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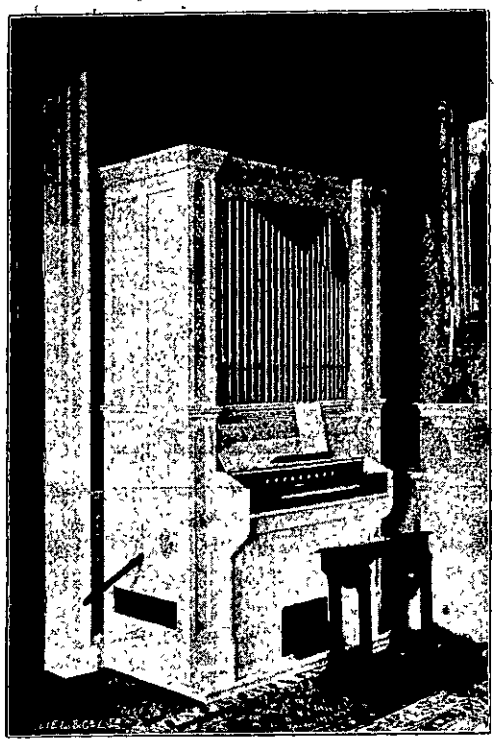

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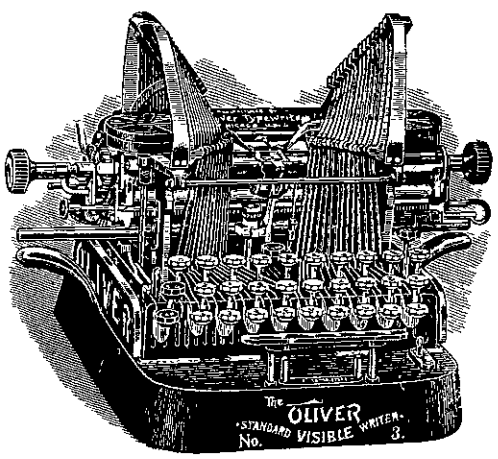

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THE SCIENTIFIC NEW ZEALANDER.

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BRIEF FOREWORD.

IT IS very gratifying to announce that the first issue of PROGRESS has been received throughout New Zealand and Australia with marked expressions of approval. Knowing well the little shortcomings that somehow seem inseparable from the first issue of any paper, the Publishers are nevertheless bent on having complete all the forces necessary to the production of PROGRESS in as perfect a form as possible. The list of quite voluntary opinions printed elsewhere testifies more eloquently to the merits of this newspaper than any editorial statement.

WORKSHOP ECONOMY.

WORKSHOP economy is an attractive subject, truly, since it may mean much in increasing the margin between profit and loss in many an implement and machinery manufacturer's establishment, whereas inattention to details may often mean great waste. The thoughtful consideration of engineers should, in fact, always be given to anything suggestive of economy in the workshop, and we welcome, therefore, a notable contribution of a contemporary on this subject, especially in relation to the question of overtime Overtime is a condition of production which may be either used or abused, and the writer under consideration appears to correctly direct his observations against the latter policy, admitting that overtime cannot entirely be done without. There are always arising, and always will be, those contingencies of breakdowns and other urgent necessities affecting hundreds, and perhaps thousands, of factory workers, which it would be folly on the part of the engineering firms not to meet by requisite overtime to expedite repairs. At the same time it will, he argues, be conceded by many thinking men who have looked at the matter from more than a superficial standpoint, that much of the overtime which is worked is due to nothing more nor less than bad management, and is therefore undoubtedly bad economy. What then, he asks, gives rise to so much overtime in engineering trades? Many causes can be cited, some of which in reason we must allow as quite admissible. Others there are, however, such as orders behind time, congestion in various departments, and the saving of increased plant, that require at least a little explanation. We consider that in some cases contracts are accepted for delivery at impossible dates, just to get hold of the work, and without the possibility of its being conveniently executed within the specified time. It is under such conditions that overtime has often to be resorted to, yet probably when the contract was estimated for, nothing was put on for extra wages involved by time and a quarter, time and a half, extra lighting, or other disproportionate expenses ; and overtime under such circumstances can hardly, he argues, be conducive to economy. As to the effect of overtime upon the life of machinery, some notable observations are offered dealing with a point which is too often likely to escape attention, namely the excessive wear and tear of machinery and plant. There is a tendency to work machines all the hours it is possible, and particularly automatic machines. "We could lay our hands," declares our contemporary, "on scores of machines that, in point of the amount of work done, have lived twice the life of a similar machine that has run the normal working day. It would seem to be hardly fair to the maker ; for when people use them so inconsiderately, it is not likely, when the machine is worn out in, perhaps, less than half its computed working days, that its owner will readily own to its excessive wear-and-tear. The position often taken up, it is correctly pointed out, is that they bought the machine at such a time, that it should have lasted so long, but that it is now ruined in half or less than half the time expected." Such facts speak for themselves in this connection of overtime in relation to workshop economy. On the physical, moral, and social aspect of overtime, this authority speaks very definitely, and his argument is quite correct, namely that, after all, "men are only human." We know very well the human limitations. It therefore follows that only for so long per day can a man perform efficiently his appointed skilled task, both as to quality and quantity. Beyond that limit both the latter suffer considerably. When, therefore, decreased quality and quantity are accompanied by increased wages, wear-and-tear of machinery, and often lighting, it will more easily be seen where the question of overtime stands in relation to real economy in workshops.

IMPORTANT ISSUES.

The president of the Wellington Provincial Industrial Association, on important issues :—

"The well-being of our industrial enterprises will at all times depend upon the capabilities of our producers to take advantage of and develop the natural advantages with which this colony is so richly favoured."

"I am quite sure neither the workers or the community will suffer any serious hardship by the decease of many unions that commonsense should have prevented the formation of. The conditions applying to a man not able to earn the wages as set forth by the Arbitration Court are of a character that will practically prevent such men getting employment. How many are there of these poor unfortunates suffering for the necessities of life consequent upon the arbitrary laws in vogue, and how many more are there receiving help from the State and other sources that would not be needed if, while the workers protected their rights and improved their conditions of living, they extended to their unfortunate brothers that right of honest labour which all free men under our glorious constitution are entitled to."

"The colony has passed through a long period of prosperity, and we believe that, notwithstanding the slight falling off in the colony's chief products during last year, we have not arrived at the end of the general prosperity that is all-important for the happiness of the community ; but it behoves us, whether in the ranks of the employer or employed, to think and act in a manner that shall be conducive to the well-being, not only of the present community, but of the coming generations, whose trustees we are in administering this splendid asset, the colony of New Zealand, whose climate and natural advantages are second to no other country."

"It was all-important that the high standard which obtained in the industrial life of this colony as compared with conditions in the older world should not only be maintained but improved upon. To give effect to this desire the natural resources of New Zealand should be developed so as to better meet the competition of people outside. The bill introduced by the Government this session, aiming at the prevention of trade monopolies, was a matter which should engage the serious attention of all manufacturers. While it was the duty of the State to prevent any system of trade that would bring about the evils manifested in connection with some trade monopolies in other countries—the only outcome of which was the accumulation of enormous wealth in the hands of a few individuals on the one hand, and the lowering of the standard of comfort of workers, together with increased cost to the purchaser consequent on the throttling of the smaller manufacturer. On the other hand it was felt that unless great care was exercised in dealing with this matter, harassing conditions might be imposed that would result in diminished activity in those concerns already established, and the prevention of new enterprises which, if established, would be of great benefit to this colony."

Paragrams.

More than 80,000 gas and oil engines are now said to be at work in the United Kingdom.

* * * * * *

An improved chain-grate stoker is now being manufactured by Messrs. E. Bennis & Co., Ltd., of Bolton, England.

* * * * * *

THE General Electric Co., of Schenectady, U.S.A., had last year a turnover of £8,000,000. Eleven thousand men were employed on a floor space of 2,000,000 sq. feet.

* * * * * *

The Premier says it is the intention of the Government to have competitive displays at the New Zealand Exhibition. He hopes each provincial district will exert itself to do justice to the scheme. A similar procedure was followed at the St. Louis Exhibition, and proved one of the most attractive features there.

* * * * *

So pleased is the Auckland City Council at the work being accomplished by the Straker steam waggon that an order for two more vehicles has been sanctioned. The steam-waggon in use at Auckland is similar to the one that is being imported by Mr. J. J. K Powell, of Wellington, for the cartage of road metal, etc.

* * * * * *

The continuous run of over 3962 hours of the 600-h.p. Westinghouse-Parsons steam turbine at the St. Louis Exposition Palace of Machinery is without a parallel in turbine history. Not the least remarkable part of the performance was the maintenance, under load, of a speed of 3600 revolutions per minute throughout the whole period.

* * * * *

Our railway authorities will doubtless watch with interest the innovation being made by one of the United States railway companies in substituting oil for coal in 780 locomotive engines on a system comprising upwards of 9000 miles of road. Using oil the cost is said to be only one-third the cost of coal. When oil is workable in New Zealand, as it may soon be, there will be found innumerable uses for it.

* * * * *

The most important seat of electrical industries in South America is Buenos Aires, in the Argentine Republic. This progressive capital has six large traction, lighting, and power companies, with stations located in the suburbs. Current is generated and distributed at voltages ranging from 1,000 to 6,000, and is stepped-down as desired by transformers. The cost of the power varies from 2 to 14 cents per kilowatt-hour.

* * * * * *

The General Electric Company of the United States has united with the Tokio Electric Company, of Tokio, Japan, and will hereafter manufacture Edison incandescent lamps and similar articles in Japan, instead of importing them from the United States. Considerable American capital will be invested in the enterprise, but the local management of the plant will remain in the hands of the Japanese interests.

* * * * *

On the subject of wireless telegraphy, the Postmaster-general said at the conclusion of the Session that the Government already had an offer but they would require Australia to co-operate and pay half the cost. They would also require to instal the system on intercolonial boats. He intended to enter into communication with the Federal Government on the subject. The offer already made was for less than £25,000, for a complete service.

* * * * * *

The revenue of the Cook and Northern Islands for the year ending the 31st March, 1905, was £8186, and the expenditure £5093. The revenue and expenditure of Niue for the same period were respectively £1587 and £605. The value of the exports from the Cook and Northern Islands for the year 1904 was £38,248, and of the imports £33,399, the values for Niue being £7016 and £6707 respectively The Minister states that everything is moving along steadily and satisfactorily.

* * * * * *

An apparatus has been devised in Germany for electrically indicating the presence and extent of shoals of fish. It comprises a water-tight microphone, connected with a battery and telephone receiver. The microphone is submerged in the water, and so long as it hangs untouched no sound is heard in the receiver. When fish strike against the instrument, however, their presence is revealed by tappings. The length of the rope supporting the microphone gives the exact depth of the shoal.

* * * * *

Nobody except themselves, probably, are surprised that the Commissioners appointed by the New South Wales Government Railways to ascertain if their locomotive engines could not be made cheaper on the spot than the imported price should have been compelled in all honesty to admit that any such proposal would be absolutely chimerical. One New South Wales firm offered to construct 120 locomotives, of certain specified types, for the sum of £643,200, or, deducting various charges returned by the Federal Customs, £632,120, or £5,260 each. This is £1,236 per engine higher than the tender received from an American company for the building of only twenty locomotives. If 120 locomotives were required, the cost per engine would be considerably lower. If the offer of the New South Wales firm were accepted, the Commissioners state that the 120 locomotives would cost £148,550 more than those of the American company, at current rates.

* * * * * *

Alongside the fact that electric lifts are being introduced in New Zealand must be placed another fact, viz., that they are being abandoned elsewhere. The latest advices from New York announce that twenty-seven electric elevators installed at the Waldorf Astoria Hotel, New York, are being removed, and being replaced by hydraulic elevators. This is due to the large annual cost of renewals, and maintenance of the electrical machinery. It is also an ominous indication that Messrs. John Wanamaker & Company, the huge American Universal Providers, are now having no less than 110 hydraulic elevators installed at their various stores. The total cost of these amounted to over £250,000. In Australia, too, the same tendency is evident, for Anthony Hordern & Sons have recently equipped their Sydney warehouse with twenty-one hydraulic elevators.

* * * * *

To keep the important electric tramways that we have installed in our chief cities in a state of efficiency will entail a considerable amount of work, and it is desirable that the manufacturers should adjust the capabilities of their workshops to carry out the many repairs that will be necessary and to further enlarge their operations so that in the near future they will be enabled to manufacture the power and running gear that represent so large an amount in the tramway undertakings. The building of the cars has been successfully accomplished, giving work and finish equal to the imported article. The splendid assets that we have in the lakes and rivers, if "harnessed," would result in incalculable benefits to the community, and many industries that are menaced by low prices would, if cheap power obtained, be profitably carried on.

* * * * * *

During the financial year there are to be built in the New Zealand railway workshops 60 carriages, 299 waggons, and 9 brake vans, the whole equivalent to 508 ordinary four-wheeled waggons. The construction of these equipments will afford employment to a considerable amount of skilled labour, and when completed, materially assist the transport of passengers and goods which is so urgently required in connection with the colony's railways. The continued prosperity of the building trade in this district is a matter for congratulation, and there is no reason to fear any marked decrease in respect of that important branch of industry.

* * * * * *

At Trentham rifle range a test was recently made, by a party of defence officers, of Major Beal's patent sight and range finder. The Commandant of the forces, General Babington, and Colonel Webb, officer commanding the district, were amongst those present. The trial was made in an extremely heavy right wind, as a result of which the shots fired did not all hit the target, but they found earth at points sufficiently close to the point aimed at to demonstrate that sighting and range-finding fittings both fill their purposes. A 6ft x 12ft target was used, and the distances fired over ranged from 1700 yards to 600 yards.

* * * * * *

An interesting hydro-electric power plant has recently been installed at the De Sabla power station, Butte Creek, California. The water-wheel employed develops 8,000 h.p. from a single 6-in. jet of water issuing from a nozzle at a velocity of 20,000ft. per minute, the electric power generated being conveyed 50 miles to the Colgate power house, and from thence to other centres, in some cases over a distance of 345 miles.

* * * * * *

PEAT is to be freely used on Swedish railways, the Board of State Railways having given instructions that it is to be employed whenever possible without incurring loss.

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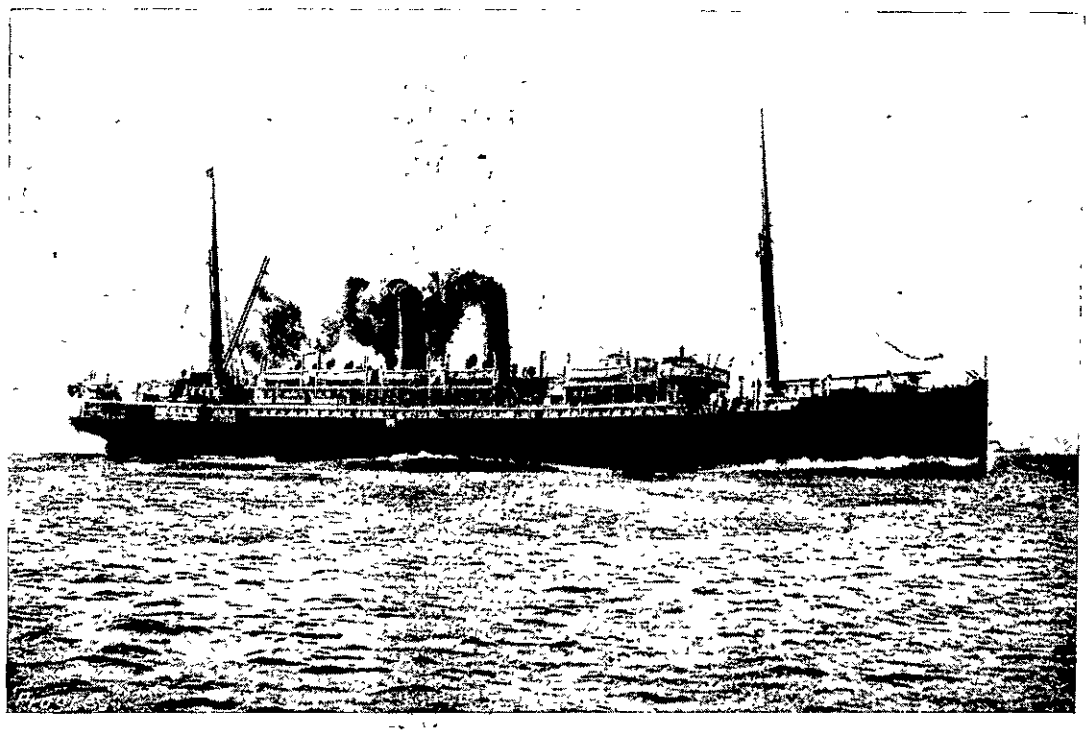


THE NEW TURBINE STEAMER "MAHENO."
(*For description see page 29.*)

Electric Tram Dangers.

Every one in communities where electric trams are running should carefully read the following.—

A tram trolly wire breaking at a pressure of 500 volts should not be grasped or pulled aside with the naked hand. The hand should be insulated with dry cloth or coat, or preferably with india-rubber gloves, which are usually provided in cars for this purpose. The best thing to do is to keep the trolly wire in contact with the earth by pressing with the foot or with a walking stick, so as to allow the current to pass back to the generating station, where an automatic switch will fall and break off the current. On no account should the wire be lifted.

If a trolley wire fall on the hand-rails of a car, an automatic switch should fall at the station and cut off the current. Whether it does so or not, no passenger should take hold of any metal part of the car on which this accident has happened.

It has often happened that a man has taken hold of a "live" wire and has been unable to release his grasp. What should be done is to earth the wire, when the pressure is much reduced, and the injured person can be detached from the wire.

To some of the accidents above-mentioned the patient will appear to have succumbed from electric shock. But the first-aid student should be able to recognise this condition and apply the proper treatment.

ELECTRIC TRAMWAYS
OF NEW ZEALAND.

No. 2. - - - Dunedin.

A recent visitor, in commenting in an Australian newspaper on the benefits which New Zealand is deriving from the municipalisation of lighting plants and electric tramways, stated that in permanence of construction and high efficiency the Dunedin tram system has no superior in the Australasian colonies.

The following particulars of this service, gleaned by the courtesy of Messrs. Noyes Bros., the engineers, will be noted with interest by PROGRESS readers.

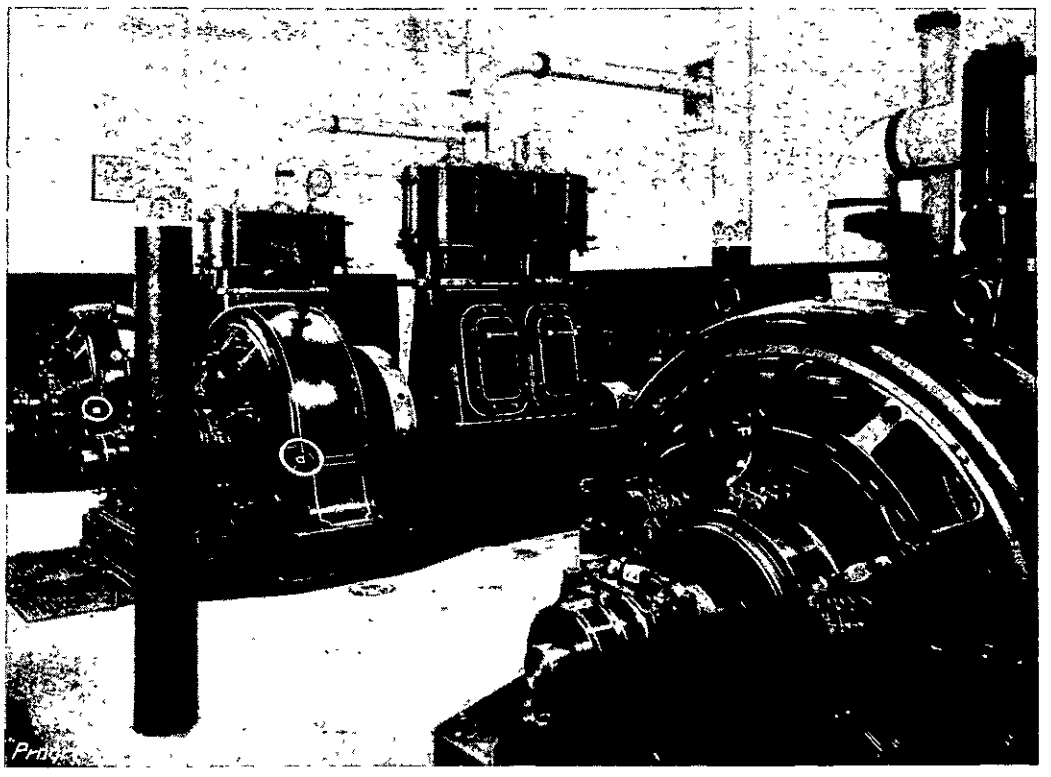
Turning first to the power house—which is of a temporary nature in view of the ultimate harnessing of Waipori—we find three Babcock and Wilcox water-tube boilers supplying steam to three of Belliss & Morcom's vertical compound engines, which are direct-coupled to three Westinghouse 6-pole generators supplying 500-550 voltage. The switchboard is of handsome Sicilian marble, and contains . three generator panels, with Westinghouse circuit breakers and instruments ; one summation panel, with wattmeter and main ammeter and voltmeter ; one battery and booster panel, with differentially wound ammeter to show charge and discharge of battery ; three feeder panels, with six Westinghouse circuit breakers, ammeters and switches ; two panels, with instruments and switches for controlling twelve circuits of six lamps in each circuit ; and one Board of Trade panel to comply with Board of Trade regulations. There are 260 Tudor accumulators capable of giving a discharge of 350 amperes for one hour. These cells take what is called the peaks of loads, and are connected to the mains through a reversible booster which causes the cells to charge when the loading falls below a certain predetermined limit, and to discharge when the loading rises above the limit. The use of this booster and battery has resulted in a saving of forty per cent. in fuel, as it enables a steady load to be kept on the engines and increases the load factor from thirty-six to thirty-seven per cent.

The car house is 165 feet square, and is lighted by a saw-toothed roof. In this house are thirteen tracks, and eight examination pits to enable ready inspection and repairs. A service of compressed air is laid to provide for the quick blowing of dust out of motors and cars. Along the sides of the car house are the revenue office, traffic staff's room—where each employee has his own locker for uniform, etc.—machine shop, armature room, stores and lavatories. The machine shop is equipped with an overhead crane, a 10-ton wheel press, planing machine, lathes and drilling machines. The revenue office is on the ground floor of the car house, and the rooms upstairs provide accommodation for the mechanical and traffic staffs.

There are thirty-four cars now running on this system, all of which have been built by the J. G. Brill Co., of Philadelphia.

The box cars are quite enclosed, measure about 29 ft. overall, and have a seating capacity for thirty passengers These cars are commodious—there being plenty of room to walk down the centre when passengers are seated on either side. The combination cars have an enclosed saloon in the centre to carry passengers, and two seats at either end for five passengers each. Both box and combination cars have glass ends provided for the protection of the motormen. The open cars, of the type originally designed for Hong Kong, have seating accommodation for fifty passengers. Doors are provided on the box cars, and iron gates and rails on the combination cars to prevent the passengers getting on and off on the wrong side. These open cars have ten seats athwarts, and provide seating capacity for fifty passengers. Weather curtains, provided for protection against rain or dust, may be pulled down or rolled up as necessity arises. Reversible seats enable the passengers to face the way the car is going, and foot rails add to their comfort. The convex panels, dashers, etc., of the cars are in Indian red ; the concave panels, stiles, posts, etc., in canary yellow and gilt lettering. The interior woodwork is of quartered oak, while the ceilings are of three-ply veneer quartered oak, decorated with aluminium. The car seats and backs are covered with Wilton carpeting, and all sashes are of quartered oak, and the glass in the windows is set in felt to prevent noise of vibration. The undertrucks are Brill, 21 E type, and the wheels and axles are by Krupp of Essen ; the motor equipment consisting of two 40-h.p. motors. The controllers etc. were supplied by the British Westinghouse Co., of Trafford Park, Manchester.

Each car is provided with a hand-wheel ratchet brake and a Westinghouse magnetic brake.*



INTERIOR OF POWER HOUSE. [*Guy, Photo, Dunedin.*

THE CARS. [*Guy, Photo, Dunedin.*

There are six trailers which have been selected from the old horse cars, and which have been renovated and mounted on new Brill trucks. These are also provided with the magnetic brake, and when the trailer is coupled up to a motor car the brakes are connected so that the motorman operates the two sets of brakes simultaneously. Each car is provided with a life-guard at either end. Nine extra cars of the open type have been ordered, and are expected to be assembled in time for the summer traffic. All cars were imported "knocked down in the white" and were fitted together and painted locally.

An electric sprinkler, holding 2,500 gallons of water, completes the rolling stock. This sprinkler is provided with a Jerrard's patent track cleaner. This is suspended from the frame of the undertruck between the wheels, and besides scraping all the dirt out of the grooves of the rail, it is very useful during the winter for clearing snow and ice from the grooves.

Destination boxes are fitted on the canopy at each end of the car, where a sign and name of destination is shewn. These are lit up by electric light at night.

The centre, side, span, and anchor poles are seamless steel tubular poles made by the Mannesmann Steel Tube Co., The scroll work of the brackets was designed by Mr. W. G. T. Goodman, and is of local manufacture, as also are the bases of the poles and arc lamp cradles.

The trolley wire—00 B. & S. gauge—is suspended from the poles—about 125 ft. apart—in the usual way by insulated hangers. Special care has been shewn in designing the overhead work so as to make it as neat as possible, and there is no question that it has been very successfully carried out.

All the feeders in the city are laid underground. The cables are drawn through the draw boxes—about 240 ft. apart—into earthenware conduits made by Doulton. Where the feeder taps on to the trolley wire the cable is brought up neatly alongside the pole, and a section switch is placed on the pole in a neat iron box. In the suburbs

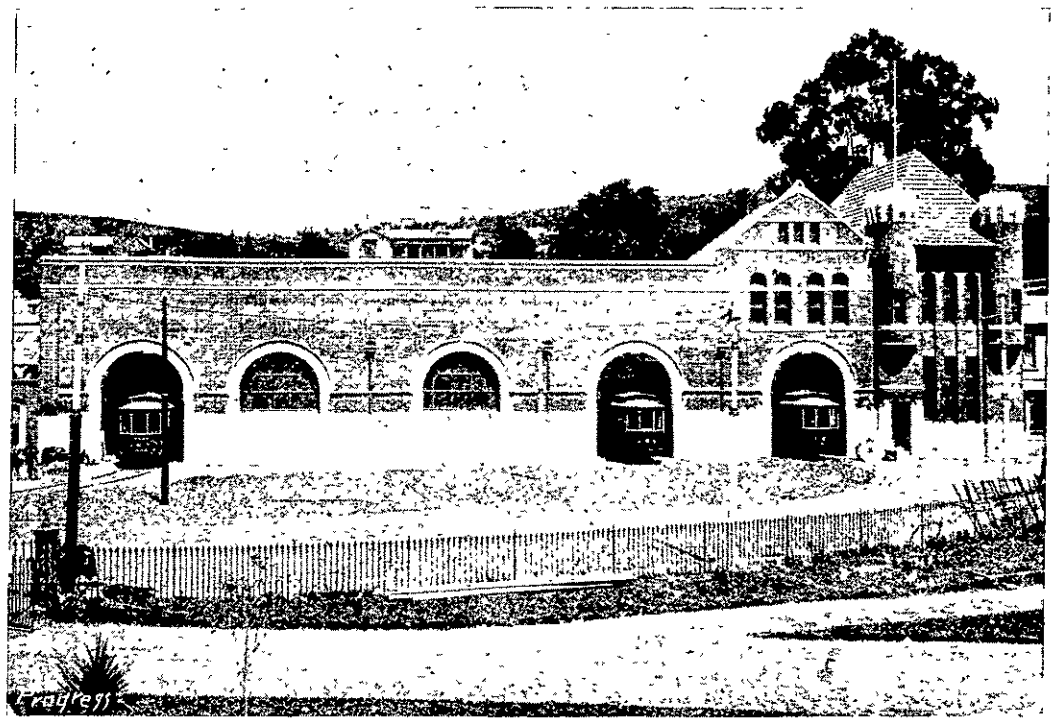
* A description of the magnetic brake appears on another page.

the feeder wire is carried overhead on the poles. The conduits also carry the cables for the arc lamps—there being one lamp on every second pole through the main streets, controlled from the power house.

The rails are 93 lbs. to the yard, in lengths of forty feet, laid on Australian hardwood sleepers 7 ft. 6 in. x 9 ft. x 4½ in., and are to standard gauge of 4 ft. 8½ in. Tie rods are placed about every 8 ft. The whole of the track is ballasted and top dressed with asphalt, except in Custom House square, where Neuchatel asphalt is laid, thus making a clean, smooth surface. Where the ground is at all poor, a good bed of concrete has been laid underneath. Each rail joint is bonded with Brown's plastic bond, and each rail is cross-bonded to the other side of the track by a No. OO copper wire. Every eighty feet of double track is also cross-bonded in the same manner between the inner rails. As evidence of the smartness with which the contractors worked on the permanent way, it took exactly twelve working days to do 130 chains of the city section from Albany street, to Dowling street. The work was commenced on the 7th. January, 1904, and tracks were boxed up on the 23rd. of that month. The total length of single track when completed will be twenty miles, of which fifteen-and-a-half is now open for traffic. The total number of passengers carried from the opening of the line to the end of May, 1905,—that is, seventeen months—was 10¾ millions, with only two fatal accidents, and during the greater part of that time only half of the system was running During the twelve months ending May 31st., over 7 millions were carried, which shows that the system has a good future before it when completed 650,000 car miles were run during that twelve months.

Several cars still in traffic have done over 41,000 miles each without renewing wheels.

£250,000 was voted for this system, and the whole of the work was carried out by Messrs. Noyes Bros., who were appointed consulting and construction engineers to the Dunedin Corporation. Mr. W. G. T. Goodman is chief engineer to Messrs. Noyes Bros, he having been assisted in the work of construction by Messrs. F. R. Shepherd, J. H Brearley, E. W. Ackland, and J. Bowman.



CAR HOUSE, DUNEDIN ELECTRIC TRAMS. [*Guy, Photo, Dunedin.*

NOTES ON EARTHQUAKES AND THEIR RELATION TO BUILDING CONSTRUCTION IN NEW ZEALAND.

By F. DE J. CLERE, F.R.I.B.A.

SECOND PAPER.

The following are notes on the Building Regulations for Ischia, Italy.

"A solid foundation should be obtained so far as is technically possible."

"Construction of iron and timber are much more safe than those of simple masonry"

"Walls built of brick are better than those of stone."

"Vaults and arches of masonry above ground should be prohibited."

"Buildings should not have more than two stories and a cellar."

"Composite construction of iron and masonry cannot be considered with regard to safety, comfort and durability as adapted to countries threatened by earthquakes"

"In the province of Belluno a great many buildings have been strengthened by means of keys, chains and iron bands."

"In the Levant buildings are frequently framed together, and then covered on each side with a trellis of laths or canes, which are in their turn plastered."

"According to a long experience, cellars may be constructed with ordinary masonry."

Timber-framed buildings, covered with rough cast, are strongly recommended; the danger from fire being prevented by anti-igneous preparations,

After the terrible earthquake in Lisbon of 1755, this timber construction was insisted upon, and the number of stories, above the soil, was limited to two. The timber used was fir from northern Europe. When the law was relaxed, timber buildings of four or five stories were built.

In Japan this system of "barrack masonry," as it is called, is very extensively used, and the rough-cast surface offers the greatest resistance to flames.

In lower Chili, it is the custom to construct buildings of only one story. Bricks are notched to fit the timber framing.

In Lima the ground floor is generally of strong masonry, and when there is an upper floor it is of very light timber.

In Calabria houses, which were not built on the "barrack" system, contained a special earthquake- proof room with an internal frame of iron bars, in which people could take refuge.

For roofs complete trusses should be used and not mere rafters resting on walls.

Embossed ornaments likely to fall are forbidden for ceilings.

Vaults (arched floors) made of stone or brick (exercising thrust)- are forbidden in any part above the cellar.

Chimney flues which reduce the walls to less than the regulation thickness are forbidden.

In the regulations for the Ligurian Commune the rules drawn up are largely of the nature of ordinary good building regulations, and in most respects are similar to those of New Zealand Squared stones are insisted upon, but the assumption is that ordinary lime-mortar is used. Flints are forbidden, as mortar does not well adhere to them.

The building laws of Manila and of Ischia contain many other regulations than those noted herein, but they relate largely to the power and duties of the controlling bodies, or have reference to matters that are not applicable to the conditions of life in New Zealand, or to the materials which are in use in this part of the globe.

It must, I think, strike the reader that the building regulations are exceedingly crude, and, if similar ones become law in a progressive country, they would tend to check improvements in general construction. Then the thickness required for walls must be an indication that the masonry is exceedingly bad The sweeping condemnation of composite construction is certainly against modern ideas and in direct contradiction to those of Ischia, where the "barrack" system is strongly recommended.

In some parts of Central America, I understand that walls are formed by posts fixed into the ground and cased in large sun-dried bricks—each brick being made in lengths to cover the distance between the centres of the posts, a groove in each end containing half the timber.

After my 27 years experience in this colony, and after reading all I can find on the subject of earthquakes, I have come to the conclusion that the aim of our laws should be to promote strong buildings, and that very little else can be done to counteract the effects of earthquakes Brickwork is better than rubble masonry in many respects, for the strength of the whole wall is even, and owing to the proportion and shape of each brick there is no wedging tendency in any part of the wall On the other hand rubble formed with strong cement has much of the nature of good concrete, and, as such, its use ought not to be forbidden

(To be concluded.)

Advance, New Zealand!

THERE is no surer indication of the enterprise and progressiveness of a people than the amount of activity displayed by its inventors. It is gratifying to know that New Zealand in this, as well as in many other matters, leads the world. The following statistics are based upon the patent records of the Australian Commonwealth, and show the ratio according to population, of the applications for Patents of Australia filed by residents of the countries given below.—

Country	Year	Applications	Population	Applications per 10,000
Australia ..	1904	2,563	3,984,376	6.4
Canada	1903	5,793	5,528,847	10.4
Great Britain ..	1904	29,655	42,789,552	7.0
New Zealand ..	1904	1,491	857,533	17.4
United States of America ..	1900	50,213	76,303,387	6.6

Provisional Protection for Inventions.

By E. S. BALDWIN, M.E., Queen's Prizeman, South Kensington.

GREAT Britain and her colonies stand alone in providing means for the provisional protection of inventions, and even Great Britain has recently curtailed the period of provisional protection from nine to six months This innovation has apparently been tacitly accepted by patent agents and inventors, and we may well be surprised that such a curtailment of acquired rights should have been so accepted. Provisional protection, besides other benefits, grants protection upon a specification in which merely the nature of the invention is set out. The application is kept secret until the complete specification is filed. Thus the inventor can pursue his experiments or trials in public without fear of invalidating his rights to protection, and be protected against anticipation as effectually as if he had complete protection. He cannot, however, sue for acts of infringement committed before the acceptance and gazetting of his complete specification.

Provisional protection affords the further benefit that the invention is not published abroad by the fact of filing his application. His subsequent application for patent abroad is, therefore, not invalidated by publication of the invention by his own act. He can obtain protection at a small cost while he arranged his finances for the larger outlay to protect the invention in foreign countries.

The important question almost daily arises of adding to a specification after it has been accepted. The Act allows amendment of a specification by way of correction, disclaimer or explanation. Anything which would increase the scope of the specification would not be allowed. A fresh application must be made to protect the added matter, and the usual taxes must be paid on both applications.

A very beneficial alteration in the law might be made by allowing an applicant to add to his specification during the period of protection, with the proviso that he could not sue for infringement of any added part upon acts committed prior to the date of filing such added part If this alteration was made in the patent law, one set of taxes would be payable on the whole invention. Seeing the large surplus derived from Patent Office fees, the concession suggested might well receive the attention of our legislators.

Gas engines of 5,400 brake horse power are being built for the new power station of the California Gas and Electric Company at San Francisco.

The.... "Maheno."

THE latest addition to the Union Co's. fleet is the turbine-propelled "Maheno," built by Messrs Wm. Denny & Bros., Dumbarton.

The vessel is an elaboration of the usual type of intercolonial ships, of which the Union Company possess so many fine examples Her dimensions are—400ft by 50ft by 33ft 6in moulded to upper deck, and she has almost a complete shade deck, with a boat deck over a large portion thereof. She is elaborately fitted out for passengers, of whom she carries 223 first class, 116 second, and 60 third class. The requirements of the cargo service have not been neglected, as will be seen from the fact that her trial had to be carried out with not less than 3000 tons of dead-weight on board, while if loaded down to her marks she could carry more than this. For the working of the cargo a complete set of hydraulic gear, by Messrs Brown Bros. and Co., Edinburgh, has been supplied.

The vessel is propelled by a set of Parsons patent turbines, constructed by Messrs. Denny and Company, of Dumbarton. There are three turbines, one high and two low pressure, working three shafts, with three propellers in all. The condensers are placed fore and aft, at the side of the turbines. Steam is supplied by four cylindrical tubular boilers, two double ended and two single, at a working pressure of 150 lb per square inch, and Howden's system of forced draught is fitted. The go-astern turbines are contained within the low pressure, and work on the wing shafts. The reversing gear is particularly well arranged, the whole of the engines being easily controlled by one engineer. The auxiliary machinery is very complete, and consists of air and circulating pumps to each main condenser, each set having two Edwards's air-pumps and one centrifugal pump, driven by simple two-cylinder engines; two Weir's feed pumps, auxiliary condenser with necessary pumps, two large Duplex pumps for bilge and ballast purposes, a Caird and Raynor distiller, and a vertical Duplex wash-deck and fire-engine, suitable for working See's ash ejector; sanitary pump, steward's pump, water service pump, oil pumps, etc.

At her first official trial, at full power, with all boilers in use, the "Maheno" easily attained a mean speed of 17.5 knots, and at the second trial, which had to be done with a third of the boilers shut down, the speed maintained for six hours, as per contract, was 16.4 knots, considerably over the guarantee.

On her recent trip from Melbourne to Sydney the ship established a record by covering the distance in 29½ hours. If the tide had been favourable the average on this run could easily have been eighteen knots per hour. The photos which we reproduce on this page, by courtesy of the Union Steam Ship Co., will give readers of PROGRESS a good idea of the beautiful proportions and splendid accommodation of this fine vessel.

THE FIRST SALOON.

THE DRAWING-ROOM.

A Glimpse at the Union Co.'s Operations.

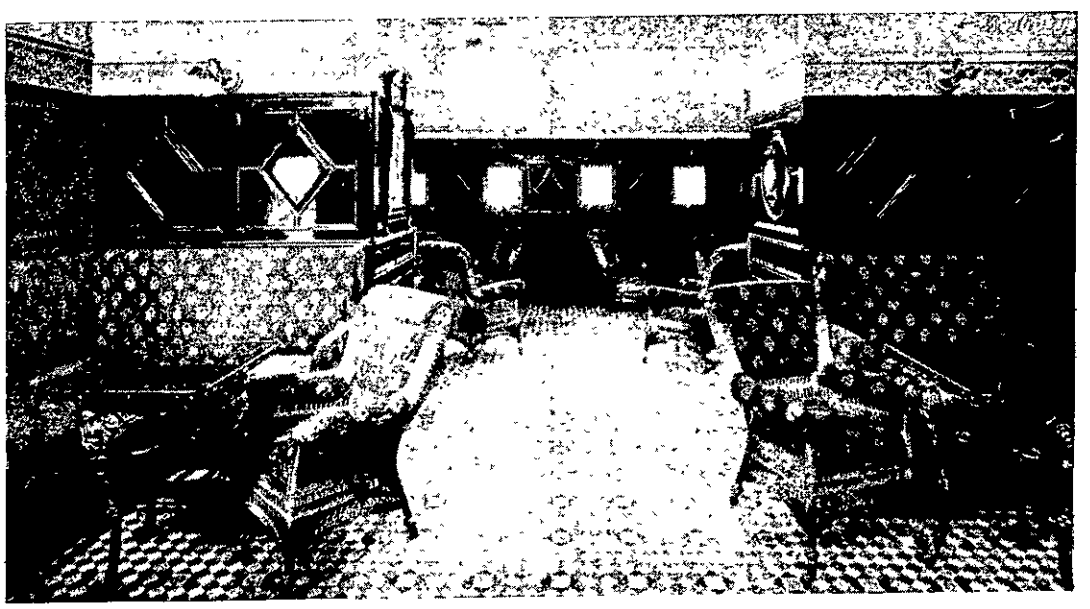
The total distance the ships of the Union S.S. Co.'s fleet covered last year was 2,000,000 miles, that is to say, that if one vessel were to cover that distance she would have to sail round the world 85 times, supposing the Panama Canal were cut The yearly consumption of coal is 280,000 tons, just about three times the total tonnage of the fleet. The number of masters and officers employed is 470, and the crews, which include seamen, stewards, firemen, etc., number 1800. The salary and wages of the army of 2740 persons, and its auxiliaries of casual labourers, amount to nearly half a million sterling annually. There is no other large steamship company in the world which pays its crews higher wages, and yet the fares are low compared with those for an equal mileage in European waters. At first sight this appears impossible, but the secret lies in the fact that the U.S.S. Co. makes more constant use of its vessels than is done at Home; that is to say, it gets more work out of each ship. For instance: two of its vessels will in many cases do the work of three at Home. Boats are loaded and unloaded with great promptitude, and, by using a night as well as a day shift of wharf men, steamers are unloaded at once, no matter when they get in.

New Electrical Plant.

The recently completed freezing works of the Canterbury Frozen Meat Co., Ltd., at Pareora. Timaru, have been equipped with a complete plant for driving all auxiliary machinery by electricity, in addition to being electrically lighted throughout. The generating plant for this purpose is steam driven, steam at 160lb. pressure being supplied by Stirling water-tube boilers. A 130 kilowatt Crompton multipolar dynamo is direct coupled to a two-crank Belliss and Morcom compound engine, the speed of the combined set being 425 revolutions per minute. The combined efficiency of the set on actual test is 87 per cent., the consumption of water per kilowatt-hour being 28lb. condensing. The electrical system is direct current, 220 volts, for the supply of both motors and lighting. There are thirteen Crompton motors installed for driving the various machines employed in dealing with the by-products, ranging from 5 to 25-h.p. each. The whole of the plant was supplied by Messrs. A. & T. Burt, Ltd., to the specifications of Mr. B. W. Glass, the company's chief engineer.

An almost similar plant has been supplied by Messrs. A. & T. Burt, Ltd., for the Belfast works of the same company.

Both plants are now in operation and are giving full satisfaction. Extended tests have shown the marked economy of the electrical system compared with the older method of driving the auxiliary machinery by independent steam engines, or other means.



THE SMOKING-ROOM.

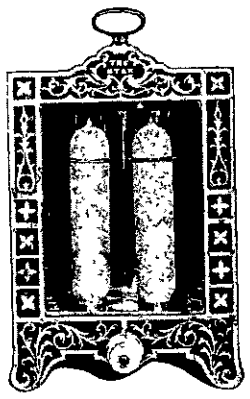
Inventions.

[*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.*]

Mr. H. Irwin writes us drawing attention to an error which appeared in last issue, viz:—that Roman candles were not, as stated, the means used for scaring birds, but Chinese crackers. The ingenious way in which the latter are automatically fired will be seen on referring to page 15 of last issue.

Modern Electric Radiator.

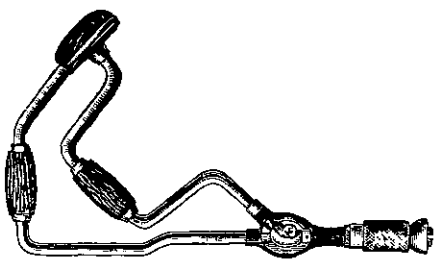
The electric circuit offers many advantages that the public are gradually beginning to appreciate. Not the least beneficial of these is its suitability for warming offices, bedrooms, and sitting-rooms. Besides their cheapness, their cleanliness, and their handiness, electric radiators have the additional quality of absolute safety. The illustration



depicts the latest type of electric heater, which, unlike some of the older forms, gives off pure, radiant heat, resembling the cheerful glow of an open fire. It may be moved about a room and placed in any position desired, while the heat is liberated immediately the current is switched on.

A Corner-Bit Brace.

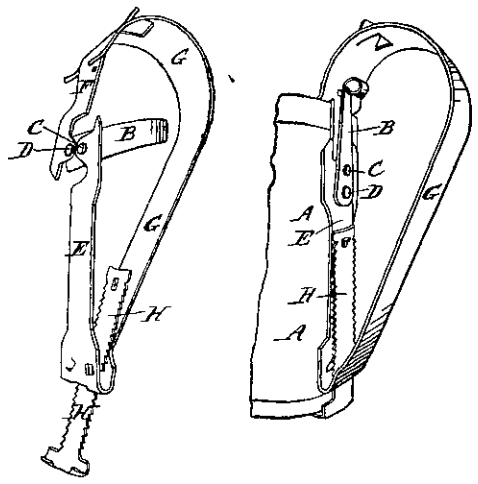
An extremely useful tool is the improved corner-bit brace, illustrated herewith. In these days of special requirements in the line of electric appliances, plumbing, etc., this device will be found of material aid in making the necessary openings for such. Unlike the ratchet brace, the



corner brace is drawn constantly either in its backward movement or its forward or cutting course with complete revolutions, in cramped positions, corners, etc., as with an ordinary brace unobstructed. In the illustration the guard-plate covering the wrought steel gears is shown partially removed, thereby showing a section of the gears. Besides keeping the gears free from dust, these plates prevent possible injury in handling the brace.

A Unique Tin Handle.

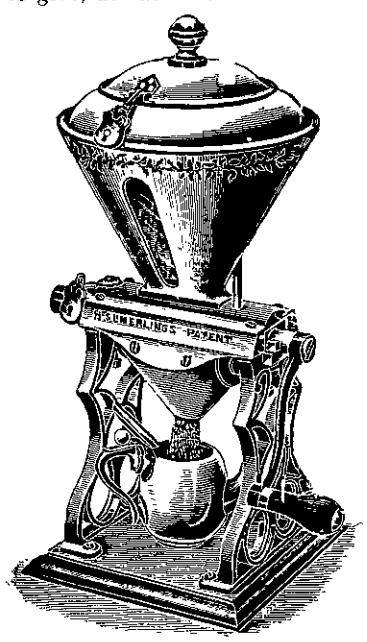
Our illustrations depict an exceptionally convenient handle for clamping to metallic or other discarded jam, meat, fish, or other tins. The left-hand figure shows it open and detached from the tin. The right-hand figure shows it applied to the vessel. A better comprehension of the simplicity of this attachment can be formed when it is said that A shows a portion of the can, and B a lever to which are attached two pivot pins, C and D. One of these pivot pins is pivoted to the lower back piece,



E, and the other to the upper back piece, F. The handle, G, and the said back piece are all in one piece. Through a hole at the junction of the back piece and the handle slides the extension piece, H, To apply the handle, the lever is placed in the position shown in the left-hand figure. The handle is then placed alongside the tin, and the lever pulled to the position shown in the right-hand figure. This draws the extension piece and the clasps protruding from the top of the handle together, and locks the handle to the said tin. In a modification of the foregoing, the lower back piece may be independent of the handle, and the extension piece be dispensed with. It is an exceedingly cheap and effective device, and the inventors are Messrs. Love & McRae.

An Automatic Tea Caddy.

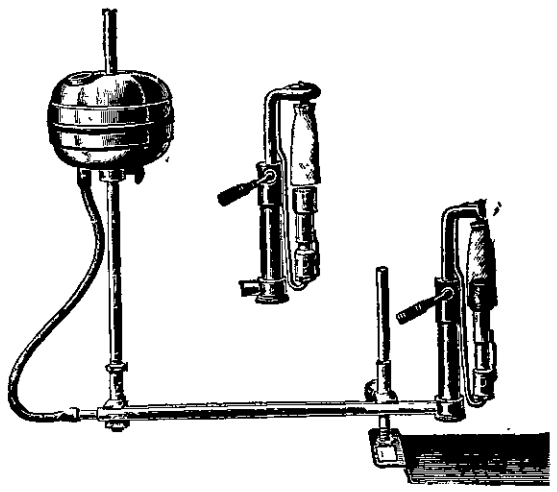
In the large refreshment houses and tea-rooms, which are now springing up at every corner of our streets, thousands of cups of tea must be "made separately for each customer." A demand has, therefore, arisen for a means of dealing out, automatically, the proper quantities of tea required. This need is met by an automatic, self-recording tea-caddy measuring machine, designed by a London inventor. The tea is first placed into a large conical receptacle, the lid of which can be secured by lock and key. A regulator is then adjusted to give, at each movement of the handle,



either sufficient for one, two, or more cups of tea, allowing this quantity to fall into the teapot at each movement. As the machine is worked, each delivery may be automatically recorded on a dial, and hence it is possible to ascertain, at the end of the day, how many cups of tea have been served out from any particular caddy, forming, in this way, a certain check upon the action of the attendants. The tea is accurately weighed out, and cannot possibly vary in the quantity delivered. The tea is placed in the pot untouched by hand, and once the adjustment is set to the position required, it is impossible for it to be tampered with, and the assistant is prevented from giving, in the rush of business, too much or too little, while customers have the satisfaction of getting their tea always of the same strength.

The "Sol" Photographic Lamp.

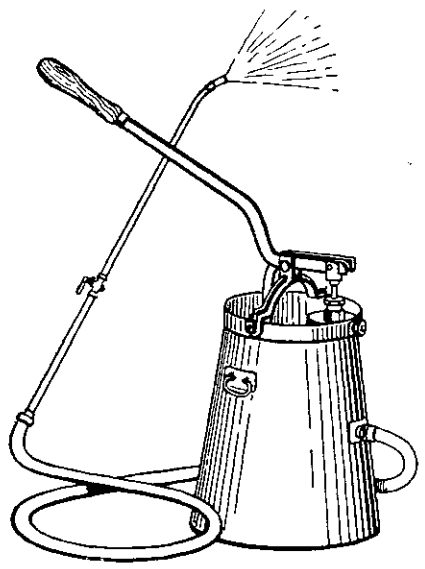
For magic lantern or photographic enlarging work when no gas or electric light is available, the "Sol" lamp provides an extremely serviceable and widely-used alternative. It gives an intensely brilliant white light, produced by an incandescent mantle in conjunction with a combustible gas. This gas is generated by heat from a supply of methylated spirit contained in a seperate reservoir, and the intensity of the light can be regulated by raising or lowering this reservoir. It will burn continuously for two-and-a-half hours, at the cost of a few pence. In the latest model manufactured by Houghtons Ltd., of London, the mantle can be easily removed without fear of breaking. The old models will not permit the



removal of the mantle very readily, and there is considerable risk attached to the operation. A small spring is fitted to the burner, which engages in the draught holes, and keeps the burner in the correct position. To remove the mantle this spring is disengaged and the burner lowered, allowing the mantle to be easily removed. This lamp can be used on a lantern tray as well as on an ordinary base, and can be used with or without a reflector.

A Paint Spraying Machine.

Paint spraying machines are now very extensively used. Our illustration depicts an English portable, self-contained machine, composed of heavy galvanised iron. The pumping apparatus is made of solid brass, which will not corrode from the use of any liquids. It also has an agitator, which keeps the liquid in motion while working the machine. One man can pump and spray at the same time, and 100 to 125 pounds pressure can be easily carried. It can be used for whitewashing, painting, spraying



of fruit trees, and many other disinfecting works. The tank will hold seven gallons of liquid, and the capacity of the machine is equal to the work of five men with brushes in the same time.

Titanic acid (the oxide of titanium) was claimed, at a recent meeting of a society of dyers in Manchester, to possess remarkable fire-proofing qualities. Some pieces of flannelette treated with the acid refused to burst into flame when applied to a match. The incipient fire in the material merely smouldered and went out. If, as is said, all inflammable textiles can thus be rendered fireproof, and neither dyeing boiling, or washing will remove the acid, the discovery, when commercially availed of, should avert many fatalities of a regrettable character, only too frequent in the past.

Metal can be fastened to wood without nails or screws by a mixture of best joiner's glue and glycerine. The metal surface should be first roughened by the use of dilute sulphuric acid.

WEAVING DESIGNS by PHOTOGRAPHY

A great many marvellous inventions have been accredited to Herr Jan Szczepanik who was born in a small village in Galicia some 32 years ago. His first invention was a wonderful process, by which one's photograph might be woven in silk almost as quickly as it is now made on photographic paper. The next invention was what seemed an equally incredible method of transmitting one's portrait by telegraphy, and finally it was announced that he had at last solved that problem, which it has been the dream of every photographer to accomplish—photography in natural colours at one exposure.

Apparently little has been heard of the development of Szczepanik's wonderful notions, and consequently, it will surprise many people to learn that the first and last of these inventions

are accomplished facts, whilst the second has been proved, and only temporarily laid aside because of the claims upon the time of the inventor by what he considers more important inventions.

In Bradford a machine is working which performs the marvellous weaving process by which are woven artistic designs and portraits by the aid of photography. The accompanying illustration shows a portrait of Mark Twain reproduced in woven silk from a rough crayon drawing under Szczepanik's process.

During his early years in his native village Szczepanik had watched the weavers in their homes working the hand looms, and he saw what a long tedious process it was to produce any ornamental pattern. The weaving was chiefly of plain material, and when any figuring was required it had to be inserted by the process known as shaft-weaving.

At this time he had never seen a Jacquard loom, but his thoughts led him to practically re-invent Jacquard's principle, and he constructed a loom on exactly the same lines. For this loom it was necessary to use perforated cards, and the old method was to punch them by hand from designs made on squared paper. Even to this day the machines for perforating cards for the Jacquard loom are of the most elementary description, and it takes days to punch a design, as it must be done hole by hole, the operator reading off the number of squares from the design, and dropping a punch when he gets to a place where a hole is required. It is far more slow and tedious even than setting printing type.

Herr Szczepanik revolutionised this part of the process by the invention of the electric card-cutting machine. For this machine a design was originally prepared with varnish or paint on a zinc plate, and this plate was placed on the bed of the machine which was fed forward by means of a screw. The plate passes under a sort of comb with numerous teeth which press on it. Every tooth of the comb is connected electrically with a punch in another part of the machine, and each punch is operated by an electric magnet. It can now be readily understood by anyone with a smattering of electrical knowledge, that when the teeth of the comb are in contact with the bare metal a current passes and the punch is operated, but when the teeth of the comb pass over the varnished parts of the metal where the design exists, no punches are operated, so that it is as if the machine were endowed with thousands of eyes and thousands of fingers, every part of the design being faithfully rendered.

The invention of the electrical card-cutting machine was a splendid step in advance for the weaving industry, but the inventor was not yet satisfied. He had obtained a knowledge of photography and process work, and he saw the possibility of producing the zinc plate designs by photographic means instead of by hand painting or lithographic transfer.

This led him at first to have the black and white designs photographed and printed direct from the negative by means of bichromated fish glue on to the zinc plate. That was a great saving of time: but the crowning point of Herr Szczepanik's work resulted when he applied the half-tone process to the production of the designs, thereby enabling any photograph or picture to be copied without the necessity of calling in the aid of a draughtsman to make a drawing.

It would take up more space than we can allow to describe the process in such detail that the various steps may be followed, but those of our readers who are familiar with the half-tone process, by which the majority of the blocks in this Journal are prepared, will quite understand us when we say that Herr Szczepanik adopts the half-tone principle of using a ruled screen and diaphragms of various shapes projecting on to sensitive paper or plates an image in dots or squares. He at the same time projects the ruling which makes the design look as if it had been drawn on squared paper.

The photographic camera accordingly maps out the design into squares, so that even those who have the old hand-cutting machines can have a design produced more quickly and cheaply than by the aid of the draughtsman, and with the advantage that anything that can be photographed will, in about fifteen minutes, be converted into a weaving design,

Herr Szczepanik obtains varied effects and shaded designs by the use of different diaphragms and screens, all resembling very much the practice of half-tone photography.

WESTINGHOUSE MAGNETIC BRAKE FOR ELECTRIC TRAMCARS.

THE Westinghouse magnetic brake is the outcome of the unequalled experience of the Westinghouse Company, in the manufacture of brakes of all kinds.

It has been designed to suit all conditions of tramway traffic, more especially those which exist in city streets, where it is absolutely essential that cars should be controlled by a brake of the most powerful and reliable description. It is instantaneous in action, and its power can be easily regulated by the driver for ordinary stopping or slowing down, as well as for the shortest stops required in case of emergency. The Westinghouse magnetic brake is, therefore, a combined service and emergency brake. Being simultaneously a track, wheel, and axle brake, it is capable of exercising the maximum braking power which it is desirable to apply to a moving car. Even when—in cases of extreme emergency—it becomes necessary to put the brake full on suddenly while the car is travelling at high speed, the consequent rapid retardation is smooth, and there is an entire absence of the jerking which characterises the action of emergency brakes of other types. The short stops effected by it, while causing no discomfort to passengers, allow the drivers to run their cars safely through congested traffic at higher speeds, and with minimum headway.

On tramway systems where the cars are equipped with the Westinghouse magnetic brake, higher speeds than ordinary have been sanctioned. The effect of higher schedule speeds is that a given service can be maintained with fewer cars, with resulting greater economy in operating expenses, and this means that with a given number of cars the service can be improved,

The action of the Westinghouse magnetic brake is quite independent of the current on the line, and even if the latter be cut off while a car is quickly running down a steep incline, the brake may be applied with equal facility and effectiveness; and one of the characteristics of the brake is that it is as positive in its action at 2 miles per hour, as at 20 miles per hour. Furthermore, its application requires no skill on the part of the motorman.

The Westinghouse magnetic brake consists of:—

A track magnet with detachable soft steel track-shoes fixed to each pole. The shoes run just clear of the rails, and the magnet is energised by current from the car motors acting as generators—brake-blocks, or wheel-shoes of the ordinary type, acting on the wheels. There is a simple link mechanism connecting the track-shoes and wheel-shoes. By means of this the downward pull, and consequent drag on the rails of the magnetised track-shoes, is transmitted to the wheel-shoes, which act upon the peripheries of the wheels in the usual way.

The constructional details of the brake may be better understood by reference to illustration. The track magnet is a horse-shoe with the pole-pieces parallel with the rails, the poles taking the form of renewable track-shoes. The magnet core is horizontal, and the coil is enclosed in a strong water-tight brass sheath. The whole is flexibly suspended by helical steel springs from the truck frame, thus allowing the track-shoes to ride over obstructions. The ordinary clearance between the shoes and the rail is ¼inch. The electrical connections of the magnet consist of strongly armoured cables in duplicate.

The entire mechanism is of the simplest character, and does not in any way interfere with the operation of the hand brake.

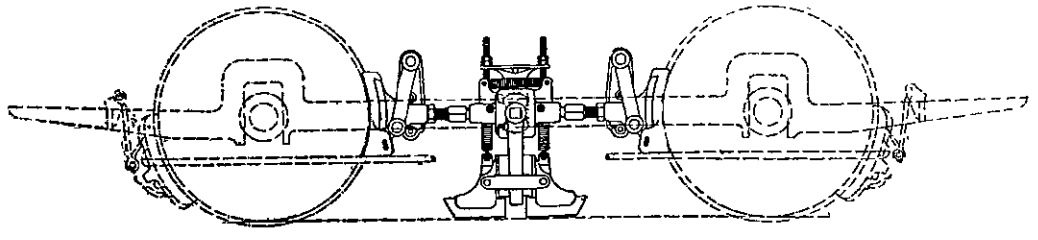
A single truck equipment includes the above three elements in duplicate, a bogie or double truck car being fitted with the equivalent of two single truck equipments. This brake has been successfully fitted to every type of truck in use.

The Wellington and Dunedin tram cars are the only ones fitted with the Westinghouse magnetic brake, in addition to the ordinary ratchet.

Auckland cars have a powerful, but slow-acting shoe-brake, operated on by a ratchet, in addition to the ordinary ratchet brake; while Christchurch cars are equipped with a compressed air brake. also in addition to the ratchet. The standby for all electric systems, but which is seldom used, is the reversing of motors, by which the operation of the controller causes the motors to generate in opposition to one another, and so retard the progress of the car.

On Electrically Propelled Vehicles.

Although their use is at present comparatively limited, vehicles propelled by electric motors, whose energy is derived from secondary batteries, have much in their favour. Not only have they greater advantages in the way of cleanliness, but they are also safer and easier to manipulate than gasoline or steam cars. They are, moreover, less liable to get out of order from ordinary causes, if well constructed and well cared for. But they possess the great disadvantage that the storage batteries must be periodically recharged from some primary electrical source, and their sphere of efficient operation, is, therefore, much reduced. Owing to the scarcity of power-charging stations, it is usually impracticable to make a run of more than forty miles at the most from the base of supplies. This deficiency cannot be counteracted by carrying an extra set of batteries, since these are so immensely heavy as usually constructed, as to greatly curtail the speed and carrying power of the vehicle. It is also impracticable to propel a vehicle by a battery of primary cells carried within it, since a battery of sufficient power to propel the vehicle would have little, if any, advantage in point of endurance over secondary cells, and when once exhausted must be entirely replaced. The plan of mounting on the vehicle a dynamo, to be continually operated by a gasoline engine, has been adopted by one or two manufacturers of electric vehicles. A storage battery is also included for the purpose of equalising the load by absorbing the current not required for propelling the motor, when the vehicle is coasting down hill, or when it is brought to a standstill with the gasoline engine still in operation. It can then supply the extra current required in ascending particularly steep grades or coming through unusually heavy roads.



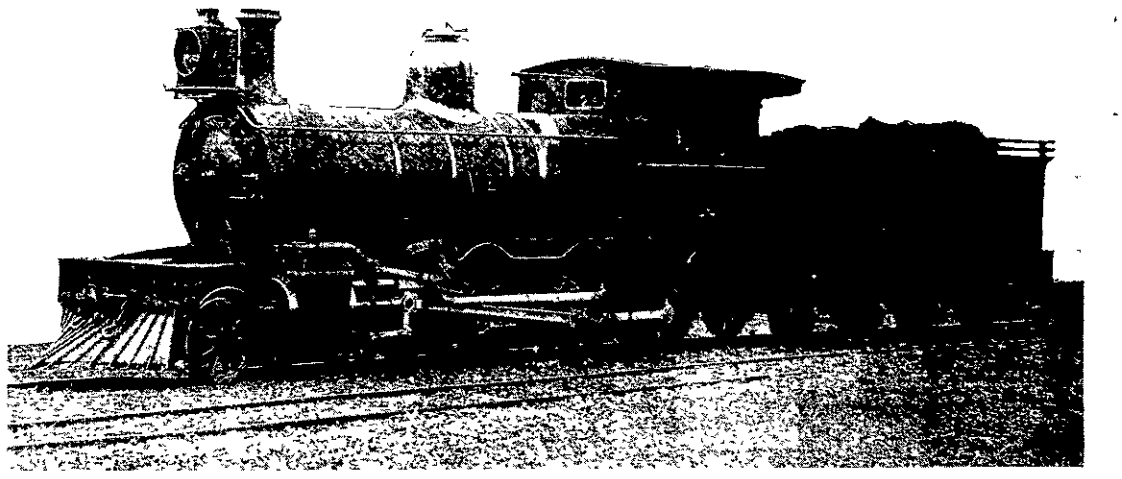
WESTINGHOUSE MAGNETIC BRAKE.

...New Zealand... Government Railways.

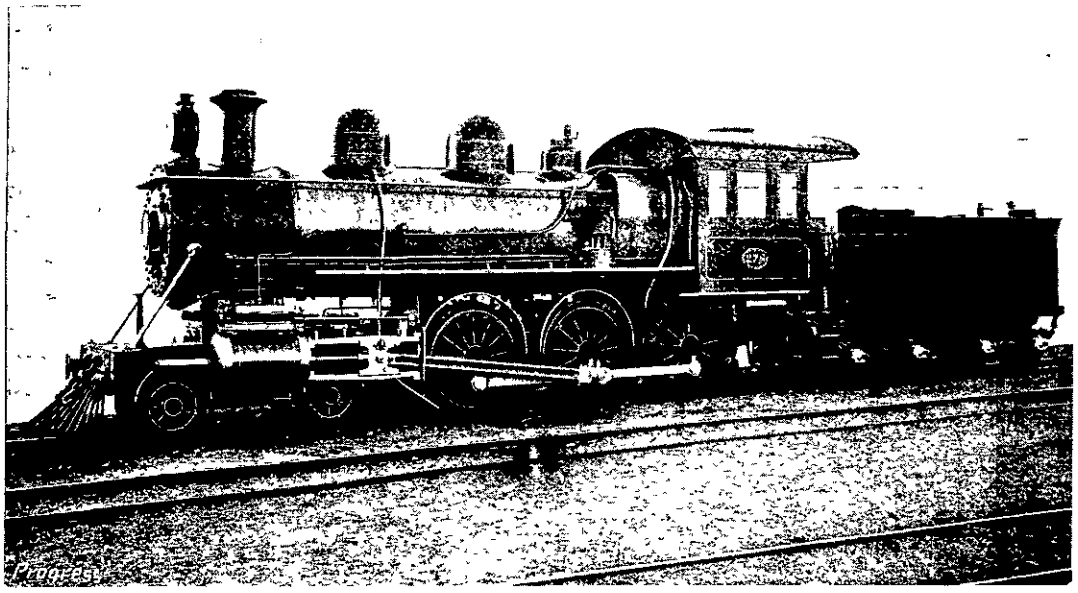
No. 1.—Locomotive Department.

New Zealand is not only the "Britain of the South," but she boasts an extraordinary variety of conditions under which railway work has to be carried on. The Premier, in a recent speech delivered at Petone, stated that despite the exceptional difficulties under which the railway Department has laboured during the past twelve years, it has successfully shouldered the responsibility of converting a semi-primitive system into one of the greatest efficiency. In the face of these disadvantages it is interesting to note how far we have really progressed, the figures from 31st March, 1893, to 31st March, 1905, being taken collectively as a guide.

	1893.	1905.	Increase.
	£	£	£
Capital cost ..	14,733,120	20,692,911	5,959,791
Passenger revenue	390,619	738,158	347,539
Coaching revenue	44,801	115,051	70,250
Goods revenue..	707,786	1,277 976	570,190
Miscellaneous revenue ..	38,316	78,046	39,730
Gross revenue ..	1,181,522	2,209,231	
Gross expenditure	732,142	1,492,900	
Net revenue ..	449,380	716,331	
Per cent. of net earnings to capital ..	£3.05	£3.58 (1904)	



Express and Passenger Locomotive class "U", built in New Zealand Railway Workshops. Diameter of cylinders 16", stroke 20"; diameter of driving wheels 4' 6"; diameter of bogie wheels 2' 6", steam pressure 175 lbs. per square inch; tractive power 12,444 lbs.; weight in working order 61 tons



Passenger and Mixed train service Locomotive class "Ub," built at Baldwin Locomotive Works, Philadelphia. Diameter of cylinders 16", stroke 20"; diameter of driving wheels 4' 1"; diameter of bogie wheels 2' 2"; steam pressure 175 lbs. per square inch, tractive power 13,680 lbs.; weight in working order 57¼ tons.

Other comparisons—

	1893.	1905.	Increase.
Miles open ..	1,886	2,374	488
Mileage run ..	3,002,174	6,107,079	3,104,905
Passengers carried	3,759,044	8,505,113	4,746,069
Season tickets ..	16,504	140,453	123,949
Goods tonnage..	2,193,330	4,185,468	1,992,138
Men employed..	4,928	9,272	4,344
Locomotives ..	269	389	120
Carriages ..	491	864	373
Waggons ..	8,357	13,855	5,528
Tarpaulins ..	5,365	10,258	4,887

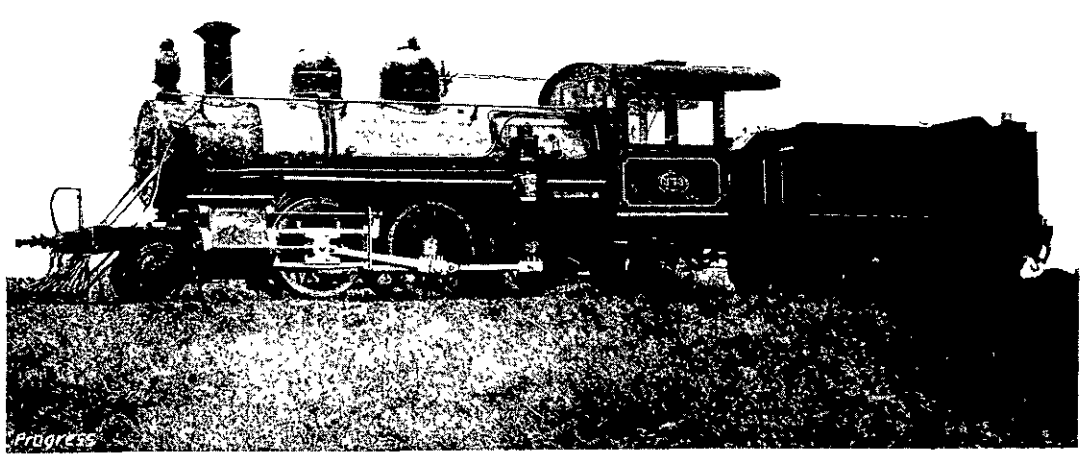
The real cause of the unduly arduous task imposed on our railway men lies in the erroneous adoption of a 3ft. 6in. gauge—a gauge wholly deficient in the attributes which spell success in railway systems where the British standard, or 4ft. 8½in., is used. Then the grades must be taken into consideration, for these range, for ordinary locomotive work, from 1 in 15, truly an exceptional condition applied to common tractive possibilities. Again the curves are such as to justify the working of "tanks" on nearly all the main lines, the radius of some in the North Island being only five chains, while in the South Island they improve in the minimum to seven-and-a-half chains. To design locomotives for satisfactory working thus constitutes an engineering distinction which the mechanical section of the Department deserves every credit for. The heads of this section were not slow in discovering that the locomotives of poor tractive power in use a few years ago were better in the shunting yard or at ballasting work; for the running of such engines meant high working expenses from continual piloting and dividing of trains.

The midgets "A" although fulfilling all expectations, were in time relegated to their proper sphere of operations, and they were followed by "C" and "D," which became for the time the most general types in the colony. These classes were all Glasgow-built. The "C's" were "saddle-tanks," four wheels coupled, with cylinders 9½" x 18". The "D's" were of equal cylinder-dimension, but had driving wheels slightly larger. Both these engines, for passenger and goods services respectively, did excellent work, but they were soon to be supplanted by "F" class, a mixed-traffic type which, as may be supposed, became "generally useful." They were "saddle-tanks" having cylinders 10½" x 18," and six 3-foot wheels coupled

As improvement became a *sine qua non* of railway practice, so our locomotives increased in their proportions and capabilities. A "Mogul" design, typified in class "J," next came into the running. This engine was a six-coupled, with Bissell bogie. The cylinders were 14" x 20", the drivers 3ft. 6in., the tractive power equal to seventy waggons, and the speed attained was 45 miles per hour. Just at this stage a somewhat interesting phase presented itself, viz:—the entrée of Americanism into our system. A few engines, having 12" x 20" cylinders, and coupled 4ft. wheels were ordered from Rogers & Co., New Jersey, U.S.A., and they worked the Dunedin-Christchurch section for some years. Then the "Consolidation," or "T" type of goods engine, made its appearance from the famous Baldwin shops at Philadelphia. These engines had eight coupled 3ft. wheels, with pony truck and cylinders 15" x 20".

At the same time the single Fairlie engine, class "R," was imported, but the "Consolidation" type did so much better than this and other locomotives in working, that it set the standard for our modern basis of efficiency; and it is to the present we will now transfer our comments.

It is no exaggeration to say that extraordinary speeds are attained on this extremely narrow gauge of ours. The writer has frequently travelled behind a "Ub" 20in. stroke, between Hinds and Ashburton, at the rate of a mile a minute. Popular, and unthinking, testimony has it that our railways are too slow, and that it is possible for one to take liberties with the time table; but



Passenger and Mixed train service Locomotive class "N" built at Baldwin Locomotive Works, Philadelphia. Diameter of cylinders 15", stroke 20", diameter of driving wheels 4' 1"; diameter of bogie wheels 2' 4½", steam pressure 200 lbs. per square inch; tractive power 13 770 lbs., weight in working order 53½ tons.

there can be no question that, given level country and freedom from curves, New Zealand locomotives are able to hold their own with anything in the world—all things considered.

The representative engine running in New Zealand at present is the "Q" of the "Pacific" class. The cylinders are 16in. diar., stroke 22in., driving wheels 4ft. 1in., six coupled, and steam pressure 200 lbs. Its tractive power is 17,200 lbs., and grate surface 40 sq. feet. This type is used principally for the hilly work between Rotorua-Auckland and Oamaru-Dunedin. It is said to represent the highest pitch of efficiency to which the handicapped section of our system has aspired, and truly it is an engine of exceptional steaming and speed capabilites.

The classes which led up to the "Q" are the various "U's," the pioneer being No. 274, which is here illustrated. This engine was built at the Addington Railway Workshops, and although the six-coupled drivers were 4ft. 6in., that diameter was not repeated in the next two batches of passenger and mixed-traffic "U's." We also show a representative of the "Uc" class, built by Messrs. Sharp, Stewart & Co., Glasgow, and some difference in the external design to that of the preceding New Zealand built engine will be noticed.

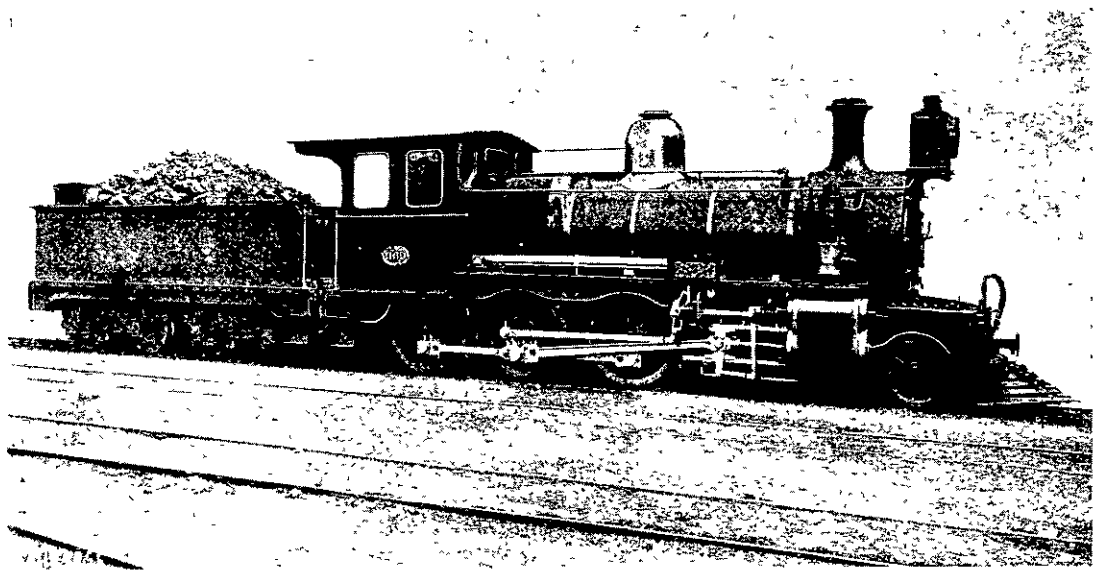
THE engine, as illustrated on the cover of this issue, is of the passenger and mixed-train service class "Ub" built at Baldwin Locomotive Works, Philadelphia. Diameter of cylinders 16", stroke 20"; diameter of driving wheels 4' 1"; diameter of bogie wheels 2' 2"; steam pressure 200lb. per square inch; tractive power 15,633 lb.; weight in working order 57¼ tons.

(To be continued.)

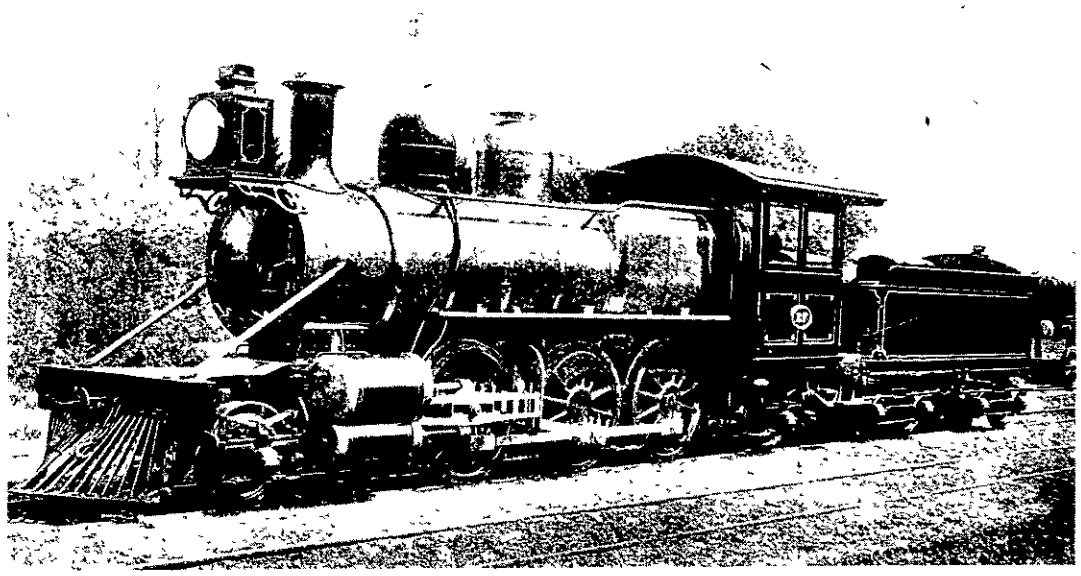
Technological Instruction.

CONSIDERABLE progress has been made by controlling authorities throughout the colony in the direction of improving existing arrangements and providing additional facilities for instruction in subjects of technology and manual training.

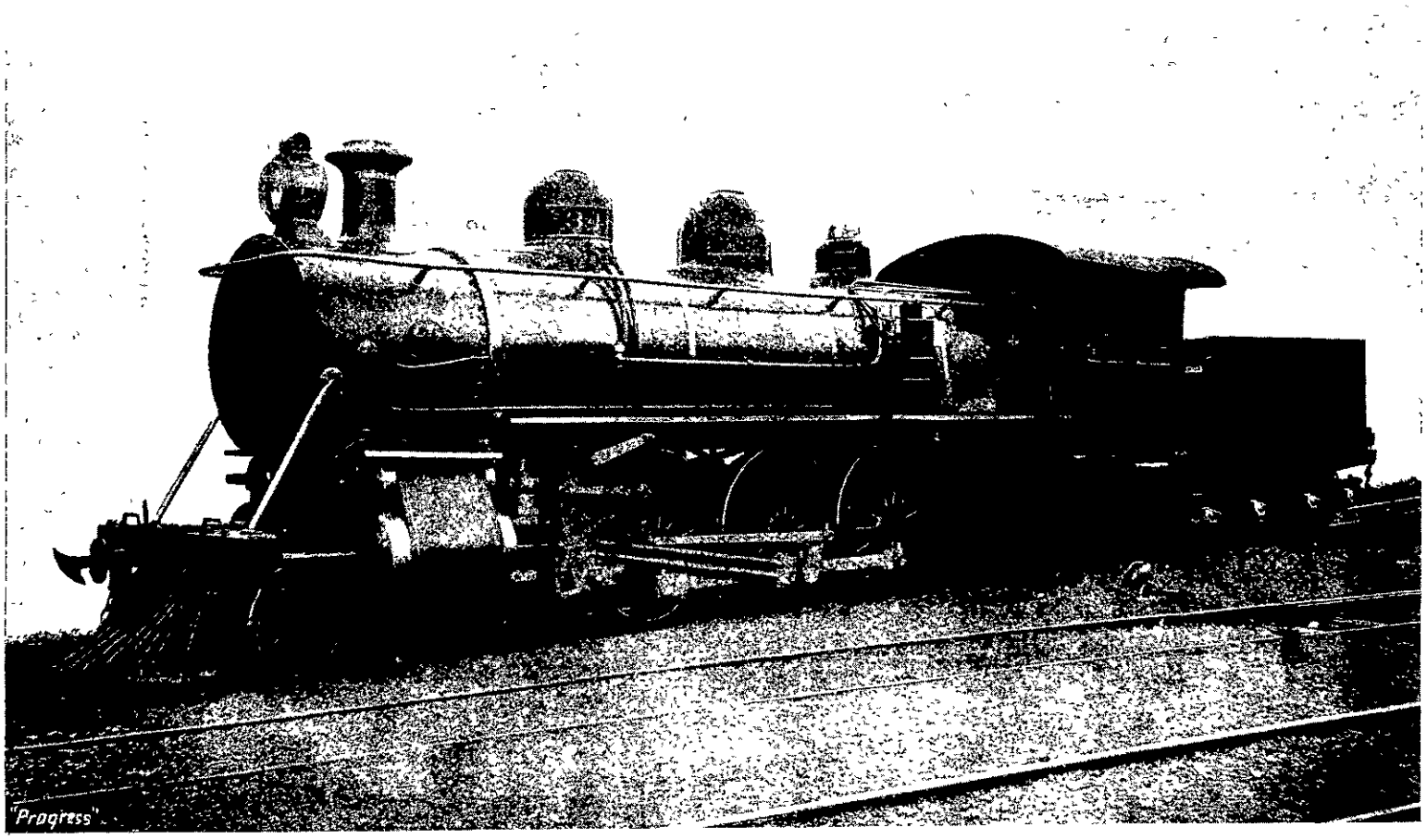
The number of technical, continuation, and school classes recognised during 1904 was 2599, as against 2287 for the previous year. Of the classes for 1904, 2001 were classes for handwork in connection with over 700 primary and secondary schools, while 598 were special, associated, or college classes for instruction in the several branches of pure and applied art and science, and in plumbing, carpentry, and joinery, cookery, dressmaking, and commercial subjects. While the actual number of technical classes was not greatly in advance of that for 1903, the returns show a great increase in the average attendance at them. For 1903 the average attendance was about 6300, and for 1904 about 13,700. Technical classes are held at about fifty different places.



PASSENGER AND MIXED TRAIN SERVICE LOCOMOTIVE CLASS "Uc," BUILT BY SHARP, STEWART AND COMPANY, GLASGOW. DIAMETER OF CYLINDERS 16", STROKE 22"; DIAMETER OF DRIVING WHEELS 4 1"; DIAMETER OF BOGIE WHEELS 2' 6", STEAM PRESSURE 200 LBS. PER SQUARE INCH; TRACTIVE POWER 17,240 LBS., WEIGHT IN WORKING ORDER 61¼ TONS.



PASSENGER AND MIXED TRAIN SERVICE CLASS "N." BUILT AS A SIMPLE ENGINE AT BALDWIN LOCOMOTIVE WORKS, PHILADELPHIA, AND CONVERTED TO COMPOUND ENGINE IN NEW ZEALAND RAILWAY WORKSHOPS. DIAMETER OF HIGH PRESSURE CYLINDERS 9½", STROKE 20", DIAMETER OF LOW PRESSURE CYLINDERS 16", STROKE 20", DIAMETER OF DRIVING WHEELS 4' 1"; DIAMETER OF BOGIE WHEELS 2' 4½"; STEAM PRESSURE 180 LBS. PER SQUARE INCH; TRACTIVE POWER 9,100 LBS.; WEIGHT IN WORKING ORDER 52 TONS.



PASSENGER AND MIXED TRAIN SERVICE CLASS "Q," BUILT AT BALDWIN LOCOMOTIVE WORKS, PHILADELPHIA. DIAMETER OF CYLINDERS 16", STROKE 22"; DIAMETER OF DRIVING WHEELS 4' 1"; DIAMETER OF BOGIE WHEELS, LEADING 2' 2", TRAILING 2' 6"; STEAM PRESSURE 200 LBS. PER SQUARE INCH; TRACTIVE POWER 17,240 LBS.; WEIGHT IN WORKING ORDER 69 TONS.

TECHNICAL EDUCATION IN NEW ZEALAND.

By W. S. La Trobe, M.A., Director Technical Schools, Wellington.

Part I.

The complicated systems of technical education which have been developed in older centres of industrial life, are by no means directly applicable to the conditions of life in a young and sparsely populated colony, and a careful study of the needs and resources of New Zealand is necessary before a suitable system can be evolved. Tentative measures have already been adopted, based largely on the methods of the Education Boards of England, but it is already apparent that a system which is suitable for densely populated centres is not economical in a new country, and indeed, so far as rural education is concerned, there are few parts of the country in which the methods of the Old World are possible. Any attempt to apply them, even with considerable modification, cannot possibly produce the best results, and is foredoomed to at least partial failure. From the point of view of technical education the industrial army of a country divides itself naturally into four distinct classes. These are, firstly, the workmen, secondly, the foremen and sub-managers, thirdly, heads of firms and general managers, and fourthly, scientific specialists—usually practising as consulting experts or as state servants. For each of these classes a special training is required. The workman naturally obtains the greater part of his training in the workshops under his foreman or leading hand. He should, however, be sufficiently grounded in the scientific principles underlying his trade to be able to carry out his work intelligently and with due economy.

This grounding in general principles he cannot as a rule obtain in any workshops run on commercial lines, and he must therefore turn to the technical school for that part of his training. It is a question how far it is just to the worker to compel him to expend time taken from rest and recreation for the purpose of perfecting himself as a workman. If the time he puts in at study does not enable him to rise above the rank and file it is obvious that he will scarcely be inclined to make sacrifices to increase his efficiency as a workman. So far then as his training as a workman is concerned, it is the business both of his employer and of the state to see that he gets this during his apprenticeship and in working hours of his employer, for the sake of future success in business, of the State, and of the general wellbeing of the Nation's industrial army.

The second class—foremen and sub-managers—should be expert workmen with a deeper knowledge of general principles than a workman need possess. A well trained workman, who has improved himself by devoting his leisure to the better understanding of his trade, and has at the same time the necessary personal qualities to fit him to lead others, will undoubtedly make the best foreman or sub-manager. To some extent his advancement should be the result of extra exertion, or extra ability on his own part, but opportunities for increasing his knowledge and efficiency should be provided, for him, either by his trade or by the State.

The heads of firms and general managers, and other "captains of industry," should have a knowledge of workmen and their work obtained, by going through a short apprenticeship; and, in addition, should possess a general scientific knowledge of the principles of their trade, and considerable business training. These men are of the greatest importance in the industrial life of the country, and ample facilities should be provided for their scientific training. Scientific experts, to some extent the scouts of the industrial army, should have a good all-round scientific education as well as a special training, consisting for the most part of original research work in their own particular branch of investigation. The questions as to how far a complete system for the training of all these classes in the many small, and the few large, industries of New Zealand is necessary, depend for their answers on a close examination not only of the present conditions of the country, social and material, but also of the probable lines of future development. It must be remembered that the education of a country, especially its technical education, should be about twenty years in advance of its requirements. In any country, but especially in a democratic State, the system must be such that every precaution is taken to prevent personal poverty depriving any individual of the training which his hand and brain deserve. The paying standard of education, from the point of view of the State, for any particular value of brain, must of course determine itself from time to time according to the circumstances of the people, and is in no way capable of accurate adjustment; but the system adopted must admit of the application of the general principle that the State pays for the education of the individual in proportion to his probable value.

Such a system has been adopted in New Zealand for general education—primary school—grammar school—university college, and so into the learned professions, and to some degree for the engineer, mining, civil, electrical and mechanical; but although the system is fairly complete so far as the lawyer, the teacher, the preacher, the chemist, the doctor of medicine are concerned, it is still very scrappy from the industrial point of view. This is the more remarkable when we consider how much greater importance attaches to the industrial, agricultural and pastoral trades in a new country. Facilities are, however, now being offered by the State which will permit of the foundation of a suitable system of industrial education being laid by Technical Education Boards in the colony. Boys and girls leaving the primary school with a good record can obtain technical scholarships which will entitle them to receive four years' training at technical schools, provided their progress is satisfactory. The payments made by the State to technical schools in respect of such students, should cover the cost of tuition and management, so that four years of free tuition is provided by the State. The first two years might well be spent in preparing for apprenticeship. In the second two years the boy should spend half his time in the workshop as an apprentice, and half in the school. After these four years, and the remaining two or three years of apprenticeship, he should be an intelligent and expert workman. The difficulty of his absence from work to go to school, and from school to go to work, could be got over by permitting apprentices to work in rotation, which would probably entail having a larger number of apprentices in the trade than is at present allowed, but would not entail having a larger proportion in the workroom than is now allowed in proportion to the number of journeymen. Considering that this is a young and rapidly growing country, and also that it is a country in which the proportion of young people is very high, the proposal appears to be sound, especially as it applies only to the pick of the primary school children.

(To be continued)

OIL ENGINES v. GAS ENGINES AND GAS PRODUCERS.

What effect will the gas producer have upon the sales of oil engines? This is a question which a good many of the Petroleum Companies are asking.

That oil engines will suffer to some extent is undoubted, but it will be a long time before they are entirely superseded.

The conveniences of an oil engine to the agricultural community is much appreciated, and the readiness with which they can be set to work in a few minutes is of great value, especially for short intermittent periods and for very variable work.

The ease with which the oil engine can be shut down without stand-by loss is another point in its favour.

Generally it can be stated that the oil engine will hold its own for the smaller powers, say to 10 b.h.p., and for larger powers when required for short intermittent periods or for very varying loads. From 10 b.h.p upwards the expenses of each type will have to be calculated over a series of years somewhat upon the following lines:—

Oil engine 20 b.h.p, running on ¾ load in practical work, with no special attention to obtain best results as regards economy. Running for five days a week, four hours each day, fifty-two weeks per annum, for five years. Average b.h.p. developed, 15 for 1⅞ gallons of oil per hour. Average cost of oil taken as 6d. throughout the five years.

	£	s.	d.
Capital outlay on engine ..	170	0	0
Carriage, fixing and foundations	30	0	0
Repairs and renewals	25	0	0
Cost of oil..	243	15	0
Less value of plant at end of five years	468	15	0
	85	0	0
	£383	15	0

Gas engine 20 b.h.p. with suction gas producer, running on a ¾ load with no special attention to obtain best results as regards economy. Running for five days a week, four hours each day, fifty-two weeks per annum for five years. Average b.h.p. developed, 15. Fuel consumption at the rate of 1⅛ lb. of anthracite per b.h.p. hour. Average cost of coal taken as 25s. per ton throughout the five years.

	£	s.	d.
Capital outlay on engine and plant	240	0	0
Carriage, fixing and foundations	35	0	0
Repairs and renewals	35	0	0
Cost of fuel, say, 40 tons at 25s...	50	0	0
Extra attendance, 1s. per week..	13	0	0
Less value of plant at end of five years	373	0	0
	120	0	0
	£253	0	0

Lubricating oil and stores are neglected as common to both types of engines.

Attendance counted as equal in each case while running, but the clinkering and cleaning of producer, relighting fires, &c., being reckoned as taking two extra hours weekly above that required for cleaning oil engine.

Depreciation counted on basis of one-half original price for engines as second-hand after five years' service.

Cost of water not accounted for, being taken as obtainable from storage at site.

The oil engine would, of course, show to greater advantage if worked at full power and with careful adjustment of oil supply to suit the load. It would do still better if worked with crude oil at about 2d. per gallon. Some makers are obtaining better economy of oil by increasing compression, and injecting water spray to prevent pre-ignition. In some parts of the United Kingdom refined oil, in bulk, can be obtained at the average rate of 3d. to 4d., and the corrected figures would then be:—

	£	s.	d.
Capital outlay on engine ..	170	0	0
Carriage, fixing, and foundation	30	0	0
Repairs and renewals	25	0	0
Cost of oil (¾ pints per b.h.p. hour at 3d. per gallon) for 15 b.h.p. average load	91	8	2
Less value of plant at end of five years	316	8	2
	85	0	0
	£231	8	2

Apart from running and upkeep expenses there are questions of adaptability for sudden and varying loads; of reliability under the ordinary care of unskilled hands; ease of repair; and safety from fire risks. On all these points oil engines can claim equality with the combined gas engine and gas plants, and the former can be attended to and cleaned out without risk of asphyxiation.—*Gas and Oil Engine Record.*

The Flax Industry.

Very few persons realise the enormous amount which might be saved to the community, by improvements in the manufacture of fibre from New Zealand phormium tenax. Millions of pounds have been wasted, and hundreds of thousands are thrown away every year through the methods employed in the production of the fibre.

The processes of stripping, bleaching and scutching are, all of them, as crude and antiquated as it is possible to conceive. The stripping injures the fibre, the bleaching is dependent upon the weather to produce a good colour, and is imperfect and wastful of time under the best conditions. Scutching, as at present performed, turns an amount of good flax into tow, which in itself, if saved, would be sufficient to pay a fair profit upon the whole industry.

From time to time attempts have been made by inventors to improve the methods of production, but their efforts have been merely spasmodic, very few indeed of their suggestions have had a practical trial; no one apparently is prepared to spend the few hundreds, or thousands as the case may be, required to improve the processes and save the colony this enormous annual loss.

In a subsequent number we hope to show that it would profit the colony to set up a commission of experts, even if the cost amounted to £10,000 per year, to inquire into the industry, and to examine the processes which have been suggested for its improvement; and, after experiment, to recommend to flaxmillers methods calculated to prevent the annually recurring loss.

A cubic foot of earth weighs about five and a-half times as much as a cubic foot of water. A cubic mile of earth then weighs 25,649,300,000 tons. The volume of the earth is 259,880,000,000 cubic miles. The weight of the world without its atmosphere is 6,666,250,000,000,000,000,000 tons. If we add to this the weight of the atmosphere given above, we get a grand total of 6,666,255,819,600,000,000,000 tons. No wonder (says the *American Machinist*) Atlas became round-shouldered.

PERPETUAL MOTION:

The Inventors' Paradox.

By H. H. RAYWARD, M.E., Medallist, Techl. Assocn., London.

PART II.

AMONGST those who have vainly pursued the "Will o' the Wisp" Perpetual Motion, we find men from all walks of life, including a bishop, several professors of Philosopy, barons, knights, doctors of medicine and science, barristers, smiths, saddlers, millers and engineers; and the writer, in searching the musty records of the past, has been amazed to find that men of learning have been the propounders of contrivances which were more obviously ridiculous and fore-doomed to failure than those emanating from less enlightened sources.

Some of the scientists, who pursued their investigations a century or two ago, appear to have been so dominated by enthusiastic belief in the practicability of their schemes, that they succeeded in deluding others as well as themselves into the belief that their machines not only could be made to work, but actually had kept in unaided motion for some considerable period. For instance, in the year 1717, Orffyreus, a famous mathematician of his day, devised a gravity ball machine almost precisely similar to that of Dr. Conradus Schweirs, which was illustrated in the first part of this article, see Fig. 3. Although it is obviously impossible that Orffyreus' machine can have worked at all, yet the Landgrave of Wessenstein, on the 27th May, 1718, certified to the alleged fact that the contrivance had worked continuously in an apartment in his castle near Bassil, for eight weeks, viz., from November 1717 to January 1718! Such is the power of faith or the art of the conjurer!

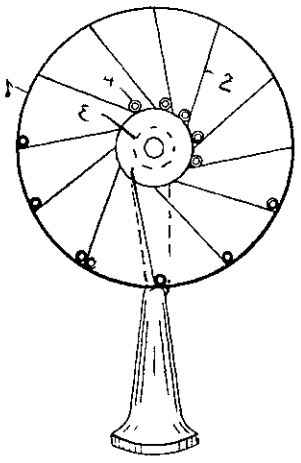


FIG. 7.

Figure 7 represents another of Orffyreus' perpetual motion machines, one of the 300 odd contrivances having the same object which are said to have emanated from his fertile brain. The rim, 1, of a wheel was connected by tangential spokes, 2, to the hub, 3. Each spoke was fashioned to form a rolling way for one of a series of balls, 4, and it was supposed that when the wheel was set in motion, the balls upon one side of the axle would roll towards the rim, while those upon the other side would roll towards the hub. The ball weights upon one side of the wheel would therefore have mechanical advantage over those upon the other side, and would cause revolution of the wheel.

It is said that this contrivance, as in the case of that by the same inventor previously referred to, fulfilled the object of the inventor, but one must hold the worthy doctor guilty of charlatanism, as the wheel certainly did not revolve by its inherent power, and means must have been brought to bear upon it other than those which have been communicated to posterity by the doctor, and writers of his period.

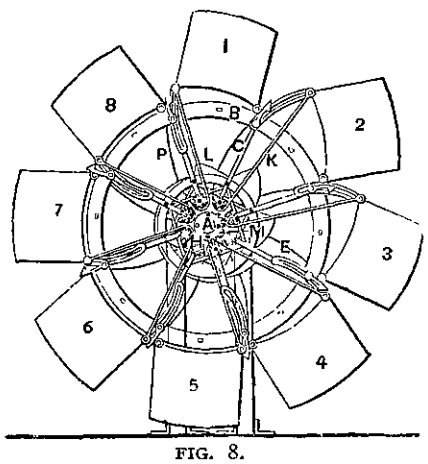


FIG. 8.

Figure 8 gives another illustration of a machine depending for its suppositious "motobility" upon the projection of weights from the rim of a wheel upon one side of its axle.

The weights, numbered from 1 to 8, were hinged at one end of the rim, B, of a wheel, while each weight was connected at its opposite end to a rod, K, operated upon by a pinion, H. As the wheel revolved (it must certainly have been impelled by some outside influence!) the pinions of all the rods, one after the other, came into gear with an eccentrically placed toothed sector, A, whereby the rods were pushed outwardly, and the weights turned upon their hinges, so that they became further from the centre of the wheel when upon one side, than when upon the other side of the axle.

The inventor of this apparatus overlooked the element of friction, and the obvious fact that the expenditure of power involved in raising the weights and in turning them outwardly at the top, and in drawing them in at the bottom of the wheel, was considerably more than could be gained by the leverage due to the projection of the weights.

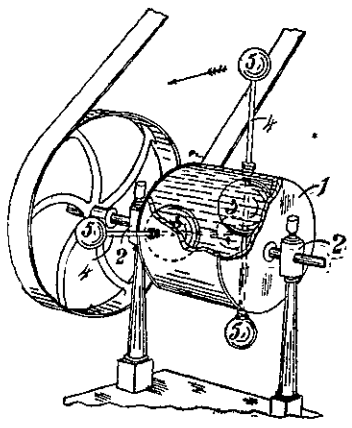


FIG. 9.

Figure 9 illustrates apparatus which to the average reader will appear to possess greater promise of success than the arrangements hitherto described.

The cylinder, 1, was mounted upon bearings, 2, and contained fluid in which were immersed the cork floats, 3. Each of these floats had a spindle, 4, passing diametrically through, and, projecting beyond the cylinder, and having weights, 5, one at each end. As the cylinder revolved the floats were supposed to rise one after the other through the fluid therein, with the result that the weights upon the float spindles were, one of them, drawn closer to the cylinder, while the other was simultaneously moved away from it.

The hopes of the inventor that the cylinder would be constantly overbalanced upon one side of the axle, and therefore compelled to revolve, never reached fruition

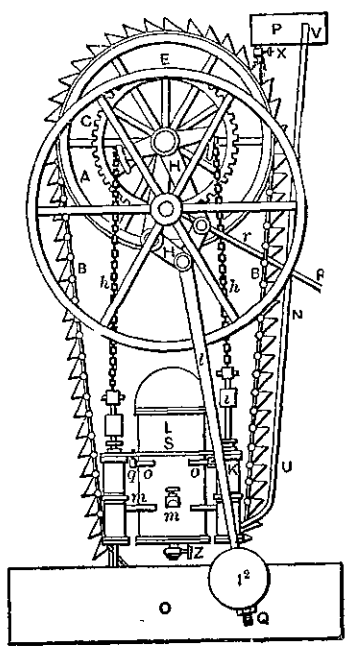


FIG. 10.

Figure 10 shows a contrivance patented in England in 1882.

The endless chain of buckets, B. is driven by water falling from a tank, P, and revolves a geared wheel and pinion, and by a cam sustains the vibration of a heavy pendulum, Q. To this pendulum is connected a sector beam having chains, H, which operate the pumps, K, whereby the water employed to drive the bucket chain is returned to the tank, P, from the lower tank, O.

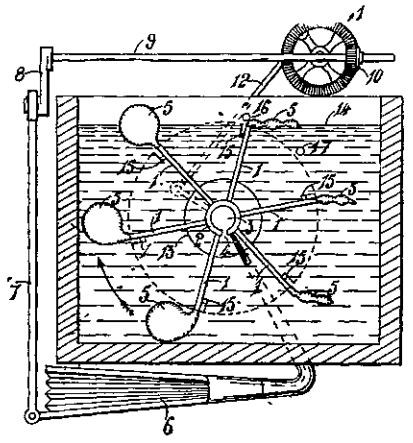


FIG. 11.

Figure 11 illustrates a most ingenious contrivance known as the "Air-buoyed wheel." The tubular arms, 1, projected from the boss, 2, which was revolvably mounted upon a fixed hollow axle, 3, through which was a passage, 4,. This passage was so placed that it came into correspon ence with the open end of each of the arms as the boss, 2, revolved. At the end of each arm was a bladder, 5, which, whe the arm reached its lower position, was inflated with air, forced into the hollow axle by a bellows, 6. The bellows was operated by a rod, 7, from a crank, 8, fix d upon a shaft, 9, which was revolved by the bevil wheels, 10, and 11, and rod, 12, from a crank, 13, upon the axle, 3. The arms revolved in a tank which contained water up to the level of line 14. Each bladder was fitted with a discharge valve, 15, having a projecting lever, operated, uring the rotation of the arm, by the opening nd closing tappets, 16 and 7 respectively.

The air bladders were supposed to be filled one after the other as their respective arms reached a vertical position at the bottom of their travel, the buoyancy of the bladders caused the boss to turn, and as each bladder reached the tappet, 16, the valve lever struck against it and opened the valve, 15; when the bladder commenced to descend the pressure of the water drove out the air; the tappet, 17, then closed the valve to prevent the entrance of water.

It is quite evident that this chain of events would have gone on recurring with unerring regularity, but for one trifling fact that was overlooked by the inventor, viz., that the frictional resistance and power required to compress the air were greater than the power generated by the buoys.

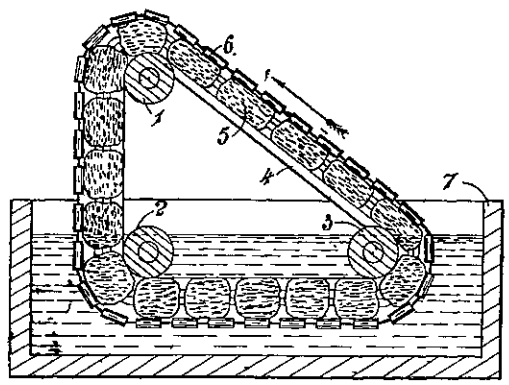


FIG. 12.

Figure 12 is particularly interesting as illustrating a contrivance devised by Sir W. Congreve, who subsequently attained distinction by his invention of the signal rocket. The rollers 1, 2, and 3, are carried in a frame, 4, and around them runs a continuous band ,5, of sponge, a chain, 6, of weights surrounds the sponge and travels with it. Every part of the sponge band and chain is so accur. tely uniform in weight, that the perpendicular side will in all positions of the band and chain be in equilibrium with the hypotenuse upon the principle of the inclined plane.

The frame is placed in a cistern, 7, containing water, in which the lower part of the apparatus is immersed. As the weights hang perpendicularly upon the vertical side of the frame the sponge band is not compressed by them, and the pores being open, the water, at the position where the band meets the surface, will rise to a certain height above its level, and thereby create a load, which load will not exist upon the inclined side of the frame because upon that side the chain of weights compresses the band at the water's edge, and squeezes out the water, so that the band ascends the inclined side of the frame in a dry state.

THE.....
HARVESTER COMBINE.

II.—The Manufacturers' Viewpoint.

By PHIL. GODFREY.

The farm implement manufacturers of New Zealand have for many years maintained a satisfactory business record in their dealings with the farming community; and it is probably due to the eternal unfitness of some things that the mutual benefit resulting to both parties should have recently been threatened with extinction. This unfitness becomes an ugly contretemps when held to be analagous to the operations of the Harvester Combine in our midst, and the local manufacturers in justice to themselves and their patrons, have lately put their case before the country in a clear and succint manner. They have endeavoured to invoke the co-operation of the farmer, in order that combined advances might prove the ultimate means of checking, if not of eradicating, the Combine's inroads on an important colonial industry. So far, this justifiable move has not been productive of as general and spontaneous an understanding as was at first expected by the people who were far-seeing enough to take the initiative. Nevertheless, both manufacturers and farmers met a few days ago in Christchurch, and they discussed the question with a degree of finality to their deliberations sufficient to induce the Government to acknowledge that emergency legislation would be necessary in event of the Combine becoming unduly arbitrary in its operations.

This was, of course, non-committing and placatory enough on the part of a paternal legislature, which goes slowly in so-called party matters, but the provision, we must admit, savours too much of coping with an improbable contingency, instead of dealing with the instant imposition of duty as the only protection against the Trust. However, it is well to note that the manufacturers place every confidence in the Government, and that when the time arrives they will, with the farmers supporting them, derive the maximum protection for a trade which must certainly rank in the forefront of colonial enterprise.

To prove that our manufacturers have no wish to increase prices it has only to be stated that they do not ask for the levying of duty on those implements which cannot be manufactured in the colony, viz:— harvesters, hay-making machinery, traction and oil engines, dairy machinery, and implements such as small ploughs and cultivators, upon which any duty would necessarily raise the price; but they merely move for assistance to protect those machines which they have brought to their present pitch of perfection, viz.— ploughs, tine and disc harrows, cultivators, drills, rollers, chaff-cutters, and seed-cleaners, and on these they stipulate for protection when they reduce their prices.

Thus, for every £1 reduction on a price the manufacturers claim that there should be a corresponding imposition of £4 duty, except in the case of implements and machinery which are the products of the United Kingdom. This latter condition, is, of course, a further guarantee of fair dealing, and British machines would, consequently, be admitted free as at present.

Then again, the manufacturers are perfectly willing to standardise their machines, so that any alteration of quality could be readily detected. If, under these circumstances, the manufacturers did not keep faith with the consumers then the law of the land could be amended to meet the disabilties of the question; but the whole subject of patriotic-cum-economic consideration is so wrapped up in the mutual agreement of manufacturers and farmers, that any departure from strictly fair practice on their respective parts would undoubtedly give the Harvester Combine the advantage it can never otherwise obtain.

It is, then, little to be marvelled at that the manufacturers recently invited the co-operation of the farmers in order to deal summarily with what is unquestionably to be the topic of the hour ere another session commences. To the farmers of New Zealand they addressed themselves in the following unmistakable terms, viz:—

We ask your support on the following grounds:—

You prevent the possibility of a foreign monopoly taking the place of the present colonial competition.

You will secure an immediate reduction in the price of colonial implements.

You will secure better machinery because colonial makers will secure some of the trade now done by the foreigners.

Owing to the increase in the number of men employed you will secure an enlarged local demand for your products.

Less money will be spent on canvassers and more on the implement itself.

In consideration of this support's forthcoming it must be distinctly understood that the manufacturers' *modus vivendi* would be as follows —

1. All harvesting, hay, threshing and dairy machinery to be free, as now.
2. All agricultural machinery from England to be free.
3. Machinery used by small farmers, that would be likely to be raised in price, to be free.
4. Duties only to be placed on the kinds of implements which colonial makers have worked up to suit colonial requirements, and on these only when prices have been reduced.
5. No alteration in price would at any time be effected unless it carried a compensating consideration for the farmer.

A fear has been expressed by many farmers that, if the leech-like Combine were interfered with, it might create difficulties by refusing to supply those machines which are popularly supposed to be made only by the International Harvester Company. But such a contingency is the last thing to occur when it is remembered that in reapers and binders—the so-called speciality of the Trust—the farmer can have alternative access to one of the finest machines in the world, viz — the "Hornsby." This machine has an extremely good record in England and Australia for durability and lightness of draught, and the recent exhibits of harvesting machinery at the Christchurch show would have been lacking in comprehensiveness had two fine "Hornsby" harvesters not been there to represent British workmanship and industrial advance.

In conclusion we require to place on record the fact that the farmer and manufacturer, if left quietly to their own common spheres of buyer and seller, will work out the disposal of monopoly in good time. In past years the two parties have got on well together, giving and taking in many things; and it is not now to be supposed that an arbitrary action on the part of one will upset the good feeling that has before existed, but rather let us believe that their careful weighing of the pros and cons of the subject will tend all the more to a firmer cementing of individual interests when the time arrives for concerted action.

CONGRATULATORY.

The Editor has pleasure in acknowledging receipt of the following letters from advertisers and subscribers, and each is eloquent testimony of the merits of this paper.

From Messrs. J. W. Wallace & Co., agents Acme Gas & Oil Engines, Wellington.—"We must express our pleasure at the excellent manner in which Progress is got up. The printing, illustrating and general arrangement of the paper are equal to the best of British publications."

From Mr. Ronald S. Badger, Advertising, Christchurch —"I must compliment you heartily on the setting, and also upon the general get-up of your paper. More than that, I can already testify to its value in getting amongst the right class of people, for I received an enquiry from Auckland within four days of publication."

From Mr. N. Andrew, agent Campbell Gas & Oil Engines, Wanganui:—"I have pleasure in congratulating you on the excellence of your first number."

From American School of Correspondence:—We are in receipt of the first copy of Progress, and have to congratulate you on the excellence of the publication."

From Mr. Horace A. Fry, Riwaka:—"I am so pleased with the articles in Progress that I will immediately fill in the order form and forward with 5/- for one year's subscription."

From Mr. A. O. Sachse, C.E., Melbourne:—"I like your journal very much, and the matter is highly interesting."

From Mr. Francis H. Snow, Adelaide:—"I congratulate you upon your progressive enterprise, and wish you every success from first issue."

From Australian Manufacturing & Importing Co., Sydney:—"Progress exceeds our anticipations, and we take this opportunity of congratulating you upon the undoubted merit of your paper."

From Miss B. J. Mouat, Patentee, South Dunedin:—"I must compliment you on Progress. It is a most creditable production."

From Mr. C. Bristow, Christchurch (a well-known inventor)—"Enclosed is my subscription to Progress. I was exceedingly pleased with the first number which I found most interesting and instructive."

From Mr. T. Taylor, Surveyor, Pahiatua:—"I am very pleased with the first number of Progress; three of my friends have become subscribers."

The water power now running to waste at the Victoria Falls, on the Zambesi River, is estimated at 25,000,000 horse power, or five times that of Niagara.

"Progress" tent at the Christchurch Show, 1905.
The illustration shows the Editor and clerical staff who distributed 3,000 copies of Progress

..Legal..

CONTRACTORS' LIENS ON LAND.

BY H. F. VON HAAST, M.A., L.L.B.

PART II.

This Act needs amendment, if contractors and workmen are to have the protection that the Legislature intended to give them. The problem that has to be solved is to devise a simple method of procedure which, while giving effective protection to contractors and workmen, does not retard bona fide dealings in land. Two policies have to be considered and reconciled. That of the Contractors and Workmen's Lien Act is to give contractors and workmen a paramount charge on the land to the extent to which their materials or labours have improved it. That of the Land Transfer Act is to free those who deal with a registered proprietor of land from the necessity of going behind the dealings recorded on the register, and to make the title they get from such proprietor secure in the absence of fraud on their part.

One amendment will be agreed upon by all parties, viz:—The alteration of the method of registration, so as to enable the lien to to registered without suing. At present it is impossible to register a lien without first issuing a summons against the owner of the land on which the lien is claimed, for the method of registration is to file a copy of the statement of claim in the action. If the contractor has given credit, it is impossible to sue until the credit expires. Therefore, if payment is not to be made until all the materials have been supplied or the job finished it is impossible for the contractor to register his lien until he has completed his contract, however great his diligence and keen his desire to protect himself. Nor will the law allow him to lodge a caveat against the land to protect his claim of lien. Even if he registers at the earliest moment that the law allows him, he may still find his lien defeated by the prior registration of a transfer. In the ordinary case, too, of a merchant supplying goods from time to time—no merchant will issue a summons so long as he has no reason to suspect the good faith of employer and owner. If he did so at an early stage of the supply, he would find that his customer resented a step that damaged the latter's credit, and the merchant would get no more orders from his customer.

One of two courses is open The lien must attach either from the commencement of the work by the mere act of doing the work, or else from the filing of some notice. In many American States the lien is made to attach from the beginning of the work, registration, of filing, or proceedings on the lien being necessary only to prevent the extinction of the lien The lien of any particular contractor has priority over all dealings with the land, subsequent to the date on which he began his work, in some States even over a transfer to a bona fide purchaser, for value without notice, in others over all subsequent dealings, except those to bona fide purchasers for value without notice. This course, while giving the fullest protection to contractors and workmen, checks dealings with land. There would be nothing on the land registers to show a person dealing with the land what liens were claimed, and people would be found unwilling to lend money on mortgage to the owner after the erection of the building had begun, for fear that some lien might subsequently be discovered ranking before the mortgage. The only safe course for the purchaser of an uncompleted or newly completed building to pursue would be to retain his purchase money until the lapse of the time after the completion of the building prescribed by the law as that within which proceedings must be taken on the liens if they are not to be extinguished. In a country where land is dealt in almost as freely as chattels, such a course would be found to have many drawbacks.

What is wanted is some simple and inexpensive procedure that, while giving notice of the claims of lien to all dealing with the land, would at the same time not cast any stigma on the credit or reputation of the employer or owner of the land—something in the nature of the caveat lodged by a purchaser of land under an unregistered agreement to protect his interest. A method that seems practicable would be to enable contractors and workmen on beginning work, to give a short and simple notice of their intention to claim a lien, and to register forthwith a duplicate of such notice against the land, charging the land from the time of registration, and protecting the contractor or workmen, filing it in respect of all work done by him upon the land in connection with the contract. Proceedings to sustain the lien, would have to be taken say, within three or six months of the completion of the particular work in respect of which the lien was registered or in any event within 30 days of the completion of the building, or else the lien would be extinguished.

MR. H. F. VON HAAST.

The advantages of this procedure would be these Contractors and workmen would be protected from the beginning of their work The employer or owner would not have to be sued to enable the contractor or workmen to register his lien. All persons dealing with the land would have notice of what liens were claimed It would become a regular practice of contractors, contemplating the supply of materials in any quantity, to register a lien at the outset, and the credit of the employer or owner would not suffer from the adoption of what would be considered an ordinary business precaution. The subtle and confusing distinction between a continuing contract, in respect of which one notice can be given within 30 days from the supply of the last item, and a series of separate contracts, in respect of each of which separate notices and separate proceedings must be taken, would be practically abolished. The filing of the notice at the outset would protect the contractor in respect of all work on the contract, whether done in respect of one large order, or of a series of separate orders from time to time The contractor having filed a cheap and simple notice, would then know that he was secure, and need not worry his head as to whether his was a continuing contract or not Not until he had completed his work need he take any further proceedings to protect himself, for he would be certain that no dealings with the land in the meantime could prejudice his lien Three or six months from the completion of the work has been suggested as the time within which proceedings must be taken to sustain the lien, for this reason A man supplying materials on a series of separate orders would never be quite sure whether there were any further orders to be received, and if he had to sue within a short time, such as 30 days from the last item, would if nearly a month elapsed between any two items, have to sue to sustain his lien On a big building the erection of which occupied a considerable time, thirty days might easily elapse between two items of the supply of materials by a merchant, and a series of actions have to be taken If within three or six months, the contractor did not get another order and were unpaid, he would then have to take proceedings to sustain his lien If, on the other hand, he obtained another order within three or six months, he would then have another three or six months from that order within which to take proceedings. In order, however, not to tie the land up too long, all liens would have to be proceeded on in any event within 30 days from the completion of the building or be extinguished That is to say, that 30 days after the completion of the building, the liens which would have to be taken into account would be those on which legal proceedings had been taken Provision might be made for the architect sending notice to the claimants who had registered liens informing them of the date of completion, and warning them that they must take proceedings within thirty days thereafter, or forfeit their liens. If the Act is to be amended, as it ought to be, a simple method should be prescribed of withdrawing a lien. The present Act only contemplates payment of the amount claimed by lien and the registration of a receipt verified by affidavit or the annulment of a lien by an order of the court. All that should be required for the discharge of the registration of a lien should be:—"I hereby withdraw Lien No. against all the land comprised therein [or against the following lands comprised therein]" signed by the Lienor and attested in the usual way.

For the series of ambiguous and confusing definitions should be substituted simpler ones, the meaning of which should be clear to an intelligent layman. The present definitions puzzle both Bench and Bar.

The Act should further make the following matters clear —

Whether the materials must be actually used on the land to enable the contractor to claim a lien, or whether it is sufficient if he shows that the materials were delivered upon the land on the understanding that they were to be used thereon.

In the present Act "work" is defined to "include the supply of material used or brought on the premises to be used in connection with the work. "Brought on the premises to be used" seems meaningless, if the Legislature intended that the lien should exist only when the materials were actually used on the land. Nevertheless, it has been held that even if the contractor places the materials on the land for the purpose of being used thereon, he can claim no lien unless he can prove that the materials were actually used on the land.

Provision should be made, too, for the case of the erection by builders of a row of houses either for themselves or for the same owner. The building of the houses is one job, and the contractors supply material for the whole job. The material is delivered where required on the land and used as required, but it is impossible for the contractor to prove in which house the material was used. At present the contractor, if one or more houses have been transferred, the remainder still remaining in the owner, stands a great risk of losing his lien altogether For he cannot prove that the whole or a great part of the material did not go into the house or houses transferred. So if there is a conflict between lien holders, and the materials have been just used as required, a very unsatisfactory position might be created. In such a case the fairest plan would be to treat all the houses as one job, to allow the contractors to claim one lien on all the houses, and to have recourse to all or any for the satisfaction of his lien. In any event, if once the contractor proves that the material was brought upon the land, either that in itself should entitle him to his lien, or the onus of proof should be on the owner to show that those materials were not used on the land. Some procedure should be prescribed by which all the claimants of lien should have notice of each other's proceedings, to sustain their liens, or the right to be represented thereat. At present there may be two or more lienors, whose claims conflict. For instance, as happened the other day, a builder was building two houses, 1 and 2, on adjoining sections. Two timber merchants, A and B, supplied timber. Neither had any notice of the hearing of the other's action, nor any locus standi thereat. A claimed a lien on house 1, B a lien on both houses, 1 and 2. Both liens were allowed, the builder raising no opposition in either case. On hearing the result of B's action, A asserted that B's timber was used only on house 2. The value of house, after deducting mortgages, was not more than enough to pay A's lien only. Eventually the matter was amicably adjusted. Had A had notice of B's proceedings, and the right to attend, B's claim would have been limited to house 2 in the first instance.

In an action for lien, all persons liable to pay the moneys claimed, must be made defendants, but only a judgment in rem, viz., charging the land with the lien and for a sale of the land for the purpose of satisfying each can be obtained for enforcing the lien. In the action the lienor should also be able to obtain judgment for the payment of the amount due by the person indebted to him, instead of as now having to bring a separate action. Whatever course is adopted, the Act should be redrafted so as to make it simple, consistent, and intelligible.

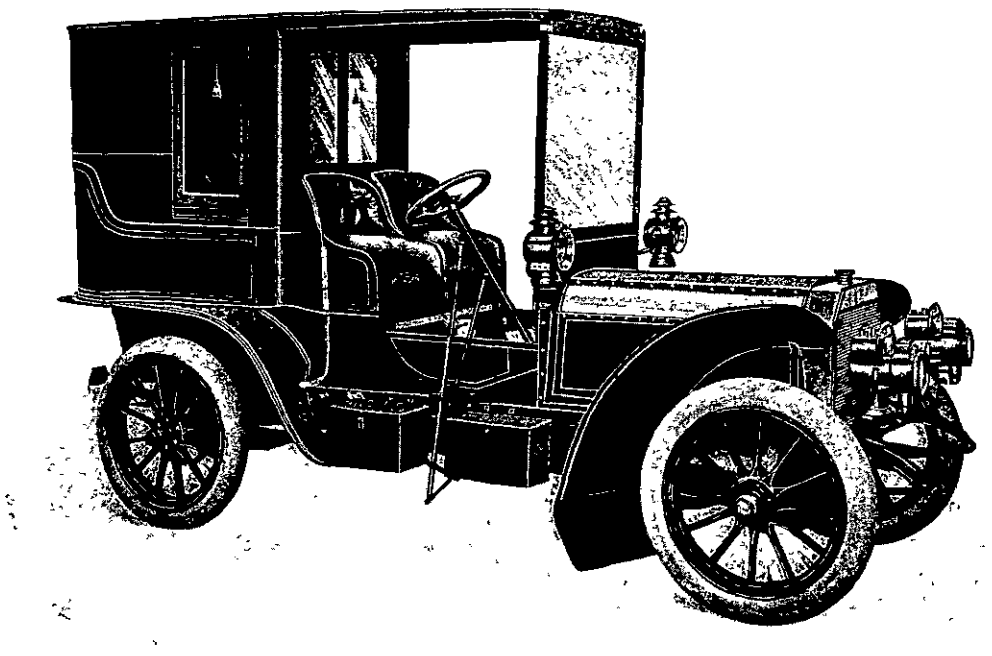
An order has been placed with Messrs. Heath and Ross, of Wellington, to instal a septic tank in connection with the new hospital for infectious diseases at Timaru. The firm is in receipt of news that the three septic tanks they are installing for the treatment of the drainage of Akaroa are on the point of completion.

MOTORS and MOTORING.

The number of workmen employed in the automobile industry of France in 1904, according to the President of the Automobile Syndicate, is at least 55,000 skilled mechanics and 25,000 employees, clerks, etc., to which should be added about 20,000 chauffeurs, making a total of 100,000 persons who are directly identified with the industry.

The increased use of automobiles during the past few years has been so enormous that the manufacture of motor cars and their accessories has become one of the most important French industries. From a total of 1,850 automobiles in 1898, valued at £320,400, the output in 1904, according to the Chambre Syndicate de l'Automobile de France, has grown to 22,000 cars, of an estimated value of £6,800,000. The yearly output of automobiles from 1898 to 1904 was as follows :—

YEAR.	NUMBER.	VALUE.
1898	1,850 ..	£ 320,000
1899	1,900 ..	367,000
1900	5,000 ..	1,062,000
1901	8,800 ..	2,046,000
1902	16,500 ..	3,821,000
1903	19,500 ..	5,250,000
1904 (estimated)	22,000 ..	6,800,000



THE TARRANT ENCLOSED TONNEAU, 12-15 HORSE POWER.

In buying a motor car note these eight points :—

First.—Buy a machine that has been on the market at least one season and proven satisfactory.

Second.—Buy of a reputable firm that has a business standing in the trade. Don't buy a freak, or any experimental machine, or be led astray by new ideas of wonderful things.

Third.—Buy the machine that suits your fancy best, and with capacity and strength to fill your requirements.

Fourth.—Touring on country roads requires more power and heavier running gear than city streets.

Fifth.—If you have never owned a motor car and object to hiring a chauffeur, select a single-cylinder or two-cylinder car, as a four-cylinder one would be too complicated to begin with.

Sixth.—Almost any good machine will last three or five years with ordinary care, but in these days of evolution only the exceptional buyer will retain a machine longer than the second year.

Seventh.—If you have a mechanical turn and are so inclined, then calculate to operate your machine all the time, and take care of all adjustments and some of the light repairs. This will be extremely interesting, the machine will last longer and do better work, and at far less expense than if operated by the average high-priced chauffeur. Of course, it is very desirable to have the tanks filled, lamps cleaned, and coach work washed and polished.

Eighth.—If you have owned a machine heretofore, then get one with four cylinders and plenty of power, although it should be light, and be careful with it. You will have less mechanical troubles as well as less tyre troubles with a light machine. Remember, the manufacturers must make their machines very heavy to withstand the treatment of the ordinary man without experience, who is usually an ignoramus. If you have had experience and are careful, you can afford to take the chance of damaging a light car by misuse.

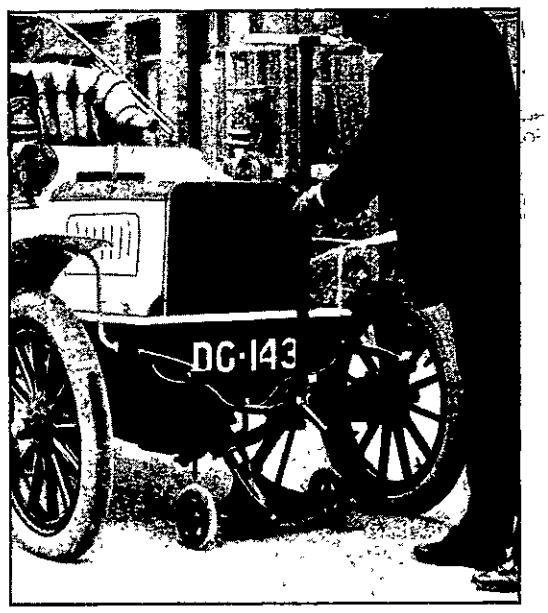
The novel and ingenious quick-lift and short-locking motor jack, devised by Mr. Henry Adams, of 30, Monson Colonnade, Tunbridge Wells, England, is undoubtedly the most convenient and effective contrivance of the kind introduced. This jack has been specially designed to bodily lift the front or back part of any motor car. As depicted in the accompanying illustration, by tilting the jack towards the car, placing the claw under the axle, and then by simple leverage pulling the handle down to a convenient position, the car is immediately raised. The jack being on wheels, it may be readily seen that the heaviest of cars can be transferred either backwards or forwards to any desired place, in the shortest area possible. If desired the car can be turned entirely round in its own length. By allowing a leg under the handle to rest upon the floor, the car is placed in a firm position, resting on the jack ready for repairs, cleaning or removing tyres, thus saving a large amount in labour alone.

A specially encouraging feature of the industrial vehicle movement is the way in which the petrol and steam wagon is being taken up by private users, who are, as a rule, far more exacting in their requirements than the public service companies.

These concerns have, to a certain extent, been forced into employing motor vehicles by the competition of rival concerns, and it is fortunate that they should be getting satisfactory financial results from their enterprise ; but the private user looks first of all to economy and convenience ; and the fact that all classes of users should be purchasing motor waggons, many of them repeating orders after employing them for a year or more, is the best possible proof that the wagon gives entire satisfaction under a large variety of working conditions So far we have not heard of any case where the owner of a motor wagon has returned to horse traction. There are, of course, conditions under which the industrial vehicle is more economical than others, and this is almost inevitable so long as the wagons are nearly all built to standard types, but when makers specialise themselves more thoroughly in motor vehicles, and are able to supply special types for various conditions of working, there will be a levelling down of running costs which will do much for the future development of industrial automobilism.

Abatement of Noise.

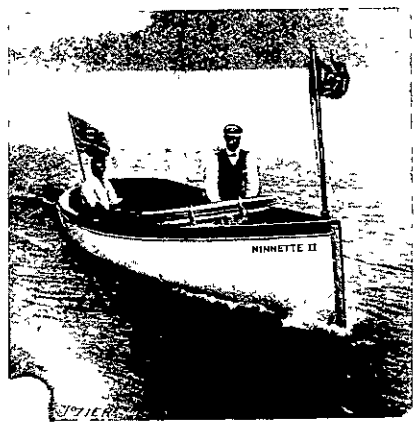
As the dust nuisance brings curses on the motor car, so does the rattle from their tyres cause anathemas to be heaped on the motor wagon. No greater source of complaint exists than the row which some of these heavy vehicles make, especially when it is at night time. The pity of the matter is that noise can, and should be, avoided, as much in the interests of those who own the machines as of those who reside along the routes which are used by this traffic. In the present state of public feeling on the whole motor question, we most strenuously urge upon all who have the larger types of steel-tyred lorries in their service to do all in their power to discountenance the over-driving which gives rise to such complaints. There are several cogent reasons, if that of consideration for the public requires any support, why owners should be very strict on this question of noise. Suppose it proceed from the tyres alone to a degree sufficient to be objectionable to passers-by or occupants of houses fronting the thoroughfares used,



RAISING A MOTOR CAR WITH THE ADAMS JACK.

the direct inference is that the driver does not use his head—that he pushes along over bad pavement without discrimination. Quite apart from any question of the public nerve, which, in these days of rush, is becoming more and more sensitive daily, it is a matter of £ s. d. to the owner to prevent this noise which is a measure of the wear on the vehicles springs, steering pins, transmission and all the bearings. It is a factor which finds expression in the annual repair bill, with an occasional breakdown on the road by way of variation. We know, full well, that drivers are only human, and that they will often force the pace regardless of anything but their intention to be booked in at the depot as early as possible. But the necessity for this hard driving not infrequently arises from the fact that too much is expected of a machine in the working day. Then it is that the blame attaches to the owner, as does the extra cost after the first twelve months.

The Yorkshire Daily Observer, in connection with the recent International Tramways Exhibition in London, states that one of the most notable features was the remarkable evidence of the motor omnibus as a rival to the tramcar. We do not agree with the statement that the motor omnibus is a rival to the tramcar, because each has its proper sphere of usefulness. The crux of the matter cannot be too strongly insisted upon, and it is that the tramcar is usually inadmissable unless a 12-minute service in each direction can be supported by the traffic. In the case of the motor omnibus, services can be successfully instituted with a much less frequent service on any particular route.



NINNETTE II.

10-h.p. Motor Boat, constructed by the Lozier Company.

Applications for Patents.

THE following list of applications for Patents filed in New Zealand during the month ending 15th November, has been specially prepared for PROGRESS.

20182—ter Hofsteede, J. G., Sunbury, Victoria: Legging fastening.
20183—Pearce, L., Fremantle, W.A.. Tobacco pipe.
20184—Stuart, R. W., Sydney Burner for Petroleum-vapour gas.
20185—Bowser, W. H., Brisbane, Q.. Scaffolding-cramp.
20186—Dickason, J. and McLennan, A., Melbourne · Cow bail and stall.
20187—Humphries, E. J., Mataura. Plough, etc., wheel mounting.
20188—Jones, W. B., Hastings Fencing standard.
20189—Watson, D. G., Timaru Trace spreader.
20190—Houseman, A., Newcastle, N.S.W.: Bottle-closure.
20191—Campbell, A., Sutton: Animal-cover fastening.
20192—Campbell, A., Sutton · Pocket.
20193—Clark, R. O., Hobsonville: Straightening earthenware pipes.
20194—Kennedy, W., Sheffield, N.Z. · Light-preventing composition.
20195—Madeley, O. P., Corindhap, Vic.: Label for mail bag.
20196—Wise, F. W., Christchurch: Filler for boot.
20197—Marsh, F., West Maitland, N.S.W.: Gold-treatment.
20198—Marsh, F., West Maitland, N.S.W.: Amalgamating machine.
20199—Hardy, A. R., Dunedin: Wire fastener.
20200—Morton, W. and Hercus, J., Dunedin. Window-sash.
20201—MacDonald, C., Roxburgh: Sleeve for dredge tumbler shaft.
20202—Wales, R., Dunedin: Rope-grip.
20203—Weir, J., Dunedin: Leg rope for cow,
20204—Worsfold A., Sydney: Vehicle seat.
20205—Buckley, D., Rakaia: Skeith buckle.
20206—Pritchard, G. T., Wanganui. Railway signalling apparatus.
20207—Wallace, A. B. and Jones, H. J., Masterton: Piano attachment.
20208—Gee, E. J., Papanui: Sun-blind.
20209—Evans, J. J.; Wharfe, W. H. and Litherland, T. E., Auckland · Kauri-gum sieve.
20210—Clark, R. O., Hobsonville. Flanging machine for earthenware pipes.
20211—Burns, J., Wyndham Combination tool.
20212—Dally, C. Y., Masterton Penetrating rays.
20213—O'Neill, T., Hendes Ferry Timing apparatus for shutting off light, etc.
20214—Sykes, A. E., New Plymouth: Cattle drenching appliance.
20215—Hayward, C. E., Jun., and Hunter, W. E., Maungakaramea: Snap-catch for leg-ropes or hobbles.
20216—Healy, L. and Hopkinson, E. C., New Plymouth: Wheel jack
20217—American Seeding Machine Co., Jersey City, U.S.A.: Distributor for seeding machine (F. G. Colley and E. Baseman).
20218—Morrell, R. L., London, England: Carburetting apparatus.
20219—Fraser, J. C., Coromandel: Steam turbine.
20220—The Horrocks Automatic Vending Machine Co., Ltd., Wellington: Vending Machine. (L. B. Horrocks).
20221—Middleton, W. and Cobbe, H.N.G., Kalgoorlie, W.A.: Shoe and die for grinding pan.
20222—Gribbon, J. S. and McKean, J., Benalla, Vic.: Sash support.
20223—Houseman, A., Charlestown, N.S.W.: Bottle.
20224—Heavener. H, Jun., Blayney, N.S.W.: Horse kicking and bolting preventer.
20225—Hardie, L., Christchurch: Swing.
20226—Brady, W. and Chaytor, B. T., Te Puke: Axle for wheels.
20227—Parker, A., Dannevirke: Stamp vending machine.
20228—McNeill, J. F., Melbourne · Go-cart.
20229—Tait, A. L. J., South Melbourne: Treating fibre.
20230—Johnston, A., Napier. Shaft tug.
20231—Nathan, A., Makino: Milk Food.
20232—Nathan, A., Makino: Egg powder.
20233—Pomeroy, J., Invercargill: Depositing tickets in bales of flax.
20234—Hurd, T., Dunedin. Draught-preventer;
20235—Robertson, E. L., Wellington: Egg carrier.
20236—Donne, B. L., Wellington: Tent. (T. D. McCall).
20237—Rouse, F., Black, R. and Black, H. G., Wellington: Vehicle wheel lock.
20238—Stocker, B. E. S., Wellington: Rifle and shot-gun cleaner.
20239—Ridd, A., Waipuku Pneumatic teat cups.
20240—Hill, W. E. and Robinson, J., Dunedin: Mitre-cutter.
20241—Vivian, T. Auckland. Medical tonic.
20242—Cowie, J., Dunedin · Milk-can filler.
20243—Smith, W., Waiuku: Runaway horse holder.
20244—Johnston, A., Milton Cornice.
20245—Thomsen, H. C., Waingawa: Cocksfoot-thresher.
20246—Walles, H. J., Roxburgh Submarine boat.
20247—Cradock, G., Bolton, Percy, England. Rope-grip.
20248—de Witt, G. C., Melbourne Refractory ore treatment.
20249—Donisthorpe, A. R., Leicester, England Crimping fibrous material.
20250—Steel, J. T., West Croydon, England: Loose-leaf account-book.
20251—Dunnett, F. E., London, England · Anti-fouling paint.
20252—Cutmore, H. A., London, England: Telephone transmitter.
20253—Martin, W. E., Stamford, England: Side-delivery rake for hay.
20254—Fowler, T. W., Melbourne · Fire-plug.
20255—Mead, J., Warkworth, N.Z.: Generating gas from kerosene and other oils.
20256—McDonald, A., Taieri · Milk-strainer.
20257—McLaurin, J. D., Pohangina: Potato and fruit sprayer.
20258—Cotton, F., Hornsby, N.S.W.: Liquid-fuel burner.
20259—Stevens, R., Christchurch: Milk cooler and aerator.
20260—Robertson, D., Wellington: Post-marking machine.
20261—Rich, F. and Walbran, G. F., Rushworth, Vic. · Tire-valve.
20262—White, G. W J., Ryde, N.S.W.: Exhaust-steam superheater.
20263—Brattstrom, E. G. A., Melbourne, Vic.: Petroleum-lamp. (Aktiebolaget Lux—S. Carlson).
20264—Butters, H., Havelock North: Fencing dropper.
20265—Nicholls, B. S. & J. H. and Bennett, C. A., Auckland · Washing boiler.
20266—McCarthy, J., Auckland: Folding and easy chair.
20267—Smallbone, R. E., Auckland: Knife cleaner.
20268—Nosworthy, W. H. and Prescott, S. J., Ramsgate and London: Non-refillable bottle.
20269—McDonald, H. E., Petone: Egg carrier.
20270—Gundrie, W. W., South Norsewood: Fencing dropper.
20271—Hubbard, A. J. Hubbard, G. and Cross, A. W. S., London: Dew collecting reservoir.
20272—Atkinson, L., Christchurch: Railway and tramway switch.
20273—Schultze, A., Greymouth: Carriage and spacer for typewriter.
20274—McDonald, H. E. and Diamanti, L. V., Wellington: Ice chest.
20275—Sollitt, R. H. and Whitlaw, H. J., Palmerston North: Lifting and lowering blinds.
20276—Firth, E. T. C., Auckland: Pumice soap.
20277—Hardy, A. R., Dunedin: Sash mover and lock.
20278—Griffiths, W. J. J., Normanby: Animal cover fastening.
20279—Tychsen, E. A., Ormondville: Velocipede driving mechanism.
20280—O'Neil, J., Christchurch · Windmill.
20281—Harris, C. H., Wellington: Kettle and saucepan.
20282—Oates, J. G., Carterton: Improved telegraph.
20283—Hall, T., and Elvines, F., Wellington: Non-siltable mat.
20284—Cooper, F., Christchurch: Disc plough.
20285—Nankivell, W. J., Dunedin: Raft.
20286—Shale, T., Dunedin: Electric wire insulator.
20287—Young, J. W., Invercargill: Brooch-pin fastening device.
20288—Markwick, H., Waihi: Cornice for window.
20289—Day, J. E., Sydney: Can washing valve.
20290—Henderson, G. J., Sydney: Making filled capsules.
20291—Cliff, H. Bunting, J. C. and Cliff, F. E., trading as Cliff and Bunting, North Melbourne: Chaff cutter.
20292—Harrison, P. Y. and Southall, R. H., of Bradford and Leeds, England: Top piece for boot-heel.
20293—Langton, E. G., Masterton · Toilet comb.
20294—Cameron, W. A. H. and Marshall, J. W., Wellington, N S.W. · Glass-washing machine.
20295—Connell, T. F., Catlins: Stirrup iron.
20296—Page, W. C., Eltham: Securing vehicle wheels upon their axles.
20297—Nalty, V., South Melbourne: Non-puncturable spring tyre.
20298—Brown, F. C., Komata: Slimes filter.
20299—Chappell, W., Puhoi: Measuring sun's altitude, etc.
20300—Paora, O., Orakei: Draining, subsoiling, and road-forming machine.
20301—Roe, M. H. Mamaku and Cranwall, B. F. Henderson: Motor cross-cutting machine.
20302—Broughton, E., Devonport: Game scoring machine.
20303—Billing, A. F., Auckland: Finger print album.
20304—Baldwin, P. E., Palmerston North: Flax-drying and bleaching.
20305—Powrie, J. A., Lower Hutt: Rainwater strainer.
20306—McCrea, F. E., Northcote: Pillow-lace loom.
20307—Mullins, P., Westport: Playing cards.
20308—White, E. L., London · Pictorial postcards, etc.
20309—Mitchell, A., Auburn, Vic.: Screwtap.
20310—Bennett, A. E. G., Fitzroy, Vic.: Shirt cuff.
20311—Aktiebolaget Separator (B. Ljungstrom), Stockholm Separator.
20312—Apostoloff, S. B., London: Bread-making.
20313—Philpott, T. S., Wellington: Game.
20314—Newnham, A. A., Wellington: Lock-nut.
20315—Coates, R. and Lees, J., Boulder City, and De Mole, L. E., Kalgoorlie: Butter provision and liquid cooler.
20316—Mapp, T. H., Sydney · Treating forage.
20317—United Shoe Machinery Company, Paterson, U.S.A.: Boot-turning machine.
20318—Chambers, W. J., Doyleston: Seed and manure sower.
20319—Hall, W., Addington · Grain dressing.
20320—Weston, R., Sydenham: Pedal strap.
20321—Miller, T., Sunnydale: Sash lock.
20322—Whitmore, F. V., Christchurch: Toasting apparatus.
20323—Bruce, J., Alexandra: Spring catch.

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, Auckland, Christchurch, Dunedin, &c.

Everyone connected with the machinery trades or the engineering industries is alive to the enormous strides which electricity continues to make as a motive power in these businesses. A unique opportunity of gauging the exact extent of the advance occurs in some particulars given by the Chief Inspector of Factories, London. He supplies returns showing that 340 works and factories derive 148,000-h.p. from motors connected to their mains. This, however, still leaves 40 or 50 undertakings concerning which information is withheld. Allowing the same average for these, the total of motors connected to the mains of all the undertakings furnish about 170,000-h.p. Comparing the present figures of 200 undertakings, which sent in returns a year ago, with their corresponding figures of last year, the rate of increase for the year works out at 57 per cent.

New Zealand International Exhibition.

Executive Commissioners' Office,
Christchurch, 24th November, 1905.

Mr. F. H. Chamberlain, electrical engineer to the Christchurch Tramway Board, is engaged to prepare a scheme for the lighting of the Exhibition buildings and grounds, and for the supply of electrical power for exhibits requiring to be shown in motion. The electric pneumatic organ and a number of side-shows, including the water chute, require a considerable extent of electrical power. In preparing a lighting scheme Mr. Chamberlain proposes to prepare his in such a manner as will give gas lighting an opportunity to display its value, the machinery hall being detached for that purpose.

The Canadian Pacific Railway Company propose to carry all exhibits consigned to the New Zealand International Exhibition from any town in the Dominion of Canada served by their railways, to the port of Vancouver, British Columbia, free of charge. Their object being to promote trade between Canada and New Zealand, and advertise the facilities their combination of railway and steam services offers for economical and prompt transport.

The contractors for the main buildings (Messrs. J. & W. Jamieson, Ltd) have made a start on the grounds with the erection of their plant, and large quantities of material, principally timber, are on the way.

The president of the Nippon Yusen Kaisha (Japan Mail Line) has signified the willingness of his Company to act as transport agents for the Exhibition throughout Japan, and further expresses his desire to promote the interests of the Exhibition in that country

H. M Consul at Portland, Oregon, writing under date the 19th Sept., states that since the closing of the Lewis & Clark Exposition in that City, he has been inundated with enquiries relative to the New Zealand International Exhibition. The supply of Official Notices despatched to him in June last is exhausted and he asks to be furnished with a further supply without delay

Mr W B Leffingwell, of Chicago who recently visited New Zealand on behalf of a syndicate of American newspapers, writing from Chicago under date the 29th ultimo states that interest in the New Zealand Exhibition is quite evident in that city, and he writes confidently of a number of exhibitors and visitors whom he knows intend to attend the Exhibition

Luncheon on the "Maheno."

A number of gentlemen, representing nearly all the branches of our commercial community, assembled on board the "Maheno," at the invitation of Mr James Mills, on Thursday 23rd ult Luncheon was served at 1 30, and afterwards the guests were shown over the ship by Mr Mills and Captain Neville.

Amongst those present were —

Hon Colonel Pitt, M L.C. (representing the Ministry), his Worship the Mayor (Hon T. W. Hislop), Hon T. K Macdonald, M L.C., Mr. Harold Beauchamp Captain Evans, Messrs. Nicholas Reid, A. Turnbull, and W. R. Symons, A. Pearce and D Williamson, W Nathan (Tyser Company), A R Hislop (secretary Marine Engineers' Association), J. Duthie and J. G. W. Aitken M.H R s, G. Allport (Marine Department), William Gray (Secretary Post and Telegraph Department), F. Dyer (Consular Agent for Greece), Philip G Palmer (representing Progress), C M Luke (Luke & Son, Ltd.), W. Cable, William Ferguson (Engineer to Harbour Board) James McLellan (Lysaght & Co.), W. J. Hanlon (Johnston & Co), W Kennedy, the local manager for the Union Company

The "Motosacoche."

Various attempts have been made to arrange an engine and accessories that could be attached to a push-pedal bicycle so as to convert it into a motor cycle. This has been successfully accomplished in an ingenious contrivance called the "Motosacoche," which had a first prominent appearance in Australia in the recent Dunlop reliability motor cycle contest for the Kemsley Cup. In this apparatus an explosion engine, carburetter, accumulator, fuel reservoir, etc., are fixed to a triangular frame of steel tubing, which may be secured to any bicycle by means of seven-winged nuts. The whole is enclosed by two side plates, bulged in front to form a scoop, so as to draw the air past the horizontal flanges on the motor cylinder. The movement of the motor shaft is transmitted by a twisted belt passed about a grooved pulley, clamped on the spokes of the rear wheel. Not the least striking feature of the entire appliance is its light weight. The motor develops 1¾-h.p., and only weighs 15½ lbs. The carburetter, which works perfectly even when inclined at an angle of 45 degrees, weighs but 14½oz. Current for ignition is supplied by accumulators, having a capacity of 24 ampere hours. The coil is situated in the fore part of the engine, only an inch or two away from the sparking plug. The petrol reservoir will hold 2½ quarts, being sufficient for a distance of about 75 miles. Oil is forced into the crank case by a hand pump, contained in the oil tank. Sufficient oil is carried for a run of 125 miles. The total weight of the whole mechanism is but 33lbs., so that a bicycle is increased but little in weight by the addition of the "Motosacoche." Regarding its practicability and efficiency no more need be said but that in a recent endurance race of 620 miles, the first and second competitors were mounted on ordinary roadsters, with "Motosacoche" engines, and ran the whole distance without a single breakdown, beating thirty-seven other makes of motor engines.

Industrial & Commercial.

Messrs. W. M. Bannatyne & Co. Ltd.

FAR back in the dim "forties" the late William McLeod Bannatyne founded the business which still bears the original title. He was joined soon after by his stepson, the late Arthur Rowsell Baker, and together the two started out on a long course of drastic, pioneer work, which practically extended over a period of twenty years. The unremitting care bestowed in fostering the partnership brought with it the inevitable–that steady and, perhaps, mechanical, expansion which supervenes on the systematic foundation of a business.

In 1877, when the firm had attained considerable proportions as a mercantile institution, Mr. Harold Beauchamp was induced to join in the capacity of salesman; and twelve years later he became a full partner. On the death of Mr. Baker, Mr. Bannatyne having predeceased that gentleman, the entire business fell into Mr. Beauchamp's hands, and the transformation of a private enterprise into a limited company was almost

MR. HAROLD BEAUCHAMP.

immediately proceeded with. As chairman of directors Mr. Beauchamp's duties would be thought to be sufficiently onerous and time-taking to warrant the exclusive supervision of his firm's affairs; but, being ably supported by Messrs. Walter I. Nathan and Frank Dyer, as co-directors, and by Mr. William Brown as secretary, he is enabled to devote a large amount of his administrative ability towards the development of industrial and other enterprises.

Mr. Harold Beauchamp may, in reality, be classed as one of New Zealand's busiest men, still, he finds time to take a keen interest in any movement for the promotion of our colony's welfare. He is not a politician, for he has repeatedly refused spontaneous requests to become a candidate for Parliament, and for the mayoralty of Wellington, holding that business and political or civic duties are incompatible with high commercial aspirations.

Besides being chairman of directors of Messrs. Bannatyne & Co., Mr Harold Beauchamp is on the board of the Bank of New Zealand, and is chairman thereof pro. tem. He is chairman of the New Zealand board of the Ocean Accident and Guarantee Corporation of London Ltd., Wellington Patent Slip Co., Ltd, and the Wellington Piano Co., Ltd; a director of the Gear Meat Preserving and Refrigerating Company of New Zealand, Ltd., Wellington Gas Co., Ltd. Equitable Building and Investment Co., of Wellington, Ltd., and the New Zealand Candle Co., Ltd.

Mr. Beauchamp has been a member of the Wellington Harbour Board since 1894 when he was selected by the ratepayers of the city to be their representative. He held the chairmanship of the Board for three years in succession–a record for the Wellington Harbour Board. In 1900 Mr. Beauchamp was a member of the Royal Commission appointed to investigate the question of federation as affecting New Zealand; and, as will be remembered, the Commission reported against the proposal of this colony joining the Commonwealth.

It is a coincidence that Mr. A. Macintosh, the General Manager of the Bank of New Zealand, while serving the Commercial Banking Company in Sydney in the "sixties," was associated with Mr. Beauchamp's uncle, Mr. Henry Heron Beauchamp, who was then a director of that bank.

Messrs. Bannatyne & Co. hold a number of important agencies, of which the following are a few:–The Tyser Line Ltd., The Oceanic Steamship Co., Royal Insurance Co., China Traders' Insurance Co., Nobel's Explosives, Curtiss and Harvey Ltd., T. C. Williams Co., Apollinaris Co., Ltd., Udolpho Wolfe & Sons, and J. Dewar & Sons, Ltd.

The friends of Mr. John Gell, formerly manager of the telegraph station at Wakapuaka, will be interested to learn that the company formed by him to manufacture his instruments for rapid telegraphy is now on the high road to success. When Mr. H. J. Thompson was in London, from whence he has just returned, he visited the factory and saw some of the instruments at work in Mr. Gell's laboratory. The factory is quite an extensive place, and employs about 20 hands, most of whom are skilled mechanics capable of executing the very fine work necessary in the manufacture of instruments. The company have spared no expense in fitting up the factory as they are assured that there will be a big demand on their output.

MESSRS W. M. BANNATYNE AND CO.'S OFFICES AND WAREHOUSE.