into existence in New Zealand. Born of the importance of our colony as a consuming centre, it has become necessary to establish a factory for the manufacture of Welsbach mantles and sundries in Wellington. Before describing the departments of this new branch it will be interesting to examine the progression of events in the career of the wonderful illuminant which to-day is everywhere familiarly known as the "Welsbach Incandescent."

The history of incandescent gas lighting is the history of the success of Dr. Carl Auer Von Welsbach's splendid chemical discoveries in the application of the rare earth's thorium and cerium in the preparation of his perfect incandescent mantle. But it is not only a story of glowing success of science successfully solving great problems and bringing new light to the world. Success has crowned the Welsbach Company's campaign throughout the world—a success that has only been secured by persistent effort.

When Dr. Welsbach invented his mantle, the patent specifications read that "a cotton filament was to be immersed and treated with a solution of thorium and cerium, the resultants being a 60 to 70 candle-power illuminant" That stands good to-day, and imitators must not infringe this formula in countries where the Welsbach patents exist. Imitators must utilise a greater percentage of cerium, and the public thereby lose, as the mantle has only 32 candle-power instead of 70.



HEAD OFFICE, WELLINGTON.

It is not a very far cry back to the time when electricity as an illuminant threatened to completely supplant gas, and relegate it from the drawing-room to the kitchen, there to perform the menial work of grilling the succulent chop, and boiling the water for washing up. Now gas not only can challenge the most powerful arc and incandescent electric lamp for power and softness of illumination, but the mantle has also reduced its cost to such an extent as to gladden the heart of the thrifty householder.

In 1893, the Welsbach Company started operations in a street off Wynyard Square, Sydney. So recently as December, 1904, a new general manager arrived from England to take up his important duties in the head office. Within a week of this gentlemen's operations, he determined on the abolition of sole agencies, and started six branches. The result has been striking—an increase of 300 per cent. in the output, and the employment of double the number of hands.

Many use the Welsbach mantle without knowing the delicacy of manipulation necessary in the processes of its manufacture, which are generally illustrated on these pages.

Here, in New Zealand the girls employed by the Company are going daily through the same delicate operations as at the works at Wandsworth, in England, where they turn out about thirty millions of mantles per annum In the first instance, one enters a spacious compartment where interest is immediately aroused by a half-dozen girls diligently mangling babies' hose without feet, with miniature mangles. Of course, it is not quite this, but something much more important—the immersion in a solution of rare earths, and their subsequent wringing of innumerable short lengths of strips of tubular cotton hose, which are the mantles in embryo destined to light our homes. To give some idea of the magnitude of operations, these girls can treat something like 12,000 mantles in a day. From figures like these the visitor flees to another floor, where more girls are fitting the impregnated bases on to moulds, which are put into drying cupboards. After the drying process come more girls who take and pass the myriads of mantles on to folders whose duty it is to straighten out and fold flat in readiness for fixing in another department. The fixing operation refers to the top of the mantle. If you take up a Welsbach mantle, you will notice a pink ring round it, that is the fixing, to which this part of the mantle is subjected before the top is gathered, and the asbestos string, by which it is suspended, is passed through it. One by one the flat, limp fabrics are picked up, and the tops are just passed between two little rollers—the operative parts of the machine—and out they come with about three-quarters of an inch of their length impregnated by the pink fluid, and the fixing process is completed Then there come more girls, and the toughening and other bewildering processes, such as burning off in a furnace, until each mantle has gone through the hands of a dozen girls, and singly placed in boxes to go to the consumer.

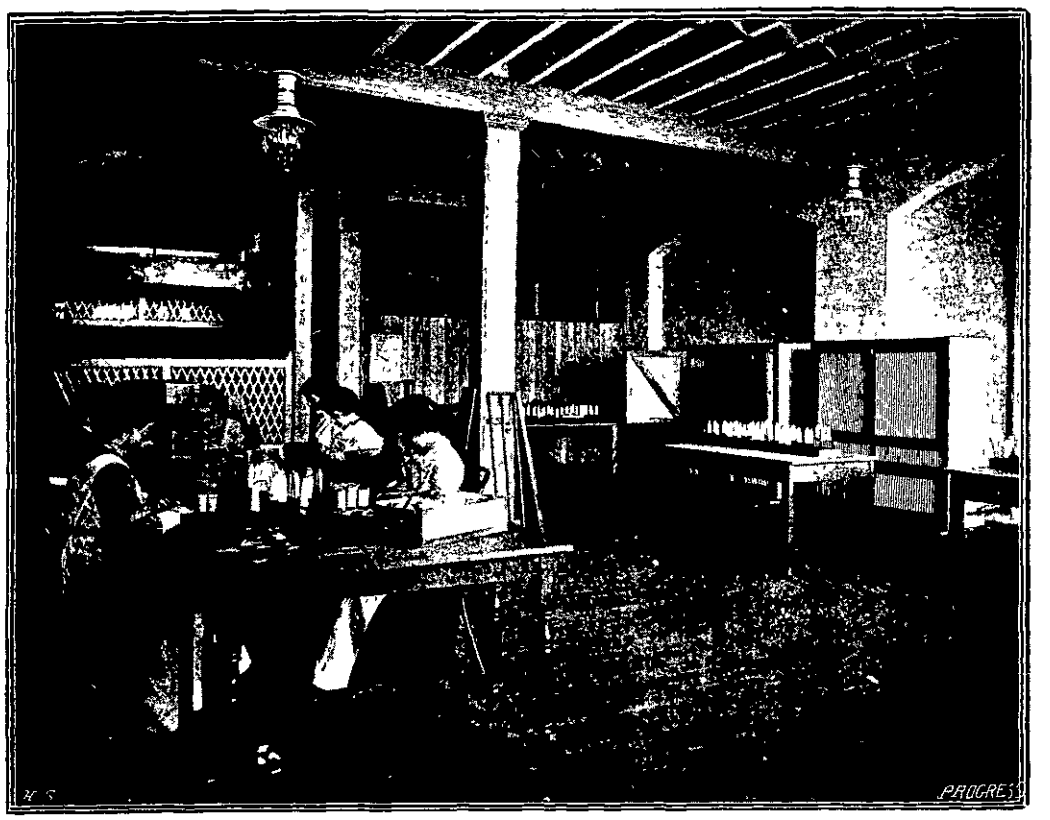
One of the greatest triumphs of the Welsbach system is the manner in which it has been made possible to adopt practically nearly all the advantages claimed for electric lighting. Until the Welsbach system came into force, electric light was preferred by many for the ease in which it could be turned on or off with innumerable switches, and the decorative effects that could be obtained through the manner in which the incandescent lamps could be suspended. But the Welsbach fittings and their pilot lights enable the light to be turned on instantaneously any time of the day or night, and can be arranged quite as conveniently as any electric light switches. As far as suspended or inverted, lights are concerned, which for so long were the feature of elecric lighting, and the great want in all gas fittings, these have been matched by the new fittings of the Welsbach Company. It must not be forgotten, too, that in the case of electric light switches and fittings, these were, and indeed are, always of an expensive nature. To put on a switch to turn out an electric light will cost anywhere from 20/- to 30/-, and the drop fittings run into any amount. The Welsbach lights with pilot light, or bye-pass,

IMPREGNATING AND SEWING THE MANTLES.

BURNING-OFF AND SHAPING THE MANTLES

attachment practically cost nothing, and the Company has a most complete assortment of art decorative suspended fittings.

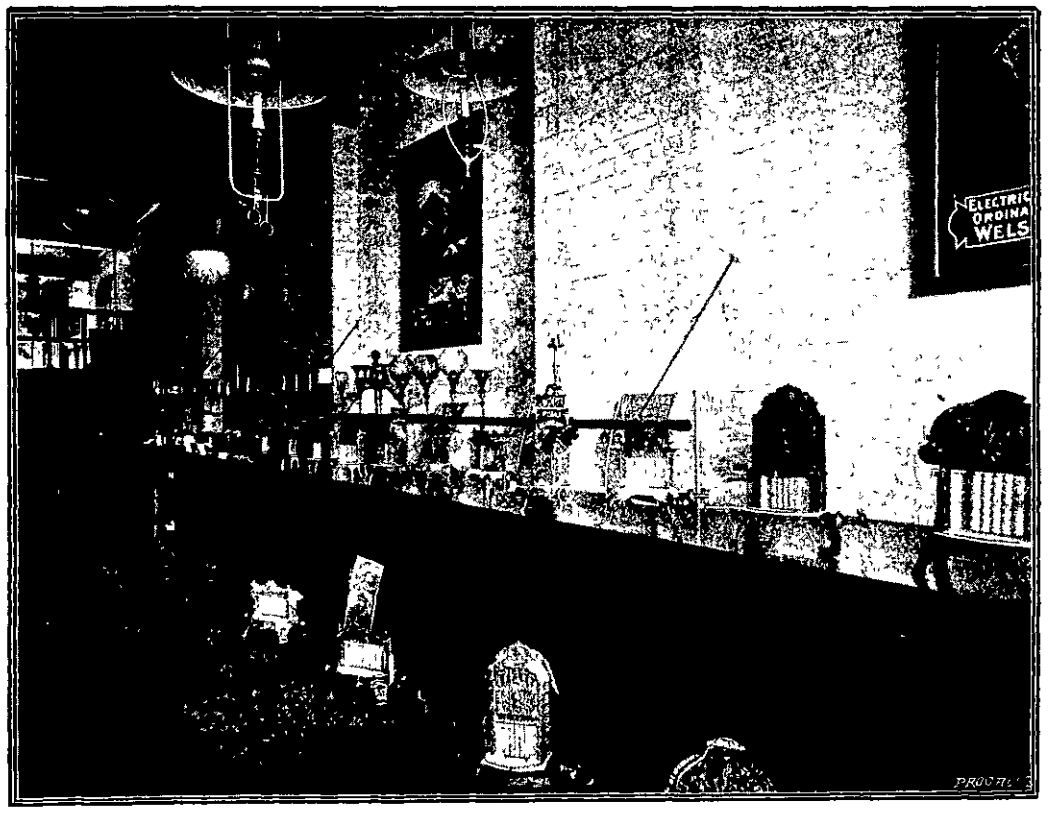
In 1893 the Welsbach Company opened up its New Zealand business, but not until 1900 did it gain complete distinction from the Australian depot. In that year the whole of the premises situated in Victoria street, Wellington, were transformed into a factory fully equipped for coping with the New Zealand demands. Mr. E. Ansell, manager for New Zealand, who joined the Company on its establishment in 1893, took charge on 1st January, 1905. With the change of management came also the rearranging of the Company's factory. Automatic machinery and other modern appliances were installed which have materially assisted to make the New Zealand depot as well provided for as the Commonwealth works of the Company.



BOXING THE MANTLES.

Carnegie Steel Works.

In the Carnegie steel works at Homestead (writes M. G. Cunniff in the World's Work), I walked about over iron floors that scorched my shoe soles, peeping now through blue glasses into open-hearth furnaces where molten steel was boiling with the effervescing liquidity of soda water, and now dodging a cherry-red billet swinging meteor-like through the air in a pair of tongs. Yet in those thunderous rooms where red-hot plates, full fifty feet long, ran back and forth through the rolls with a deafening musketry crackle as a workman sprinkled them with saltpetre,and then shot snakily out with their ends lip-lapping serpent-like along the rollers to the tables—in all the successive infernos I missed the figures of men running here and there. Why? The men were not there. Three or four stood about each roll, and a dozen or two were marking the finishing plates in a shop at one side. Yet the plant simply clamoured with activity. Gigantic tongs whirled here and there, great blocks of red-hot steel flew magically into place, shot along towards the rolls, smashed through, flopped over, smashed back again, and then ambled off apparently alive up a course of rollers. Glowing chunks of steel weighing tons serenely rolled and slid and flew through those mighty rooms as if animate. Uncanny electric cranes glided smoothly overhead. Trains of incandescent ingots puffed in and out. What moved it all? Well, there was a man sitting quietly at a lever here, another sitting there, and a few conversing quietly near the rolls, and as they crooked a finger now and then the whole pandemonium dinned its industrial pæan and steel products were created.



THE SHOWROOM.

New Zealand's Export of Gold.

SIXTY-SEVEN MILLIONS STERLING

The export of gold from New Zealand last year was greater by 146 ounces than that for 1904, the respective totals being 520,486 ounces, of the value of £2,093,936, and 520,320 ounces, of the value of £1,987,501, and it was the largest since 1871, when the Thames was producing gold in such quantities. The importance of the industry is shown by the fact that since 1857 (the first year when a record was kept) the colony has sent away 17,146,630 ounces, of the value of £67,230,584, made up as follows :—

Year.	Oz.	Value. £
1857 ..	10,347	40,422
1858 ..	13,534	52,464
1859 ..	7,336	28,427
1860 ..	4,538	17,585
1861 ..	194,031	751,873
1862 ..	410,862	1,591,389
1863 ..	628,450	2,431,723
1864 ..	480,171	1,856,837
1865 ..	574,574	2,226,474
1866 ..	735,376	2,844,517
1867 ..	686,905	2,698,862
1868 ..	637,474	2,504,326
1869 ..	614,281	2,362,995
1870 ..	544,880	2,157,585
1871 ..	730 029	2,787,520
1872 ..	445,370	1,731,261
1873 ..	505,337	1,987,425
1874 ..	376,388	1,505,331
1875 ..	355,322	1,407,770
1876 ..	322,016	1,284,328
1877 ..	371,685	1,496,080
1878 ..	310,486	1,240,079
1879 ..	287,464	1,148,108
1880 ..	305,248	1,227,252
1881 ..	270,561	1,080,790
1882 ..	251,204	1,002,720
1883 ..	248,374	993,352
1884 ..	229,946	921,797
1885 ..	237,371	948,615
1886 ..	227,079	903,569
1887 ..	203,869	811,100
1888 ..	201,219	801,066
1889 ..	203,211	808,549
1890 ..	193,193	773,438
1891 ..	251,996	1,007,488
1892 ..	238,079	954,744
1893 ..	226,811	913,138
1894 ..	221,615	887,839
1895 ..	293,491	1,162,164
1896 ..	263,694	1,041,428
1897 ..	251,645	980,204
1898 ..	280,175	1,080,691
1899 ..	389,558	1,513,173
1900 ..	373,616	1,439 602
1901 ..	455,561	1,753,783
1902 ..	508,045	1,951,433
1903 ..	533,314	2,037,831
1904 ..	520,323	1,987,501
1905 ..	520,486	2,095,936
Totals..	17,146,630	67,230,584

The export of December was 37,951 ounces, of the value of £151,022, made up as follows :—Auckland, 22,982 ounces, £91,746 ; Otago, 6,476 ounces, £25,373 ; Greymouth, 6,395 ounces, £25,510 ; Southland, 1,917 ounces, £7,668 ; Nelson, 181 ounces, £725. The return was larger by about 8000 ounces than in December of the previous year.

In December of last year New Zealand exported 183,661 ounces of silver of the value of £18,479, as compared with 56,693 ounces, of the value of £5,684 in December, 1904

Gas v. Electricity for Street Lighting.

The London correspondent of the *Evening Post* writes :—"After careful investigation and due deliberation it has been decided by the Corporation of the City of London that electricity is far costlier and less efficient than gas, provided, of course, that the latest improvements, including the incandescent mantle, are adopted in gas lighting. Accordingly, the electric light apparatus is being removed throughout the city streets, incandescent gas lamps being substituted, and the Corporation estimate is that fully £1000 a year will thus be saved to the city, while a far better light will be obtained, especially in times of fog. It will, of course, be understood that I am referring to the city proper—the small central block with only 75,000 inhabitants, and only to the street lighting. But one or two of the great railway companies have followed suit in their vast London termini, and count upon a still larger proportion of saving. These little facts will probably be rather an eye-opener for many people who have innocently imagined that electricity has come to revolutionise the world."

TRADE MARKS IN NEW ZEALAND.

BY H. H. RAYWARD, in the *Australasian Accountant.*

Every person guilty of an offence against this part of the Act ("The Patent, Designs, and Trade Marks Act, 1889") is liable:—

"(a) *On conviction on indictment, to imprisonment, with or without hard labour, for a term not exceeding two years, or to fine, or to both imprisonment and fine; and*

"(b) *On summary conviction, to imprisonment, with or without hard labour, for a term not exceeding four months, or to a fine not exceeding £20, and, in the case of a second or subsequent conviction, to imprisonment, with or without hard labour, for a term not exceeding six months, or to a penalty not exceeding £50; and*

"(c) *In any case to forfeit to his Majesty every chattel, article, instrument, or thing by means of or in relation to which the offence has been committed.*"

Probably very few of the persons who offend against the law, in regard to the imitation of trade marks, realise the pains and penalties they are liable to under the Trade Marks Act. It has been the aim of the English-speaking world to uphold the proprietary rights in trade marks to the utmost extent, and in all Acts of Great Britain and her Dependencies, as well as of the United States and many other countries, the imitation of trade marks has been made unlawful, and severe penalties have been imposed for infringement.

A trade mark is used by a manufacturer or dealer to indicate that certain goods have come from his factory, or have been selected or handled by him, and is intended to enable the public to distinguish such goods from others of a like nature, so that they may have assurance that the goods are equal in quality to those they have proved to be good, or know to bear a good reputation.

In order that the provisions of the Trade Marks Act may be availed of in an action at law against an infringer it is necessary, if the trade mark in question is capable of registration, to register it according to the Act. The Act clearly defines what marks are capable of registration. Many marks do not comply with the conditions, and are, therefore, unregisterable. In many of such cases infringement can be restrained by an action at Common Law for "wrongful passing off," but the expense of such an action is considerably greater, and the chance of success considerably less, than when an action is brought in respect of a mark which has been registered.

A mistake which traders most frequently make is to select as a trade mark either a word or words implying quality in the goods to which the mark is to be applied, or the name of some place at Home or in a foreign country. Words indicating quality in the goods, unless they be invented words, are not admissable for registration for the obvious reason that no trader has the right to prevent another from describing his goods in every-day terms. For instance. "Excellent" tea might apply to a large number of teas, "Beautifying" soap might be used for not a few detergents, and "The Easy Fitting" boot would be a term appropriate to the wares of a great many manufacturers. Coined words as "Waukenphast" for boots, "Osolite" for hats, and "Rumatakil" for medicine, have been held to be registerable in this colony, and are good types of registerable coined words, as, although they convey some impression of quality in the goods, still they are not such words as would be likely to be used by another trader in describing his wares, unless he had intention to pass them off as those of the proprietor of the mark. Geographical terms have been made unregisterable for the reason that many manufacturers and dealers in the same goods may manufacture them in or procure them from the same place. For instance, the "Dunedin" hat might apply to goods of a hundred-and-one retailers in that city. For that reason geographical terms are rigidly excluded from registration as trade marks, even although the word sought to be registered is the name in a foreign language of some insignificant place in a foreign country in which the goods could not possibly be manufactured.

A pictorial device or the design of a label is registerable as a mark providing that they are sufficiently distinctive and not in common use by traders for the same goods.

The name of an individual or firm printed, impressed, or woven in some particular or distinctive manner is also registerable as also is the written signature or copy of a written signature of the individual or firm applying to register the same as a trade mark; but it will be seen that in the case of a written signature registration is not so essential, as forgery is an indictable offence capable of easy proof in an action in the police courts.

The penalties for forging or falsely applying a trade mark or any mark so nearly resembling a trade mark as to be calculated to deceive are set out at the head of this article. These penalties also apply to a great many other acts constituting offences under the Trade Marks Act, such, for instance, as applying or using the word "Colonial" or any similar word or words to any goods not manufactured in the colony; making any die, block, machine, or other instrument for the purpose of forging or being used for the purpose of forging a trade mark, etc. For selling or exposing or having in possession for sale or for any purpose of trade or manufacture any goods or things to which any forged trade mark or false trade description is applied, or to which any trade mark so nearly resembling a trade mark as to be calculated to deceive is falsely applied, unless the person so selling, or having in possession for sale, proves that having taken all reasonable precautions against committing an offence against the Act he had at the time of the commission of the alleged offence no reason to suspect the genuineness of the trade mark or trade description, and that on demand, made by or on behalf of the prosecutor, he gave all the information in his power with respect to the persons from whom he obtained such goods or things, or otherwise he had acted innocently. It will be noticed that proceedings can be brought in a court of summary jurisdiction or an action may be brought by indictment.

Writer hopes that these few comments upon the Trade Marks Act may have the effect of minimising to some extent the infringement of the proprietary rights in trade marks, which is now taking place in this colony.

Luther Burbank.

WONDERS OF HYBRIDISM.

One summer evening, years ago (writes Mr. William S. Harwood, in the "Century") as Mr. Burbank was walking through his experimental grounds past a bank of verbenas—a scentless variety which he was breeding up into a finer variety—he was attracted by a faint odour from the bed. Bending over the flowers, he tried to locate it, but was unable. A year later, as he passed beside the bed of verbenas, now somewhat advanced in development, he was again attracted by the scent, a delicate hint of the odour of the trailing arbutus.

With his characteristic patience, he went over the plants one by one, until at last he found the one that had the elusive odour. It was at once isolated, and its seeds were saved and planted with great care. Succeeding sets of seeds were planted year by year, and year by year the plants were challenged for an increase of fragrance. Such as persisted in the odour were in turn chosen for future testing, and the others discarded. The scent became more and more pronounced, continuing in its likeness to arbutus, and becoming at last greatly intensified. To-day, the bloom itself having been much improved, the fragrance still identical with that of the arbutus, and double its strength, has been established.

Mr. Burbank once called Mr. Harwood's special attention to a little case of earth containing a few scattering plants just appearing above the ground, a new generation of a beautiful hybrid larkspur, upon which he had been at work for several years. It is much larger than any other, and has a combination of colours never before seen in the larkspur. From the new plants in the case some were to be selected for further tests as soon as they were large enough. The day before a whole colony of little birds swooped down upon the case, and by the time a workman had discovered them they had destroyed all the plants save a few scattering ones here and there. In the opinion of Mr. Burbank they were worth their weight in diamonds but in a day the birds had well-nigh undone the work of years

From Siberia, Australia India or Africa devoted friends, ever on the alert send Mr Burbank new and strange plants that he may make them over into more beautiful and useful forms of life. An agent in Japan sent some plum pits coming from a tree not specially remarkable, but from which he thought Mr. Burbank might develop a higher order. After several years had passed in growing the plum, one of the trees was chosen for further treatment. It early showed that it had marvellous reproductive powers, and three or four years ago in a large orchard planted from its cuttings, 22,000 plums were stripped from a single tree in order that the tree might have a chance to mature its normal number of plums. The greatest obstacle in the way of this plum—one of the most famous that Mr. Burbank has produced, and bearing his name—is that it is so marvellously productive. It requires many hired "strippers" each year to go through an average-sized orchard to strip the branches of the green plums, in order that the trees may not overbear.

At Santa Rosa Mr. Burbank blindfolded one of the best-known fruit merchants in the world—an expert, too, in all lines of the earth's fruits. A fruit was handed to him to eat, and he was asked to name it.

Enthusiastically he replied, after the first bite, "That's the most delicious Bartlett pear I ever put tooth into."

With sight restored he found that he had been eating a plum, with not a hint or trace of the pear in all its ancestry. A vague pea flavour had been discovered years before in one of its forebears. This flavour Mr. Burbank has nurtured and intensified with vast pains until at last he has produced this marvel, a plum having the flavour, the meat texture, and the aroma of a pear. Strangely enough, some of the typical pear-tree characteristics are noticeable in the Bartlett plum tree, without there having been the slightest strain of pear-tree blood in its veins.

But let no one think that the evolution of a new plum, or of any other new fruit, is a matter of a morning's stroll with grafting knife or pollen saucer. More than 500,000 plum trees, developed during years of patient breeding and selection have been raised for a single test, and all but one of two of them have been put to death.

Water for New York.

The problem of finding an adequate supply of water for the constantly increasing population of New York is one now exciting the attention of the civic authorities, and elaborate engineering surveys have been made looking to a sufficient supply for the next fifty years. The sources proposed are the streams in the Catskill mountains, about one hundred miles distant, and cost of the improvements is estimated at 161,000,000 dollars. To bring the Catskill water to the city it is proposed to build a reservoir with a capacity of seventy billions gallons, near the sources of supply, and to tap this great artificial lake, which will cover 10,000 acres, by an aqueduct under the Hudson at New Hamburg, which will be extended to the Kensico reservoir. The dam of the Kensico is to be raised to give it a capacity of 25,000,000,000 gallons. Lower down, the water will be conveyed into the Hill View reservoir, near Yonkers, with capacity of 500,000,000 gallons, whence distribution can be made to the various boroughs by other aqueducts, one of which will be constructed under the East river, near Randall's Island, and another from Brooklyn, under the Narrows to Staten Island. Brooklyn, however, already has a Long-Island supply with a capacity of 100,000,000 gallons a day. In an abnormally dry season the present water supply would prove inadequate to the needs of the city. At full capacity the new Croton aqueduct can deliver 295,000,000 gallons a day to Manhattan and with the 80,000,000 gallons of water available from the old aqueduct the total is 375,000,000 gallons a a day. During one month in the past year the city used 325,000,000 gallons a day, and it was by no means a dry season. Of the imminent danger of exhaustion in Brooklyn, Engineer Smith says in his report:—"The water supply in Brooklyn during the past season is almost without precedent in the history of a large American city. The consumption so outran the supply that there were hours in the day, and even days at a time when houses in upper levels are said to have been deprived of a public water supply." Brooklyn has the first claim on the city for a better water supply, but for the present it must be developed from the sand springs on Long Island. It is estimated that the system of supply for all the boroughs could be completed in ten years. A sufficient water supply New York must have, no matter what the expenditure is, if it shall continue to maintain its rate of growth, which in the fifty years calculated as the life of the system will increase the population to 10,000,000.

Applications for Patents.

THE following list of applications for Patents filed in New Zealand 12th December, 1905, to 12th January, 1906, has been specially prepared for PROGRESS.

No. 20445—Terry, R. J., Hobart : Egg tester.
No. 20446—Buckeridge, H. Richmond, Nelson : Stooking attachment to reaper and binder.
No. 20447—Kilgour, E. C., Echuca, Victoria : Acetylene generator.
No. 20448—Angus, A. R., Neutral Bay, N.S.W. : Running gear for railway cars.
No. 20449—Angus, A. R., Neutral Bay, N.S.W.: Running gear for railway cars.
No. 20450—United Shoe Machinery Company, Paterson, U.S.A. : Lasting machine. (W. A. Bond).
No. 20451—United Shoe Machinery Company, Paterson, U.S.A. · Sewing machine. (W. C. Meyer).
No. 20452—United Shoe Machinery Company, Paterson, U.S.A. : Rough-rounding and channeling machine. (G. F. Wolfe).
No. 20453—United Shoe Machinery Company, Paterson, U.S.A. : Fastenings, forming and inserting machine. (G. A. Ambler).
No. 20454—The Chartered Patents Company, Limited, New York, U.S.A. : Type casting and setting machine. (J. R. & G. A. Pearson).
No. 20455—Aktiebolaget Separator, Stockholm : Separator. (B. Ljungstrom).
No. 20456—Hemming, H., Jnr., Hither Green, England : Sterilising and preserving foods, liquids, &c., with gases.
No. 20457—Philpott, T. S., Newtown, N.Z. : Ventilating window.
No. 20458—A. B. Robertson and R. W. Bond, New Plymouth : Cow-bailing appliance.
No. 20459—Robson, R. H., Taihape, N.Z. : Composition for building-blocks.
No. 20460—Rodgers, S., Tuapeka West, N.Z. : fish plate for railway rails.
No. 20461—Rodgers, S., Tuapeka West, N.Z. : Railway rails.
No. 20462—Steer, J., Napier : Washing fluid.
No. 20463—Hanson, C. P., Waireka, N.Z. . Non-refillable bottle.
No. 20464—Walsh, L. A., Remuera, N.Z.: Fish hook or artificial bait.
No. 20465—Turton, J., Johannesburg, Transvaal : Extraction of metals from ores.
No. 20466—Lavertine, A. G. and McNellan, J. E., Johannesburg, Transvaal : Inflating rubber tyres.
No. 20467—Forscutt, S. B., Oamaru : Funnel.
No. 20468—Matthews, K., Auckland : Treating New Zealand flax.
No. 20469—Jack, A., Palmerston North, Production of gas from hydro-carbon, etc., oils.
No. 20470—Cleary, H., Whangarei : Cream cooler and holder.
No. 20471—Collier, A., Geelong, Victoria : Cheque form.
No. 20472—Stubbs, F. ,Auckland : Fixing and and tightening steam boiler tubes.
No. 20473—Pulley, C. F., Wellington : Dressing timber used in wharf building, etc.
No. 20474—Power, J. J., Glenlyon, Victoria : Washboard.
No. 20475—Ehrmann, M. B. L., St. Kilda, Victoria : Manufacture of butter.
No. 20476—McPhee, J. H. A., Dunedin : Tobacco cutter and box.
No. 20477—Rodgers, S., Tuapeka West, N.Z. · Fish plate for fastening railway rails.
No. 20478—Rodgers, S., Tuapeka West : Ratchet nut.
No. 20479—Moore, D., Timaru · Seed sower.
No. 20480—Andrews, O., Levin : Vulcanising tyres.
No. 20481—Barrett, E., Brunswick, N.Z. : Churn and butter washer.
No. 20482—Reeve, V. R., Matapu, N.Z. · Diverting from service tanks first portion of rain water caught upon roof.
No. 20483—Kolling, C., Sydney, N.S.W. · Automatic discharge goods elevator.
No. 20484—Barnes, R., Fitzroy, Victoria : Heels for boots and shoes.
No. 20485—Angus, A. R., Neutral Bay, N.S.W. : Running gear for railway car.
No. 20486—Gordon, F. E. A., Palmerston North : Washing fluid.
No. 20487—Blanchard ,A., Wood, H. and Burgoyne, E. A. H., London : Incandescent vapour burner.
No. 20488—Park, R. P., Melbourne, Victoria : Sluice box for gold saving.
No. 20489—Hercus, P., Christchurch : Recording movements of persons.
No. 20490—Lutjohann, J. F., Christchurch : Raising surface of billiard tables.
No. 20491—Heskett, T. J., Brunswick, Victoria : Iron and Steel manufacture.
No. 20492—Dunne, R., Dunedin · match striker.
No. 20493—McNarry, J., Oamaru : Spring key.
No. 20494—Shephard, W., Adair S , N.Z. · Destroying blight on plants.
No. 20495—Banks, S. and Jones, E. J. W., Aratapu, N.Z : Cool safe.
No. 20496—Garside, J., Dunedin, N.Z. : Sprayer.
No. 20497—House, H., Melbourne, Victoria : Grain riddle.
No. 20498—Mackay, J. J., Auckland Trolley wheel guide.
No. 20499—Angus, A. R., Neutral Bay, N.S.W. : Railway car gear.
No. 20500 — Bewick, Moreing & Co., Kalgoorlie, W.A., and London Wall, England, Decantation of cyanide, etc., solutions. (P. Fitzgerald).
No. 20501 — Sutherland, I., Fitzroy, Victoria : Roundabout.
No. 20502—Dennison, F. R., Oamaru : Motor speed gear.
No. 20503—Walker, J. J. London, England : Music recorder.
No 20504—Killen, E B., London, England · Tyre.
No. 20505—Machine Made Casks, Limited, London, England : Stave preparing machine for casks. (W. Jamieson and R. Burn).
No 20506—Machine Made Casks, Limited, London, England · Casks. (R. Burn).
No. 20507—Matthews, K., Auckland : Flax process.
No. 20508—Bradbury, R. A., Christchurch : Sleeve waterproof coat.
No. 20509—Forscutt, S. B., Oamaru : Clamping mattress frame to bedstead.
No 20510—Douglas, R. R. ,Dunedin : Dredge tumbler and shaft.
No. 20511—Chatfield, E. F., Auckland : Drainer for fish, meat.
No. 20512—Kirkpatrick, J. S. and Starr, C., Huntley Railway turn-table.
No. 20513—Peters, J. F., Auckland · Baking tin.
No. 20514—United Xpedite Finishing Co., Berwick, U.S.A. : Heel finishing machine. (C. B. Tuttle.)
No. 20515—Hatmaker, J. R., Paris, France : Eggs and egg-containing substances in dry form.
No. 20516—Laycock, W. S., Sheffield, England : Railway carriage, etc., seat.
No. 20517—Walton, F. J. and Rodgers, L. V., London : Time-table and advertising apparatus.
No. 20518—Harkins, T., Auckland : Shaping machine for tinsmith.
No. 20519—Aston, E., Te Kuiti, N.Z , and Thompson, W. H., Ohaiwa, N.Z. : Preventing horses from kicking.
No. 20520—Grueneberg, C., Poszony, Hungary : Brush drilling and tufting machine.
No. 20521—Grueneberg, C , Poszony, Hungary : Manufacture of brushes.
No. 20522—Juriss, M., Wellington : Signalling at night.
No. 20523—Hughes, W. E., Wellington : Linotype machine. (Linotype and Machinery, Limited).
No. 20524—Campbell, A. J. and R. H., Edmonton, England : Seltzogene.
No. 20525—Kyle, T. D , Marrickville, N.S.W. : Preventing decomposition of fish.
No. 20526—Waters, E. N., Melbourne : Mortar for crushing mill. (J. H. Hendy).
No. 20527—Macquitsten, A. P. S., Glasgow, Scotland · Separating solid particles.
No. 20528—Serpollet, L., Paris, France : Steam engine or motor.
No. 20529—Dineen, T. B., Sydney : Back of detachable leaf ledger, etc.
No. 20530—Keogh, H. P., Melbourne, Victoria : Treatment of sulphide ores containing zinc.
No. 20531—Davies, G., Christchurch : Water-jacketed larder.
No. 20532—Carrington, G., Lake Wanstead, N.Z. : Wire strainer and twister.
No. 20533—Betts, A. G., Troy, U S.A. : Electrical conductor
No. 20534—Societ. Anonyme Westinghouse and M Le Bland, Paris France · Ejector.
No. 20535—Hubbard, A R and Flay, R., Surrey and Middlesex England · Kitchen range.
No. 20536—Way, A. J., Wellington, N.Z. : Carburetting air and producing conbustible gas.
No. 20537—Way, A. J., Wellington, N Z. : Carburetting air and producing combustible gas.
No. 20538—Harkins, T., Auckland, N.Z. · Manufacture of sheet metal receptacle for tea, etc
No. 20539—Hadida, H., London, Cross S F., Birkenhead, and Slingsby, London, England : Affixing stamps or labels to envelopes, etc.
No. 20540—Bywater, J. D., Christchurch, N.Z. : Mounting of discs in disc ploughs.
No 20541—O'Rourke, T. M , Matakitaki, N.Z. : Scraper attachment to brushes.
No 20542—Kelly, W F. C. and Bentham, J. A., London, England · Photographic dry plates.
No. 20543—Curwood, A., Campbelltown ; Harrison, J., Half-Moon Bay ; and Cameron, A., Invercargill, N.Z. : Window sash balance and fastener.
No. 20544—Dalton, J., Rongotea, N.Z. : Protection of river banks.
No. 20545—Wright, P., Durban, Natal : Gold, etc., extractor.
No. 20546—Nield, D., Wellington, N.Z. : Steam engine regulator.
No. 20547—Henderson, J. W., Karori, N.Z. : Pneumatic tyre protector.
No. 20548—Wilson, T. L., Ottawa, Canada : Gas whistling and bell buoys.
No. 20549—Klever, W. F., Cologne, Germany : Manufacture of lubricating and anti-corrosive oils.
No. 20550—Firth, A. T. C., Auckland, N.Z. : Concrete sleepers for railways, etc.
No. 20551—Leman, A., Auckland : Boot-polisher.
No. 20552—Wilson, A. B., Brisbane, Queensland : Line spacer for typewriter.
No. 20553—Whitelegg, R. H., Forrest Gate, Essex, England Blast pipe for engine.
No. 20554—United Shoe Machinery Company, Paterson, U.S.A. : Sole pressing pad. (H. N. A. Devonport).
No. 20555—Booth, J. H., Jambunna, Victoria : Turn-coupling for fore-carriage of vehicle.
No. 20556—Leggo, A. V., Ballarat, Victoria : Ore furnace.
No. 20557—Todd, J., Otautau, N.Z. : Spreader for draught chains.
No. 20558—Kensall, E., Papanui, N.Z. : Motor-driven friction hoist.
No. 20559—McDonald, H. E., Petone, Wellington, N Z · Spanner.
No. 20560—McDonald, H. E., Petone, Wellington, N.Z. : Pipe wrench.
No. 20561—Bell, H. C., Ballarat Victoria : Hat and clothing cabinet.
No. 20562—McDonald H. E., Petone, Wellington, N.Z. : Pipe Wrench.

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 & Rayward, Patent Attorneys, Wellington, &c.

Wireless Telegraphy.

CONNECTION BETWEEN AUSTRALIA AND NEW ZEALAND.

Captain L. E. Walker (Third Battalion Durham Light Infantry), representative of the Marconi Wireless Telegraph Company, recently arrived in the colony to confer with Sir Joseph Ward regarding the establishment of communication by wireless telegraph between New Zealand and Australia. Captain Walker has the promise of the Commonwealth Postmaster-general, Mr. Austin Chapman, that if New Zealand will reciprocate in a wireless telegraph scheme, the Government will consider the advisability of calling for tenders for the installation of a high power station somewhere on the coast. The object of this station, he explains, would be to open up communication with New Zealand, Tasmania, and some of the islands in Bass Straits.

At the present time the Marconi Company is carrying out practically the entire naval and commercial application of wireless telegraphy throughout the world. A few of the contracts are those with the Governments of Great Britain, Italy, Canada, Newfoundland, Belgium, United States, Russia and Chilli; the Congo Free States, Lloyd's, and the principal British, German, American, Dutch, Italian, and French shipping companies. The Admiralty contract gives the Company the sole right of supplying British men-o'-war with tuned wireless apparatus. With the Board of Trade the Company's contract is for the use of the apparatus on board lightships and on lighthouses.

The contract with the British Postmaster-general provides for the collection of messages for transmission to ships at sea, and the delivery of all messages received from ships at sea. In the first three months of the arrangement being in force—from January 1st to March 31st, 1905—no less than 1766 messages were dealt with by the post office. The contract with Lloyd's is a most important one, being for a period of fourteen years. The contract with Canada covers the long distance station at Glace Bay, Cape Breton, which, since 1902, has been able to communicate with Poldhu, Cornwall. It also covers the two stations communicating across the Belle Isle Straits, established in 1901, and it provides, furthermore, for the five stations on the St. Lawrence for the purpose of rendering safer the navigation of this dangerous river, as well as for the opening up of an efficient substitute for the land line service along the shores of the St. Lawrence.

The... International Exhibition.

"Dun's Review," New York, in commenting on the New Zealand International Exhibition, says.—"Such an exhibition should command the support and attention of all the manufacturing nations of the world, and, if taken advantage of, must accomplish tangible and satisfactory results. The colony of New Zealand being essentially a producing country, offers a splendid outlet for the manufactures of other countries, which pay more attention to the development of manufacturing industries and whose industrial conditions and facilities are better adapted to the promotion and development of manufacturing." The article also draws attention to New Zealand as a resort for tourists and sportsmen, and adds that the colony offers most interesting attractions at a cost which compares favourably with similar opportunities in any other part of the world.

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The "Official Review of Progress," published by the executive of the Exhibition, contains the following:—"Messrs. Baldwin and Rayward, of Wellington, have approached the executive commissioners of the Exhibition with a proposal to offer prizes up to, say, £20, for the best models of ordinary working and stationary machinery made in the colony by students attending engineering schools, technical classes, or employed in workshops in New Zealand. The proposals of this firm are considered excellent, and are certain to produce results satisfactory and creditable to the engineering students of the colony."

Complete particulars of these competitions will be announced in a future issue of Progress.

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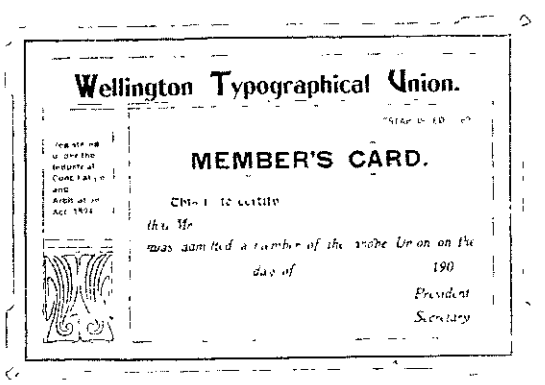
From the latest report of the executive we learn that satisfactory progress has been made in the task of interesting the outside world. Even the manufacturers of the United States, who were at first not over-enthusiastic, have fallen into line, and a good representation of American exhibits is expected. The Japanese Government has officially notified its intention to assist,financially, representations of industrial exhibits from that country.

"Progress" Advertisements.

THEIR SETTER WINS THE W.T.U. PRIZE

An examination of the advertisements in Progress will convince the most critical compositor that good setting is their predominating feature. In dealing with the many announcements which our clients send in to the publishing office every month, it is essential that due regard be extended the literary and typographical compositions of such announcements. Contrast and the avoidance of monotony on a page must be carefully watched; the *ensemble*, as it were, made to reach the highest point in "pulling power."



It is therefore with great pleasure that we are enabled to state that one of the ad-setters of Progress, Mr. A. E. Ivar, recently beat all comers in a competition promoted by the Wellington Typographical Union. The work of the contestants was judged by six Christchurch craftsmen. Mr. Ivar's design is here produced.

Building Notes.

The Albemarle Private Hotel, Ghuznee street, Wellington, has been completed. The building cost over £3000, and contains 31 rooms. Mr. James Benmie and Messrs A. & E. Reynell were the architect and builders respectively.

Mr. John S. Swan, Wellington, advises that he has the following buildings in course of erection, in addition to those mentioned in our last issue.—

For	*Price*	*Contractors*
Martin Kennedy, Lambton Quay, Wellington	£8,000	W. L. Thompson
Court Sir George Grey, Lambton Quay, Wellington	1,300	John Wood
M. Leadbeater, Tinakori Road Wellington ..	2,500	Clark & Son
Parish School, Island Bay, Wellington — —	470	P. C. Watt
C. A. Briggs, Berhampore, Wellington	1,800	P. C. Watt
Martin Kennedy, Salamanca Road, Wellington —	5,000	J. J. Callaghan
Kelburne Tramway Co., Wellington Terrace, Wellington	1,800	J. Ranson
R.C. Convent, Nelson ..	2,500	John Moffatt
Dr. Ross, Masterton ..	2,000	Coradine & Whittaker

The World's Coal

LARGEST PRODUCTION YET RECORDED.

According to the Board of Trade's annual report, the production of coal in the United Kingdom, in 1904, amounted to 232,428,000 tons, in Germany, 120,818,000 tons, in France 33,838,000 tons, in Belgium 23,507,000, tons and in the United States 314,563,000 tons. The production in 1904 in the United Kingdom and Germany was greater than in any previous year.

Last year the United Kingdom exported 65,000,000 tons, Germany 21,631,000 tons, and the United States 8,574,000 tons, the exports in each case being the greatest recorded.

The total known coal production of the world (exclusive of brown coal or lignite) is now about 790 millions tons per annum. Of this Britain produces rather less and the United States rather more than a third.

Compared witth the population, the British production of coal still surpasses that in the United States. It amounts to nearly 5½ tons per head; in the United States it is under four tons per head.

The average value per ton of coal taken at the collieries in 1903 was: In the United Kingdom, 7/8; in Germany, 8/7½; France, 11/3½; Belgium, 10/4½; the United States, 6/7.

These prices represent a fall of about 7d per ton in the United Kingdom, of 3d per ton in Germany, and 5d per ton in France, but a rise of 3d per ton in Belgium, and 11d per ton in the United States. The provisional figures available for 1904 indicate a further fall of 6d per ton in the United Kingdom, and 1d per ton in Germany, whilst in the United States there has also been a fall of about 8d per ton. The average value of coal in Great Britain in 1904 was less than in any year since 1898. In the United States the enormously increased output of recent years has had its effect on prices, which, though slightly lower in 1904 than in 1903, are still higher than in any other year since 1888.

Cut this out and return with Five Shillings.

The Editor, "Progress,"
Progress Buildings, Cuba Street,
Wellington.

Please place my name on Subscribers' List for one copy of "Progress" each month for twelve months from next issue.

I enclose Postal Note for Five Shillings in payment of Subscription.

Name .....

Address .....

.....

Messrs. Whitaker Bros., Wellington, forward us their catalogue of technical books. This firm has an extensive collection of works on engineering and the allied subjects..

* * * * * *

The Indian Government is considering a plan to designate certain types of passenger cars on Indian railways which can be easily adapted for use as ambulance cars in times of emergency by attaching to the side of each car an iron plate bearing a large red cross. One scheme which has been suggested is to have a reversible plate bearing on one side a small cross for the purpose of distinguishing these cars in ordinary service, and on the other side a large and prominent red cross to be placed outward when the car is in use as an ambulance.

NOTICE.

"PROGRESS" is so distributed as to be obtainable at all principal stationers throughout New Zealand. In event of any of our readers being unable to procure a copy by this means, prompt notification, addressed to the Editor, would be appreciated.

In order to save time in correspondence the Editor desires to state that advertisements for "PROGRESS" are only accepted from reputable firms. *Quasi*-specialists and propounders of "cure-alls" need not therefore apply.

"Progress" Office, Wellington.
February 1, 1906.