PROGRESS

With which is Incorporated

THE SCIENTIFIC NEW ZEALANDER.

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Progress

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The Scientific New Zealander.

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EDITORIAL COMMENT.

The Proposed Fast Mail Service.

IT would be a pity if the brilliant service which the Prime Minister of this Country did at the Conference, by producing his very practical proposals immediatlely after the failure of the Preference resolution, led to no practical result. Those proposals were seized upon by all sides of the Conference table as a Heaven sent blessing to relieve the tension. They succeeded in very effectually relieving that tension while the orator of the Conference who had presented that body with a splendid phrase,—declaring the best of all possible bonds of Empire to be "The bond of the free," had nothing more to offer. Sir Joseph Ward, as the leader of at all events the Australasian section of the Conference, gave the Conference a practical policy. Now the practical policy is very well embodied in a paragraph in the Governor's speech, and it will be a thousand pities if it does not get any further. That part to which we alluded on a recent occasion, the proposal for a fast mail service on an all red line, which shall connect this country by a 20 days bond with the seat of the Empire which the Conference was engaged in building up, has received considerable attention since the Conference broke up. According to a recent newspaper communication the proposal finds the public mind divided between two opinions—that of the experts who speak with the professional accuracy without which they must never appear in public print, and the opinion of the laymen who are permitted to indulge in those hopes which to the professional man are publicly "tapu" The laymen have confidence apparently that there is nothing in the way of the project. The former give it as their opinion that successful as the 20,000 ton steamers may be on the Atlantic section of the sea voyage, nothing smaller than a tonnage of 30,000 will do the voyage on the Pacific section in the time required for securing a 20 days service. Assuming this to be "bed rock," there is here a reason for not giving up the idea of a fast service, but for accepting the fastest that the present state of engineering can produce. When that is found, it will be well. After that, any day human invention, stimulated by the enormous prizes offered by ocean travel, may be reasonably expected before long to bring the vessels up to the rates of speed originally intended, and without much extra expense. The great thing is to get the service started, for not until it is started will the Empire and its dependencies be in a position to take advantage of the opportunities offered by the development of invention.

Christchurch Exhibition.

IT seems that the loss which the treasury authorities are expecting to have to admit as the direct financial result of the Exhibition is something in the neighbourhood of £60,000. This is the probable debit balance of the accounts of the concern. Were there no other considerations in the case it might still be held with good show of reason that as a mere advertisment of the rapid development and present status of this country, the Exhibition has earned its cost, large as that cost looks on paper. Fortunately, however, there are in the case other considerations. In the Railways statement for the year 1906-7 just published, it may be seen that, on the one hand, the revenue collected during that financial period exceeded the takings of the preceeding period by £279,000, while, on the other, the estimate for the takings of the period succeeding—the period now current—is less than the revenue received during its predecessor by £75,000. We may fairly regard this sum as representing the official estimate of something not likely to recur; in other words, as the net gain accruing to the railway system from the Exhibition traffic. If we are wrong, then that gain must be a larger slice of the increment of £275,000 shown by the figures of the Exhibition year over its predecessor. To avoid the possibility of controversy we will take the minimum, relying on the official estimate, at the above £75,000. Now as the Customs Revenue is usually affected by the same events and in the way as the Railway revenue we may confidently put down another £75,000 for the special Exhibition contribution from the Customs to the revenue. Assuming another £10,000 as the Exhibition contribution from other sources of revenue to the Consolidated Fund, we get as the Exhibition contribution a total of exceptional general revenue of £160,000. If the debit balance of the Exhibition separate account be subtracted. there is left a real net profit on the Exhibition account—using that word in its broadest sense—of £100,000. It is a fair reward for the enterprise which while informing the outer world of the position and resources of this country, assembled for its people a collection of the wisdom and achievements of the world, for the study of experts, enabling them to make comparisons and deductions and to develop plans for future improvements and progress.

Progressive Work for Parliamentary Committees.

OUT of the ruck of the past year four subjects suggest themselves as imperatively requiring the attention of Parliamentary Committees, and the decision of Parliament. These are the new Murray Marine Structures; the Mono-rail of Mr. Brennan; the multiplication, for the various soils climates and elevations of this country, of the system of Experimental Farms which has proved so successful at Levin, Momahaki, and Ruakura in the North Island; and last but not least the forcing forward of some large comprehensive scheme of tree planting. The Marine Structures, and the Mono-rail speak for themselves, in connection with defence, harbour improvements, and roading. The need for the teaching of results under the varying conditions of our agriculture is self-evident. The fact that we de-forest 40,000 acres annually and replant but 1400, while our timber supply will not last more than 75 years, is alone sufficient to make the Legislature forsake all business to concentrate on the proper provision for the planting of trees.

Mastery of the Air.

DAILY MAIL COMPETITION TRIAL OF ÆROPLANES.

Disappointing Results.

This enterprising paper has reduced the hopes of some recent "flyers" to pulp.

Great interest was shown in the trials of the model flying machines entered for the "*Daily Mail*" competition, which were held by the Aero Club of the United Kingdom, in the Alexander Palace, on 13th April. The enthusiasm of the crowd was somewhat damped by the many failures, and their sense of humour not infrequently aroused by the comical evolutions of some of the machines, especially when, after one dismal failure, Mr. Hewitt Griffin threw a paper dart into the midst of the hall, which flew a great deal better than the two preceding aeroplanes.

The preliminary tests took place inside the building, in a large hall. Several of the machines either dropped to the ground or performed weird evolutions. The trials appeared to prove little or nothing. There was little to be learnt, and nothing startling was accomplished.

The only two machines worthy of mention were Mr. A. V. Roe's aeroplane, propelled by elastic, and Mr. W. F. Howards' diamond shaped glider, driven by clockwork. Mr. Roe's machine came as a welcome surprise after the first few unsuccessful attempts, and in its first flight almost reached the net at the end of the open space. The second attempt was even better, while at the third a boundary was scored.

Mr. Howard's device, which consisted of a diamond shaped kite, with its sides slightly bent upwards, and two uprights low down, on one of which the clockwork motor and propeller were situated—was attached to a long tape, and sailed gracefully across the open space.

A further test was held in the open air, on a downward slope. Here again the machines entered by Messrs. Roe and Howard were pre-eminently successful. That run by the latter gentleman, however, seemed to swerve somewhat on occasions. In its best flight it traversed 108 feet 6 inches. Mr. P. W. K. Clarke's machine, which did not distinguish itself in the hall, behaved much better in the open, and travelled 80 feet. No first prize was given, on the ground that none of the competing machines behaved sufficiently well to deserve it. Mr. A. V. Roe therefore was awarded the second prize of £75, and Mr. W. F. Howard the third prize of £25.

But an aeroplane exhibition without the Wright Brothers is like Hamlet with the Prince left out. These two young Americans have, without doubt, gone furthest in aerial navigation, but their success has largely been due to secrecy, and so they did not take part in the Islington exhibition. Curiously enough, they were first inspired to experiment by seeing the toy made by a French cripple named Penaud. Until 1903 their machine was merely a glider, with its tail in front instead of behind. On 17th December, 1903 a motor was used, and one of the brothers flew for 59 seconds against a strong wind. Two years later they covered 94 miles in six flights. One witness who saw a 21 mile flight, said that he wished he could control his automobile as well as Orville Wright managed his big flying machine. It is remarkable that such success should have been achieved by men who had so little money to back their experiments. Their invention has become the centre of public interest in aerial locomotion circles in both England and America. In a recent issue we gave a fine illustration of the machine, worked by one of the brothers. The most interesting query of the day is—"Is he the first man to fly?"

Professor Alexander Graham Bell, Peter Cooper Hewitt, A. M. Herring, Israel Ludlow, and the Wright brothers will compete in a contest that has just been arranged for 14th September, at the Jamestown Exposition grounds, Norfolk, Virginia.

The Wright brothers will use their improved flying machine, and the others are all building new machines of the heavier than air type.

It is stipulated that the successful machine must fly at least 1000 feet and start under its own power.

SOME ACCIDENTS.

The loss of the two military aeronauts recalls the stories of former balloon fatalities and narrow escapes by flood and field. Of these the first naturally to recur to the mind is the loss of the balloon Saladin, with Mr. Powell, M.P. for Malmesbury. On 10th December 1881 Mr. Powell ascended in the War Office balloon Saladin with Captain Templer of the Rifle Corps and Mr. Agg-Gardner of Cheltenham, to take meteorological observations. The balloon started off at 35 miles an hour, maintaining the speed to Exeter. Finding there was danger of being carried out to sea, the aeronuats tried to come down. For some reason, however, this proved difficult; the car got near the ground, but instead of coming down tore along dragging at a tremendous rate. The balloon being out of control, the aeronauts determined to quit. Captain Taylor and Mr. Gardner jumped out promptly, but Mr. Powell hesitated, and while he still hesitated, the balloon relieved of the weight of the other two suddenly rose up into the air and sailed swiftly out to sea. It was never seen or heard of again. The belief in aero circles was that the rapidity of the ascent caused an escape of gas sufficient to asphyxiate the unhappy rider who had lost the opportunity of jumping. The balloon corps, however, continues its functions just as the submarine goes on regardless of accidents. The loss of the Aldershot balloon the other day is the first fatal accident in the war balloon department since the disappearance of Mr. Powell.

The phenomenon of obstinately dragging along the ground at a furious rate was first made known by the exciting trip of M. Nadar, the famous aeronaut photographer of Paris, in the year 1862, in the heyday of the Second Empire. This aeronaut disbelieved in the balloon as against the aeroplane, and conceived the idea of building an immense balloon in order to raise funds for the cost of experiments in natural flying. He availed himself to that end of the principle of the "compensator," by which a second balloon within the main balloon was supplied for the purpose of receiving the excess of gas produced by dilatation and so prolonging the power of the balloon to stay up in the air. The balloon named, "Le Geant," was a leviathan, 200 feet high, equal to a pressure of 6,000 metres of gas, employing 22,000 yards of silk, and supporting a weight of 4½ tons. It started from Champ de Mars with fifteen passengers, *viz.*, M.M. Nadar (Captain) Marcel, Louis, and Jules Godard, all well known aeronauts (lieutenants), the Prince of Seyn-Wittgenstein, Count de Saint Martin, M. Tournachon, seven others and one lady, the Princess de la Tour d'Auvergne. The last named happened to be passing by and seeing the balloon, pressed so hard to be taken in, that Captain Nadar could not find it in his heart to refuse. When all was ready, Nadar mounted into the network, took off his hat to the big crowd and started the machine with orders to let go.

The following rules made by the Captain were subscribed to by the passengers before the start:—

1. Every traveller before mounting must study the rules and engages himself to obey during the whole of the voyage.
2. The command shall be absolute and there shall be but one captain.
3. The Captain's authority is always to be decisive.
4. Every passenger declares that he carries with him no inflammatory materials.
5. Passengers must co-operate in all the manoeuvres, submit to all the necessities of the service, and must not on landing quit the balloon without the Captain's permission.
6. Silence must be observed when ordered by the Captain.
7. Victuals and liquors carried up by the travellers must be deposited in a common canteen, of which the Captain alone holds the key.
8. The duration of the journey is entirely for the discretion of the Captain, as also the question of taking on or putting off of passengers.
9. All gambling is strictly prohibited.
10. No passenger to throw overboard anything.
11. Weight of luggage per passenger limited to 30 lbs.
12. No smoking except with the Captain's permission which naturally can only be given under exceptional circumstances.

When the balloon had attained a height of 4,000 feet her people saw the sun and afterwards described the effect as marvellous, and as having thrown them into a sort of ecstacy. The balloon took a north-easterly direction, but at nine in the evening suddenly came down at Borcy near Meaux, and dragged badly for about a mile. The passengers all had to take to the ropes and some of them were considerably injured and all were alarmed. It is related that Captain Nadar showed so much anxiety about the safety of the fair princess that she rebuked him. "Every one to his post," said the sprightly little lady; "You keep to yours and I will keep to mine." Later when all were landed safe but bruised, it transpired that they had decided on the sudden descent because they were under the impression that they were near the sea and were being blown out. As a matter of fact, however, they were going on a course which would have kept them over dry land till they reached the Caspian.

Soon afterwards Nadar made another ascent, this time with only eight passengers and carrying Madam Nadar. At nine o'clock they were over Erquelines, and by midnight they were over Holland. From time to time it was necessary to descend to take bearings. Nobody on board slept, so great was the excitement, conjoined to the fear of falling into the sea which was present to everyone's mind. "In the morning after a frugal breakfast, made in the clouds we redescended. An

immense plain was beneath us; the villagers appeared to us like children's toys, rivers seemed like little rivulets, it was magical. The sun shone splendidly over all. Towards eight o'clock we arrived near a great lake. There we found our bearings and announced that we were at the end of Holland, near the sea." A violent gale arose, the balloon began to race for the ocean. the anchors were hurriedly thrown out but the momentum of the "Geant" snapped them off short, and after a brief rise the balloon fell and began a fearful and giddy career. All disappeared before them, trees, thickets, walls, all broken or burst through by the shock. Sometimes it was a lake into which the car plunged, then a bog, the thick mud of which entered their mouths and eyes.

"It was maddening," writes one of the passengers. "'Stop! Stop!' we shouted, enraged with the monster who was dragging us along. A railway was before us, a train passing. It stopped at our cries, but we carried away the telegraph posts and wires. An instant afterwards we perceived in the distance a red house—I see it now—the wind bore us straight for this house. It was death for all for we should be dashed to pieces. No one spoke. Strange to say those nine persons—one of whom was a lady—who were clinging to a slender screen of osier, for whom every second seemed counted, not one had any fear. All tongues were mute, all faces were calm. Nadar held his wife covering her with his body. Poor woman, every shock seemed to break her to pieces. Jules Godard then tried and accomplished an act of sublime heroism. He clambered up into the network, in spite of the shocks, which were so terrible that three times he fell on my head. At last he reached the cord of the valve, opened it, and the gas, having a way to escape, the monster ceased to rise, but it still shot along with prodigious rapidity."

Suddenly a forest appeared on the horizon: the voyagers must leap out at whatever risk, for they felt that the car would be dashed to pieces at the first collision with the trees. One jumped and made numerous somersaults falling upon his head. Another was stretched on the soil fearfully wounded, his arm broken, his chest torn, and an ankle dislocated. Nadar had a dislocated thigh, his wife had fallen into a river. But after a time the travellers were picked up, vehicles were brought and they were thus conveyed to Rethen in Hanover. In seventeen hours they had made nearly 275 leagues

During the siege of Paris there was a great deal of ballooning, and it showed the same lessons, *viz.*, that it was impossible at times to know the direction, equally impossible to steer out of danger, and very difficult often to perform the simplest functions of aeronauting. The services were performed by experienced aeronauts, such as Tissandier, Nadar, de Fonvielle, Durouf, Godard and others, some of whom had made as many as 800 ascents. and all knew their business well. The first thing they found out of course was that there was no getting back to Paris. That difficulty was, however, to a certain extent got over by sending carrier pigeons with the balloons, which brought messages back of often valuable import, such value in fact that had the conditions of the struggle been less one sided the fate of the besieged might have been changed effectually. The sailors of the French navy did very good service with these balloons. Said one of them one day when asked about the trip he was about to make "Sir, our topsail is high, and hard to reef, but we shall sail all the same, and we shall, please God, arrive at some port." Another set of men utilised for the service were the professional acrobats from the circuses and street shows. These were not so reliable as the sailors, nor were they so faithful, sometimes escaping down a guide rope leaving balloon passengers and mails in a tight place. But out of 64 balloons despatched, no less than 57 fulfilled their mission so that the authorities had some right to claim that their service had on the whole been a success. The total number of persons who got out of Paris was 175, the weight of despatches carried was nine tons, and the number of letters reached 3,000,000, and the speed varied from 20 to 50 miles an hour for the most part, in one instance getting up to the phenomenal figure of 80.

When Gambetta got away in the "Armand Barbes," he got within shooting distance and for a long time the Prussian needle guns were very busy trying to riddle holes in him. He had an extremely narrow escape.

Now for the casualties. Three balloons soon after the start of the service fell into the hands of the enemy, and after that, as it was seen that the Prussians were prepared with relays of Uhlans on the roads to follow, and guns of special calibre to shoot, the balloons were sent off only at night. This, however. exposed them to a new danger, the danger of being taken anywhere but where they wanted. One night the "Ville d'Orleans" rose from Paris with one aeronaut and one passenger and with a north wind blowing it was hoped she would reach Tours in due course during the night. But towards morning the travellers heard the sound of surf under them and when day broke found themselves suspended over the sea out of sight of land. They saved themselves from falling into the sea by throwing away bag after bag of their despatches, and eventually they landed among the wilds of the back country of Norway.

Very shortly after that the "Jacquard" went up in charge of a sailor named Prince, sailed down the English Channel without being able to turn landwards, and hung suspended for a few moments over the Land's End. During that interval Prince threw out his despatches, when he ought to have opened his air valve. As a consequence of his blunder, the balloon rose up at once and darted out with him over the Atlantic disappearing for ever more.

The "Jules Favre" followed soon after, and found itself not at Lyons where the skipper expected to be according to the set of the wind, but over the island of Hoedic in the Atlantic and driving furiously seawards. Fortunately the larger island of Belleisle still lay between them and the open ocean. It was seen that they would have to pass one end of it which was very narrow, and that they must either land there or be lost. They tore open the valve with frantic energy, brought the balloon down a thousand feet in a few minutes, and luckily succeeded in striking land. The shock was terrific. Three times did the balloon bounce into the air, and at last, catching against a wall, shot the occupants out on to terra firma. They were badly injured but received much kindness and attention from the people of the country.

Some weeks later the "Richard Wallace" got away down to La Rochelle, the people called out to the aeronuat to descend, but he, losing his head threw out ballast frantically and was carried to sea never more to be heard of. Two other balloons fell into the enemy's country and that completes the record of the casualties during the siege of Paris.

These stories enable us to realise how the Aldershot officers got out of hand with their balloon the other day.

Attack on the North Pole.

Wellman's Balloon.
The Fate of Andre.

Where André died Wellman hopes to reap success. He is not waiting for aeroplane developments, being content with the "Dirigeable" balloon. With this type the French military authorities have just announced a great success.

Mr. Wellman believes that his new balloon will easily carry him and a party of four or five men, with twelve dogs, and the necessary provisions and equipment, from Spitzbergen to the Pole in from ten to twenty days. They will never ascend more than 300 to 500 feet, and their guide-rope will trail over the surface of the earth. This guide-rope is absolutely essential to the safety of the balloon's navigation, and is of considerable weight. It is made of leather, 15 inches thick and 130 feet long, weighing about 1400lb, and the explorers have hit upon the ingenious notion of packing the inside of that guide rope full of reserve food to the amount of 1200lb. The expedition will be able to carry 3000lb of food, or enough to enable them to subsist on their own stores for a period of ten months. If the airship fails as a true cruiser at, or anywhere near the pole, they will descend upon the ice pack, make a snug hut of the fabric and material and pass the entire winter at or in the vicinity of the Pole, returning by sledge the following year. They will carry dogs, sledges, and small boats and complete sledging equipment with this possibility in view.

The Wellman airship ("America") is at present housed at Spitzbergen in readiness for the start. With the single exception of Count Zeppelin's it is the largest ever built—184ft. long and 52ft. at its greatest diameter, giving a total lifting force of 19,500lb. The car consists of a framework of steel tubing, 115ft. long, 10ft. high and 8ft. broad, suspended close under the balloon at such a distance that those standing on the top of the car can easily reach the balloon. The keel or backbone of the airship consists of a steel tank 18ft in diameter and 115ft in length, with a capacity of holding 1200 gallons of petrol. At the stern of the vessel is a rudder of some 900 square feet, in the form of a bicycle wheel, which, despite its great size, only weighs 30lb. A little forward of the centre is placed a very heavy motor, built for endurance and safety, of 70 h.p., and having a weight of 900 lb. In this new airship the propellers are placed in the centre on either side of the vessel. They consist of two blades of steel, 11ft in diameter, and capable of 380 revolutions per minute. The living quarters of the airship are in triangular bunk-like spaces within the enclosed steel car. These are capable of accommodating ten or twelve men, and twelve dogs, together with provisions and equipment. The total weight of the steel car and tank is 1200lb. The motors, screws, and machinery weigh 1350lb. The petrol tank carries 6800lb of petrol, capable of running the motor for 150 hours at a normal speed of 14 knots per hour. The weight of the cargo diminishes on an average of 600lb per day by the consumption of petrol for the motor, but, deducting gas leakage, the net result is that the airship has on an average day 450 to 500lb of lifting force no longer required. The utilisation of the waste gas as fuel will augment the motoring vitality by 30 hours, increasing the radius of action to 2500 miles, double the distance to be covered.

The expedition is now at Spitzbergen and proposes to start in the present month sometime for the Pole.

The ....Motor.

MOTOR NOTES.

By "Accumulator."

Sooty Cylinder.

It is a very important item in the case of the engine to mitigate the constantly recurring troubles arising from sooty deposits in the cylinder.

This accumulation is due to a variety of causes—too much oil in cylinder—bad quality oil—faulty mixture and combustion—and also road dust.

It is advisable from time to time to inject a little kerosene into the cylinders—it is no good doing this on starting out for a run as the kerosene is immediately expelled with the exhaust gases—rather do it on stalling the car at the end of a run.

I saw a good plan suggested in a Home contemporary—it was to fit a small cup to the injection pipe providing it with a tap—then just before stopping the engine fill the cup and turn the tap on—then almost immediatelly switch off—the kerosene is therefore sucked in and covers the walls of the cylinder.

Road Dirt.

It is not properly realised what a large amount of road dirt is sucked through the carburetter into the cylinders of a car—but a moment's thought will make it plain that this dust and dirt must play an important part in sooting up the cylinders. This condition of affairs may to a very small extent be improved by a wire gauze baffle—though I think that some experiments with say sponge or cotton wool as a filter would produce good results—Have any of our readers investigated in this direction ?

Light Motor Cycles.

It is wonderful the way in which the light motor cycle has taken on all over the world. We may expect to see in the future a great advance in this direction, and many more makes on the lines of the Mota-Sacoche machine will place this form of locomotion within the reach of all ; the great economy of the Mota-Sacoche is sufficient guarantee of this—since the lightness of the maintenance bill is what is required.

Mishap and Relief.

Mr. Cleland's "Stewart" car will soon be on the road again—it will be remembered that a few weeks ago he had the misfortune to be precipitated into the creek on the Ngahauranga Gorge while on the up grade. Just as he was taking a curve, the bank gave way, with the result that the car rolled over sideways, making two somersaults, and landing on its side 15 feet below.

Marvellous to relate, no one was hurt, though everyone admitted to feeling very badly shaken. It was fortunate that Mr. Garnet Holmes, who was on his way up to Palmerston on Messrs Holmes & Allen's fine "Clement," arrived at the right moment, and he was able to convey the party back to town ; returning with a staff of men to rescue the car.

Motor Stamps.

Bosnia and Herzegovina have adopted a stamp with a motor mail van on its face, a departure which may be adopted in other countries before long. This form of acknowledgment of the utility of the self propelled vehicle is, for the present a novelty.

A Deserved Compliment.

Prince Fushimi is reported to have been greatly interested during his visit to the Alexandria Works of Argyll Motors, Limited, on the 20th May last and to have complimented the directors who received him upon the magnitude of the business in hand, as well as upon the plant of their organisation.

About Speeds.

When you run a mile in

Min.	sec.		Miles per hour.
5	0	You are running	12
4	30	,,	13⅜
4	0	,,	15
3	30	,,	17⅛
3	0	,,	20
2	25	,,	21 4-5
2	30	,,	24
2	15	,,	26¾
2	0	,,	30
1	50	,,	32¾
1	40	,,	36
1	30	,,	40
1	20	,,	45
1	10	,,	51½
1	5	,,	55½
1	0	,,	60
	59	,,	61
	58	,,	62⅛
	57	,,	63¼
	56	,,	64⅛
	55	,,	65½
	54	,,	66¾
	53	,,	68

A Clean Body.

I have used a splendid preparation for cleaning the body work of cars ; it is called "Sacabolite"—it is made up in two gallon tins and consists of a thick brown liquid ; to apply it, put about half a cupful into a bucket of warm water and then sponge it on after all mud has been removed, next finally wash off and dry in the usual way—the beneficent feature of Sacabolite is in the way it removes grease and leaves a good lustre on the paint work. The Stewart Co. stock it here, and I would advise our readers to give it a trial.

The Trolley Head.

Mr. Garnet B. Holmes of Messrs Holmes & Allen has left New Zealand for a trip to America, England and Europe with a view to closing several negotiations in connection with the well known trolley-head. It is his intention also to look closely into the motor car industry with a view of securing the "best things" to bring back to New Zealand. He expects to be away about a year.

Novel Comparisons.

A correspondent of *The Railway News* has established the following instructive comparisons between a train, a horse bus. a motor bus, and an electric tramcar. A train seat is carried 420 miles for 3s.; a horse bus seat 26 miles for 10d.; a motor bus seat 34 miles for 1s.; and an electric tramcar seat 60 miles for 7d. Also a seat in each of the foregoing vehicles is carried 185,640 miles for the respective total amounts : train, £66 6s.; horse-bus, £357 ; motorbus, £273 ; electric car, £90 4s 10d. I observe that the motor-bus cost is taken at the high figure of 1s per mile.

THE ALL IMPORTANT CARBURETTER.

A carburetter functions correctly if—

(1) The degree of vacuum in the float feed chamber remains normal at all speeds.

(2) If the proper relative proportions of petrol and air remain constant at all speeds and at all degrees of opening of the throttle valve.

(3) If before gaining access to the cylinders the petrol is absolutely atomised and completely blended with the air.

Air Cooling.

At first one is inclined rather to pooh-pooh air-cooling, as there are several minor disadvantages, such as the smell of burnt oil and the great quantity that one has to use ; also in place of the radiator, the open space protected by wire, which leaves the cylinders exposed, makes the engine more noisy than one hears with a nicely fitting bonnet. On the other hand, one does away with the water arrangements. which, of course in certain countries, is an immense advantage. The time has not yet come for dogmatising on the point. For the present it is certain that some very reliable runs have been done with the air-cooler in rough country.

Nuts and Bolts.

The use of a spring washer with Castle nuts is excellent practice but very rare. As regards the easy handling of bolts and nuts on cars, I have strongly advocated that all bolts be fitted with a "screwdriver notch." This costs little and weighs nothing, does not weaken the bolt head, and allows of it being either held or turned with great ease and with a tool which is universally available. Of course, large bolts well screwed home must be started out with a spanner, but they can almost always be driven the rest of the way with a screwdriver, thus saving much time. —A correspondent in *Auto-Car*.

Motoring, Near Sight, and Danger.

If, as the speeds of the motor traffic increase, the sight of the motor driver were also to increase the case against allowing the near-sighted to grapple a driving wheel would be less strong. It makes one think ; one must know all the points of the motor, and have a license after proper test. But one must also see ; and there must be a test of that. Some people think this test should be similar to the test of locomotive drivers' sight, though not necessarily quite so severe, although to be really effective it should not fall short of the severity of the test for a locomotive driver ; and other people who urge that short sighted men hunt, shoot, golf, etc., forget that these men have nothing to do with the control of a moving vehicle ; therefore they are not suitable to be cited as examples in comparison with an automobile driver. As regards the case of a cyclist, well ! logically he ought to be subject to test also, most certainly if he runs a motor cycle and

takes pride in running it up to 40 miles an hour on the road and 60 on the hard beaches of the ocean. If he insists on an unsafe pleasure, this man ought to be made as safe as possible.

Make Gas Valve Stems Longer.

"This," writes Mr. Ferguson of Belfast to a leading Auto journal "is an everyday job with us, and our method, which we have found to be most successful, and we feel certain would be interesting to your readers, is as follows:—Braze a piece of tool steel to the end of the valve stem; before this has had time to cool, plunge in water to harden it, and grind same to correct length. This makes a splendid job—in fact, better than new, as the end of the valve stem has a perfectly hard surface, and wears much longer. Also there are fewer loose parts, and consequently less wear than in the methods recently suggested.

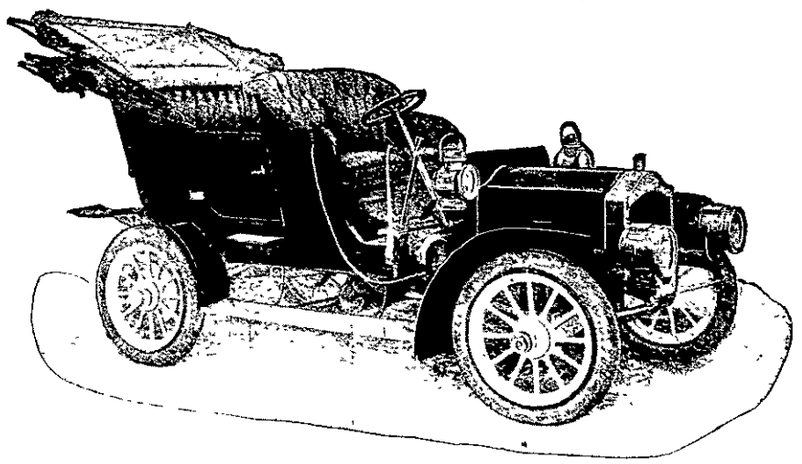
About a Low Sun.

Who has not ridden or driven in the early morning or the late afternoon with the level sun blinding him? All who have had that experience know how impossible it is to see anything on the road in front. It is the same with motoring, and for the motorist it is the same as tearing along in the dark with both eyes shut. Now smoked glass enables you to look the sun in the eye and see quite plainly without inconvenience. Every motorist ought to carry a pair of smoked glasses; without them there will some day be a terrible accident.

Catering for the Moderate Man.

Writes another enthusiast—"One hears much of the car for the man of moderate means. To fulfil his requirements it should be one of moderate price and one that requires a minimum of adjustment and attention, for in many cases he must dispense with the services of a chauffeur. For these reasons four-cylinder cars have certain obvious drawbacks, and cars of one cylinder are not to be recommended if above 8 h.p. Therefore, the man of moderate means who requires a car of about 12 h.p. must confine his search to the two-cylinder variety. All of these, if with vertical engines, possess, I believe, the undesirable features either of applying their engine impulses irregularly, or if with both pistons acting on the same crank, and firing alternately, of being wanting in balance.

The two-cylinder engine with horizontal opposed cylinders obviates both these disadvantages and also possesses many advantages over the vertical type. The crank case can be made more accessible, and the crank bearings can be easily inspected and adjusted. A pump can be dispensed with, as thermo-syphon cooling can more readily be made efficient.



MODEL D, RUSSELL 2 CYLINDER 18 H.P.

A Big Trip in a Small Car.

A record of achievement by a practical man has much impressed us—Car, 8 h.p. 1905 Darracq tonneau, accumulator and coil ignition, driving tyres 700x90, non-slipping Dunlops; weight of driver and passenger about nineteen stone, as much luggage as tonneau would hold, three spare covers, spare can of petrol, etc.—in all, equal to more than three people. The following is the record; voluntary stops, stops due to over-throttling when standing, and stops due to empty petrol tank are not counted against the car: This thing started from Glasgow in July 31 of last year, and on to Carlisle the first day 95 miles, and got to Fowey in the remote end of Cornwall (travelling by Chester, Hereford and Exeter) on August 4th, spent the rest of August touring round Fowey in the highest part of Cornwall, travelled back by Barnstaple, Bath, London, Granton, Darlington, and Dumfries to Glasgow, arriving there on September 10th.

The Record of the Same.

July 31st.—Glasgow to Carlisle Non-stop—95 miles.

Aug. 1st.—Carlisle to Chester. Non-stop.—137½ miles.

Aug. 2nd—Chester to Hereford Burst tyre. One stop. 94 miles.

Aug. 3rd—Hereford to Exeter. Burst tyre, one stop.—142½ miles.

Aug. 4th—Exeter to Fowey. Non-stop.—74 miles.

Aug. 5th to Aug. 31st.—In one of the hilliest parts of Cornwall, touring from Fowey as centre One gear box stop, one loose wire stop—532 miles.

Sept. 1st.—Fowey to Bideford, Westward Ho, and Barnstable. Stops owing to severity of gradients, shed passengers, chocked wheels, raced engine, and banged in clutch. No other compulsory stops.—91 miles.

Sept 2nd.—Barnstaple to Bath. Non-stop.—100 miles.

Sept 3rd.—Bath to London. Non-stop.—108 miles.

Sept 4th to Sept. 6th.—Car not used. Accumulators charged, tyres changed, no other adjustments.

Sept. 7th.—London to Grantham. Loose wire, One stop.—110 miles.

Sept. 8th—Grantham to Darlington. Puncture, several stops to inflate, and finally tube changed.—120 miles.

Sept. 9th.—Darlington to Dumfries, *via* Barnard Castle, Brough, Penrith, and Carlisle. Loose wire finally adjusted. One stop.—106 miles.

Sept. 10th.—Dumfries to Glasgow. Puncture. One stop.—80 miles.

Total number of miles, 1,795.

Average speed (stops excluded) Glasgow to Fowey 16.1 m p.h. (no acetylene lamps).

Average speed Fowey to London, not taken (no acetylene lamps).

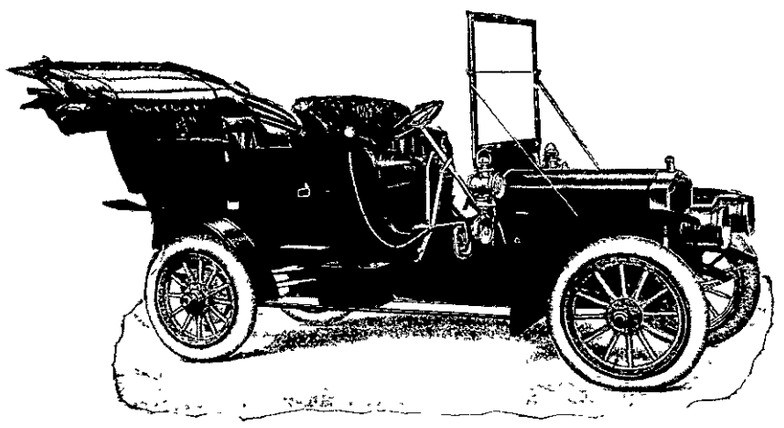
Average speed London to Glasgow, 17 5 m.p.h. (no acetylene lamps).

Mileage per gallon of petrol, approximately 29.

There was thus only one mechanical stop of any consequence in about 1,800 miles running, of which 548, 300, and 416 were continuous day-after-day journeys. This one breakdown was due to tilting over the washer between crankshaft and gear box shaft, thus disengaging the clutch. Further, between July 12th and 19th the car had done a non-stop trip (tyre trouble and loose switch excluded) in the highlands, extending to 464 miles, only ordinary adjustments like valve grinding being done between this and the start of the long trip. Some days after returning from London, and without any adjustment beyond ordinary oiling and greasing and one tyre change, the car took four people a non-stop run of 136 miles at 18.8 miles per hour, and did 32 miles to the gallon of petrol.

How the tyres and the transmission mechanism stood the strain I was obliged to put upon them to get up certain Cornish hills I cannot imagine. At least six times it was necessary to race the engine at its hardest and let in the clutch in the most heart-breaking style. I am inclined to think that this record, taking into account the size of the car and the gear racking work performed in Devon and Cornwall will take some beating on the score of reliability, even in the matter of speed, when it is remembered that time lost over wrong turnings, asking the road, and all such minor delays, is counted in the running time, and that a good many hours of driving were after dark and with only paraffin side lamps, the average for the South and North journeys is very fair.

I have absolutely no interest in the Darracq Co., and while by no means considering that my car is faultless, as so many writers consider their cars, I think my journeying is a proof of more than average merit in a small car set to do heavy touring work over all roads and in all weathers. E.T.



MODEL F, RUSSELL 4 CYLINDER 40 H.P.

A Company is being formed for the purpose of erecting a first-class motor garage on Lambton quay, Wellington. The building will have four stories and basement with showrooms on the ground floor. In addition, the usual appurtenances of a garage will be provided for, such as repair shop, social rooms, and ladies and gentlemen's retiring rooms. The architect, we understand, is Mr. William Turnbull.

The Tariff.

The most important item to motorists in the recent tariff revision is undoubtedly the remission of the 20% duty on British cars. We do not propose to discuss the nature of this remission as opposed to the increase of 10% (20% in all) on foreign built cars, but it is self evident that the change will greatly enhance the sales of the British machine—sales which throughout the Colonies exceeded those of all other countries' makes by 75%.

"Cow Catchers for Cars."

"Cow-catchers" on motor cars may be seen shortly. Mr. J. F. Ansell, a London barrister, who was induced to consider the subject by seeing a man pinned under the wheels of a car in Trafalgar Square, is patenting an invention which is now under official consideration. This life guard is V shaped, sloping from top to base, and projecting beyond the wheels and mud guards, so that a person struck would roll off away from the vehicle. The guard is made to strike below the knees, and the base has a pneumatic or resilient covering. It is said to be practical for all kinds of cars.

One difficulty for inventors, however, is that many cars are already of regulation length—twenty-three feet—so that a protruding cow-catcher would make the vehicle illegal. In the case of small fast cars another difficulty has been that at high speeds all the proposed life-saving apparatuses investigated have been more likely, than otherwise, to drop on the victim and crush him.

In Praise of the Steam Car.

Perhaps the most noticeable point in the development of the modern touring carriage is that during the last three of four years the steam car has enormously improved. This form of power (an English expert writes) was, from the first, terribly handicapped on account of the extremely rubbishy little vehicles which were originally imported into the country, and which created the greatest prejudice against the system as a whole.

Things now, however, are very different, and there are on the market several types of steam cars which give great satisfaction to their owners; and one of the most noticeable facts in touring about the country is that one sees an ever-increasing number of motor-cars thus driven. One cannot get away from the fact that a two-cylinder double-acting steam engine exerts a steadier and smoother drive than do six-cylinders with petrol, while a single cylinder double-acting steam engine has the same effect as regards the turning movement of the crank shaft as have the four cylinders of the petrol engine.

Moreover, it is to be remembered that the gear box, with its trains of cog-wheels, the delicate carburetter, together with the whole ignition system is swept away when fuel is burnt externally instead of internally. Some steam vehicles burn paraffin, and run over fifteen miles on a gallon of it, at a cost of sixpence. There is a tendency in some quarters to adopt a Pecksniffian attitude towards steam cars, but from many sides one learns that the public is now beginning to be considerably interested in them.

MOTOR-RACE TRACK, BROOKLANDS, ENGLAND,
On which S. F. Edge will be pitted, in a 6-cylinder 60 h.p. Napier, against the world.

Look to Your Steering Gear.

The following extremely awkward happening has come under our notice.—"The rod connecting up the steering lever to the front wheels dropped off when the car was being driven through the streets of a town. Luckily, the car was travelling in a straight line and very slowly, otherwise there might easily have been a very serious accident. In this particular steering gear there was quite a lot of side wear on the unhardened socket and on the sides of the hardened ball, and, through lack of inspection, these were allowed to become so worn that the steering rod fell off the ball, thus leaving the car unsteerable. Now, had the joints been examined and lubricated, this would not have happened, as, in the first place, lubrication would hake reduced wear, and, in the second, examination would have revealed what was actually happening."

We might write three columns on this incident, but it would be useful only to those who have not sense enough to come in out of the rain. Such are not to be found amongst the readers of Progress.

We need only, by way of conclusion, refer to the late accident in Italy. Five persons were driving towards Naples on a cliff road, when their car, without warning, simply turned towards the precipice and plunged off the road, killing every one of its passengers with horrible mutilation. The above paragraph is a clear exposition of the probable cause of that fearful catastrophe. We say again: "Look to your steering gear!"

ACHIEVEMENT STRANGER THAN FICTION.

An adjustable hall is one of the many useful and desirable developments of the building art which have hitherto been supposed to belong to the region of dreams. We learn, however, from an American paper that the thing is now an accomplished fact. A new theatre, at St Paul, U.S.A., is capable of conversion, from a vast auditorium, seating 10,000 people, into a theatre with less than half that seating accommodation. Apparently there is no need for the audience to move during the transformation process. If the audience does not come up to the expectations in point of numbers, it is quite possible, apparently, to reduce the building to more convenient dimensions without incommoding anybody.

Thus was it done in the above theatre for a concert after a big meeting:—"At a signal from A. H. Stem, the architect of the building, the electric motor concealed from view was started and the cables attached to either of the sixty-ton masses of steel which go to make up the movable boxes tightened. Each side of the house began moving towards the centre, enclosing the audience, slowly but surely, the ends of the boxes nearer the stage moving in graceful curves, the end further from the stage remaining stationary. . . . . As the boxes began moving outwards the scene shifters began their work. The sectional sides were erected around the chairs of the orchestra, the canvas ceiling was lowered to meet the sides, and when the boxes had reached their destination the stage setting was all in place. Then came the lowering of the proscenium sides. A section of the ceiling on either side of the proscenium opening began to descend. It was discovered that each section carried with it a long frame structure covered with asbestos and exactly fitting the ends of the boxes. When the proscenium sides were in place the spectators realised that instead of sitting in one end of a big convention hall they were sitting in a theatre, with the stage, while looking small, yet having a proscenium opening of 60ft, and a depth in proportion."

Building & Architecture.

The Architectural Editor will be glad to receive suggestions or matter from those interested in this section. Address: Architectural Editor, Progress, *71 Lambton Quay, Wellington.*

Electrolysis in Armoured Concrete.

One of the strongest recommendations for the use of armoured concrete, and for the use of concrete as a protective envelope for structural steel in tall buildings is the fact, or the belief, that concrete effectually prevents the corrosion of the imbedded material. As far as we are aware, nothing has transpired where concrete has been used for structural or protective purposes under normal conditions to shake this confidence.

The question has recently been raised, or rather revived, as to whether, under certain conditions, the steel of reinforced concrete may not be subject to the destructive effects of electrolysis. The revival of interest is due to some experiments recently made by Mr. A. A. Knudson, of New York, and reported a few weeks ago to the American Institute of Electrical Engineers. The experiments were carried out as follows: some blocks of one-to-one Portland cement sand concrete were moulded in a common metal water pail, with a piece of 2-inch wrought-iron pipe placed vertically within the blocks to a depth of about 8 inches. When the blocks were three years old one of them was placed in a tank of sea water, and another in a tank of fresh water, with direct current to feed to the iron pipes in the centre of each block, the negative electrode consisting of a piece of sheet iron placed in the tank. A third block, similar to the other two, was placed in a tank of sea water but was not subjected to the electric current. After a period of thirty days the last named block was found to be in perfect condition and the imbedded pipe was perfectly right. But the other two blocks which had developed cracks during the test, were easily broken open: yellowish deposits were found in the cracks where the concrete had deteriorated to such a degree that it could be cut easily with a knife: and the pipes were considerably corroded, showing a loss of weight of over 2 per cent. Similar results were obtained in tests with blocks of standard Rosendale cement, made in the same mould, although in this case the blocks were tested thirty days after they had been made. The cracking of the concrete appeared as early as the sixth day of the test, and by the eighteenth day they looked as though they might fall apart. One of the pipes showed a corrosion similar to the pitting action of underground electrolysis, a hole $\frac{3}{8}$ by 1 inch being formed through the wall of the pipe.

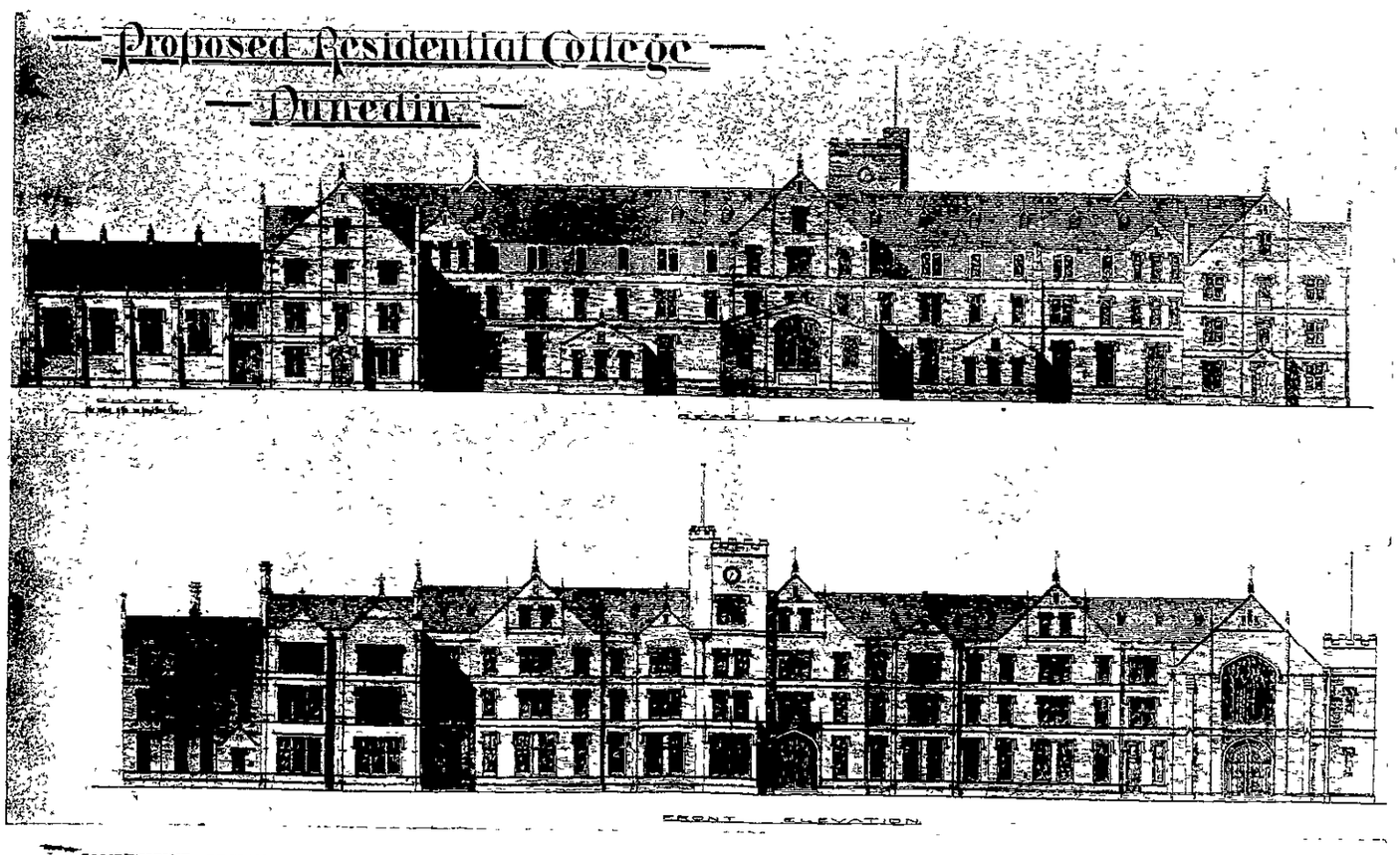
It cannot be denied that these results are of profound significance. They call for careful investigation on the part of concrete engineers, and the provision of special means of insulation in all cases where imbedded structural steel, of the reinforcing material of armoured concrete, is liable to attack by stray currents in the neighbourhood of wet foundations. The whole subject of electrolysis which, because of the exaggerated use to which it has been put by a sensational press, has not received from technical men the attention which it deserves, should be made the subject of a searching investigation with a view to determining the laws and limits of this form of corrosion. The existence of a valuable building material is menaced, and the preventive is simple.

A Big Chimney.

The American passion for big things will be gratified by a huge chimney now being erected near New York. It will rise 506ft. above the top of the foundation, and will have an internal diameter at the top of 50ft. The size of the chimney has been proportioned for leading off 4,000,000 cubic feet of gases a minute, with a maximum temperature of 600 degrees Fahr. The gases, mainly from the smelter furnaces, will travel 2,000ft through flue ducts before reaching the chimney. The total dead weight of the chimney is estimated at 17,000 tons. The scaffolding for the chimney from the inside will be quite a feature, and four electric lifts will be employed to carry up men and materials. The contractors expect to finish the chimney in about twelve months. The contract price, without foundation, is about £40,000. Except for the Eiffel Tower and the Washington Monument, this chimney, when built, will be the tallest structure in the world.

Liability of Architects.

In Britain, the architect is liable for accident to his assistant whether employed in the office or superintending buildings in progress, provided the assistant is not in receipt of a higher salary than £250 a year. He is also liable, according to the opinion of the learned counsel, for accident to articled pupils. But the question of compensation obtainable is complicated and difficult, depending on the earnings (if any), the age, and the length of service of the apprentice or pupil. Finally it is pointed out that an architect who works for commission is not in the position of servant to the building owner and could not recover compensation for accident to himself.



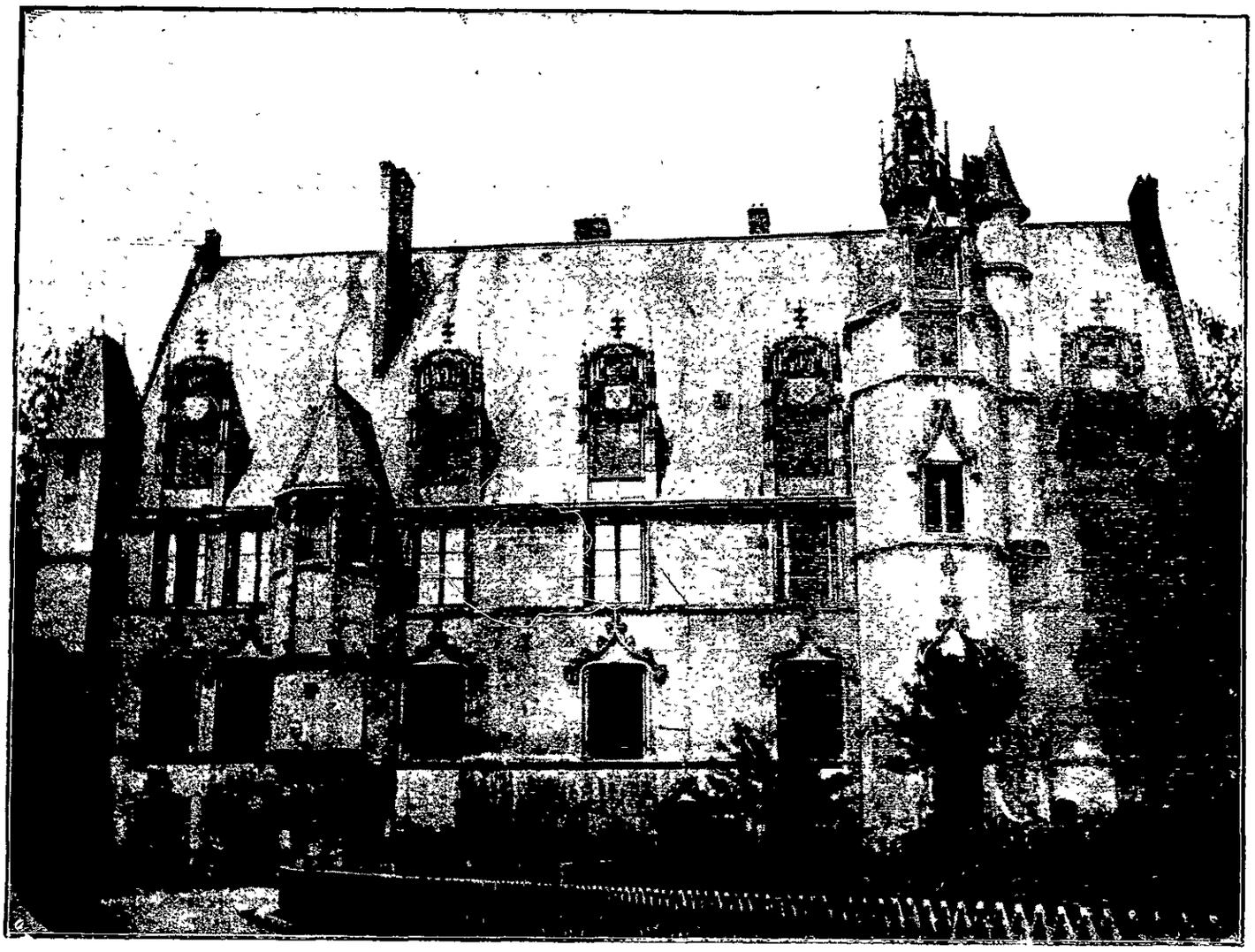
COMPETITIVE DESIGN OF F. DE J. CLERE, F.R.I.B.A., OF WELLINGTON. A NOBLE PILE, BUT BEYOND THE MEANS OF THE AUTHORITIES.

ARCHITECTURAL ANTIQUES.

In this issue we present to our readers three Old World pictures which cannot fail to be of extreme interest to all lovers of the Artistic. One of these is a view of the old Bishop's Palace at Beauvais, in France. Generally speaking the beauties of the Cathedral in this city overshadow those of its other buildings, and there is a tendency to overlook the Architectural gems which are scattered about its quaint streets and which charm the eye at almost every turn. It is the architecture of the North of France that is probably the most interesting of any that was in vogue in the Middle Ages, and it was here, it seems almost certain, that the pointed style had its birth and was brought to that perfection which has made Gothic the most poetical, as perhaps it is the most wonderful, of all architecture. During the decadent period of Medieval Architecture, the taste of the people ran very much towards the production of buildings rich in ornament, and with comparatively small unbroken spaces, as is exemplified in England in Henry VII.'s Chapel at Westminster, King's College Chapel at Cambridge, St. George's at Windsor, and elsewhere. In this design at Beauvais this fault is not so apparent, for though parts are highly ornamented, there is a certain air of repose given to the whole edifice by the large extent of unbroken walling lying between the windows. It will be observed that heraldic devices play a large part in the scheme of ornament, as it did in the English work of approximately the same period, and which is absent from the earlier periods of Medieval Architecture. Although the building has been adapted to modern requirements, in the main, it is evident that the original design has not been materially altered for good or bad, and there is a harmony in the work which is wanting in another building which we illustrate, namely, Oriel College, Oxford. Here we note a distinctly Gothic basis in the building, the six principal windows being well designed and decorated, but the porch and bay windows are Elizabethan while the gables and the pediment over the three niches must have been added fully a hundred years later. Notwithstanding these defects, if we can call them such, there is a marvellous charm about these old buildings, not only in their form and colouring, but on account of the actual personal impress which the builder of the period, in which alterations or additions have been made, has left upon them. However incongruous a design may appear to the critical lover of absolute correctness, the mellowing influence of Father Time has softened down those incongruities to such an extent that it is only by a reasoning process that they are observed. Why the original corbel-table and parapet came to be removed it is hard to imagine; we can only suppose that the architect of the year during which it was condemned did not consider it up-to-date, and so it had to give place to the meaningless row of gables which have stood to this day. The description of the next building should be put into the hands of a poet rather than in those of a prosaic writer of "Progress." Is it possible to imagine a more inspiring piece of English cottage life? Sheltered from the north and east by the beautiful limestone rocks which are half draped by ivy and other vegetation, the whole presents such a picture of cosy, sunny happiness as to make the onlooker almost feel that the lot of the humble lodge-keeper is perhaps as enviable as that of the occupier of the mansion to which this is only an adjunct. The simple materials of which the cottage is constructed show that good effect is not always a matter of cost, and we cannot wonder at the reaction which is now setting in against the vulgar tawdriness of design which has for some time characterised most of the buildings erected by our middle classes, and at the growing popularity of the simple outlines of the work of Voysey, May, and Newton, and others, to say nothing of some of our own architects whose work shows an originality and a power to suit their buildings to the surroundings of the place, and to the requirements of our people which, though perhaps not appreciated by an unthinking public, is undoubtedly most commendable.

THATCHED COTTAGE, ENTRANCE TO ORDNEY PARK, FRENCHEY, BRISTOL. [*C. Dillworth Fox, Photo*]

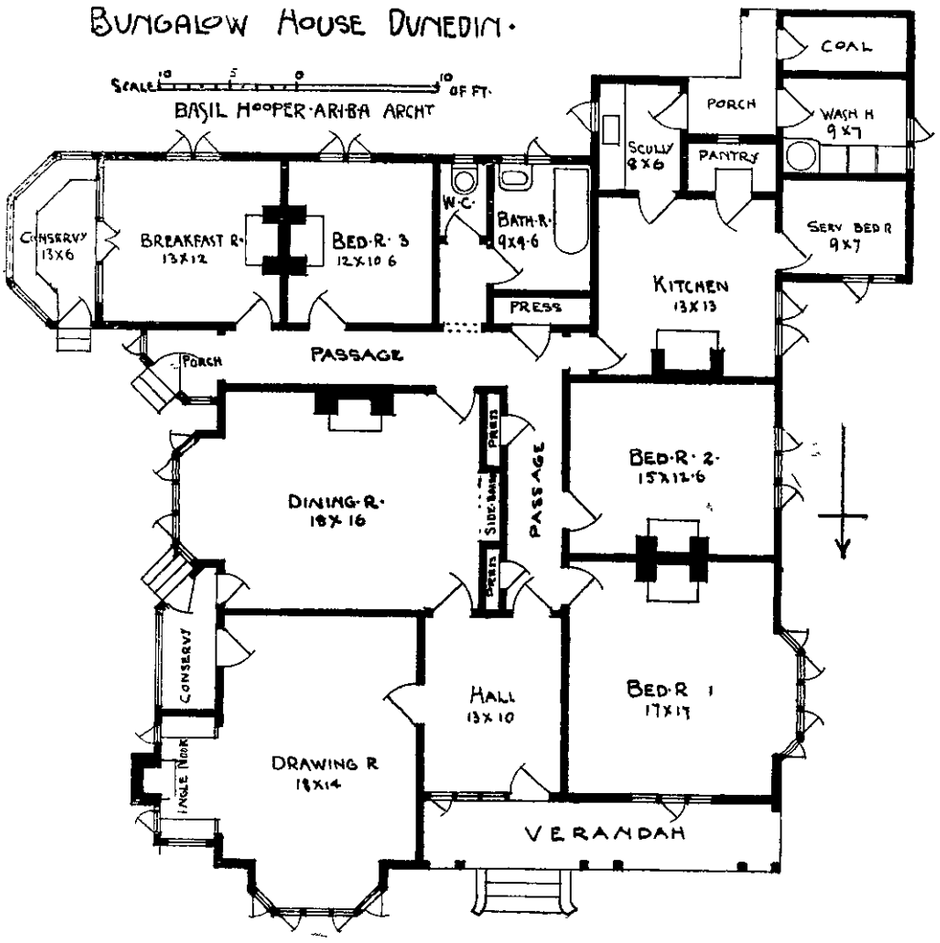
The application of the motor to agriculture in France is steadily growing, and the month of May has seen another company for the exploitation of agricultural motor vehicles come into existence at Arras. This company, which is called the Société des Automobiles Agricoles, is calling up a working capital of only £10,000. Its *raison d'etre* is the selling or loaning of tractors, wagons, and all kinds of motor vehicles applicable to agriculture, all of which are to be supplied under contract by a company now forming at Arras, which second company will carry out the work of constructing the vehicles, will undertake all repairs, and will place garages at the disposition of the Société des Automobiles.



MUNICIPAL BUILDINGS (FORMERLY BISHOP'S PALACE), AT BEAUVAIS, IN FRANCE. (*C. Dillworth Fox, Photo.*)

ORIEL COLLEGE, OXFORD [*C Dillworth Fox (Scargill, Canterbury), Photo.*]

A PRETTY DUNEDIN HOME [*B Hooper, Architect*]



A PRETTY DUNEDIN HOME (GROUND PLAN)

Notes.

A cottage is in course of erection at Lowry Bay for Mr. John S. Swan. Contract price £520. Contractors. Davis & Browman.

* * * * * *

The new class rooms and latiine building for St. Patrick's College are in course of erection. Contract price £2,500. Architect, John S. Swan; contractors, Davis & Browman.

* * * * * *

A residence is in course of erection at Lowry Bay. Contract price, £679. Architect, John S. Swan; contractors, Page & Anderson.

* * * * * *

Plans have just been completed for a large residence in Timaru, the special features being the large size of rooms, the combined size of drawing room and breakfast room, when folding doors are open, being about 70′ x 17′. The entrance hall is 25′ x 15′. Architect, B. B. Hooper, Dunedin.

The contract for the erection of a tea kiosk at Miramar has been let at £1450. Architect, John S. Swan; contractors, Young & Pettey.

* * * * * *

Mr. H. Alexander, Petone, has signed the contract for the erection of a residence at Trentham. Contract price £900. Architect, John S. Swan.

Humphries' Scaffold Bracket.

By the last Canadian mail we received an interesting communication from Mr. G. E. Humphries, the inventor of Humphries' Patent Scaffold bracket, which was fully illustrated and described in our issue of 1st November, 1905.

Mr. Humphries reports that he conducted his first demonstration at the Windsor Hotel in Montreal, and the tests were so satisfactory that orders totalling 300 brackets per month for the province of Quebec were at once booked. Shortly after this, Mr. Humphries received an urgent order to supply 150 more per month, this time from New Brunswick, making a total of 450 secured within a few weeks of the inventor's arrival in the Dominion. Cable advice received by the Wellington Scaffold Bracket Company since the above communication was written, states that Mr. Humphries had received orders for upwards of 5,000 brackets. We wish Mr. Humphries the fullest measure of success in the exploitation of his excellent device.

N.Z. State Coal.

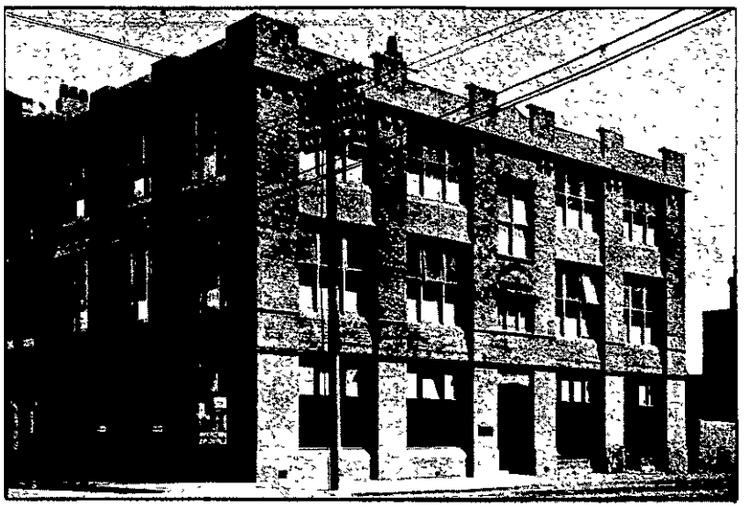
It was recently stated by the Under-Secretary for Mines that the supply of State coal is not sufficient to meet the requirements of the Railway Department, and Westport coal was obtained to supplement the supply. Regarding briquettes, he said the works had not been completed a fortnight ago. The works had not been idle, and as to there being no market for the output, that was a rash statement, as the briquettes had not been placed on the market. The briquettes were not friable, and as to their commercial value, that was another matter that had yet to be proved. On the cost Mr. Hamer was diplomatic; said he, "This remains to be seen."

TYPICAL CANTERBURY HOME (DR. BRITTIN'S HOUSE, CHRISTCHURCH)

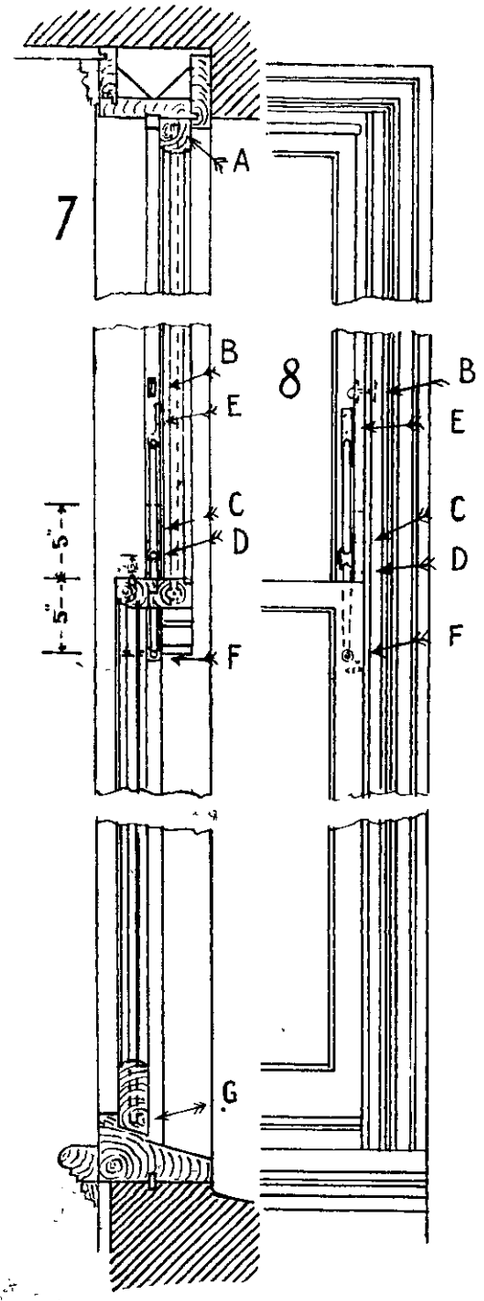
THE AUSTRAL SASH BALANCE.

A REVERSIBLE WINDOW WITHOUT WEIGHTS OR CORDS.

The acknowledged deficiencies of the ordinary window sash have led from time to time to many attempts at improvement. Some of the inventions in this direction have disclosed considerable appreciation of urgent requirements, and they may be classed amongst the many successes which have characterised the varying phases of building construction during the past decade. The Austral Sash Balance, however, makes a very reasonable claim to superiority in respect of ease and safety of inside cleaning, and has already commended itself to practical architects and builders, having been largely adopted in Wellington and other centres of the colony, as well as in Australia, America, and Europe.



SCHOOL OF DOMESTIC INSTRUCTION, CHRISTCHURCH
(FITTED THROUGHOUT WITH THE AUSTRAL SASH BALANCE.)



CROSS SECTION AND ELEVATION.

A. and G. indicate position in which bolts are fitted in centre line of sash, the pins of which run in a groove in the frame.
B. Sash screw used to secure upper section of parting beads, which are removed temporarily during cleaning.
C. Point at which parting beads are cut.
D. Screw plate on which balances are pivoted.
E. Screw plate attaching end of balance to upper sash.
F. Bolt securing other end of balance to lower sash.

Our first illustration shows how the sashes are attached to either end of metal bars pivoted in the centre and supported on screw-plates, the screw-plates in turn being attached to the parting beads on the frame. The effect thus produced is that the sashes are evenly balanced and can be moved up and down in the frame guided by means of fixed pins fitted to the sashes and running in a groove in the frame. Only a minimum of force is required to overcome the friction of the pivot, and between the sash and frame, so that a child can readily move sashes weighing up to 100lbs. By this system the rattling and jamming of sashes and breaking of cords, which are the attendant evils of the weight-and-cord windows, are all entirely overcome, and a perfectly smooth-running pair of sashes is the result. Improved ventilation, which is now admitted to be a question of vital importance by medical men, is secured by the Austral Sash, for it opens in such a manner that the volume of draught tends in an upward direction, rendering possible free ventilation without a direct draught and the resultant cold in the head. For this reason the sash is being adopted for factories, hospitals, and school buildings, one of the latter being illustrated herewith.

Ease and safety in cleaning, as before mentioned, is a most important feature in the Austral Sash Balance. The outside glass of both sashes can be readily cleaned without leaving the room, thus obviating the extreme risk of standing outside on the sill—a course which so often leads to fatal accidents where high buildings are concerned; and the timid housekeeper will not only find a new delight in the improved order of things, but the large employer of labour will experience, no doubt, material reduction in his accident insurance premiums, following on the installation of the system in his factory.

Another of our illustrations shows the top sash swung into the room for cleaning. The full simplicity of its movements must be seen to be properly appreciated, but it will be sufficient, however, to state that both sashes are suspended at a convenient angle during the operation of cleaning, and there is absolutely no weight upon the operator, nor risk of breakage.

We are informed that orders are now on hand to fit the Austral Sash Balance in the following Wellington buildings:—Office of the Wellington Publishing Co.; warehouse for D. Anderson & Son, Molesworth Street; Irvine and Stevenson, Brandon Street; W. H. Turnbull & Co., Panama Street; and other buildings; and we understand that arrangements have already been made for the introduction of over 2000 sashes in New Zealand. (*For further particulars see page* 385.)

TOP SASH, REVERSED FOR CLEANING.

A New Departure.

A novel feature in tunnel design devised by Mr. Charles M. Jacobs, the chief engineer to the Pennsylvania tunnels under the Nadson river, is found in the screw piles, which will be placed at intervals of fifteen feet throughout the length of the tunnels. While the silt forming the bed of the river is sufficiently tenacious to hold the tunnels in perfect alignment during construction, it was not considered firm enough to do so when they are in use. To forestall this possible danger screw piles will be sunk to a solid foundation, and upon them the tunnel proper will rest. The piles will be 27 inches outside diameter, and the shell will be 1⅛ inches thick. The sections will be 7 feet in length, and will be bolted together through internal flanges. The lowest section will be cast with one turn of a screw 4 feet 8 inches in diamerer.

The Gas Cooking Record.

Norwich has in use 18,000 gas cookers and 18,000 slot gas meters, and this total is not equalled by any other city of the same population—just over 100,000.

Seddon Memorial Technical College,

CHRISTCHURCH.

North Canterbury, from the earliest days of colonisation well to the front in the cause of education, has recently added to its great services a great achievement by establishing a College of Technical Instruction as a memorial to the lamented statesman who, as ministerial head of the Education Department, had the canse of technical education so much at heart. The Right Hon. R. J. Seddon was never weary during his life of dilating on the necessity for special instruction on all technical lines, without which, he always strongly urged, the industries and commerce of this Country would be unable to cope with the competition of the well instructed, enterprising nations of the civilised world. Nothing, therefore, could be more honouring to his memory than the association of his name for all time with an institution of the comprehensive aims and generous proportions, founded with Government help. according to law, by the people of North Canterbury and now under construction in their enterprising City of Christchurch.

Early History and Present Position.

The story goes back to 1902, a date long prior to the death of Mr. Seddon. In November of that year, a guarantee fund having been established by various public and local bodies, managers were elected by the contributors in accordance with the Manual and Technical Instruction Act. During 1903 Continuation classes were held at Richmond and Sydenham, Continuation and Technical classes in Victoria hall, and Practical classes in workshops rented from the City Council in Armagh street. With the exception of the classes at Richmond and Sydenham, these have been continued up to the present time with such alterations and additions as have been found necessary. The work done has received the cordial support of the public bodies of the district without whose financial support it could not have been maintained. The following is a list of the contributors with the amount of their annual contribution :—

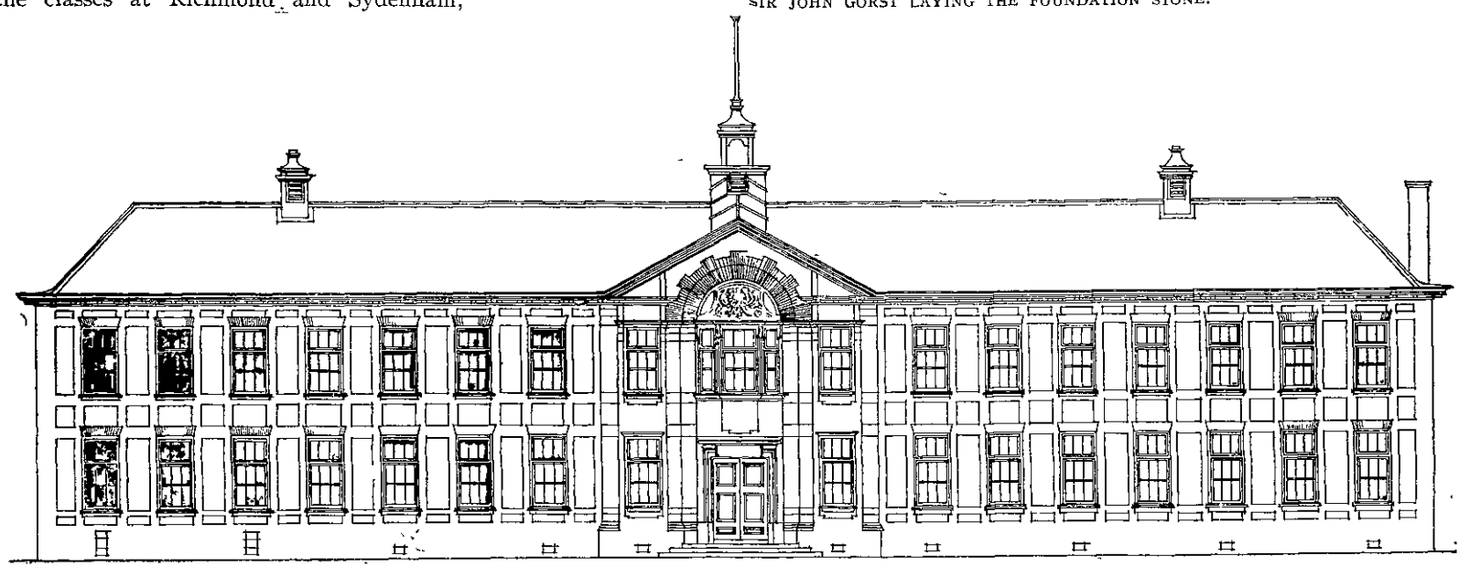
Christchurch City Council	£300	0	0
Selwyn County Council	50	0	0
A. & P. Association	20	0	0
Woolston Borough Council	12	10	0
Sumner Borough Council	10	10	0
Christchurch Drainage Board	10	0	0
Chamber of Commerce	10	10	0
Industrial Association	10	0	0
Employers' Association	10	0	0
Trades and Labour Council	10	0	0
Riccarton Road Board	10	0	0
Trades Unions	20	3	0
New Brighton Borough Council	5	5	0

During the present year classes have been held in the following subjects :—

Principles and Practice of Carpentry and Joinery, Plumbing, Coachbuilding, Cabinetmaking, Tailors'-cutting, Dress-cutting, and Woolclassing ; Building Construction, Builders' Quantities, Drawing, Practical Geometry, Practical Mathematics, Applied Science, Shorthand, Book-keeping, Commercial Correspondence, Commercial Geography, Commercial Arithmetic, Typewriting, English, French, and German.

When the proposal was made to expand the institution to the dimensions of a fitting Seddon Memorial, the Board of Education granted for the site of the new buildings an acre of land at the corner of Barbadoes street and Moorhouse avenue. The site is now the centre of the industrial quarter of Christchurch, and there is ample room for expansion. At a large and representative meeting summoned by the Mayor it was resolved, with only one dissentient, to adopt the Technical College as a local memorial to Mr. Seddon. This, with the addition of an Assembly Hall, Reading Room and Technological Museum,

SIR JOHN GORST LAYING THE FOUNDATION STONE.



SEDDON MEMORIAL TECHNICAL COLLEGE, NOW BUILDING (FRONT ELEVATION).

a Wool department, and a Smith's workshop, will be complete enough to form a worthy memorial to the Statesman whose sympathy with the workers was so keen, and of whose policy the development of technical education formed so large a part. Provision will there be made for thoroughly equipping the workers for their callings and for the cultivation of those wider and more intellectual and social interests which are of such importance in the training of the citizen.

A Technical Day School.

LINK BETWEEN PRIMARY SCHOOL AND TECHNICAL COLLEGE—SCHEME OUTLINED.

The Director proposes that the building and equipment of the Technical College should be utilised during the day for a Technical day school, as is commonly done in the case of Technical Colleges and Institutes in Great Britain. Such a day school has been established with great success in connection with the Wellington Technical School where, in 1905, when the day school started, the entry was 160 pupils, while at the beginning of 1906 the entry was about 280, an

MR. S. HURST SEAGER, ARCHITECT.

increase in one year of about 120. The same has been done in Auckland this year, and the Director understands that there the entry exceeds accommodation. The object of the school would be to provide for boys and girls from about fourteen years of age upwards, such an education as will enable them more readily to become skilled in the occupations which they take up. It is intended, in short, to be to the skilled artisan, mechanic, clerk, or farmer what the ordinary secondary school is intended to be for the professional classes.

Owing to the changed conditions of labour, the old system of apprenticeship is falling into disuse and, where it survives in a modified form the apprentices are required to get instruction elsewhere in the principles of the trade. If, therefore, the supply of skilled artisans and mechanics is to be maintained, a new method of training must be initiated. The Technical day school is intended to lay a sound foundation for this, and if the proper equipment is forthcoming, a pupil who goes through a three or four years' course at the school will be far better able to master what yet remains to be learned of his trade than an apprentice of the same age trained under the old system.

MR. HALL
(Building Construction and Drawing.)

The proposed course of education is briefly as follows:—For the first year the subjects necessary to a sound general education will be taught, such as are indicated in the public school syllabus for standard vii., while special attention will be paid to practical work in elementary science for both sexes, to manual training in wood and metal for boys, and to cookery and advanced plain needlework for girls.

No foreign language will be taught, not because training in them is not held to be valuable, but because under the conditions of our life here they are not at present essential, and their omission will permit more attention to be given to the study of English and more immediately important subjects.

In subsequent years while the instruction in certain subjects will be the same for all pupils, in others they will be allowed to choose their course according to the occupation they intend to pursue. The optional courses will be as follows:—

A. Boys.—(1) Commerce; (2) Building trades; (3) Engineering trades; (4) Agriculture and Horticulture; B. Girls.—(1) Domestic pursuits; (2) Commerce.

When the pupils leave the day school and enter upon their trade, it is intended that they shall continue to receive instruction in its higher branches in the evening classes. It will be seen that the day school will thus form an important link between the Primary School and the Technical College, and, in the case of those who wish to qualify for higher positions in industry and commerce, to Canterbury College. Christchurch will then have, on the technical side as well on the professional side, a scheme of education as complete as circumstances will allow.

It may here be stated that the course in agriculture and horticulture is directly intended to encourage town boys to engage in these pursuits by giving them an opportunity to learn their principles and acquire some knowledge of their practice, and thus do something to counteract the growing migration to the towns.

MR. G. T. BOOTH (closely identified with the movement from the beginning)

MR. HARRIS (of the Staff)

Reasons for a Technical Day School.

(From a memorandum by the Director, Mr. John H. Howell.)

A lad leaves school from twelve to fourteen years of age and is sent to the office or to the shop. If the parents are anxious about the lad's education and he is industrious, he may be sent to the evening classes for three or four nights a week. This means that for half the week the lad leaves work at five or sometimes six, goes home to change and tea, back to classes at seven, and home between 9-30 and 10 p.m. Moreover, if he is to profit to the full, home work must be done equal to at least another evening's work. Any teacher will realise how little can in general be accomplished under these circumstances. This proves the vital necessity for a technical day school.

Suppose on the other hand, that the lad postpones attending evening classes until he is seventeen. Experience shows that for the most part the habits of spending the evening formed in the intervening years are hard to break through, and where the effort is made the power to profit by instruction is to a large

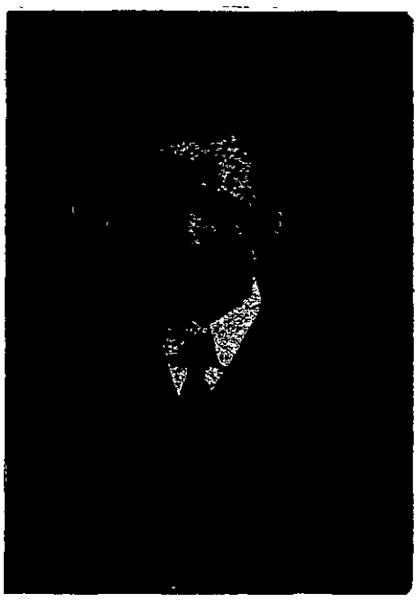
MR. J. MAWSON STEWART
(Book-keeping and Office Routine.)

extent lost. Even a foundation on which to build is wanting; for the knowledge gained in the primary school is forgotten, and the power of concentrating attention has never been acquired,

No one who has had the experience of the work—no one even who has considered carefully the Technical Schools' exhibits in the Exhibition—has any doubt that much is being even now accomplished. There are earnest, able students scattered through the classes who profit fully by what is being done, but they are not one-tenth of the number there should be. The words that were spoken by Sir John Gorst in this connection may be remembered:—

"In the efforts that have been made in the Old Country to promote technical instruction the great obstacle that had been met with was not want of money or buildings, nor good teachers of technical subjects, but it had been the want of preparation on the part of the young men

MR. WYNN IRWIN (Shorthand.)



MR. W. BRIDGE (Wool-classing)

and young women who came to take the instruction they provided. I would like to see this, that the Colony should not attempt to run technical education by itself, but there must be a good, solid foundation, a general instruction, and general development of the intelligence and powers of the boys and girls. Until then technical institutions would not be as effective and advantageous as they might be."

The Director of the Working Men's College in Melbourne told me that they experienced the same difficulty and that they found it necessary not only to establish a technical day school, but also a preparatory lower technical day school. The director of the Technical Day School in Wellington in his last report to the Minister said: "The

Christchurch Technical College.

Controlling Authority: North Canterbury Board of Education.

Board of Management

J. Hight. M.A., Litt.D *Chairman* (Board of Education.)
C. Allison, *Vice-Chairman* (Christchurch City Council).
F. Barlow, A.R.I.V.A. (Christchurch Drainage Board.)
W. M. Bellamy (New Brighton Borough Council.)
G. B. Chick (Christchurch City Council).
W. F. Cooper (Trades Unions).
W. H. Cooper (Christchurch City Council).
T. B. Gaffney (Sumner Borough Council).
T. Gapes (Christchurch City Council).
A. Hart (Trades Unions).
J Hayes (Woolston Borough Council).
F. W. Hobbs (Employers' Association).
W. Jameson (Selwyn County Council).
D. Lumsden (School Committees' Association).
B. P. Manhire (Christchurch City Council).
W. Devenish Meares (Chamber of Commerce).
W. Minson (Industrial Association).
M. Murphy. F.L.S. (A. and P. Association).
G. W. J. Parsons (Christchurch City Council).
C. A. Richardson (Riccarton Road Board).
T. W. Rowe, M.A., L.L.B. (Board of Education).
H. R. Rusbridge (Trades and Labour Council).
Director, Secretary, and Treasurer: John H. Howell, B.A., B Sc.
Assistant Secretary: Miss Beare.
Office: 7 Bowron's Buildings, Manchester St.

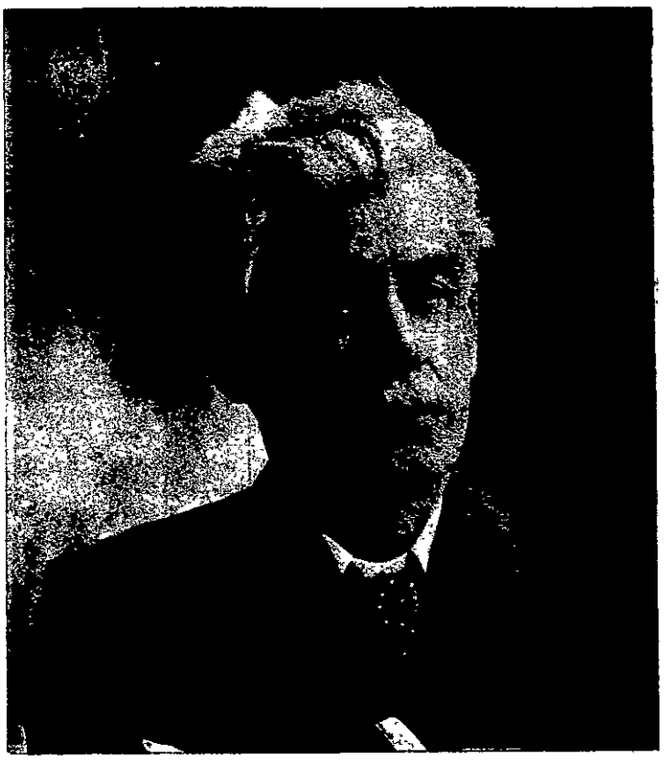
N.B.—The first promoters of the Institution were Messrs. Booth, Hurst Seager, Minson, and Beavan, whose portraits appear in this issue.

MISS CHARLES (Dress-cutting.)

MR. J. WILSON (French.)

MR. W. E. BEST (Book-keeping, etc.

MR. J. H. HOWELL, B.A., B.SC (Director.)

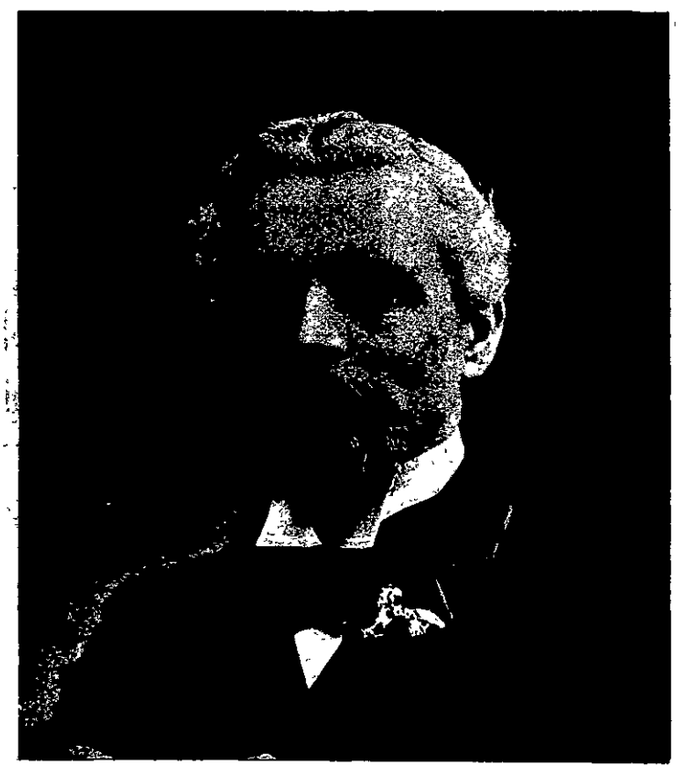


MR. A. W. BEAVEN

Plumbing Classes were the only trade classes in the School that were on a really sound basis and in which really sound work was done." In a conversation I had with him last vacation he said it was to the Technical Day School that he looked for future results. Really satisfactory work in evening classes was not possible under present conditions, and it was only when the day school had prepared students for the office or workshop, had showed them what was the goal at which they must aim, and linked them to the institution which would enable them to reach it, that the education given would be really worthy of the name. *The Technical Day School is the keystone of the structure.*

The instruction to be given in the Technical Day School will be directed to fit boys for the following pursuits :—commercial, engineering, building, and last but not least, agricultural ; and in the case of girls, for either commercial or domestic pursuits. This means only that the studies which the pupil pursues will be in general specially directed to the calling he proposes to take up. No foreign languages will be taught, but special attention will be paid to English. A distinguishing feature of the school will be the amount of time given to the various kinds of practical work—by which I mean work in which a large part of the training is derived from *doing*. Practical work will include laboratory work, domestic science, typewriting, woodwork, metal work, and the drawing in connection with these. The time devoted to these subjects will be about one-third of the total given to instruction, though the amount given to each will depend upon the career to be followed. Those going in for commercial pursuits will, for example, do no metal work, while those intended for agriculture or the skilled trades will do no typewriting. All girls will be required to take domestic economy. The school curriculum will cover about 30 hours per week, and of these about 10 hours will be given to practical work. As illustrating the kind of work to be done, a girl intended for the position of a correspondence clerk would give about five hours to typewriting, four to domestic economy, and one or two to general science ; the remainder of the time being taken up in English, arithmetic, shorthand, commercial history and geography, and bookkeeping. A boy intended for engineering will give about eight hours to drawing and workshop, four hours to practical science and mechanics, the remainder to English, practical mathematics and geometry, theoretical mechanics, and science.

It must be borne in mind that the technical education outlined above needs very special equipment ; and if it is to be economically administered it can only be given at one centre. Take instruction in typewriting only : a good typewriter on the most favourable terms will cost from £10 to £15. If proper instruction is to be given, in a school of fair size at least 30 of these will be needed (at the Auckland Technical College they have 40). This alone means a capital expenditure of at least £300, to say nothing of the special room, tables, stools, and other appliances needed. The building and equip-



MR. W. MINSON (Industrial Association.)

DR. HIGHT
(Chairman of Board of Managers.)

MR. W. SINCLAIR (Commercial Arithmetic).

MR. DALZIEL (Carpentry and Joinery).

MR. CHETWIN (Sign-writing).

ment of a simple laboratory will cost less than £500, and the annual cost for its upkeep for a school of 300 will be about £70.

Similarly for domestic science and workshop practice. All these must be provided, and are indeed already arranged for at the Technical College.

I have had a wide experience and a not unsuccessful career as a teacher, but I say frankly that preparing boys for University Scholarships is child's play compared with the effort required to get satisfactory results from, say—one of our English classes. We want for our evening work teachers in the best physical condition and we can only ensure that by using our own day staff for the evening work and providing for them equivalent relief during the day.

The most successful schools are those where there is a strong *esprit de corps* among the staff. It is impossible for this to exist if their interests are mainly concerned in other institutions. The temporary character of an evening staff is a further serious obstacle to that continuity of work which is so necessary to success.

The Buildings.

On the submission of the plans, the Education Department recommended that one of the three workshops proposed, together with the Assembly Hall, Museum and Reading Room, should be omitted. Seeing that the Assembly Hall is necessary for the proper conduct of the technical day school which it proposes to establish, that a third workshop is urgently needed, and that a Museum and Reading Room would add much to the value and interest of the work done, the Board accepted the recommendation of the Department with great reluctance. The Government then made a grant of £5650 and on the tenders proving too high increased its contribution to £7306.

Whilst recognising the liberality of the Government, the board feels that the work of the Technical College must inevitably suffer if there is no more liberal infusion of educational interests and pursuits than can be effected by class routine alone. A properly conceived Technical College should be to the workers all that a University College is to the professional classes; and it should have as its ideal the fostering of those wholesome, general interests, which are of such moment in moulding character and in cultivating public spirit.

The Government has done its part generously, and it remains for the people of Christchurch to decide whether the work of technical education in their city shall be conducted with broad modern aims, or confined to the narrowest limits.

MR. GREENFIELD (Carriage Building)

MISS BEARE (Type-writing), Assistant Secretary.

MR. KERSHAW (Principles and Practice of Plumbing).

The Phono-Cinematograph

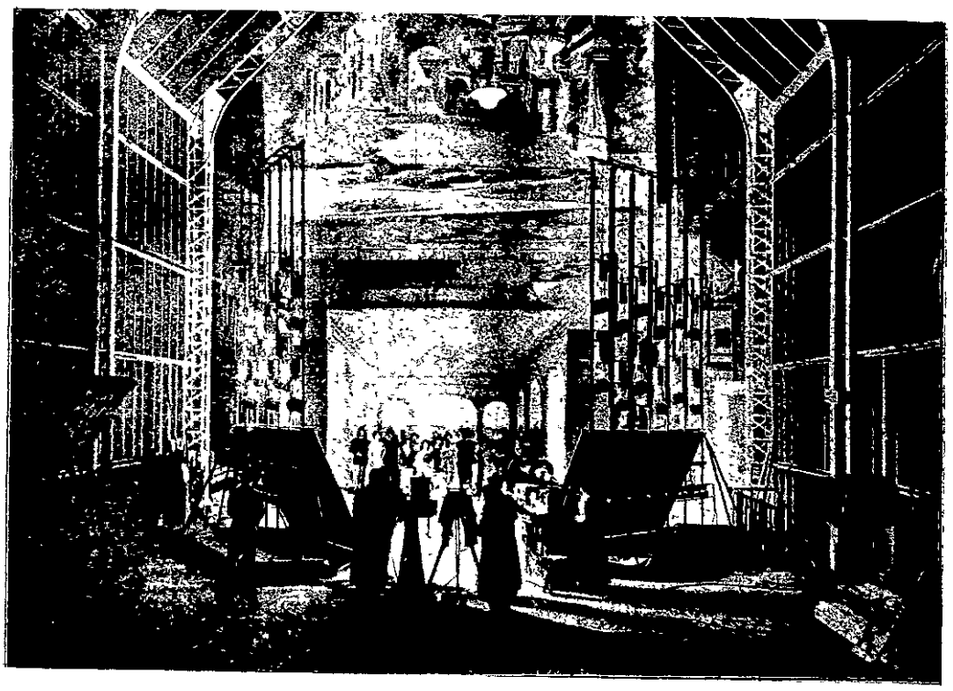
A notable invention which brilliantly fulfils the promise of early days.

This combination of the phonograph and the cinematograph has now become a thoroughly practical success. One for the picture and the other for words or sounds, they instantly seize and afterwards reproduce at will living scenes, enabling interesting and useful records to be preserved of a period, an industry, or an art.

If, separately, the phonograph and the cinematograph record interesting events, it is evident that their combination in one apparatus, producing at the same time a living scene and voices of all kinds which accompany it with rigorous exactitude, presents a far greater interest.

We will describe, in the first place, the phonograph which entirely fulfils these conditions.

The Phonograph.—The phonograph of to-day (1907) is constructed exactly on the same principle as the primitive apparatus of Edison dating back to 1877. It comprises: (1) a plastic surface (cylinder or disc) rotated so that every part passes successively below a fine point of agate. It is upon this surface that sounds are registered: (2) a reproducer diaphragm, consisting of a small cylindrical box one of the ends of which is a vibrating membrane supported by the sides of the box, and carrying in its centre a pencil the point of which serves—either to scratch the surface of the "phonogram," in order to trace thereon a furrow more or less wide and deep, according to the nature and volume of the sound vibrations received by the membrane; or to retraverse the furrow without altering it, to operate in an inverse manner upon the membrane, and make it emit the sounds registered previously: (3) a motor mechanism operated by clockwork or a small motor (generally electricity), giving to the phonogram its rotary movement, and to the diaphragm the corresponding movement, so that the combination of these two movements causes the pencil to traverse regularly over the whole surface of the phonogram: (4) a trumpet mounted above the mouth of the diaphragm, and serving to concentrate upon itself the sounds which it is desired to register, or inversely to amplify the sounds emitted by the membrane when reproducing sounds.



"TAKING" A SCENE BY PHONOGRAPH AND CINEMATOGRAH IN A THEATRE SPECIALLY DESIGNED FOR THE PURPOSE.

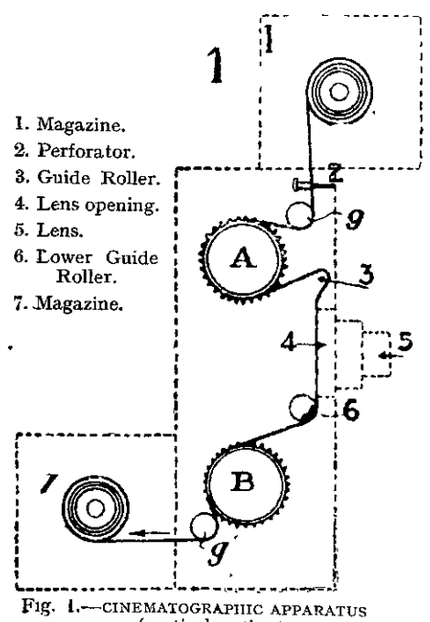


Fig. 1.—CINEMATOGRAPHIC APPARATUS (vertical section).

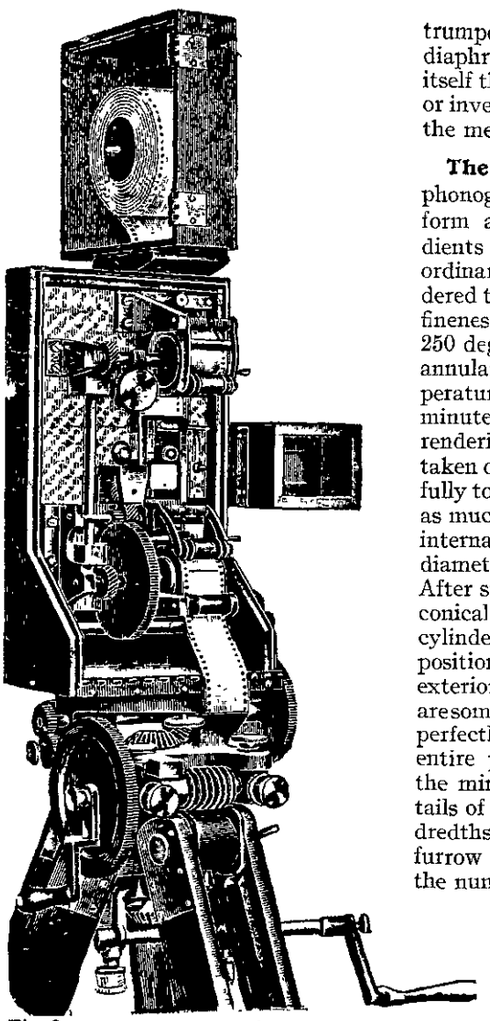


Fig. 2.—CINEMATOGRAPHIC (Rear view).

The Phonogram.—For a considerable time phonograms have been made in cylindrical form and of plastic composition, the ingredients of which are principally wax, or more ordinarily stearine. The composition, rendered thoroughly homogeneous and of perfect fineness, melted by a temperature of about 250 degrees, filtered and purified, is run into annular moulds maintained at a lower temperature, and rotated in order to expel the minutest bulbs of air, which would leave holes rendering the cylinder useless. It is then taken out of the mould, trimmed, cooled carefully to avoid unequal shrinkage, scooped out as much as possible in the intervals between internal ribs, which alone are left to the exact diameter of the mandril of the phonogram. After suitably boring (this mandril is slightly conical to facilitate the introduction of the cylinder and to avoid placing it wrongly in position), it is finally turned and polished exteriorly by a machine (the cutters of which are sometimes of sapphire), and then presents a perfectly cylindrical and smooth surface. The entire perfection of phonograms consists in the minutest exactitude of the smallest details of the impression, because it is by hundredths of a millimetre that the depth of the furrow is measured, and by thousandths that the number of undulations scratched in each centimetre of the furrow is measured; scarcely perceptible, and yet so characteristic that a person can recognise under microscopical examination a special feature, according to the nature of the

voice or the musical instrument which has made the impression.

Receiving & Transmitting Diaphragm.—A diaphragm of either sort consists of a flat cylindrical box of about fifty millimetres diameter, the vibrating plate of which, generally of mica, crystal, or metal, is supported at its circumference by a ring of indiarubber. Above the centre of this plate is a pencil either cemented thereto or mounted upon a fixed rigid arm in such a manner that the vibrations are freely produced. For perform-

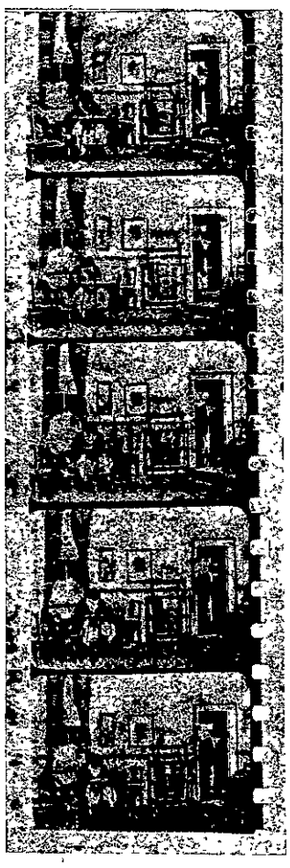


Fig. 3.—SOME FILMS.

ance in a large hall amplifiers are used, which greatly reinforce the effect of the trumpet. Amplifiers of compressed air comprise special diaphragms to which a flexible tube is brought carrying compressed air well filtered. This air escapes into the trumpet carrying on the sound, which it increases. Certain kinds of diaphragms for compressed air have a vibrating plate in the shape of a cone interposed between two other fixed cones, and the air passes in the intervals uncovered by the cone during its vibrations.

The Cinematograph.—The photographic object is exposed a great number of times per second by means of an obturator in the shape of a perforated disc, and gives a succession of instantaneous images of the movable object upon different points of the sensitized plate. In another manner the negative is made by a sharp displacement of the sensitised surface, in this case a flexible film, between two instantaneous impressions. The recording of the scene is easily prolonged according to the length of the film. The apparatus has a head rotatable in two directions and at diverse inclinations, according to the direction in which one wishes to view, and is composed of an upper magazine box comprising a blackened chamber, an object glass, and a lower magazine box for the used films. The size generally adopted for each image is one inch by three-quarters of an inch. At each side of the film, of the number of four per

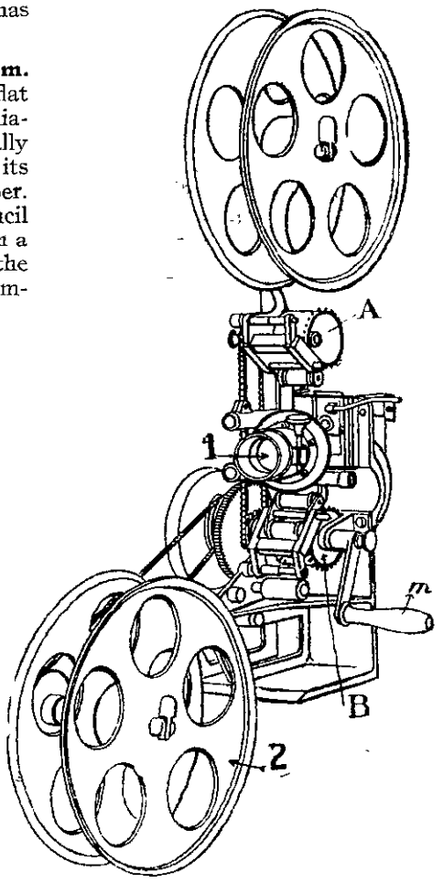


Fig. 4.—CINEMATOGRAPH APPARATUS (Front view.)

image, are perforations which serve to traverse the film as required. Fig. 3 shews a slightly enlarged sample of the band film. The sensitised band unrolls itself from the bobbin in the upper box in such a manner that the gelatine side faces the object, passes over a roller, then over a toothed cylinder (A), which meshes with the perforations; afterwards it descends through a slot which guides it vertically in a position corresponding to the focus of the object. Below the slot is a mutilated toothed wheel, which at each revolution draws the band through a length equal to the height of an image during the time that the obturator is closed. The band passes to a second toothed cylinder (B) around a roller (C), and rolls itself around the bobbin in the lower magazine controlled by a friction brake. All the movable parts, the cylinders, rollers and obturator, are actuated by a single crank handle; the film, therefore, is not submitted to any strain. The lower bobbin, the diameter of which increases as the band rolls itself thereon, is operated by friction. Its angular speed, therefore, diminishes freely in proportion as it carries more of the band. The longest normal exposure is about one-sixtieth of a second, and sometimes of one-seven-hundredth of a second for very rapid and highly lighted objects. The taking of a picture is made by turning a crank handle at two revolutions a second. Ordinarily twenty images per second are taken; an indicator shows at each moment the length of band used.

Phono-Cinematograph.—The synchronism between the phonograph and the cinematograph is indispensable. All illusion would disappear if, for example, the voice continued to sound when the mouth of the image had already closed and was not moving. Originally the synchronism was only obtained by the skill of the operator in turning the crank handle of the cinematograph more or less quickly while following the sounds emitted by the phonograph. The phonograph, operated by a special electrical motor, governs synchronously the motor of the cinematograph, whatever may be the speed adopted for the whole apparatus. Two motors operated by the same continuous current are connected together by means of wires. It is necessary also to be able to establish this synchronism in case the point of the phonograph leaves the furrow and jumps into a neighbouring furrow. This is obtained by the interposition, between the motor and the mechanism of the cinematograph, of a deferential apparatus, operated by a small special motor. This is started by the operator only in case of such an accident. A commutator is employed to cause this mechanism to start in the necessary direction, either forwards or backwards. The taking of negatives is made generally, for the sake of facility, in two operations. Records are made first of the words or the music, then the two apparatus are united, and while the subject re-enacts the scene, accompanying it by his own voice, the cinematograph records the actions. Sometimes also the two apparatus record simultaneously the actions and the sounds, but it is naturally necessary to have very skilful operators to operate thus at some distance from the subjects. The makers of phono-cinematographs have private theatres similar to that shown in first furnished specially for taking records. The lighting is obtained from two powerful batteries and arc lamps.

The brief description which we have just given of the ingenious apparatus which absorbs the varied resources of mechanism, photography, acoustics, and electricity, shows the great amount of minute work which underlies a phono-cinematograph scene, and the great expense which it entails. No doubt this recent industry which is being perfected from day to day promises success and a development similar to photography. Its role of usefulness will no doubt also become as important as its role of pleasure, and no doubt we shall soon see new applications in this direction.

Repulse of Balloons by Coast Defence Batteries.

The German military authorities have been conducting a series of interesting experiments at the Heubude coast defence battery, Danzig Bay, with the object of determining the efficiency of modern ordnance in repelling captive and free balloons. The battery was equipped with 10-centimetre guns and mortars. Shrapnel was the ammunition used. Floating at a height that varied between 18,000 and 25,000 feet, balloons of 100 cubic metres capacity were quite easily brought down. Only one balloon escaped inland.

British v. American Invention.

The Army and Navy Journal says that though England appears to be taking the lead in turbines, she has copied America far more in her types of screw engines than America has copied England. The prevailing types of screw engines first used in the mercantile marines and the navies of both countries are what are known as the "back action," "direct action," and the "vertical overhead cylinder," engines; and these types all originated in America. The first ship in the English navy which had her entire steam machinery below the water line, and the first one whose engines were attached directly to the screw shaft, was the "Amphion," the design of whose machinery was made in New York and sent to England.

Our Industries.

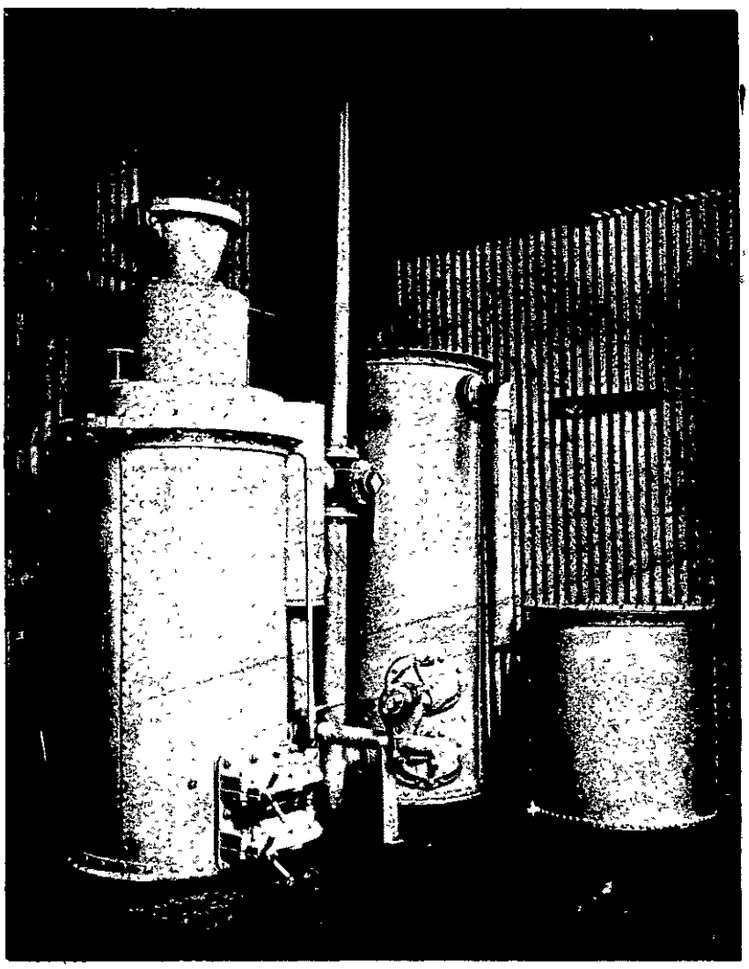
NO. XVIII.

The Cable Gas-Producer Plant.

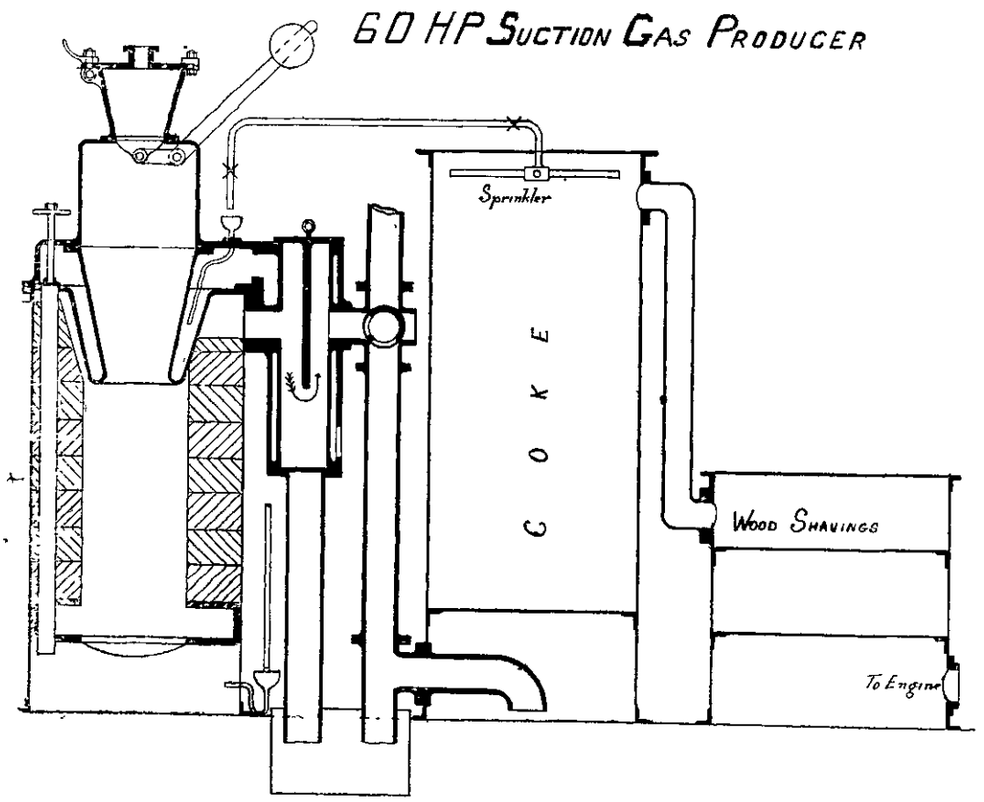
THE advance of the modern gas engine and its accompanying economy-worker, the producer plant, is truly remarkable. So quickly has this new power expanded to almost universal usefulness as a labour-saving element in the industries, that it is not surprising to learn that the manufacture of producer plants has commenced on a large scale in New Zealand. We are indebted to Messrs. W. Cable & Co., the well known iron-founders of Wellington, for the opportunity of seeing their plant at work, and for the drawing we publish with the present article. It has been well said that—"There is probably no more important mechanical industry involving the production of motive power for all purposes within the age of steam, than that of the explosive motor and its far-reaching effect in the promotion of industry by a cheap helping hand." The history of the gas engine itself goes back a long way, and the available records of the internal combustion engine proper further still. The first name of importance in the record is that of John Barber who, in 1791,—116 years ago—took out a patent for the production of force by the combustion of hydrocarbon in the air. His idea was to turn coal, oil, and other combustible matter into gas by external firing, and then to mix the gases so produced with air in a vessel called the exploder. This mixture was then ignited as it issued from the vessel, and the ensuing flash caused a paddle-wheel to rotate. The records also show that an object of the inventor was to inject a little water into the exploder, in order to strengthen the force of the flash.

After this beginning the gas engine went ahead fast until it engaged during the "sixties" of last century in decisive competition with steam. So well did it acquit itself that the manufacture of gas engines spread rapidly, and their makers continued to report good business. Quite recently the decisive victory over steam in certain lines was definitely announced and measured.

"In dealing with the respective merits of blast-furnace steam plant, and of blast-furnace gas plant," a distinguished authority points out that "the comparative working expense of the two systems may be illustrated by the following examples:—A horizontal blast fan, driven by a gas engine developing 600 effective h.p. at 80 revolutions per minute, and actually averaging 90 per cent., or 540 h.p. for the year, consumed 1,620 cubic metres of gas per hour, at a cost of 3.52s shillings, or, per year of 8000 working hours, £1,500. The cost of attendance and repairs amounted to £660, bringing up the total to £2,160 per annum. Compared with this was a blast fan driven by a compound condensing steam engine, working under 90 to 100lbs pressure, and developing a force of 600 h.p. at 60 revolutions per minute, with an average of 540 h.p. for the year. The gross consumption of steam was only 9.4 kilos. per horse power hour, at a cost of 11.8 shillings, or per working year (8,000 hours), £5,175. Attendance and repairs cost £490, the total cost of working being therefore £5,565, that is to say, £3,405 more than with the gas engine already mentioned."



CABLE GAS PRODUCER.



CABLE GAS PRODUCER (SECTIONAL DRAWING.)

This is a fitting introduction to a brief statement of particulars of the Cable Producer Plant. It is a 60 h.p. generator, 44 B.H.P., engine, with a coke consumption of three sacks for nine hours work, and banking at night. The daily cost for 44 B.H.P. is three shillings. The plant is stoked twice per day, and the engine is started in seven minutes from the time the hand fan is set in motion.

It has been said, and it is a fair conclusion from the above, that the gas engine's future is truly gratifying, and that in its running for favour it bids fair to find a very forward place. At any rate here is a very striking example of gas engine efficiency. In the above comparison a gas engine of old type was better than a modern compound up-to-date engine, by over £3,000 a year. What are the possibilities with a producer of the capacity of the one we illustrate to-day? Messrs. Cable are to be congratulated on their enterprise in founding so promising an industry.

Applications for Patents.

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

22978—J. F. Rasmussen and J. F. G. Rasmussen, Westport: time stamping telegrams, letters etc.
22979—J. C. C. Pearson and L. J. Steele, Auckland · Concrete.
22980—H. Corbett, S. Yarra, Vic.: Food for stock, or manure
22981—W. H. Hanwell, Wellington: Chalk suspender for billiards, etc.
22982—W. Biddle, Kilburnie: Tyre-protector.
22983—F. Hutton, Waikaia Knife cleaner.
22984—P. Borgnet, Liege, Belgium Electrolytic apparatus.
22985—W. H. Lawrence and R. Kennedy, Glasgow, Scotland · Suction milking-machine.
22986—L. Simeon, Gisborne Bodkin.
22987—E. V. Featon, Gisborne Tongue for boots and shoes.
22988—C. Newman and R. M H Stoot, Ballarat, Vic: Recovery of gold from ores.
22989—T. Sakauchi, Tokio, Japan. Manufacturing Portland cement.
22990—G. G. Holmes, Pigeon Bay: securing together ends of fencing wire.
22991—A. Hare, Auckland. Operating gas-valves, electric-switches, etc.
22992—G. J. Clegg, Oaonui: Saddle cover.
22993—W. E. Hunter, Maungakaramea,· Wire-strainer.
22994—J. Ringland, Dunedin Well fire-grate.
22995—J. C. C. Pearsons, Auckland. Attaching rails to sleepers
22996—G. T. Girdler, Auckland Explosive-engine.
22997—J. H. Noonan, Auckland · Explosive-motor.
22998—C. Lewis, Oaonui Hammer head.
22999—A. W. C. Palmer and J. W Carrick, Wellington. Bracket or clip for supporting brooms etc.
23000—B. G. A. Harkness, Stratford: Potato planter.
23001—N. I. Gooder, Taitville. Trolley arm, head, and retriever.
23002—R. A. Wiggins, Wellington · Milking machinery.
23003—D. M. Robinson, Christchurch: Totalisator.
23004—B. Locking, Napier Gas-generator.
23005—G. S. Stevenson, Dunedin. Safety-lock for firearms.
23006—A. Doig and A. E. Wilson, Marsden · Transporting apparatus for cargo.
23007—J. Ford, Dunedin. Combination perambulator, cradle, chair, etc.
23008—T. Warner and J. Kannulnik, Melbourne, Vic. Drawing off fumes or gases from urinals, etc.
23009—A. J. Fippard. London. Eng. Hydraulic-clutch.
23010—T. Winstanley, Hightown, Eng.. Manufacture of lime sand bricks or blocks.
23011—H. H. Kerr, Elsternwick, Vic., and F. J G. Knight, Wagin, W.A: Piping and teat cup for milking apparatus.
23012—J. Burns, Christchurch: Teat-cup.
23013—Waddell and Sons, Christchurch. Water-tubular boiler.
23014—J. F. Robinson, Auckland · Tea-caddy.
23015—J. Thompson, Dunedin: Blocking the heels of boot uppers.
23016—H. Owen, Kilburnie: Trolly pole retriever.
23017—J Bryson, Otatara · Wood-splitter
23018—A. P. F. and G. D. Watson, Christchurch. Boot scraper.
23019—A. P. F. and G. D. Watson, Christchurch: Construction of gravel screen or riddle.
23020—H. Ffitch, Christchurch: Safeguard attachment to tram or railway cars.
23021—Pintsch's Patent Lighting Company, Limited, London, Eng · Inverted incandescent gas lamp.
23022—Thermos, Limited, London, Eng. Double walled vessel with space for vacuum between the walls.
23023—J. F. and W. P. Liernur, London, Eng · System of sewerage.
23024—N. S. McNab, Caulfield, Vic and J. S. Link, Melbourne, Vic.· Time recording register
23025—B. F. H. Dawson, E. Brunswick, Vic.. Culinary utensil
23026—F. J. Cox, London, Eng Production of gas.
23027—T. Parker, London Eng Fuel.
23028—A. R. Gill, Abervagenny, Eng · Turning over cards, papers, etc.
23029—R. O. Clark, Auckland · Use of slimes and tailings in the manufacture of bricks, pipes, etc.
23030—A. Storrie, Invercargill: Seed-sower.
23031—A J. Hobbs and J. R. Jewell, Brunswick Vic.· Means for preventing horses running away.
23032—W. O. Webber, Boston, U S.A.: Tide-actuated hydraulic air compressor.
23033—A Lawton, Vogeltown: Scaffolding bracket and hook.
23034—W. H. Blackham, Melbourne, Vic.: Teat cup for milking machine.
23035—J. B. Massey, Auckland: Former for ferro concrete construction.
23036—A. Hayes, New York, U.S A.. Treatment of iron and steel.
23037—A. Hayes New York, U S.A. Fibrous steel
23038—A. Hayes, New York, U.S.A Solution for treatment of iron or steel.
23039—T .P. Ransom and E. St. G. Tucker, Wanganui · Device to prevent corks blowing out of bottles.
23040—M. G Smith, Christchurch · Pedal strap for bicycles.
23041—Lamb and Todd, Limited, Wellington · Displaying and sorting lace curtains, etc.
23042—J. J. Clark, Kensington, Vic.: Milking-machine.
23043—W. Watson and W. Craig, Wanganui Flax-dressing.
23044—L N. Dyhrberg, Ashburton: Machine for making earthenware pipes.
23045—W. W Wakely, Featherston Stuffing box for piston rods.
23046—J. Atkinson, Titirangi Spinal and body supports.
23047—W. Carver, Prospect, S.A.· Broom.
23048—H. E. Wallace and F. Clark, Windsor, Vic Attachable resilient heel for boots and shoes.
23049—A. J. F. de Bavay Kew, Vic: Separating parts of the constituents of ores
23050—J. L. Campbell, Adelaide, S. Aust.· Machine for moulding plastic material.
23051—W. L. Johnstone and N. Scrimgeour, Christchurch. Construction of hurdle for horse-jumping
23052—F. H Jackson, New Plymouth, and R Pierce, Bell Block Windmill.
23053—W. White, Fitzroy, Vic · Interchangeable heel for boot or shoe.
23054—R A. W Green, Longueville, N.S W. Screw propeller.
23055—W. H. Hooper, Lynn, U S A. Boot-treeing machine.
23056—W. Fuller Kirikiri · Cattle food made from flax, refuse, etc.
23057—F. B. Clapcott, Auckland Suspender for braces.
23058—R. B. Restell and F. Currie, Hamilton: pan and dish holder.
23059—J. Hutchinson and A. Lindsay, Hobsonville, Parlour game.
23060—United Shoe Machinery Company, Paterson, U.S.A. Abrading-device.
23061—H. B. France, Levin · Iron covering for buildings.
23062—A. L. J. Tait, Dunedin Hanging and fastening window sashes.
23063—D. Wellwood, Boulder, W A · Preventing deterioration of fermented and aerated liquors.
23064—E. W. Paterson, Dunedin: Rotary oil-engine.
23065—W. H. Bird, Wanganui Cover for motor-car tyres.
23066—H. Frew, Cromwell. Bird trap.
23067—W. Edwards, Motueka. Acetylene-gas generator.
23068—J. Y. Dixon, Auckland; Gate-latch.
23069—F. de J. Clere, Wellington · Glazing-bar.
23070—E. Bouzaid, Otahuhu Envelope.
23071—A. Lawton, Vogeltown: Scaffolding-bracket.
23072—J. Long, Christchurch · Delivering tickets, cards, etc., from containers.
23073—H. V. Johansen, Auckland Internal explosive engine.
23074—J. R Masson, Wandong, Vic Recovery of Antimony from ores.
23075—J. J. Keppel, Outram · Flax stripper.
23076—F A. Robinson, Nelson Indicating peg for gardeners.
23077—J. W Compton, Kuripuni Seed sower
23078—W Gratton, Dookie, Vic Furniture drawers and fittings therefor.
23079—H C. Mitchell, London, Eng · Printing process and treatment of surface of paper.
23080—Saxton and Binns, Limited, Pyrmont, N.S W: Construction of wooden houses.
23081—D. Jackman, Pleasant Point Window fastener.
23082—J Upchurch, Wellington · Vice.
23083—R. White Auckland. Ointment.
23084—J. Kershaw, Nelson · Machine for pressing hops in packets.
23085—E. H Friend, Annandale, N S W.: Pump.
23086—R. P. Park, Melbourne, Vic. Lid for tins, cans, etc.
23087—H Severin, Achern, Baden: Manufacture of hollow glass articles.
23088—J. Salinger, Auckland: Operating elevator doors.
23089—A. F. Pfeiff, Stockholm, Sweden: Liquid heating apparatus.
23090—R. Groombridge, Margate, Tasmania: Preparation for curative purposes.
23091—H. L. J. Torpy, Johnmont, Vic.: Filling bottles with liquid.
23092—J. Cornwall, Auckland: Reinforcing concrete post.
23093—D Elder, Christchurch · Agricultural machine.
23094—H. Jones, Diamond Creek Vic.: Harvesting, thrashing and pressing machine.
23095—H. H. Hesketh, Epsom. Vulcaniser gauge electric alarm.
23096—W. Grant, Invercargill: Pin.
23097—T. Harcourt, Otatara Prospecting dish.
23098—D. Brigham and G. Rainey, Auckland: Winning gold from river or sea bed

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, etc.

Clutches with Cork Inserts.

[FROM AUTO CAR.]

A clutch with cork inserts is still more or less of a novelty. Further light is thrown on the matter by a report of tests made under Professor Hollis at Harvard, U.S.A. This has been sent us by the British-American Co. of Widdrington Road, Coventry, who refit clutches in this way. It seems from the Harvard tests that the co-efficient of friction between two cast iron surfaces was approximately half what it was when one of the cast iron plates was provided with compressed cork inserts, which were forced into holes in the cast iron, and only allowed to project 1-32in. above the surface of the metal. The claims for cork are very well put by the British-American Co., and as we have at present no practical experience with cork used in this way, we cannot do better than quote them:

"The theory of action and explanation of the phenomenon is this · Cork not only has twice the co-efficient of friction of leather or metal, but it strongly grasps the surface with which it comes in contact, in such a way that it gathers up dust abraded particles and globules of oil which, under other conditions, act as rollers and diminish the friction and cause slipping by keeping the surfaces apart, so that it will be seen that by the use of these inserts the surfaces are brought into intimate contact and the friction thus doubled. The cork used is solid natural cork, specially selected and specially prepared, and is forced under high compression into sockets made to receive it. It is held in place by its own expansion, and the curious result is found that it wears down no faster than the solid material in which it is embedded, and that it retains its frictional and other qualities under constant service for many years. It differs from ordinary frictional surfaces by the fact that it is impervious to air, water, and oil, and its great frictional quality is neither diminished nor affected by air, moisture, atmospheric conditions, water, oil or other lubricants, so that but little reflection will be needed to show the enormous advantage gained over every other friction-producing material by the use of these inserts. Automobile clutches of either the cone type, or of the metal-to-metal disc variety can be enormously improved in their gripping power by the use of cork insertions. In metal-to-metal disc clutches they are used in alternate discs or in place of leather in leather-faced disc clutches."

We may add that the cork inserts are also recommended for brakes as well as clutches the corks being fitted into the faces of the brake drums. The consequent increase of holding power is considerable.

Engineering: Sea and Land

INCRUSTATIONS IN WATER MAINS.

(Continued.)

By Thomas Ward, A.M. Inst. C.E., Member Association of British Waterworks Engineers.

It certainly seems extraordinary that hitherto this subject should have received such scant attention. Fanning and Burton, well-known writers, scarcely allude to it. This ommission is surprising on the part of the latter as his book is recoguised as the most up-to-date one. He strongly insists upon the coating of pipes by Dr. Angus Smith's method, and inferentially the conclusion can be drawn that this is a sufficient precaution to take. Experience, however, shews that it does not answer in all cases. With a few exceptions the minutes of the proceedings of civil engineers are silent on the matter.

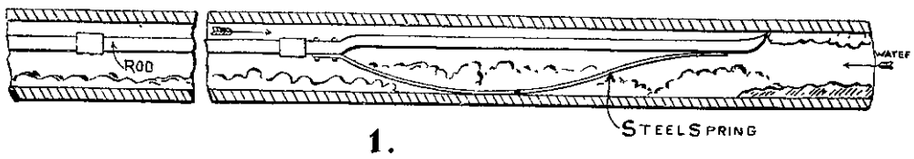
Jamieson's paper has been mentioned in my former article. Messrs. Henderson and Mansergh also have written about it. Preparatory to the latter's report on the Lancashire Waterworks in 1875, as mentioned in vol. 68, he was made aware that the discharging power of the original 8-inch main was seriously diminished and recommended that it be scraped, which was carried out in the year 1878 with great success, the apparatus used being that devised by J. G. Appold, modified by Thomas Kennedy, managing director of the Glenfield Company, Kilmarnock. The methods adopted consisted in making use of the pressure of water in the mains to drive scraping tools: its form and construction is shown in diagrams Nos.1 and 3. The engineer to the Wakefield Corporation has another kind, and a company has been formed in England to take it up. The machine is somewhat in the form of an ordinary winch fitted with a winding drum worked by hand, carrying a chain working in a spurred wheel similar to a bicycle chain. This chain turns the wheel which works the cutter. The machine is fixed on the top of the ground and is placed on rails, and as the cutters work their way through the pipes it is pulled along the rails by an endless rope over a pully.

The method of working is to take out one length of pipe over which excavation the apparatus works: another length of pipe is removed about 150 yards further along, from which place the debris from the encrusted pipe is removed. If the pipes are very much filled up, another pipe must be cut out at a much shorter distance than the above: but hitherto pipes have been cleaned out as far as this before a fresh excavation is required. This expedient is only suitable for diameters of 3″, 4″, and 6″.

Before scraping was resorted to, new mains were laid and old ones taken up when much corroded; or the mains were taken up and heated, which involved the substitution of another main. When another main to Wainui-o-mata is laid down the opportunity should be taken to thoroughly overhaul and clean the present mains.

Pipes have also been cleaned by hand labour. The tool used is shown in diagram No. 1. The cutting edge being of steel of the same curviture as the internal diameter of the pipe against which it is pressed by the steel spring. As the cutter proceeds along the pipe rods are added. It is driven forward and backwards by men working on the excavations made by means of ropes: horses have also been used being attached to the apparatus by chains.

The form of scraper now used is shown in diagrams 2 and 3. It consists of two distinct parts connected by a swivel joint. The front carrying the four steel scrapers, and the rear portion the steel propelling pistons. Leather discs intersected by radial cuts, and stiffened at the back by lead plates, are placed behind the pistons: the cutting edges are set in such a way that should the scraper encounter anything in the shape of a projection such as a ferule screwed into the pipe, the whole machine will slew or turn round, and pass the obstruction without getting blocked, while the leather packing behind the pistons will fold back and pass any obstruction that can be passed by the pistons themselves. Originally, two sets of scrapers and two pistons were used on the one rod, but owing to its length it could not be passed along bends in the pipes. To overcome this, one set of scrapers and one piston were taken off, and in place of the rigid iron rod, one with a



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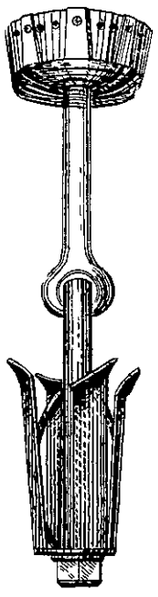

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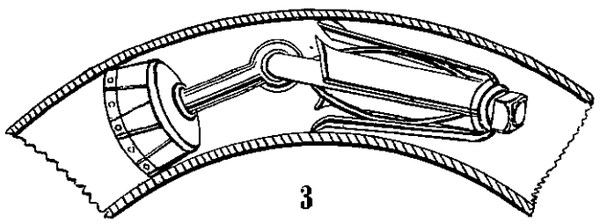

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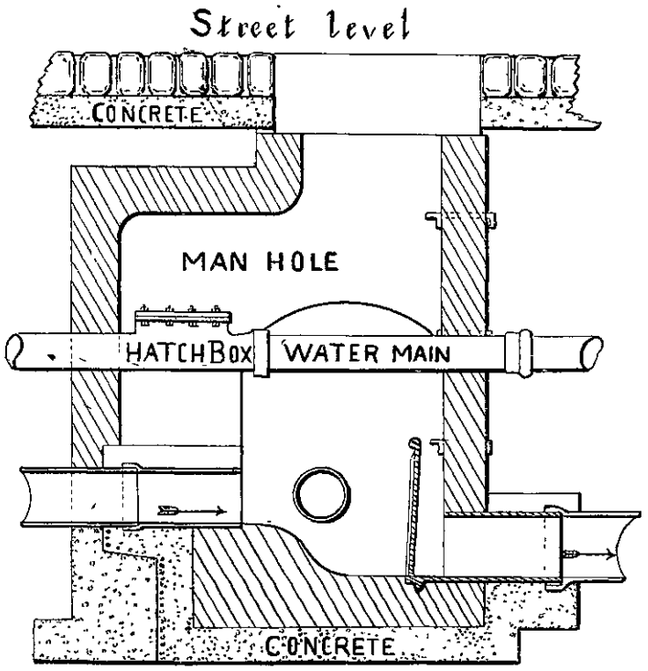

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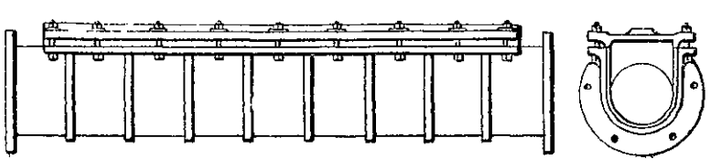

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flexible joint has been substituted. By this means the machine has been made to pass bends of a radius 3½ feet: this is shown on diagram No. 3.

It is important to have two sets of scrapers of different diameters, so that when the scraper is inserted in the main for the first time the smaller sized pistons may be used, and after the main has been partly cleared, then the larger sized pistons can be employed.

Operations of scraping must be continued during the night for two reasons, (1) to reduce the inconvenience to the public, (2) to prevent the detection of obstructions from being hindered by the noise of the traffic.

Opinion is now steadily growing in favour of providing conveniences for scraping of pipes when new water-works are contemplated. The mains should be subdivided into areas and sections having hatch boxes at suitable places: each box being placed in a man hole having a moveable cover at the street surface, and a bottom drain to remove water. Box covers may then be opened at any time without injury to the road, and without damage to the mains caused by cutting out lengths of piping. Sketch plans of hatch boxes are shown in diagram No. 4, and their position in the man-hole by diagram No. 5

The following is the descriptoin of the system of cleaning a 6in. main at Kendal, contributed to the journal by the British Waterworks Engineers' Association, by Mr. Ritson, engineer to the Kendal Corporation:—

"When everything was in readiness the scraper was inserted into the first hatch box at the reservoir. The pipe line across the fields having been previously pegged out, a number of active young men were posted along the line of main at intervals of twenty-five yards, with instructions that directly the scraper is passed underneath (which can easily be distinguished by the low rumbling sound it makes) each man had to shout to the man in advance, "Passed," and then proceed 25 yards in advance of the man farthest away, and so until the scour pipe is reached. The turncock was instructed to turn on the water at a given time, and also to listen for the inspectors' signal whistle, and follow the instructions of the code of signals given to him. The scraper moved off directly the water was turned on, but it only proceeded 130 yards when it stuck fast. When the scraper sticks its position can be located by means of a stethoscope from the sound of the water rushing past. The position of the stoppage in this case having been speedily located, the water was turned off, the main cut, and the scraper removed. It was then found that the stoppage was due to about 12 lbs of lead the result of a badly run joint. The pipes having been made good the scraper was once more inserted, and it came down as far as the scour pipe. In the evening the scraper was again set in motion, and it arrived at the second hatch box in a short space of time, bringing with it a goodly quantity of filth and corrosion.

The next day the scraper was again inserted at the reservoir in the hatchbox, and the water turned on, when an exciting chase took place, for No 2 hatchbox (a distance of 2,523 yards) was reached in 17 minutes. A good deal of corrosion came down again and the main had to be well flushed.

In the evening the scraper with knives set to 5⅜ in., and fitted with 4¾ in. diameter pistons was inserted in No. 2 hatchbox. The men were instructed to lie down at intervals of 20 yards, with ear to ground, on the line of pipes. The water was turned on and the scraper moved off gaily, the inspector following it up with his stethoscope, but after a journey of 40 yards it stuck. The sluice valve was turned off and opened suddenly in the hope of again setting it in motion, but without success. The pipes were then bared and well rapped with a hammer which had the desired effect. The scraper moved off another 40 yards and stuck again. The same operations were repeated but failed. A loosely rolled wisp of hay was inserted into the main behind the scraper and the water turned on, but all to no purpose, it had to be cut out.

On examining the interior of the main at several spots between No. 2 and 3 hatch-boxes, it was found to be so badly corroded that in some places there was barely two and a half inches of waterway through it, and as the pipes had not been treated with Dr. Angus Smith's composition, the carbuncles of oxide of iron had coalesced to such an extent, and were, moreover, so firmly fixed to the interior surface of the pipes, that it was regarded as next to impossible to scrape this length (66 yards), and a new main was laid instead.

Operations were now directed to scraping 830 yards of 4″ main, which was known to be badly corroded. It was feared, however, that the task would be both laborious and expensive, unless some means could be devised which would admit of the work being done expeditiously and well. A local blacksmith was brought into requisition, and a set of steel spring scrapers was made somewhat on the model of the 6″ scraper, but without the rear or propelling pistons, but with a ring formed in the front of the apparatus to hook on a rope. A hundred yards of ¾″ strong Manilla hemp rope, a similar length of ¾″ steam tube, a couple of cast iron clips for 4″ pipes with rubber bushes or cylinders (used for speedily joining up the ends of cut pipes), and a crab winch completed the kit. The main was cut at intervals of 90 yards. Length after length of steam tube was screwed together, and passed along the main until it emerged at the other open end. The rope was then hooked into an eye made in the front length of tube, and the whole withdrawn. One end of the rope was then attached to the drum of the winch and the other end hooked to the scraper before being inserted in the main. A piece or four inch pipe was cut to length, and the rubber brushes slipped over the ends of the cut main, the whole evenly and tightly clamped together by means of the clip joint.

A gentle stream of water was turned on and the scraper slowly drawn through the main by means of the winch. This operation was repeated twice, and the main well flushed after each scraping; and on completion the corrosion had been completely removed, and the pipes appeared almost as good as new.

The cost of scraping amounted to 6.32d per yard. Pipes coated with Dr. Angus Smith's composition can be scraped quite easily, and at cost of from 4d to 5d per yard. The success of the scraping of the 4″ main was so marked that it was determined to make another attempt upon the 6″ main where operations had ceased. Accordingly the scraper was set to full size, and inserted into No. 2 hatchbox at 10 o'clock at night. Men were posted at intervals of 10 or 12 yards on the line of main, with strict orders to listen with ear to the ground. The scraper moved forward after the water was turned on at a fairly rapid pace, and for a time was lost, but eventually located by means of the stethoscope, and the mud, filth and encrustation at No. 3 hatchbox showed that it was doing its work. After a good deal of dodging such as turning off the water and putting it on again suddenly, passing several lengths of ¾ in. steam tube down the main to try and force the scraper back a bit, at last it came into No. 3 hatchbox bringing with it a ton or more of iron rust, the shattered remains of carbuncles.

The total cost of scraping the 3,190 yards of 6″ main amounted to 4.08 per yard. The result has been that the water supply has been so much improved, *without the anticipated extensions of the mains*, that a constant supply is able to be given and the total cost under £55.

TABLE GIVING SUMMARY OF COST OF SCRAPING WATER MAINS BY PRESSURE SCRAPER.
(From Minutes of Proceedings, Inst C.E.)

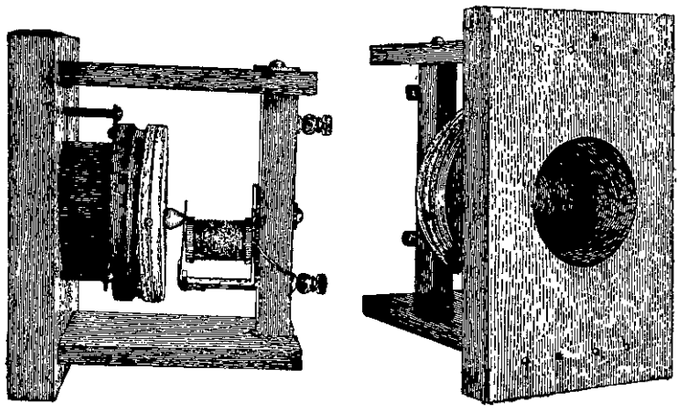
Year.	Place	Diameter.	Length of main	Total.	Cost per yard	Obstruction.	Gain in delivery after scraping.
			miles yds.	£	1 d.		per cent.
1877	Oswestry	7″	1 440			Large stones, lead, and defective pipes	54.4
		6″	4 660	121	2 93		
1878	Lancaster	8″	1 1500	30	2 2	Peaty matter	56.1
1880	Durham	12″	1 586	91	9 1	Lead spade, spike, waggon spring	
1880	Bradford	18″	4 1100	634	18 6	Stones, lead, crowbar, &c	55.6
1881	Halifax N.S.	12″	1 573	91	9.3		
1882	Exeter	16″	2	192	6 5		
		12″	2				
1883 1885	Whitehaven	13″	2 1056	516	11.1	Mussels stones, lead	27.6
		11″	3 1232				
1885	Bristol	6″	1 785	35	3 3	Stones	
1886	Denbigh	6″	1 880	150	13 6	Stones, gravel, lead	
1887	Omagh	6″	2 792	53	2.9	Lead, defective castings	30 0
1887	Halifax	6″	776	21	6 5		
1888	Ulverston	6″	1	72	9.8		
1890	Dundee	15″	2	256	17 4	Wood, stones	
1890	Dumfries	9″	1	113	3	Stones	
		8″	4				
1890	Scarborough	8″	1 440	62	6.7		
1891	Newport	10″	1080	50	11 1	Lead.	
1891	Lanark	7″	6 880	75	1.57	Lead, wood stones.	33.7
1892	Roubaix (*France*)	24″	5 594	242	6.4		16ft. taken off pumping engine
1892	Burntisland	8″	3 1320	252	9 02	Piece wood 2ft 3″ x 5½″ x 5″, lead	
1893	Bridge of Allen	6″	1				35
1893	Thurso	6″	3				7
1894	Stirling	8″	3 1320			Stones, lead, broken pipe	
1894	Waterford	13″	8	211		Same	40
1895	Cuper Fife	7″	3 880	66	2.6	Piece broken pipe, rabbit	52
1895	Merthyr Tydvil	14″	5 617	318	8.01	About 400 stones.	30

THE TELEPHONE.

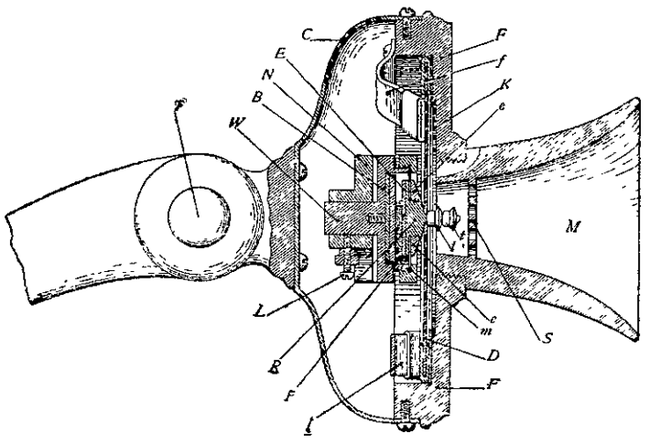
A GREAT INVENTION AND ITS ANNIVERSARY.

The bell rings, a voice says in an authoritative tone "No 3421," and the drama of domestic life begins to unfold itself before you. "Have you any nice fish this morning." After a pause—"But it must be fresh." Evidently the fish is fresh, fish always is fresh in the mouth of a fishmonger. But the house wife is still not content. "It mustn't be in the freeze. You know I can't bear the freeze." The pause that follows is long enough to convey the information that the fishmonger thinks so too, together with all the supporting references to all the saints and virgins of the past month's calendar. "Then send me three nice soles: and let them be here not later than half-past seven."

In this manner all your tradesmen file before you as you shave and dream of breakfast. It strikes you as all very natural. Presently you take a hand yourself. The postman has brought a letter early telling that your best friend will be in town from Canterbury this very day, but the best friend has not thought it worth while to tell you where he intends to rest the sole of his weary foot. You are not a bit disconcerted. You just ring up "Royal Oak," "Empire," "Grand" until you get your friend: you have your chatter with him, ending with an appointment for business or pleasure as the case may be, and presently you are at your office making all sorts of enquiries by 'phone of all and sundry. You do it with the easiest air; speaking comfortably into the instrument, waiting with patient tact for the answers, unravelling any difficulty of understanding with the mastery of long experience.



The First Telephone (Philadelphia).



Parts of the Present Solid-back Transmitter.

M. Mouthpiece FF. Face, set in metallic outer bell C. D Sound-receiving diaphragm K. Resonating chamber in front of diaphragm S. Perforated screen of wood, protects diaphragm from injury E Disk constituting front working electrode B Heavy back electrode, also disk-shaped (Electrodes are made of carbon) P. Finely divided carbon, placed between the electrodes, E and B. W Metallic casing for E and B. The chamber in W, enclosing the electrodes, is lined with gummed paper to prevent short-circuiting the instrument m Mica disk, one-thousandth of an inch thick; supports front electrode, E, and aids it to follow the movements of the diaphragm D. f and t Nuts attaching E to D ff Dampening springs ee Front nuts for holding together electrode E and mica disk m. R. Brass block to which E is soldered N Metallic bridge, fastened at ends to face F L. Set screw, locks casing of back electrode B to N. T. Thumb nut enables transmitter to be moved up or down The wires to the transmitter are connected with the front electrode E, and with the supporting bridge N. The electric current, therefore, flows through the granular carbon P, when battery power is applied to the wires

It is all very nice no doubt. When anything goes wrong, what a rage you are in to be sure. Patience flies out of window pursued by the anathemas you hurl at "those wretched girls," or the incapable government, or the Wellington wind that breaks up the peace of households and the harmony of telephone wires. There are throughout the world millions of subscribers to the telephone who do as you do precisely, and there is perhaps not one who thinks once of the wonders of the instrument that you all treat so lightly. Many of these subscribers imagine that they have in the telephone a thing almost of nature, old perhaps as the air we breathe. Most of them after using the 'phone wear the air of the man who going to sleep in his orchard has been awakened by a ripe luscious plum falling gently into his mouth. Of course. That's what you keep an orchard for, and all those lazy fellows to manure the ground and kill the weeds and prune the branches.

It will doubtless astonish all this world of men and women to be reminded that the instrument is scarcely thirty years old, that its initial invention, that which started the whole story of its wonderful development, is one of the great prize inventions of science, and that the subsequent discoveries are all examples of the greatest that is in the power of human wit, ingenuity of resource and enterprising courage From first to last there never was such a story as the story of the telephone, opened so brilliantly by Professor Graham Bell in the year 1876 with as wonderful an introduction as any story has ever had on this planet.

The professor is now a regent of that great scientific assembly of talents known as the Smithsonian Institution; he is also ex-president of the National Geographical Society; he is full of years and honours, he numbers troops of friends, there are about him hosts of worshippers of his splendid intellect and of these hosts the extended order covers the globe.

All this he has won by the strength of his character and the power of his mind. But in that not so far off day when he contrived that famous introduction to the story of the telephone he was rich only in the modesty, the faith, the hope, and the indomitable courage of youth. Born in Scotland in 1847, he was a farmer in Canada in 1870, and three years later he was professor of Vocal Physiology in the University of Boston; a fact which entitles the authorities of that famous institution to claim some credit for perspicacity. His object in life was then not the telephone: it was to perfect an apparatus for making language sounds visible to deaf and dumb persons. He did not succeed in that: as a matter of fact he failed. But the trials he made convinced him of the possibility of conveying articulate speech electrically.

He set to work on his conviction. He connected two electro magnets by a wire, he fastened two steel rods to the poles of the magnets, he drew two diaphragms tightly across two small boxes, arranging the steel rods so as to beat against the membranes, in consonance with voice impulses. He thought he had only to give the voice impulse to be crowned with complete success. He gave the voice impulse, but the result was nothing, not even a voice. He concluded for the moment that his proper line was multiplex telegraphy and away he went after the multiplex in full sight of his friends who cheered the energy and enthusiasm of the young man. Accident however, saved him from the permanent desertion of his mother idea. A biographer relates how one day a wire snapping in two sent a sound through another wire which had attached at each end a thin sheet iron disc a few inches in circumference. Experiment promptly made proved that this could be repeated; and after that there arose in the enquiring mind of the youthful professor the epoch making question "Can vocal sounds be transmitted thus?" The apparatus for the answer was put together quick as thought. Two small cylinders of metal each with a parchment diaphragm stretched across: inside each cylinder two magnets, their poles wound with wire and, between the magnets, a small strip of soft iron: a soft iron button in the centre of each diaphragm; and lastly, a wire connecting the two cylinders.

The professor's assistant took his station in the basement of the professor's house holding one of the cylinders: the professor marched up to the attic with the other, while the assistant paid out the connecting wire

Arrived at the attic the professor spoke quietly into the diaphragm of his cylinder, the other diaphragm being kept at the ear of the assistant. "Can you hear me?" said the professor. The assistant was startled as a man might be who hears a message from the other world. He bounded up the stairs, he panted into the attic. "Mr. Bell," he roared. "I heard your question plainly."

Such was the first telephone message ever sent over a wire.

After this the first telephone was constructed, and Professor Bell offered to exhibit the same at the Philadelphia Exhibition in 1876. The Commissioners scoffed at it as a toy, without any hope of practical application to any useful purpose. But the Emperor Don Pedro of Brazil happened to be present one day. He had seen the new machine in Boston, knew the inventor and being interested greatly in scientific matters, being an intelligent monarch, asked the professor to let him see the thing once again. Bell spoke into the transmitter. "To be, or not to be.

That is the question," he humourously soliloquised. Brazil was charmed and said so. The Commissioners left off scoffing and the telephone became the prize hit of the great Exhibition.

One of the clauses of Bell's wonderful patent is as follows :, " The method of the apparatus for transmitting vocal sounds telegraphically, as herein described by causing electric undulations, similar in form to the vibrations of the air accompanying the said vocal and other sounds substantially as set forth."

This was the notice to the public that the instrument they were invited to use for ordinary communication would transmit every inflection of their voices one to another. But when the first exchange was established in 1877, it was found that the magnet transmitter was not sufficient for business needs, and the Bell Company sought to apply battery power. Edison here flashed into the field and, with his carbon transmitter added, led the world for some time. The foundation of his success was the discovery of the French physicist, Count de Moncey, that " when two ends of a severed circuit are brought into contact, the resistance of the contact is variable with and proportionate to the pressure between them. The next step forward was made by Edison and Berliner who acting separately combined the induction coil with the transmitter. In 1878, Professor Hughes of London proved, with his microphone that to obtain the best results with resistance changes due to changes of pressure, it is necessary to have a light contact. From that time all transmitters have been on the light contact plan.

Before this, iron had been substituted for the parchment of the first diaphragms, and the thickness fixed at one hundredth of an inch ; experience having proved that thinner sheets were shrill, and thicker confused.

The Blake transmitter followed the discovery of the microphone, but sensitive as was that transmitter at short distances it was found to be useless as the distances increased. A ruck of inventors at this juncture jostled one another for the discovery of some expedient to get over that difficulty. The lucky one proved to be a clergyman quite unversed in electricity. The Rev. H. Hunnings, using granulated carbon, gave clear talking at long distances and his transmitter could stand high battery power. But very soon the granules were found to be liable to pack, thus stopping the passage of sound. Investigation revealed the fact that the electric current heated the transmitters. More space was given and the packing ceased. The best transmitter, the White solid back transmitter, followed, in which the packing is avoided by the insertion of a mica disc, the carbon granules occupying only part of the space between the electrodes.

The receiver has a simpler story of development. The essential parts of the present receiver consist of magnet, air chamber, diaphragm, ear-piece and case ; the air-chamber giving increased distinctness to the voice speaking through the transmitter.

But the new telephone was not complete with the perfection of the transmitter. There remained the problem of long distance. In the beginning the Bell company guaranteed communication up to twenty miles. To-day men talk freely 1700 miles apart with as much ease as across an office table. The first difficulty was the attenuation of the very weak currents used. After much experimenting and the granting of many patents, Professor Pupin, of Colombia University, demonstrated that " inductances distributed at certain intervals along a telephone wire strengthened the current greatly." Accordingly slight coils of wire (copper with iron core) ten inches in diameter, were fastened, four miles apart to the line, and these receiving the electric current were found to send it on undiminished. That cured the trouble of attenuation. These rings treble the capacity of telephone lines.

As distances of telephony grew longer it was found that iron wire could not be used profitably. Copper being tried could not be tightened sufficiently, and the invention of Doolottle, who succeeded in hardening copper wire, so as to enable it to stand almost the same strain as iron, simplified matters.

Interference was the last of the troubles, and this was got over by twisting the wires. Professor Bell discovered that if two wires of a circuit be wound about each other, interference (induction) cannot occur, as outside currents passing into the twisted wires are neutralised. Thus the first and the last of the inventions of the first thirty years of the telephone are Bell's

Of the multiplication of exchanges and the improvements in the handling of their multitudinous wires it would be tedious to speak at length. Of the thousands of patents taken out for the betterment of various details of telephones and circuits it is impossible to speak at all. The chief aspiration is still unfulfilled. It is for the complete removal of the attenuation which has been partially got rid of so far as the establishment of the 1700 mile limit of long distance telegraphy. When complete success is attained men will be able to talk from Paris to Pekin and from Pekin back to Paris by the other side of the globe.

A few figures are interesting. There are in the United States alone in use some six millions of telephones, and what may be the number in the world may be imagined from the fact that the telephone has spread over Europe, Canada, all the Americas the British Empire not forgetting India, Burmah, China, Abyssinia, Persia, Turkey, Siberia, and other countries too numerous to mention. Of these the United States, as becomes the birthplace and cradle of the invention, stands pre-eminent. Berlin has one telephone to every seventeen families: Paris one to 22: London one to 58 : New York one to 12 : Boston one to 6 : and San Francisco (before the earthquake of 1906) one to 4.

The rise and progress of the telephone compressed as it is into the limits of a single generation make one of the most fascinating stories in the history of human achievement. But for the initial discovery of Graham Bell that story would have been impossible.

Successful Engineers.

[By Peter Ellis, Wellington.]

Successful engineering is the outcome of a happy combination of science and practical experience ; each is essential to the other. The man who is all science fails, because he carries formulas and exactitude to the verge of absurdity in real practical work, while the practical rule-of-thumb engineer fails because he depends too much on his judgment as a sufficient guide ; the balance ensuring success lies beyond the junction of the two principles each merged in the other. It is hard to say whether the workshop or the College training is the more important. Certainly a long workshop experience is an immense advantage to an engineer, and a man having such a training is less likely to develop " that superior air " the *bete noire* of the mere collegiate which stands so much in the way of success to many really clever men, and renders them unpopular among the fraternity. Mathematics will never teach design ; a lively imagination is essential to that end, and imagination springs from observation and experience, for what can a man imagine but from what he knows ? If he imagines wheels, he has seen wheels ; if levers, he has seen levers ; and some men have a positive gift amounting almost to genius for combining these things in original design which have no mathematical origin whatever. It does not help practical engineering much to apply the precision of a Geneva watch to the damming of a river, and we always find the most successful of the world's engineers among those who know how to brush aside unimportant petty details and give prominence to broad practical principles.

Honours for the Inventor.

An American Tribute. During the formal opening of the building of the United Engineering Society of America in April last, the John Fritz Gold Medal was presented to Alexander Graham Bell for the invention and introduction of the telephone. This is the third medal of the kind awarded. The first was given to Lord Kelvin for his work in cable laying, and the second to George Westinghouse for perfecting the air brake.

The Building of the United Engineering Society.

The dedicatory exercises of the new building of the United Engineering Society, at 25 West Thirty-ninth Street, New York city, to which Andrew Carnegie gave $1,500,000 for construction and still more when it came to raising an endowment fund were held on April 17th, 1907. The exercises were in the assembly hall of the new building which is one of the finest auditoriums of its kind in the city.

Mr. Carnegie shared attention with the venerable Dr. Edward Everett Hale, President Arthur T. Hadley, of Yale, Ambassador Creel, of Mexico ; Sir William H. Preece, president of the institute of Electrical Engineers of England, and John Fritz, of the building committee, who received the most prolonged applause of any of those present.

Charles Wallace Hunt, who presided, had as a gavel the setting maul which Mrs. Carnegie used when she laid the cornerstone of the building. T; C. Martin, president of the Engineers' Club, read this telegram of congratulation from President Roosevelt :

The White House, Washington,
April 13, 1907.

My Dear Sir : I heartily congratulate you on the opening of the building of the Engineering Societies. The building will be the largest engineering centre of its kind in the world. It is, indeed, the first of its kind, and its erection in New York serves to mark and emphasise the supremacy which this country is steadily achieving through her proficiency in applied science. The whole country is interested in the erection of such a building, and particularly of course, all of those who follow either the profession of engineering or any kindred profession, and in no branch of work have Americans shown to greater advantage what we like to think of as typically American characteristics.

With all good wishes, believe me, sincerely yours, Theodore Roosevelt.

Mr. T. C. Martin, 114 Liberty Street.

President Hadley delivered the principal address and declared that a combination of ethical and technical standards would produce the best professional service.

LEGAL

Contributed by H. F. von Haast, M.A., LL.B

Recent Decisions.

Company Prospectus. Offer to the Public. Circulation of Prospectus by Directors among Friends.—The Companies Act, 1903, section 95, provides that no allotment shall be made of any share capital of a company offered to the public for subscription unless the amount named in the prospectus as a minimum subscription, upon which the directors may proceed to allotment, has been subscribed. If the foregoing conditions are not complied with in 90 days within after the first issue of the prospectus, all money received from applicants for shares shall be forthwith repaid to the applicants without interest.—The Combined Incandescent Mantles Syndicate (Limited) was formed as an incorporated syndicate for the purpose of securing an option to purchase certain property and to promote a company for the purpose of working it. A prospectus marked "Strictly private and confidential: not for publication," was printed and some of the Directors, without any authority from the company, sent copies to their friends. Some shares in the syndicate were subscribed for and allotted, but not the amount named in the prospectus as the minimum upon which the Directors could proceed to allotment. Mr. Sherwell, a subscriber, sued the company to recover the amount paid by him for his shares on the ground that the share capital had been offered to the public for subscription, that the conditions required by the Companies Act had not been complied with, and that therefore, the time prescribed having expired, he was entitled to have his moneys repaid to him.

Held by Warrington, J., that while Mr. Sherwell would have been so entitled, had share capital been offered to the public for subscription, there had been no offer of shares to the public within the meaning of the Act, and that the section means that there must be an offer of share capital by the *Company* and not by an individual who chooses to come in, whereas in the present case there was nothing but an intention on the part of the existing members of the Company to keep the share capital to themselves, and a few other persons whom they might like to bring in. —*Sherwell* v. *Combined Incandescent Mantles Syndicate* (*Limited*). 23 *Times L.R.* 482.

Life Insurance. Suicide. Evidence of Motive.—H. J. Blake, the manager in Perth, W.A., of an insurance company, while in the midst of a course of embezzlement of the company's moneys, and when he was hopelessly insolvent, effected a policy on his life with the Mutual Life Insurance Co. of New York, in which he warranted that he would not die by his own hand, sane or insane within one year from the issue of the policy. The Inspector of Blake's Company on auditing the books, found that Blake had embezzled large sums, and suspended him. Blake sent a cable to his father asking for £1500 "to avoid legal proceedings." The Inspector warned him that he would be prosecuted, and that if he attempted to abscond, he would be arrested. Two days after the discovery of his embezzlement, and within a year from the issue of the policy, he rode out to a lonely spot in the bush, and his dead body was found shattered by an explosion of dynamite. The Official Receiver in Bankruptcy of his estate sued the Insurance Company for the amount of the policy. The judge directed the jury that "If on the evidence there was anything which inclined them to believe that Blake took his own life, they would be more entitled to give effect to that view if they found that there were strong motives existing for his committing that act; they must therefore look at all the facts, and one, and the most important one, was the presence or absence of motive."

The jury found that Blake died by his own hand. The Official Receiver appealed.

Held by the High Court of Australia that when a man does an extraordinary or wicked thing, there is probably some cause inducing him, or impelling him to do so, and the more heinous the act, the more important the question of motive. When, therefore, the question for consideration is whether such an act is intentional or not, it is of the highest importance to consider whether the person in question, in the circumstances in which he was placed, had any inducement to form such an intention. Held, further, therefore, that the judge had rightly directed the jury, and that a new trial will not be granted on the ground of misdirection, because the judge has laid stress on one point more than another.—*Mutual Life Insurance Co., of New York* v. *Moss.* 4 *Commonwealth L.R.* 311.

Pawnbroker. Stolen Goods Pawned. Order for Restitution on Payment of Amount Advanced. Civil Action.—The Pawnbroker's Act, 1868, sec. 37 provides:—"It shall be lawful for any two or more justices of the peace to order that any goods unlawfully pawned, pledged or exchanged, which shall be brought before them, and the ownership of which shall be established to the satisfaction of such justices, shall be delivered up to the owner by the party with whom they were so unlawfully pawned, pledged, or exchanged, either without compensation or with such compensation to the party as the said justices may deem fit.—Leicester & Co., manufacturing jewellers, entrusted to an agent articles of jewellery for sale on the instalment plan. He pawned some with Mr. Cherryman, a pawnbroker, was prosecuted for larceny, and convicted. The police asked for an order for restitution of the goods to Leicester & Co., and an order was made by the justices that the goods should be restored to Leicester & Co., on payment to the pawnbroker of the amount advanced by him. Leicester & Co. did not ask for the order, or object to its being made, but sued the pawnbroker claiming the return of the goods. The pawnbroker maintained that an order having already been made by a court for the return of the goods, Leicester & Co. were debarred from taking proceedings in another court.

Held, however, by Ridley and Bray J.J., that as the application for the order was not made by the owner, but by the police, Leicester & Co. were not so debarred, and that the provision in the Pawnbrokers' Act did not exclude the civil remedy. Leicester & Co. therefore were held entitled to recover their goods. *Leicester & Co.* v. *Cherryman.* 23 *Times L.R.* 444.

English Factory Acts. Workshop. Floral Decorations. Florist's Shop. —Robert Green (Limited), retail florists, occupied a shop with a room at the back, and employed 10 girls as florists' assistants, selected on account of their taste, and 8 as beginners. These girls attended to retail customers in the shop and made bouquets, wreaths and crosses and arranged floral decorations (in which the flowers were fastened to frames of wood or wire) in the back room. The company was prosecuted for not exhibiting on the premises the prescribed abstract of the Factory and Workshop Act 1901 as required by the Act. It contended that the back room was not a "workshop" as the work done there was not manual labour and the things produced were not "articles" within the meaning of the Act.

Held by Lord Alverstone C.J., Darling and Phillimore J.J. that, if what the girls did in the room was only incidental to their employment, *e.g.*, if they only tied flowers into bunches for purchasers in the shop, the back room might not have been a workshop, but that the crosses and wreaths were "articles" which were both "made" and "adapted for sale" within the meaning of the Act, and that the making of them necessitated "manual labour," which was not necessarily labour requiring a great exertion of strength but might be very slight indeed. The back room was therefore a "workshop." The New Zealand Factories Act is on rather different lines, and defines a factory as "any building, office or place in which two or more persons are employed, directly or indirectly in any *handicraft*, or *in preparing or manufacturing goods* for trade or sale." *Hoare* v. *Robert Green Ltd.* 23 *Times L.R.* 483.

Mercantile Agent. Goods sent by Agent to Auctioneer to Sell. Advance to Agent.—Waddington & Sons, pianoforte manufacturers, employed Hutchinson, a piano dealer in Nottingham as their agent for the sale for cash or on the hire system of pianos consigned to him. He sent a piano so consigned to him to Neale & Sons, auctioneers, to be sold by auction, and obtained from them an advance of £10 against the anticipated proceeds of the sale. He then disappeared. Waddington & Sons found the piano and claimed it from the auctioneers, who, however declined to return it unless their advance of £10 was repaid. By arrangement the piano was sold and fetched £17 17s. Neale & Sons being sued by Waddington & Sons paid this amount into court less their charges and their advance of £10 and contended that Hutchinson was a "mercantile agent" and that his transaction with them was either a sale or pledge in the ordinary course of business and therefore valid under the Factory Act 1887 which corresponds with "The Mercantile Agents Act 1890 (N.Z.)

Held by Darling and Phillimore J.J., that this was not a pledge, but even if it were it was a pledge incidental to a transaction which Hutchinson had no authority to do at all, and therefore not protected and that it was not a sale as the piano was given to Neale & Sons with instructions to sell but there was no sale. *Waddington & Sons* v. *Neale & Sons.* 23 *Times L.R.* 464.

The Workers Compensation for Accidents Act 1900. Master and Servant. "Serious and Wilful Misconduct."—A rule of the L. & S.W. Railway Company prohibited enginemen and firemen from leaving the footplate of their engine, when the latter was in motion. The engine driver of one of the Company's passenger trains, left the foot plate and got upon the tender of the engine, while the train was travelling fast, was struck by an arch of a bridge and killed. He went on the tender apparently to pick better coal than that in the well, as the train was a little late and the pressure of steam had got a little low, but there was no proof that any inferiority of coal caused either fact. He knew of the rule. In proceedings by his widow to obtain compensation: *Held* by the House of Lords that the rule broken by the engine driver was intended for the safety of the servants of the company and the public alike, the breach of it involved danger to the man himself and to those under him, and that he had been guilty of "serious and wilful misconduct" so as to disentitle his widow to compensation. *Bist* v. *L. & S.W. Rly. Co.* 23 *Times L.R.* 471.

AN EXHIBITION OF INVENTIONS.

A most interesting feature of the Jamestown Exposition which has just opened will be the "Section for Inventions," in which inventors are invited to display their inventions and demonstrate their value to visitors. The invitation is open to all, and every facility is offered in the way of floor space, tables, and shelves, advertising cards and labels, electric current, gas, light etc. A modest fee of from ten to not more than thirty dollars, except in very special cases, is charged for such space and service. The service includes as well as general care of models, explanation to visitors, and the return of the exhibit at the close of the Exposition. Awards will be made of gold, silver and bronze medals and diplomas. That inventors are alive to this unparalleled opportunity of making public their creations is shown by the fact that within four weeks after the first notice was sent out by the Bureau of Inventions of the Jamestown Exposition, applications had been made for more than 5,000 square feet, and new applications are coming in at the rate of a hundred a day. The inventors are not the only ones who will profit by this display, for the exhibition cannot fail to be of interest and material benefit to the public at large. Never before has such an opportunity been presented at any exposition, and now that the first step has been made in this direction such exhibitions of inventions become a part of all future expositions.

BUILDERS AND CONTRACTORS, Etc.