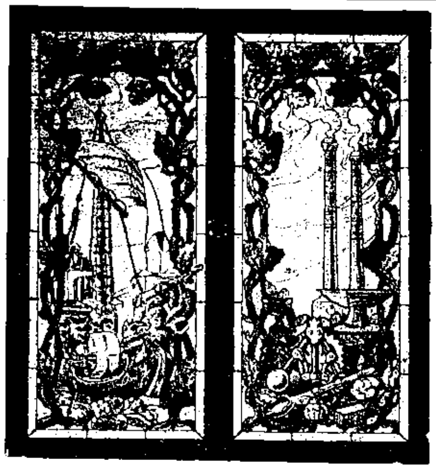

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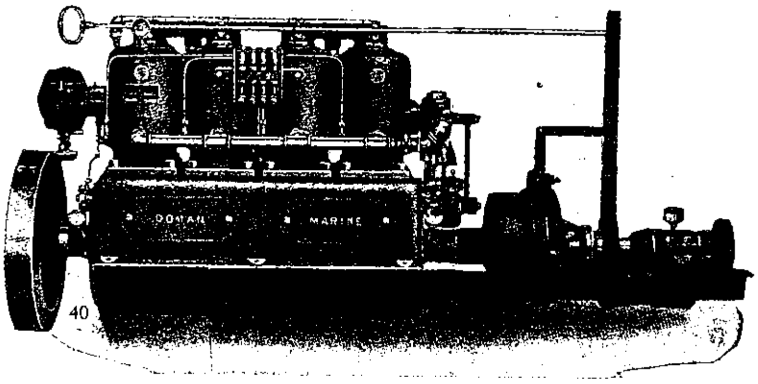

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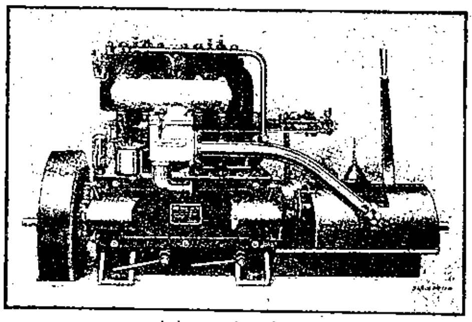

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THE SCIENTIFIC NEW ZEALANDER.

Devoted to the Interests of Industry, Architecture, Science, Engineering, Inventions, and Aerial Matters.

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EDITORIAL COMMENT.

The Declaration of London.

Before discussing the chorus of protest rising on all sides throughout the British Islands against the Declaration of London, it will be as well to consider what the Declaration is and what led up to it. The Declaration is the outcome of the last of the Hague Conferences, which amongst other things resolved on the setting up of an International Prize Court. The reason was to get rid of many doubtful points of practice and to transfer the decision of international law points from interested to disinterested authorities. At present the prizes of war are adjudicated by Admiralty Courts of the capturing country, according to international law, it is true, but international law chiefly as interpreted by authorities interested in the decision. The determination of the Hague Congress was duly considered by a conference of representative men, and these came to agreement. As they had met in the city of London, the principles they drew up for the guidance of the International Prize Court came to be known as the Declaration of London. This international court is not a court of first instance. That would be impossible, regard being had to the urgent necessity for prompt despatch of such business, the Admiralty Courts of all nations being by common consent as numerous as possible, and well scattered among their ports so that all captures may get quick settlement. The courts of first instance will be the courts under the present system, and from their decisions there will, if the Declaration of London is sufficiently ratified, be appeal to the International Prize Court sitting probably at the Hague.

About the goods of an enemy in the bottoms of the enemy there can be no doubt. They and the enemy's bottoms are legitimate prize of war. To safeguard their goods, therefore, belligerents have recourse to the expedient of shipping their goods in neutral bottoms. Hence the necessity for drawing the line between goods that are contraband and goods that are not. In theory there is no difficulty; in practice the difficulty is extreme at times. All munitions of war are, of course, contraband; and all food, comforts and appurtenances destined for the use of armies. The difficulty of deciding what is contraband in certain circumstances is great. It may be reasonably an open question. But a prize court of the old order is sure to decide it in favour of its own country's wishes, which are identical with its interests always. The appeal to international authority accepted by all and administering international law according to a code agreed upon by all nations through their representatives no doubt reduces danger of injustice to a minimum. In that respect the Declaration is an improvement.

But with the question of contraband or conditional contraband it is different. The doctrine of "continuous voyage" brought into great prominence by the United States during the American Civil War provides that a voyage is not to be considered broken when the goods destined for an enemy's harbours are landed at a neutral port in the neighbourhood of one of them with intention to forward them at convenience, *i.e.*, favourable moment for breaking blockade. The Declaration is said to lay down the principle that this doctrine is only applicable in the case of island countries, so that goods landed in a neutral port for transmission overland to an enemy's country are immune from the doctrine of "continuous voyage." Now under that doctrine the goods in question are seizable during the whole voyage from the start of the first part to the end of the second, namely, the moment of running the blockade. But if a neutral be free of the doctrine of "continuous voyage," known contraband of war can pass under the noses of an enemy's cruisers on the way to the territory of the other belligerent. This is what the whole English speaking world is now protesting against as likely to happen in the event of war with Germany, in the course of which the British cruisers would have to let everything bound for a neutral port, say Flushing, pass, though their arrival at Hamburg or Bremen or Wilhamshaven in due course by land might be as certain as the shining of the sun at noonday. That would be a hardship to Britain, and there would be no mitigation in the shape of reprisal, for the simple reason that being an island, Britain is subject to the doctrine of continuous voyage. In another case, moreover, it is arguable that the whole of our food supply might be declared contraband by ingenious reasoning on the line that goods destined for an enemy's troops are contraband. The argument might run thus: There is no food in England except what is brought by sea; it is impossible to say what part of the food at sea is destined for an army; manifestly the wisest course is to declare it all contraband. Moreover, as the British people would be unable to carry on the war without food, the food caught by the enemy's cruisers is destined to help Britain to maintain the war; consequently it is contraband of war. Such a decision would have irresistible attractions for an enemy of Britain and indescribable provocations for the people of Great Britain. It is well to declare that people have obeyed such conventions as the Geneva Cross, but none of them have before them such contingencies as this, which no one would deny must offer tremendous temptation to disobedience. Britain would, it comes to this, be without much reason for complaint so long as she remained the stronger, and in the event of weakening would have no hope at all. This is one cause of the protests. The other is the doctrine of continuous voyage. We are of opinion that it is arguable—with sufficient tenacity for a belligerent to make good—that voyages are continuous whether they are wholly or partially on the sea; but the difficulty of distinguishing would be enormous. When the vast majority of the shipping representatives protest it is clear that the business of ratifying this Declaration of London ought not to be done in a hurry. Are our Chambers of Commerce going to do anything?

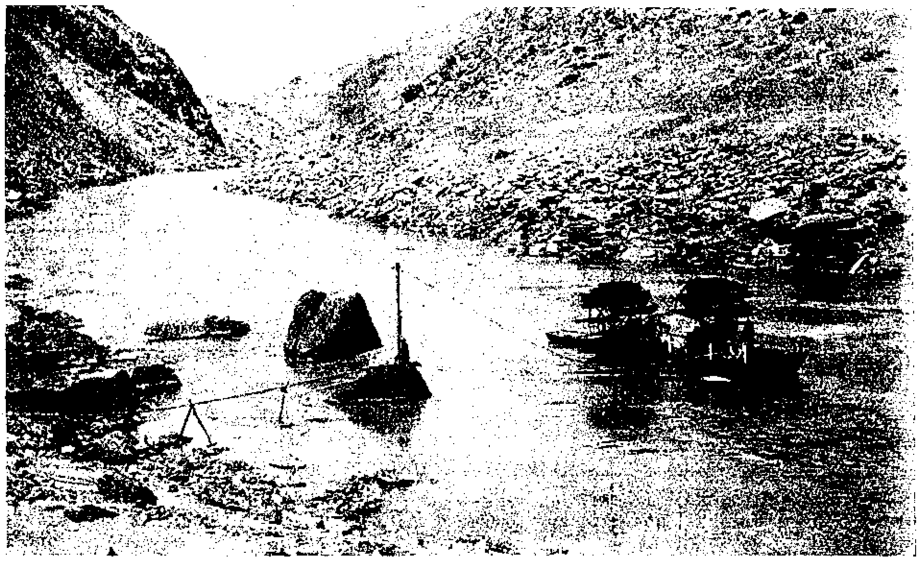
An Important Industry of Central Otago.

Unlimited Water for Mines and Irrigation.

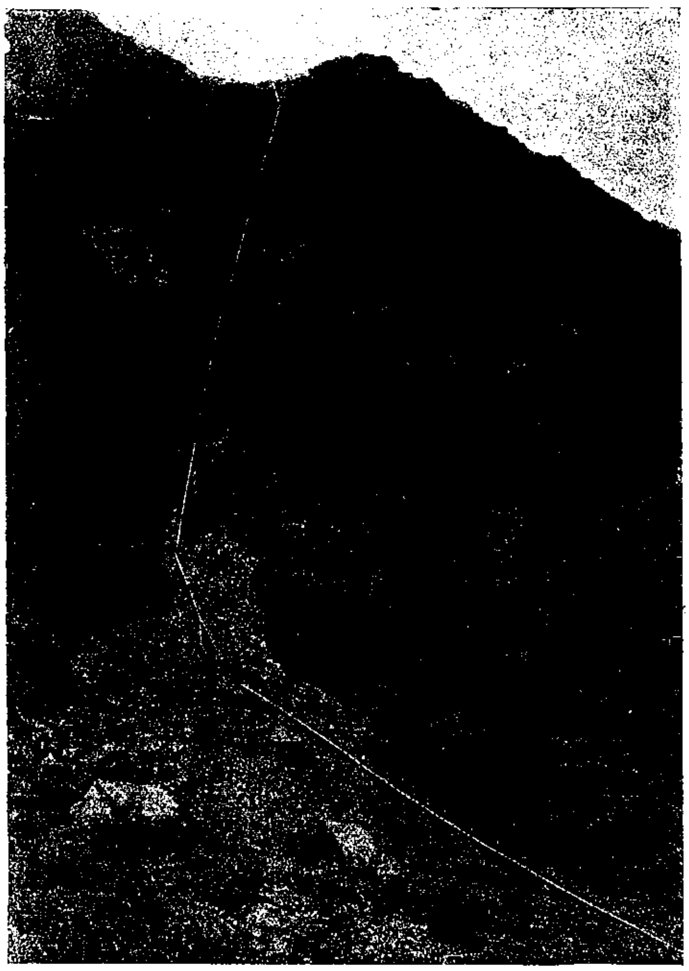
A Unique Pumping Plant.

Kitto and Co.'s.

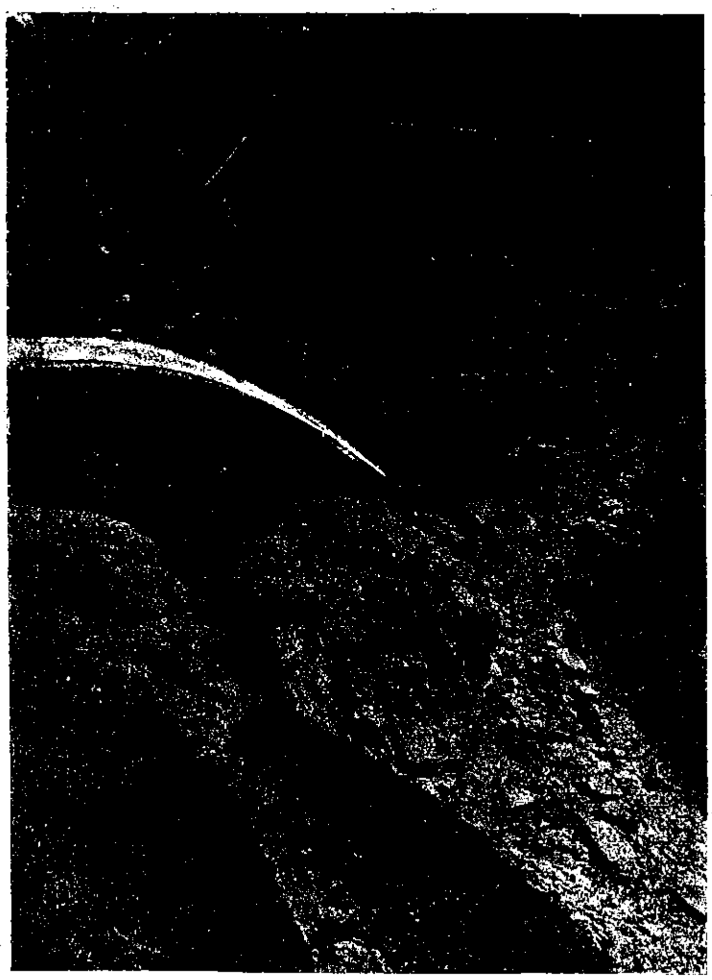
This plant, which we illustrate, is the invention of Mr. Kitto, long associated with mining--sluicing and dredging—in Central Otago. It is the only one of its kind in the Dominion which lifts water 400 feet above its own level for sluicing purposes. The pontoon was built and launched by R. F. and J. F. Kitto, who took some six weeks over the work, and navigated it to the claim seven miles by the river Clutha. Immediately after arrival they laid the pipes up the cliff, a work of great difficulty, and were delayed after its completion by a variety of accidents. The total length of pipes from pump to reservoir is 1000 feet. The wall of reservoir is built of stones and earth, the inside face being lined with cement, which renders it perfectly watertight. The original estimate was for a pump of a capacity of fifty gallons a minute, but the capacity of the pump installed has been proved up to seventy-five.



The Pontoons, Wheels and Pump.



The Way up the Bank for the Water.



The Water at the Claim.

The plant is giving great satisfaction, working day and night without further attention than the night and morning oilings. The new departure has opened up a new method of mining by which hundreds of acres of highly payable ground along the banks of the river Molyneux (Clutha) can be mined far more cheaply than by the construction of water-races, which cost nowhere less than fifty shillings a chain to construct. There are millions of horsepower in the river to be had on the same terms. As there are besides the auriferous country many thousands of acres of fertile land waiting only for water to make it produce in profusion, it would appear that a very prosperous future may be secured for the district. Struck by this consideration, Mr. Kitto took out a patent for his pump in 1888. The water of this big river is practically inexhaustible.

The machine in question will meet the irrigation demand with completeness, promptitude, and cheapness.

MOTOR CYCLES & MOTOR BOATS.

Motor Cycle Trials.

(By Our Christchurch Correspondent.)

The Christchurch-Dunedin Run.

Judge's Awards Announced.

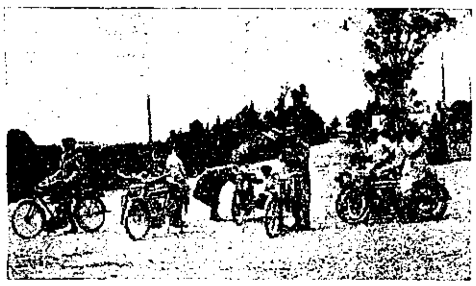
The adjudication of the motor-cycle trials promoted by the North Canterbury Motor Cycle Club, has been announced by the judge, Mr. R. P. M. Manning. The trials extended over the journey from Christchurch to Dunedin and back, and covered the four days from December 26 to 29. Of the twenty-six competitors who entered in the three classes, only six, including one who did not start, were unable to complete the tests.

The following are the awards in order of merit, together with the remarks appended by the judge to his report:—

Class I.—Trade.

Certificates of Merit: Tourist Premier Motor Agency (L. B. Young, rider), 2¾ h.p., 2-cylinder Douglas. Reliability points, 898, petrol points, 78; total 976. Belt fastener broke.

Certificate: Adams, Limited (B. Baker, rider), 3½ h.p., single-cylinder Triumph. Reliability 900, petrol 68, total 968. Penalised 32 points in petrol consumption, 32 per cent. difference in figures.



Adams, Limited (G. B. Brown, rider), 3½ h.p. single-cylinder Triumph. Reliability 860, petrol 70; total 930. Penalised 40 points for exceeding speed regulations at Ashburton.

Tourist Premier Motor Agency (A. E. Dendy, rider), 3½ h.p. single-cylinder Premier. Withdrawn owing to tire troubles.

In this class the first award for teams average was gained by L. B. Young, with 976 points, and the second by Adams, Ltd., with an average of 949 points.

Class II.—Trade Employees.

First prize, valued at £7.—R. M. Adams, 3½ h.p. single-cylinder Triumph. Reliability 900, petrol 85; total 985. Fined 15 points for refilling tank without proper supervision.

Second prize, value £5.—F. Howarth. 3½ h.p. single-cylinder Triumph. Reliability 888, petrol 77; total 965. Belt, stopped on hill, repaired tool bag, etc.

Third prize, value £3.—H. Jones, 3½ h.p. single-cylinder, King Dick. Reliability 865, petrol 62, total 927. Spill, carburetter, etc.

C. A. Mallard, 2¼ h.p., 2 cylinder, Royal Enfield, and A. M. Reynolds, 5 h.p., 2-cylinder Matchless, withdrew from the trial, whilst C. L. Black, 3½ h.p., single-cylinder Matchless, did not start.

With an average of 975 points Adams and Howarth gained the first award for team average, and Jones, with 927, the second.

Class III.—Private Owners.

Triumph Challenge Cup, Club prize value £10, and special prize value £5.—S. F. Barnett, 3½ h.p., single-cylinder Triumph. Reliability 893, petrol 97; total 990. Spill, stopped four times on return journey.

Second prizes, value £7.—A. Laurie, 3½ h.p. single-cylinder Triumph. Reliability 900, petrol 88; total 988.

Third prize, value £5.—F. E. Bell, 3½ h.p. single cylinder Triumph. Reliability 895, petrol 89; total 984. Belt, stopped twice.

C. Bonnington, 3½ h.p., single-cylinder Triumph. Reliability 890, petrol 86; total 976. Belt trouble, penalised for leaving 41 (Mr. H. Johnston) when punctured.

R. H. Parker, 3½ h.p., single-cylinder Triumph. Reliability 899, petrol 75; total 974. Belt came off.

P. Foster, 3½ h.p., single-cylinder Triumph. Reliability 894, petrol 68; total 962. Penalised for leaving 41 when punctured, spill.

C. Broad, 3½ h.p., single-cylinder Triumph. Reliability 891, petrol 66; total 967. Generator, horn, lamp, penalised for leaving 26 (L. S. Wright) when punctured.

F. M. Cordery, 3½ h.p., single-cylinder King Dick. Reliability 879, petrol 69; total 948. Jet blocked twice, belt, hill, mudguard.

H. Fancourt, 3½ h.p., single-cylinder Triumph. Reliability 858, petrol 84; total 942. Belt troubles, also penalised 25 points for long delay near Rakaia with puncture.

S. L. Wright, 3½ h.p., single-cylinder King Dick. Reliability 847, petrol 79; total 926. Spill, petrol tank, replaced exhaust valve, failed twice on hill.

W. H. Johnston, 3½ h.p., single-cylinder Matchless. Reliability 827, petrol 87; total 914. Belt troubles, machine would not start, ten minutes late starting from Dunedin, failed on hill.

S. F. Caverhill, 3½ h.p., single-cylinder Matchless, retired at Dunedin, and C. Walters, 3½ h.p., single-cylinder Premier, his inlet valve having broken, retired at Palmerston on the return journey.

W. H. Stone, 5 h.p., two-cylinder Matchless. Reliability 833, petrol 83; total 916. Speedometer, belt, left 26, ten minutes late starting from Dunedin.

Motor Boat Notes.

AUCKLAND.

Messrs. BAILEY & LOWE report:—23ft. tuck stern launch for Mr. Buchannan, Auckland: fitted with an 8 h.p. Stirling eng'ne; completed early in February. Also 20ft. tuck stern launch for Messrs. Davis and Boyd, Hastings; 5 h.p. Holladay engine. Also 24ft. launch for Messrs. Marshall, Ryan & Co., Taupo; 7½ h.p. Holladay engine; and other work on repair, dingies, etc. A large number of orders have been placed to be taken in hand as soon as building space is available.

Messrs. COLLINGS & BELL report:—A 30ft. launch for Mr. Guest, of Warkworth, was launched at 6 o'clock on Christmas Eve.

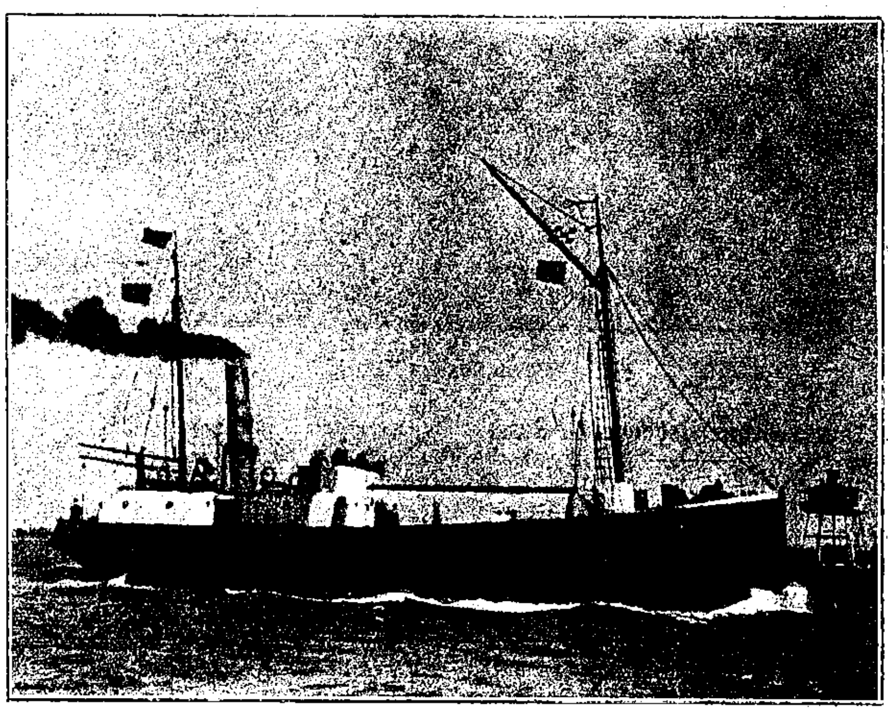
A 29ft. launch for Mr. Pemberton, of Warkworth, fitted with a 3 h.p. Perfection engine.

A 26ft. yacht launched and delivered to Mr. C. Chamberlain, Ponui Island.

During the past month engines have been sent to Mr. Terry, Gisborne; Mr. Fell, Kohukohu; Mr. Banks, Wanganui; Mr. Bell, Tiniki; Mr. McFarlane, Waikato; Mr. Robson, Auckland.

Build'ng—A 25ft. cabin launch, 6ft. 6in. beam, carvel built. To be fitted with bunks in cabin, seats in cockpit. Plenty of lockers for stowage. Jarrah keel and deadwood plumb stem, and French stern. She will be fitted with a 5 h.p. two cylinder h.c. Doman engine, ignition make and break. The magneto controls from engine will be at the wheel, so that the helmsman can control engine without leaving it. Built for Mr. Gaudin, of Wellington.

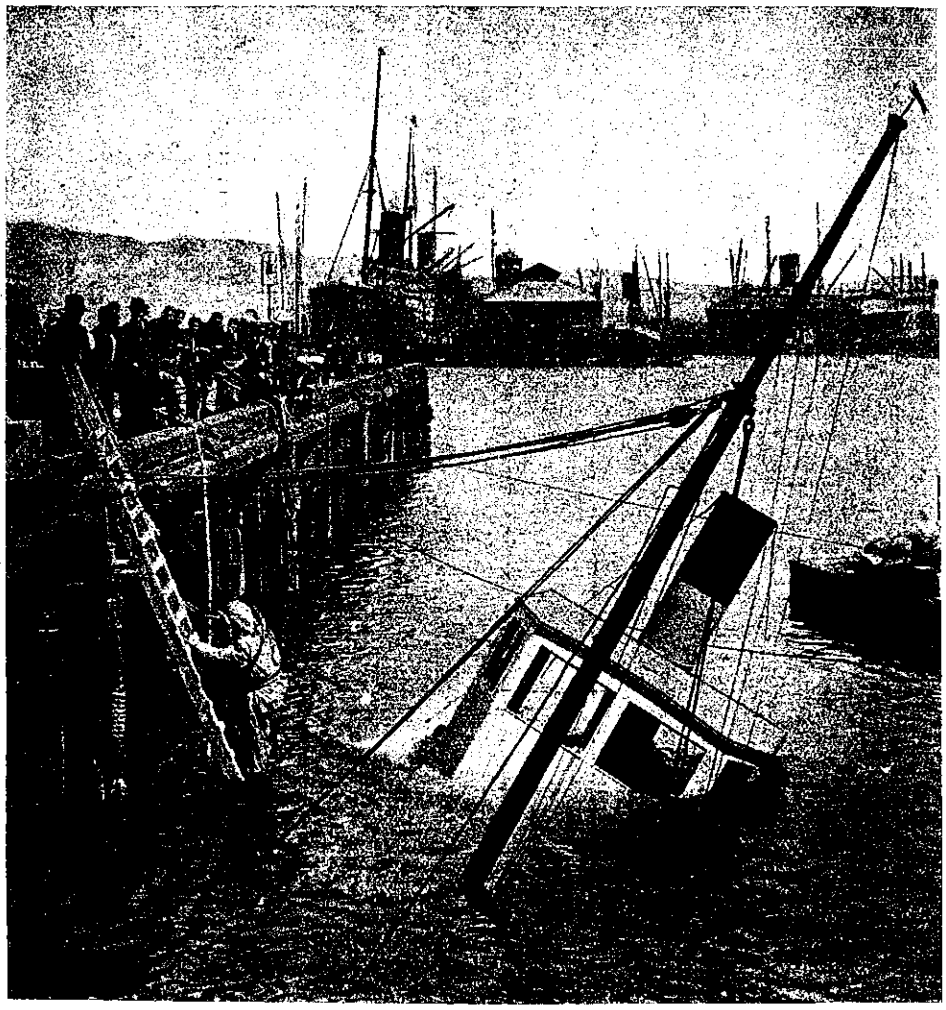
A small boat for Fiji; another for Mangurewa; a launch for Kawau Island, and several dinghys.



"Kotonui." Chas. Bailey, Junior, builder.

The Raising of the "Pilot."

The mishap to the small harbour steamer is recalled by the illustration on next page. The boat, for some reason unexplained, sank at the Ferry Wharf one night in January. Attempts were made to pump her dry, while divers endeavoured to patch leaks and close hatches. But it was soon found that the very powerful centrifugal pumps of the Harbour Board were incapable of pumping the harbour dry. In other words, the patching and closing operations were a failure. Science thereupon retired in favour of brute force, as represented by a powerful derrick, and the "Pilot" came up without further delay.



THE SUNKEN "PILOT."

INDUSTRY (*Perron*).

Brother Britons Beyond the Seas.

At the Wellington headquarters of the New Zealand Branch of the Institute of Marine Engineers, there was, in the middle of the month, a notable presentation. Mr. Reddaway (the head of the firm of Reddaway & Co., of Manchester, ironmasters) being struck by some pictures—probably those published in PROGRESS some months ago—of the Institute's handsome building lately erected on its commanding site in Aitken Street, determined to take a hand in the adornment. He accordingly purchased Perron's masterpiece, "Industry" (Le Travail), and sent it out to "My Brother Britons beyond the seas." On January 17th the Minister of Marine, Hon. J. A. Millar, presented the handsome gift to the President, Mr. Wallace, in the presence of a representative gathering, and Mr. Wallace, on behalf of the Institute, made suitable and graceful reply. It was announced that the Institute had made Mr. Reddaway a life member, and sent him its commemorative gold medal. The bronze of the presentation is the statue of a young worker, an ideal figure of Industry, sinewy, strong, graceful, in a moment of repose, as signified by the heavy hammer behind him, but braced alert, ready to resume the interrupted task with cheerfulness, energy and endurance: a magnificent conception of calm force.

REPRESENTATIVE GATHERING AT MARINE ENGINEERS' INSTITUTE, WELLINGTON, N.Z.

The Mastery of the Air

A Record of the Achievements of Science in the Realm of Aerial Navigation

Aviation.

(By Peter Ellis.)

Flying.

Suppose a machine weighs 100lbs., and we wish to raise it vertically in the air 100 feet in one minute by means of a screw propeller (I do not say this is practicable, only assume it), the propeller having a helical pitch of one foot, we would require to revolve the propeller 100 times and the thrust would be 100lbs., assuming, of course, that there were no slip. Now, if instead of rising vertically we go up an incline of 1 in 50 with the horizontal, with a propeller of the same pitch, we would require to revolve it 5000 times, with a thrust of 2lbs., 10,000 foot lbs. of work being done in either case, the speed in the first instance being a 100 feet per minute and in the latter 5000ft., or nearly 60 miles per hour.

To revolve a propeller at the slow speed of 100 revs. per min., with the heavy thrust of 100lbs., would mean a very heavy, slow-moving motor (or a fast motor geared down with reducing gear), and the heavy thrust would require a very strong propeller, which would also be heavy as a natural sequence, the whole thing being preposterous. On the other hand, a propeller revolving at the high speed of 5000 revs. per min. with a light thrust (2lbs.) makes it easy to apply a light motor, light shaft, and light propeller. Of course atmospheric and frictional resistance is neglected in the discussion, in order to make this explanation clear, and to show the absurdity of attempting to fly *vertically* and the ease and practicability of flying in a nearly horizontal direction, rising gradually to the desired height.

Force and Motion.

When a block of wood lies on a table, the Savants tell us that it presses on the table, and the surface of the table reacts on the block. Now, suppose we smear the surface of the table with cement, and place the block upon it so that the block unites with the table, what has become of these contrary forces? We have not altered the position of the block, only interposed a thin layer of cement to exclude the air, where the under surface of the block meets the upper surface of the table. If it be contended that the forces are still acting, then since the block and the table have become one mass, these forces must be acting not only at the joint where the cement is, but above and below it, everywhere, from the top of the block to the bottom of the table legs, and even right down to the centre of the earth. Beginning at the centre of the earth, we follow the material from that point upwards until we reach the top of the block, we find the density of the material greatest at the earth's centre, diminishing as we go upward (that is, if the density of the material decreases proportionately all the way, as it seems to do). Take the foundation blocks of a building. Are they pressed upon, and more dense by reason of the superincumbent weight, weight meaning the pull of gravitation (of course, if there were no gravitation, there would be no weight). Now we cannot draw a horizontal line, or fix on a point, anywhere between the centre of the earth and the top of a building, and say here, at this line only, or at this point only, there is a downward pressure and an upward pressure; the fact seems to be that these upward and downward pressures are everywhere, vertically throughout the mass. The mass or masses being considered as strata of different materials, but the meeting surface of the different strata do not locate the contrary forces we have been considering. Relying on the "Atomic theory" (which, anyhow, is a convenient one for our purpose), does it not appear that the opposite forces exist throughout every mass of material in all directions, and by this principle are able to exist as masses. The atoms must hold together, and also be kept asunder, in different densities in order to form masses. The whole matter, then, resolves itself into a question of varying densities, dependent on position. A castiron column, for instance, lying horizontally, will have the density of its ends equal, but if raised on end, the lower end will become denser than the upper. Another curious fact seems to appear, and that is, that the force or forces in connection with atoms, only really act, when they are in motion, for after the respective densities have adjusted themselves, and the contrary forces balance each other, they mutually destroy each other and have no real existence. Will the pursuit of this study give a clue to the mystery of what is heat and electricity? It seems to open the door in that direction. May not electric energy be simply the disturbing of balanced forces, and so causing motion, *i.e.*, a state of unbalance. In a word, is not electricity simply motion born of disturbance and working again towards a balance?

When a ball is projected vertically in the air by considerable force, it reaches a point where it ceases to rise, and is for an instant in a neutral position, *i.e.*, having no weight, neither going up or down. Now if, at this critical moment another force is applied to cause the ball to move rapidly in a horizontal direction (tending upwards) the ball will have little time to descend, and will nearly maintain its height and weightlessness as long as the horizontal force acting upon it is sufficient and continuous. Gravity, like every other force, requires time to act, but the rapid horizontal motion of the body in this case does not give it full opportunity. Of course there can be no real force apart from motion. This shows that the art of flying through the air is a much simpler matter than is ordinarily supposed.

Alighting with Planeless Flying Machines.

Since there are no planes to depend on for supporting the machine, a constant horizontal motion is necessary, the propellers being kept constantly going. Twin motors, capable of being coupled, or working independently, are needed for safety.

When it is desired to alight on a particular spot, the machine would be steered in a wide, sweeping circle around it, and the speed of the propellers lowered so that gravity may gradually draw the machine to earth in a helical or spiral course of considerable length.

The Belmont (New York) Meeting.

This meeting was marred by the dispute over Moisant's win in the flight around the Liberty Statue. His death at Los Angeles gives a melancholy interest to the event. We glean the following regarding the matter from the American press:—

"The prince of the power of the air seems to have been alive to his opportunity to sow dissension among the airmen. At any rate, a Satanic sequel to the international aviation meet at Belmont Park, Long Island, has been a crop of protests and charges which threatens civil war in the Aero Club of America, and moves one paragrapher to remark that birds in their little nests agree better than birdmen competing for prizes. Let no one after this say that the aeroplane is not destined to be an instrument of warfare,' exclaims the New York *World*, which notes that ever since the Belmont Park meet, 'rival forces of flying men have been ranged in hostile array at banquet tables and about hotel lobbies.'

On October 30, which had been officially announced as the last day of the meet, three contestants, representing France, England, and the United States, flew in a race from the aviation grounds around the Statute of Liberty in New York Harbour and back, a prize of £2000 to go to the airman making the best time. This race was won for the United States by John B. Moisant. There the incident would have ended had not the committee in charge of the meet extended its original programme by arranging that certain events postponed because of bad weather on the opening day should be decided by flights on Monday, the 31st. It seems that the conditions of the Statue-of-Liberty race provided that each contestant could make the flight more than once during the meet, his best time to count. Therefore the English aviator, Claude Grahame-White, Moisant's nearest competitor, applied for permission to try again on Monday, but was refused on the ground that the meet had officially closed with Sunday's flights, those of Monday being exhibition performances. This ruling did not meet with the approval of a number of the airmen, and the dispute following it divided the flyers into two camps and brought to light a smoldering feud within the ranks of the Aero Club of America."

Value of the Meeting.

Whatever may be the merits of this controversy, says the New York *Herald*, "it can not change the fact that the international aviation tournament this year was the greatest ever held." The same point is emphasised by the Springfield *Republican*, which goes on to say:—

"In general the most striking result of the tournament was its demonstration of the capacity of the aeroplane to stay aloft in bad weather. A 40-mile wind, such as was faced one day in a height contest, comes close to storm velocity, and would be dangerous to small sailing craft. Flying machines that can take such risks are not mere toys, and in war time would seldom be driven to shelter.

"It is quite true that no air craft is yet able to make progress against a strong wind, but the aeroplane has in this respect greatly the advantage of the dirigible, and it is not impossible that with more powerful motors a speed of 80 miles or more an hour will yet be realised, which would make feasible a moderate progress against anything short of a hurricane.

"Of the records made at Belmont Park the most important was the new altitude achieved by Johnstone in one of the new Wright machines. The ease with which he reached 9714 feet, a clear gain of 528 feet over the world's best previous record, showed that the limit is still far from being reached. It is not long since the odd 528 feet would have been considered an astonishing feat, and talk of altitudes of 1000 feet was regarded as rash prophecy.

"It is likely, in fact, that in war aeroplanes will be numerous and will take daring chances by flying low, just as in the past cavalry scouts have risked annihilation by riding close to the enemy. But the aerial scout of the future will have the great advantage that even if shot down in transit he will have sent his report by wireless up to the moment of disaster. It is a risk which in a great battle many a brave man would be glad to take."

The "Aeroplane Portfolio" is a series of nine sheets of scale drawings of the Farman, Voisin, Santos Dumont, Wright, Curtiss, Bleriot, and other well-known aeroplanes, with a description of each. Each of the machines is shown in end view, plan, and elevation, and the drawings will be of value as well as of interest to all interested in aerial navigation.

Hamilton and the Law of Gravity.

There have been few passengers in aeroplane accidents to report their sensations for us, and professional aviators generally are reticent about their experiences. One of the latter, however, has described some of his adventures in the New York *World*. Mr. Charles K. Hamilton began the habit early in life by jumping off a fifty-foot trestle when he was fourteen years old. Since that time he has gained in experience and in the past six years his falls total a little over two miles through the air. Broken limbs and hours of unconsciousness are merely incidents of the game. A few of his falls have been sufficiently unusual to merit attention. At an exhibition at Paterson, N.J., with his dirigible, Mr. Hamilton had risen nearly 5,000 feet, and was preparing to come down slowly. Says he:—

"I had just begun to descend and had dropped 600 feet gradually, when, without warning, the gasbag burst and the machine began to fall. The instant I heard the explosion I knew what had happened and I thought everything was over. I knew that a fall from that height would dash me to pieces, and I also knew there was nothing I could do to save myself. My whole life flashed through my brain. I thought of everything I had and hadn't done. The mere sensation of falling wasn't particularly unpleasant. I had fallen so many times that I was used to it. If I had known that I wouldn't be dashed to death, the fall would have been little more than a thrilling experience. However, I knew that I should be killed, and the quick review of my whole life was terrifying. I don't know how many seconds I was falling. It might have been fifteen; it might have been twenty, or even more. It seemed an eternity.

Down, down, down, I went. The rush of the air was so great that I couldn't breathe. Suddenly when the city loomed up directly below me and I thought every second I should be smashed into a thousand pieces the gasbag of the balloon spread out like a parachute. It was only an accident that it did so. It had been cracking and flapping above me, making a terrific racket, and how or why it spread out two hundred feet above the ground instead of six hundred feet or ten feet—when it would have been too late—no one will ever know. It did spread out, however, and that saved my life. My fall was not stopped, but the parachute made by the gas-bag broke it to such an extent that when I cracked upon the roof of a hotel I was simply knocked unconscious. Part of the engine went through the roof, but within five minutes after it struck I was able to get up and walk away. Not a bone was broken, but the shaking up I got was so terrific that I had to spend the next three weeks in a hospital. Of course I was covered with bruises, but I wasn't really badly hurt. Several falls that I have had from gliders had far more disastrous consequences. The balloon was far more seriously injured than I."

Since he has taken to aeroplanes Mr. Hamilton has had few serious falls. "Really," he says, "flying is much more exciting than falling. Besides, it isn't half as dangerous."

Aero Club of New Zealand.

Leo A. Walsh, President.

Notes.

(By K. D. Murray, Secretary.)

Mr. Henning has now completed his Bleriot-type monoplane of steel tubing, and has commenced the tuning up of his engine, which is of the two-cycle horizontal opposed type. In this engine there are several interesting features which we have never seen in any other aero engine, and we are anxious to see how it will turn out.

The whole machine has a very crude appearance, and there are many details which might be improved on, but Mr. Henning frankly admits that the machine is purely an experiment, so we hope that when he builds another aeroplane he will have sufficient time at his disposal to be able to put more work into it.

The Club President, Mr. Leo. Walsh, has obtained a private flying ground at Manurewa, about thirteen miles from Auckland City. He has been kind enough to give the free use of these grounds to the Aero Club of New Zealand, with the agreement that members erecting hangars be charged a small ground rent. We are very much indebted to Mr. Walsh for the privilege, and members can best show their appreciation by taking full advantage of his offer.

During the summer months the general meetings will be held monthly instead of fortnightly as before.

A competition for designs for a "club glider" has been arranged. The results will be known in February.

At a recent meeting of the Aero Club of New Zealand, at Auckland, Mr. W. Langguth gave an interesting lecture on "New Zealand Woods and their adaptability to Aeroplane Construction." Mr. Langguth first defined the necessary qualities of wood required for aeroplane construction, and then at some length described the various methods used for obtaining the different strength of woods (tensile, shearing, etc.). He then worked out by equation the strength of a beam of wood 1in. x 2in. x 15ft. of the woods in the list given below, and compared these to a beam of aeroplane ash of similar dimensions.

In order to facilitate the comparison of the woods he divided the strength of the before-mentioned beam by the weight per cubic foot, giving the figure in the third column:—

Wood.	Average Weight in lbs. per cubic feet.	Strength in lbs.	Fig. of Comparison.
Kauri	36	426	11.8
Titoki	58	533	9.2
Manuka	58.7	644	10.9
Rimu	38	184	10.3
Miro	59	429	7.2
Matai	47	586	12.2
Ash	46	169	7.9—8.3

*The beam supported at both ends, and loaded equally all over.

Continuing, he explained that Matai is not necessarily more suitable than Ash, as grain, fibre, springiness, and various other factors have to be taken into consideration; but he thought that either Matai or Kauri would make splendid formers (foils), and that Kauri would lend itself well to the construction of propellers because of its lightness, strength, and workability. Titoki, when obtained in long enough lengths, would make good spars, and Manuka would make excellent skids. In conclusion, in regard to New Zealand timbers, Mr. Langguth emphasised the fact that great importance lay in the season in which timber was cut. "This," he said, "is sadly neglected in our country, and it is a great pity that the Government does not lay greater stress on this important factor, as the quality of the timber cut in the winter (when the sap is low) is undoubtedly superior."

The Club's Glider Competition.

The glider for which the competition closed with the last month, has been the subject of a very long felt want. It is interesting to learn that the specifications require a glider on which provision is made for controlling the lateral and longitudinal stability of the machine by machinery or any movement except the movement of the body, a condition which reminds us that the art of flying belongs to the domain not of acrobatics but of aviation.

The Amateur Photographer.

Photography Simplified.

With Notes on Pinhole Photography.

(By Barclay Hector.)

Introductory.

It matters little to the photographic novice how the lens forms the image, why plates must be developed and fixed, or why papers have to be toned. He wants to know the shortest cut towards obtaining moderately goods records of scenes, etc., with a minimum of technical knowledge. For this reason I recommend him to use 1 plate, the "Imperial Special Rapid"; 1 developer, "Burroughs Wellcome's Tabloid Metol-Hydroquinone"; and one paper, "Leto Seltona." The special rapid plates, because most amateurs are anxious to take subjects which require rapid exposures, and in nine cases out of ten, if they took these with slow plates, under-exposure would result, and even slight under-exposure cannot be satisfactorily rectified. The Tabloid developer, because it is much handier and saves weighing of chemicals; and, one greater advantage, the solutions made from the tabloids do not vary in strength. The Seltona paper I recommend, because with very little practice in printing the results are certain, and are obtained with a minimum expenditure of both time and money.

Usually the beginner is taught in the first place how to make a negative, and afterwards how to take a print from that negative. I do not recommend this. I would strongly advise him (before attempting any other branch of photography) to buy a packet of Seltona paper, some Hypo, and a printing frame, and to borrow from a friend who is an advanced photographic worker a first-class negative; to print from this negative according to the directions given later on, and so get used to the quality of negative requisite to give good prints. He will then have a better idea as to the kind of negative to be aimed at.

It may be as well to give a summary of all that has to be done, from the time of making up one's mind to "go in for" photography.

First of all it will be understood that a half-plate (6½in. x 4¾in.) outfit costs more, both in initial and subsequent expenses, than does a quarter-plate (4¼in x 3¼in.); so that the first thing to decide is not merely as to the ways and means, but also as to whether the extra expense will be warranted in view of the prospective work. Personally I prefer the quarter-plate for taking ordinary topographical records, such as most amateurs wish to obtain; and a quarter-plate picture can always be enlarged. I would ask my readers to bear in mind that no more picture can be got on a half-plate than on a quarter-plate with the outfits as usually supplied by the makers. True, the objects in the half-plate are, of course, larger in reality, but not in proportion.

Secondly, those who do not know a camera from an enlarging box would be wise to get a photographer friend to help in the selection of a camera. By way of suggestion, I would name the following quarter-plate cameras as being quite satisfactory:—

"Folding Vida," with Ensign Symmetrical lens, complete with 3 double dark slides, case and tripod. Costing about £2 5 0

"Century," with Rectilinear lens, complete with 3 double slides, case and tripod. Costing about £3 10 6

"Premo," with Rectilinear lens, complete with 3 double dark slides, case and tripod. Costing about £3 10 0

These can all be used as hand or stand cameras. *Do not be persuaded to purchase a box-form hand-camera.*

Although I have included the tripod in the estimate for each of the above sets, the tripod for the first named will have to be selected separately. Let it be light but rigid. Two fold is better than three-fold.

A focussing cloth will be needed. If means will permit, have a "Paragon"; if means will not permit, have any thickish black cloth (3 feet square), which will answer the purpose well enough. Say 2/- for this.

Next, dishes. For developing get a deep porcelain dish, 5in. x 4in. (inside measurement), and for fixing get a Xylonite dish, 8½in. x 6½in. The former will cost 1/-, the latter 2/-. The advantage of having so large a fixing dish will be apparent later. (For half-plate size 7in. x 5in. porcelain and 13in. x 12in. Xylonite, 1/9 and 8/6.)

Now for a lamp. A folding fabric lamp is all that is necessary, price 3/-; or a japanned tin lamp with ruby glass, say 5/-. In either case, as we are to use rapid plates, it will be well to buy a piece of yellow fabric to put round, or in front of, the red fabric or tin lamp, as the case may be. This may cost 1/-.

BOTANICAL GARDENS, WELLINGTON.

Plates. Be advised, if it is hoped to benefit by the instructions given later, and buy a box of "Imperial Special Rapid Plates," 1/3 (half-plate size, 2/6). *Do not put the box out in the sun.*

Chemicals: two only. (*a*) A box of Burroughs Wellcome's "Metol-Hydroquinone" Tabloids, 1/6; and (*b*) 1lb. of Hypo, 3d.

A four-ounce glass measure, 1/3, is most necessary, and a glass rod, 6d., is handy.

Two more things, if you have not already got them, to complete the list. A printing frame (4¼in. x 3¼in.), "Jay Nay" pattern, 1/-; and a packet of "Leto Seltona" printing-out paper (glossy, matte, or antique-white), 1/3; (half-plate size, 1/9 and 1/3).

Dark Room.

The plates when removed from box and unpacked will be affected by all light except ruby, or ruby and yellow mixed, and they are even somewhat affected by these colours; more so when they are in a dry state. Therefore it is necessary to exclude from the dark-room all light except red or red and yellow mixed. Ordinary commercial ruby glass will not do; buy special glass from a photographic dealer. If a special room can be set apart, so much the better; in any case we must, if working in daylight, block the light coming through all windows and chinks in the doors, even the key-hole. At night time the bathroom is perfectly safe, unless the light happens to shine through the window from the next house or from a street lamp, in which case the rays of light must be stopped. A good water supply is a great convenience.

Negative Making.

It is necessary first to explain what a negative is. It is a glass plate, or film, coated with a sensitive gelatinous emulsion which has been more or less affected by the light coming through the lens, and which has been treated (developed and fixed) with certain chemicals. All the light parts in the original view are the dark parts in the negative, and *vice versa*. Suppose the following diagram (*a*) were photographed:—

a. *b*. *c*

The dark parts photographing light, and the light parts photographing dark, would form the reverse, or negative (*b*); and on taking a print this would be again reversed and form the positive (*c*), similar to the original (*a*). If some of the dark parts of the original were not so dark as others, they would photograph darker on the negative, and consequently would appear lighter on the print.

A finished negative is no longer sensitive to light, and with careful handling thousands of prints may be taken from it.

Direction 1—Filling Dark Slides.

(NOTE—The following directions apply to all sizes of plates, but I am at present assuming that we are using quarter-plate.)

Most dark-slides, or plate-holders, carry two plates each. Take the dark-slides and box of plates into the dark-room, and make sure that no light is coming from outside the room. Then light the ruby lamp and place it on some convenient shelf or bracket. Open the box of plates. *Do not go too near the light.* The plates will be found to be packed in fours; the two outside plates of each four with glass sides outwards, the two inner plates with the emulsion sides outwards and the glass sides in contact. Into each side of the dark-slide put one plate, *emulsion side outwards, i.e.*, towards where the lens will be. Before putting the plates into the slides it is well to give them each a sharp knock edgeways on a table or the hand, so as to remove any dust. *Do not brush the film, and do not touch the emulsion side with the fingers;* catch the plates by their edges. Having filled the dark-slides, be careful to close the box of plates and put out the light. Wrap the dark-slides in a cloth.

Direction 2—Taking the Photograph.

We are now ready for exposing a couple of plates. Choose some simple view on a bright day between 9 a.m. and 4 p.m. *Do not face the sun.* Set the camera up so that the base-board is perfectly level, so that the camera is not tilted either towards the sky or the ground. The lens should be open, *i.e.*, as large an opening in the lens as possible. Put the focussing cloth over the head and examine the ground glass where the image will be found, upside down. It will probably be blurred and indistinct. Rack the lens nearer to or further away from the ground glass until an object at, say, 20 feet distance, is quite distinct. This is called "focussing." If all that is required in the picture is now included on the ground glass, proceed as in Direction 3. If not, move the camera backwards or forwards, as it is wished to include more or less view. If it is found that the camera has to be tilted to get in a tall tree or building, the ground glass focussing screen (*i.e.*, the back of the camera) must be put vertical. But, if the lens be a good one, it is better to keep the camera level when possible, and to raise the lens to take in high objects. The camera should always be level from side to side. Having arranged the view to your satisfaction on the ground glass, be sure that all clamps and screws are tight, and *do not forget to set the shutter* (*or put the cap on the lens*).

TAKEN WITH $\frac{1}{75}$IN. PINHOLE AT 16INS. FROM PLATE. EXPOSURE 25 MINUTES.

Method in Focussing.

First make up your mind as to what is the principal object in the picture chosen. It may be a tree, the cloud effect, a building, or it may be the general effect of light and shade. But there must, in every scene, be some special feature which predominates, and it is necessary to find out what this is before focussing can be properly done. A good way to ascertain what this special feature is, is to close the eyes for a few seconds, then open them for one-fifth of a second only, and try to think what you saw most of. Perhaps the whole scene you will think! Try again, and again, and in time you will find that some object will engage your attention more than the other. This will be the object of principal interest, and must be in the sharpest focus (*i.e.*, sharper than any other object in the picture) but not necessarily microscopically defined. We will suppose that the principal object is a tree, twenty feet away; near at hand are bushes, and, in the distance, hills. Use the largest stop you have (say F. 8), and bring the tree into the focus desired. Now stop the lens down to F. 11, and focus again in such a way as to render less sharply the distant hills, but at the same time retaining the desired degree of sharpness in the tree. Now turn your attention to the bushes in the foreground. Probably you must use a still smaller stop, and again adjust the focussing so as to retain the tree just as sharp as you wish, the distant hills less sharply defined, and at the same time get the foreground bushes sufficiently sharp so that the eye may see them and know quite well what they are without being specially attracted to them. The guiding principle should be to put the principal object in sharpest focus, and other objects in subordinate degrees of definition according to their pictorial importance. It must be remembered, however, that the colours of nature are apt to mislead even experienced workers at times. The small scale image as seen on the ground-glass is often such a charming object that for a moment we may fail to remember that our print will be robbed of its colour charm. It is an excellent plan to have a dark blue glass to slip on the lens. This will in general serve as a reminder as to our ordinary monochrome rendering.

(To be continued.)

Writing approximately, there are 147,500 miles of highways in England and Wales, of which 118,000 may be regarded as district roads. There are 29,500 miles of main roads, 23,500 being in the rural districts and the remainder in urban districts. Of these latter a considerable stretch have been treated with preparations to ameliorate the dust nuisance; Mr. R. Brown, the surveyor to the Southall District Council, estimates that probably one-third of the total mileage has already been dealt with. This leaves about 4,000 yet to be reconstructed at a cost of over three-quarters of a million sterling.

INDUSTRY: LABOUR AND CAPITAL

The Last Trade Union Congress.

(Engineering.)

Another error is that what is called "the Osborne case" vetoed the right of trade-unionists "to engage in political work and to send forward and maintain representatives in the House of Commons." It was rather the acceptance by the Court of the objections of some trade-unionists to compulsorily contribute towards the advocacy of views and the promulgation of schemes to which they were opposed. Therein lies the crux of the whole question.

The representation of the views of labour is in itself commendable. It is almost a necessity. All Parliamentarians welcome the accession of workers in every sphere of activity, from the highest commercial expert or the engineer, to the humblest miner or the unskilled worker. No one will for a moment deny the claim of the President that "the influence of labour in Parliament has been for the good of the community." As he pointed out, there has been an increasing number of the manual-worker class in Parliament since 1874. Men like Broadhurst, Howell, Burt, Fenwick, and others that might be named stand out prominently in the annals of law-making. But it is because they were Parliamentarians first and Labourists afterwards that they did good work and satisfied the trade unionists of all classes. It was when extremists asserted themselves that they ceased to have influence in the promotion of sound legislative work. Not all trade-unionists can agree to pay for the advocacy of the nostrums of Graysons and Keir Hardies. The cause which influenced trade-unionists to utilise the law in challenging "the hitherto unchallenged right" is easily understood.

We are not concerned here with party divisions; we consider rather the effect of legislation on the prestige of the nation from the economic or industrial standpoint. In the heat and turmoil of political party warfare, all are too prone to forget the science of government, the application of which is the function of Parliament. To effect this duty it is essential that every interest which affects the welfare of the State should be represented. Such representation is best achieved by men whose lives have been spent in close alliance with these interests. In the evolving of legislation concerning factories, for instance, the experience of a factory worker is invaluable, and it is the respect paid by all to the views begotten of such experience, expressed from any quarter of the House, that has made the British Parliament the model for the world. But this complete acceptance of the desirability of a Parliament comprehensive of all elements of the population at once establishes the fact that the first, if not the sole, duty of the Member of Parliament is to the State. Members are elected by constituencies because these constituencies are units of the nation, a system accepted as the most expedient in order to secure comprehensive representation, collected experience, and direct responsibility. Any other method would not be feasible. A trade union never embraces all the workers in a trade, and cannot be said to represent completely such interest as is comprehended by the organisation. Moreover, there are trades and interests which have no analogous organisation.

It is true that the trade unions do not seek to be directly represented - at all events for the present. But when a trade union chooses a representative and meets the financial obligations, they are the masters of the situation. Those who pay the piper call the tune; and if the tune is not to the liking of the union, and "supplies" are cut off, the member or candidate ceases to be the representative, although his services to the State have been exemplary, and his views are acceptable to the constituency as a unit of the nation. This is in direct opposition to the accepted view that each member, although he may represent the views of some interest, has, as a first duty, the advancement of the State. Obviously, if his services are required by the State, the nation must meet the financial obligation, and therefore, since Parliament requires among the membership men of all classes, those unable to bear the expense ought to be recouped from the national exchequer. Then only can he be free to express his views for the benefit of the whole community without fear of the opprobrium of factional faddists. The Osborne case thus brings us to the payment of all Members of Parliament, so as to avoid that undesirable pressure which was brought to bear, for instance, upon Members of Parliament like Mr. Bell, Mr. Burt, and Mr. Fenwick.

The other alternative is for such trade-unionists who wish to pay Members of Parliament to meet the expense by voluntary contribution. Much is said about the rule of the majority; but where this involves financial hardship it is indefensible. Trade unions were established for "regulating the relations between employers and employed;" the preponderating majority of members entered the union and have continued contributing members on this understanding. So long as extraneous action and expenditure were not opposed to their honest convictions they may have remained quiescent; but they did not forfeit their right to object. Now that they do object, and since the law has proclaimed the levy illegal, the domination of even the majority, forcing members to forfeit their rights in the funds accumulated in part by their contributions, has become intolerable, and must not be sanctioned by law. Let the advocates of the payment of members by unionists form associations for this specific purpose. All that they seek would be attained, and those opposed to the principle could stand aloof, and the unions for "regulating the relations between employers and employed would remain inviolate. We are satisfied that if the Congress issued voting papers to each trade-unionist stating that if more than one-half of the unionists did not vote in favour of the continuance of the levy for expenses of Parliamentary representatives, the matter would end. They would then realise that the decision of the Congress was not so clearly approved by the workers of the nation.

The other subjects raised at the Congress were eclipsed by this one topic. Nor was there any of special significance. It was natural that the institution of labour exchanges should come in for special commendation. The Congress, by one of its resolutions, however, would like to exercise supervision over the arrangements made for employers and employed by the exchanges. They seek for a return of firms wanting orders, and the wages offered, for annulment of engagements unless trade-union rates are paid, and they demand that no firms shall be brought to the notice of workers in the event of a dispute existing between such firms and their workers. Such interference with the work of the exchanges would immensely affect their utility and the advantage which they may yet achieve. Freedom of action must be accorded if they are to reduce unemployment, especially in times of trade depression. Another usurpation of the rights of the citizen is contained in the resolution making it prohibitive for employers to "house" workers when strikes or lock-outs prevail. We sympathise with the plea that something should be done for the employment of the blind instead of sending them to workhouses, where they are said to involve an expenditure by the nation of £170,000 per annum.

In addition to the annual call for the nationalisation of railways and canals, there was a resolution which declared that the working agreements of railways were prejudicial to the interests of the workers, although conductive to economy. Since the return to capital has been diminishing for years, while concessions to workers have been growing, it is fair to assume that the new conditions, which reduce avoidable expenses, have been undertaken to permit the concession to be maintained without further disadvantage to the general economy of the system. There seems no serious disadvantage in meeting the view that clerks should come within the pale of the Factory Act; but we very much question if the majority of clerks desire this.

The Parliamentary Committee were instructed to promote a Bill providing that all persons in charge of engines and boilers should be compelled to obtain a certificate of "Competency." This is a far-reaching proposal, and much depends on the degree of "competency." An agricultural internal combustion engine requires little attention, and were it compulsory to have boilers periodically inspected, steam plant might also come within this range. The aim seems rather to extend the scope of trade unionism, which is commendable in principle, but must, if carried too far, be tyrannical, and as a consequence alienate the support of labourists as well as the pure economists.

Workers' Compensation.

The idea that the Workmen's Compensation Act is responsible for the increasing difficulty of elderly workers in finding employment has again been put forward—this time by Sir John Gray Hill at the International Law Association Congress. The fact is, however, that old men, instead of being more liable to accident than young men, are actually less liable. Their greater experience and caution more than makes up for their lessened agility. The Trade Unionist idea, as Mr. George Barnes, M.P., pointed out the other day, is that old men find special difficulty in getting employment, not on account of the Compensation Act, but because they are slow and cannot keep up with the requirements of modern workshops.

The C.E. Diploma.

(By John G. Kerr, M.A., LL.D.)

This department of the College is wide in its scope and aims at preparing its students for many demands. As indicative of these demands reference may be made to the operations of the great railway companies, two of which have their head offices in Glasgow, and to the Clyde Trust, by whom the River Clyde, a pleasant stream, 2ft. or so in depth at the Broomielaw a century ago, has been rendered navigable for ships of largest tonnage into the heart of the city. The Glasgow Corporation, with its magnificent and always developing water supply for over a million people, and its beneficent sewage scheme draining a densely populated industrial area of 41½ square miles, require a large staff of well-trained engineers, capable of dealing with the problems emerging from these enterprises, and skilled in executing the engineering work necessary for their satisfactory solution.

Lanarkshire, with its abounding wealth of coalfields, its prolific output of iron and steel, its countless engineering establishments, and particularly those devoted to structural and bridge-building work (made famous by the achievements of Sir William Arrol and those who follow in his footsteps), represents an imperative call for the best possible education in civil engineering science in all its aspects. Accordingly an outline of the provision which has been made by the Governors of the College to meet this call should prove of interest to the readers of "Engineering."

The diploma of civil engineering can be obtained by students attending a prescribed course covering a period of three winter sessions and one summer session, the interval between the second and third winter sessions being spent, if at all possible, on works under construction. The first winter is given, as in other diploma courses, to the study of pure science, and thereafter specialisation proceeds rapidly. Broadly stated, the students' work falls under the following heads:—(1) Descriptive lectures, (2) laboratory work, ((3) tutorial drawing-office design, (4) field-work, (5) reading and discussion of papers, and (6) visits to works in progress.

A titanic engine weighing one million pounds, capable of drawing any load of freight cars or coaches which will stand the strain on the drawing bars.

At first glance the suggestion may strike one as being absurd. But is it? Listen to this:

"It is probable that within a few years we shall see a 500-ton locomotive."

The statement was made by the superintendent of motive power of one of the largest railroad systems in America, a man who is acknowledged as one of the highest authorities.

Our Navy.

British Battleship Series.

(By "R.")

II.—The Duncan Class.

The example this week is of the "Cornwallis," one of the "Duncan" class. This is a class now consisting of five vessels. They did not immediately succeed the "Majestic" class, but may be taken as a good type of the kind of ship laid down about 1900. The displacement is 14,000 tons, a slight falling off from that of the "Majestic." The main armament is almost exactly the same, consisting of four 12-inch and twelve 6-inch, disposed as in the "Majestic." The only difference in the armament, indeed, is that the guns of the later vessel are of an improved type. The "Duncan's" speed is 19 knots, which represents an advance of 1½ knots on the speed of the "Majestic." This speed is obtained at a sacrifice of two inches of broadside armour, but in the later vessel the armour is Krupp. All the ships in the class are splendid steamers, and can be relied on for their 19 knots for a long time.

It is very dangerous to attempt to gauge the fighting efficiency of any ship of war simply by reference to her speed, the number of her guns and the thickness of her armour. One of the most important considerations is her age. An old ship is, *ipso facto*, inferior to a new one of apparently equal power in a hundred and one ways. Not merely has she probably fallen off considerably in speed, not merely are her guns probably more or less worn, but in a host of other ways she is less up to date. Improvements are constantly being made (they are made with almost every class, and even with the later ships of a single class) in such things as ammunition hoists, fire control, torpedoes, boilers, etc., and these improvements greatly add to the efficiency of a ship. The policy of the British Admiralty is against reconstruction. When the French will clean out an old ship, substitute new guns for her old, and fill her generally with the latest appliances, the British, as a general rule, prefer to build a new ship altogether. We have to remember, therefore, that the "Majestic" is not a more powerful vessel than the "Duncan" because she has the same armament and two inches more armour.

In appearance the main difference between the two classes is that whereas the "Majestic" has her funnels abreast, the "Duncan" has hers fore and aft, to which fashion the British Navy has ever since adhered. The "Majestic" has two tops on each mast; the "Duncan" has only one. There is no difference in the shape of the hull.

The "Indefatigable," armoured cruiser, has just been completed. She is an extremely powerful ship, carrying eight 12in. guns, all firing on the broadside, and designed to steam 26 knots. Twenty-eight knots is confidently expected of her. She displaces 18,000 tons. She is said, in addition, to be the ugliest ship in the Navy. This is mainly due to the remarkable appearance of her three funnels, which are all different in length, width, and shape. A difference in width and shape is no new thing. To take a familiar case, the "Powerful" has four funnels, one of which is round, two of which are broad oval, and one narrow oval. And some of the later Dreadnoughts have funnels of different width. But a difference in all three dimensions at once is certainly startling. Some of the papers say that the idea was to raise the fore funnel well above the navigating bridge, but none of them say what difficulty was experienced in raising all three, which would seem an obvious course.

Belonging to the same naval programme as the "Indefatigable," we have the battleship "Neptune." She, too, has just been completed and appears to have gone through her trials with every success. On the measured mile she attained a mean speed of 21.786 knots. With the tide she reached about a knot more as the maximum. The "Neptune" is our first completed "Dreadnought" to carry all her main guns (in this case ten 12in.) in such a way as to be able to use them all simultaneously on the broadside. This has been done by placing three pairs on the centre line, one forward and two aft, and *echeloning* two additional pairs amidships. She displaces 20,250 tons, and has a length of 510 feet.

A study of a photograph of the "Neptune" shows her to be a very ship-shape vessel. In no other vessel in the British Navy has the top hamper been cut down to such an extent. In appearance she is quite unlike any other Dreadnought. She has two tripod masts. Her two funnels are disposed, one close up against the foremast, and the other about half-way between the two masts. There are two box-like structures at the base of the masts, presumably containing conning-towers, etc.; there is a small boat deck running between the tops of these, and a small bridge forward; and this is absolutely all the superstructure she has besides her five turrets. One of the turrets, the fourth, is raised so as to be able to fire over the top of the fifth, and this gives her a nominal stern fire of eight 12in. It is never contemplated, however, with these superposed turrets that one shall fire directly over the other. The object of superposing is to allow a fire to be maintained much more nearly in a line with the lower turret than would otherwise be possible.

Apparently the age of "wonder ships" is not yet over. The "Dreadnought" was one, the "Indomitable" another, and the "Lion" another. Of course, these huge ships are more interesting from their very size than the smaller ones, but still we must all look forward with keen anticipation to the advent of the next scout, if, as *The Navy* says, she is to have new guns, new engines, new appearance, new protection and new dimensions.

By the way, the same publication is responsible for the statement that Britain has already designed a big advance on the 13.5 inch gun—presumably a 16.25 inch. The 16.25 inch gun was, it will be remembered, the largest gun in the Navy in the early nineties and prior thereto. The ill-fated "Victoria" and her sister ship, the "Sans Pareil," carried a pair, as did also one of the old "Admiral" class. It weighed 110 tons, but was abandoned and replaced by successive improved 12-inch guns.

To Teach Men not to Drown.

Had the scores of men who have died like rats drowned in a trap, imprisoned in disabled submarines, been through the course of training now provided in the British Navy, and had they possessed the simple life-saving apparatus now used there, they might all have been alive to-day. This apparatus robs submarine service of its terrors, but lest the drowning men in a sunken boat should lose their nerve and not be able to use the apparatus properly, classes have been instituted to teach the crews of submarines in the Royal Navy how not to drown. Says a writer in *Harper's Weekly*:

"Of all the duties that fall to the enlisted sailor's lot none calls for stauncher qualities of courage and self possession than the manning of the submarine. During the present year Japan and France have each lost a vessel through accident; less recently France has lost two besides, England two, and Russia one, and in each instance the crews, trapped and helpless, have slowly died from the exhaustion of the air or have been poisoned by chlorin gases within their tombs of steel.

"To avoid a recurrence of such loss of life in cases of similar disasters, England will fit to every submarine that she builds in future air-traps—into which the men can go for momentary breathing-time, while they put on their helmets—and air-locks, through which to leave the submarine. The men will be provided with special life-saving dresses and helmets. The helmet contains an oxylithe chamber, providing a supply of air for the period of an hour and a half, and has a glass window. It is so buoyant that it will support the wearer and another man upon the top of the waves. The dress is fitted with a chamber which can be inflated when the wearer comes to the top, and, after closing the valve, the man can open the front window and breathe the air for an indefinite time, until rescued by some passing vessel.

"There is a twelve-pound weight attached to the dress, which enables the wearer to keep down while travelling from the air-lock to the place of escape. Then, if he has not enough buoyancy to start from the bottom, he slips the weight. This gives him extra buoyancy and takes him to the surface. If, on the other hand, he has enough buoyancy, he keeps his weight in place until reaching the surface, and it is slipped there. Several hundred men have been instructed in the use of this invention in the Submarine Depot at Portsmouth. The accounts describe how the men are trained by being sunk in an airlock, which is a sort of diving-bell, in a tank of water. This reproduces the conditions under which the men would find themselves when the boat was actually submerged.

Raising the Submarine "Pluviose."

The raising of the submarine "Pluviose" has substantiated the fact—sometimes forgotten—that our French seafaring brethren know how to die. The scenes inside the raised submarine were cheek-blanching in the extreme, and it is good to know that the French public are alive to the fact that, in death, at least, it will be creditable to them to honour their seagoing heroes. The submarine sailor carries his life in his hand, in the full acceptance of the term, and the pity is, that a perverted ingenuity ever gave birth to such monstrosities, as these underwater freaks undoubtedly are. So far in their careers, they have killed more of their friends than, in war time, they will ever kill foes. Still, as long as one nation is asinine enough to patronise the beastly little abortions, then, other nations must follow suit. No sailorman believes that they will be worth anything in actual war, no, not even as a demoralising influence. They have been too long in existence to demoralise anything to speak of; and their weaknesses—even in peace time—are too well understood. In all probability, it will be mutually agreed between nations, at no distant date, to scrap the filthy crawlers, and purchase something that might be useful for killing purposes when the war really begins.—*Maritime Review*.

Sinking of the German Submarine U3.

The escape of the crew of this illfated boat, which has swelled the list of submarine disasters, has helped to fix in the memory of men the new departure alluded to above. Full details are wanting, but it is evident from the sketch cabled that the apparatus in use was something of the nature of the one in question. These men happily were shown how not to drown. Their escape was facilitated by the skill and bravery of their comrades of the fleet, who actually met them half way, by entering the tube of the submerged boat. Unhappily the angle at which the boat was hauled proved fatal to the heroic captain and his equally heroic comrades who remained in the tower. It is melancholy to reflect that had the cylinders been better fastened they would not have been suffocated, but would have been saved, as the supply of oxygen was ample for some hours longer. It only remains to add that the heroism displayed by the crew of the French Pluviose was repeated by these brave Germans. We will not, therefore, call it worthy of the traditions of the German Navy. We prefer to say such conduct was worthy of the best traditions of manhood, of which no nation can be said to hold the monopoly.

Motor Engines for a Battleship.

The announcement is made in the *Motor Boat* that motor engines for a "Dreadnought" battleship are building in England to-day. From an article on the subject in that journal we make the following extracts:

"The consummation which engineers declared only a few months ago to be years distant has actually been achieved. . . . So astounding and so utterly unexpected is this announcement that there may be a n w unnatural inclination to doubt its accuracy. But our source of information, while it may not be divulged, may be regarded as absolutely reliable. . . The design consists of eight-cylinder engines, practically two four-cylinder motors coupled in tandem, developing 12,000 h.p., that is, 1500 h.p. per cylinder. Three of these 12,000 h.p. units are in process of construction, making an aggregate of 36,000 h.p. The engines will be installed in a 'Dreadnought,' we believe, of this year's or next year's programme, and a speed of 21 knots is anticipated.

"It will be matter merely of regret, not a calamity, that the first motor-driven 'Dreadnought' will be a foreign, not a British vessel. France, we believe we are correct in saying, will be the first Power to have a motor 'Dreadnought' in commission. Germany will be actually the first country to have one of these monster engines afloat in a warship, but her experiment, though further advanced, is of a more tentative nature; the engine will be in a vessel smaller than a 'Dreadnought.' The second motor 'Dreadnought' will, therefore, belong to Great Britain."

The Declaration of London.

Admiral Fremantle is reported by cable to have said, *apropos* of the Declaration of London, happily as yet unratified by the British Government, that Australasia has a deep interest in the same because it possesses the fourth in size of the mercantile navies of the world. This is interesting, more especially in view of the statement made by a British statesman lately, that Australasian criticism of the Declaration had not been followed by any explanation of the reasons. As to the reasons, they are obvious to anyone who knows what the Declaration portends. The London Chamber of Commerce is possessed of that knowledge and the committee of that body lately resolved as follows:—

> "That the effect of the Declaration is to alter the law of nations hitherto maintained in a manner entirely unprecedented, and to expose to capture or deliberate destruction food supplies borne to any port of Great Britain in neutral vessels."
>
> "That the absence of any provision in the Declaration for preventing the conversion of merchant vessels into commerce destroyers on the high seas constitutes a valid reason for praying His Majesty's Government to decline to ratify the Declaration or to proceed with the Naval Prize Bill."
>
> "That the admission of the principle of destruction of neutral prizes would be in the highest degree prejudicial to the interests of this country."

Declaration of Paris, 1856.

It is well to recall what the Declaration of Paris provided, which is still binding:—

(1) Privateering is and remains abolished.
(2) The neutral flag covers enemy's merchandise with the exception of contraband of war.
(3) Neutral merchandise, with the exception of contraband of war, is not capturable under the enemy's flag.
(4) Blockades in order to be obligatory must be effective, that is to say, maintained by a force really sufficient to prevent access to the coast of the enemy.

Astronomy.

About the Heavens Generally.

Lecture by Mr. C. P. Powles. President of the Astronomical Society.

(Continued.)

I have spoken of a zodiac, and will now explain what it is. It is so called from a Greek word zodion, meaning an animal, and is applied to the belt in the sky in which the Sun and the planets have their paths, and comprises nine degrees on each side of the ecliptic, or path of the Sun. When I say the path of the Sun I mean the path which the Sun appears to take in consequence of the motion of the Earth round him. As the Earth goes on in its orbit, we see the Sun in different places with respect to the stars, making him appear to travel through certain constellations. These constellations are twelve in number and are called the signs of the zodiac. They are Aries (the Ram), Taurus (the Bull), Gemini (the Twins), Cancer (the Crab), Leo (the Lion), Virgo (the Virgin), Libra (the Scales), Scorpio (the Scorpion), Sagittarius (the Archer), Capricornus (the Goat), Aquarius (the Water Carrier), Pisces (the Fishes), or as I learnt them years ago—

> The Ram, the Bull, the Heavenly Twins, and next the Crab
> The Lion shines, the Virgin, and the Scales,
> The Scorpion, Archer and He Goat, the man that holds the Water Pot, and Fish with glittering scales.

There are twelve, one for each month. The Sun enters Aries in March, on the 21st, which in the Northern Hemisphere is the spring, or "vernal equinox" (equal day and night), and during a year passes through the twelve constellations. Professor Newcombe, in a work of his on the stars, gives the following as a summary of more or less probable conclusions drawn from facts known to astronomers:—

1. The stars differ enormously in their actual luminosity. Some are thousands or tens of thousands of times more luminous than the Sun; others only one hundredth or one thousandth as luminous.

2. The more luminous stars are generally the hotter, the bluer, and the rarer in their constitution. They are, as it were, inflated masses of rare and intensely incandescent gas. Hence the stars do not differ in mass so easily as in luminosity.

3. The bluest and most luminous stars are situate mainly in the region of the Milky Way. There is some reason to suspect that in this region the more densely the stars are agglomerated the larger and more luminous they are.

4. The collection of stars which we call the Universe is limited in extent. The smallest stars that we see with the most powerful telescopes are not, for the most part, more distant than those a grade brighter, but are mostly stars of less luminosity, situate in the same regions. This does not preclude the possibility that far outside of our universe there may be other collections of stars of which we know nothing.

5. The boundary of our universe is probably somewhat indefinite and irregular. As we approach it the stars may thin out gradually.

6. The Universe extends further around the girdle of the Milky Way than towards the poles of that girdle. But in every direction it extends beyond the limit within which the proper motions of the stars have yet been determined.

7. It does not yet seem possible to decide whether the agglomerations of the Milky Way lie on the boundary of the Universe or not.

8. The total number of stars is to be counted by hundreds of millions.

9. Outside the galactic region the stars in general show no tendency to collect into systems or clusters, but are mostly scattered through space with some approach to uniformity.

Now the Sun, as I have said, is a star and only a second-rate one. It has been estimated that Sirius, the brightest star in the constellation Canis Major (the greater Dog), and the brightest of all the stars, is of more importance than any other star, however large and brilliant it may be. The Sun is the centre of our system; he gives us light and heat, without which life of any kind would be impossible, and the force of his attraction keeps the Earth and the other planets in their places revolving round him. His diameter is 865,000 miles, his temperature far greater than any heat that can be artificially produced. Our mean distance from him is about 92,700,000 miles, and yet we can feel his heat, and in some parts of the earth, as we know, his heat is oppressive. It has been found that the Sun revolves on his axis in about 25 days, and this has been done by observing the spots which from time to time appear on his surface. They are seen to pass from one side of the disc to the other, always going the same way, apparently passing across, really being carried round by his motion. These spots are seen to be depressions in the Sun's surface caused, it is believed, by disturbances in what is called the photosphere, the luminous outside covering of the Sun, which gives us light. The interior of the Sun is supposed to consist of various substances in such a state of heat as to be resolved into a gaseous state, and at times there are great eruptions of flame from the photosphere which are seen as prominences projected from the edge of the disc. Some of them can be seen when the Sun is totally eclipsed, and now, by recent improvements in the spectroscope, they can be observed, and even photographed, at any time. From the fact that the spectrum of the Sun has in it lines which we can produce by the combustion of various substances, it is found that the sun has three substances in an incandescent state. So we say that in the Sun are iron, nickel, manganese, cobalt, carbon, calcium, palladium, magnesium, sodium, silicon, stoutium, barium, aluminium, zinc, copper, silver, tin, lead, potassium, altogether some 35 substances known on the Earth. The Sun is being constantly observed by astronomers with specially constructed instruments, and fresh information about its phenomena is being obtained.

The Earth and the other planets revolve round the Sun in orbits which are ellipses, some departing more than others from a circle. There are, including the Earth, eight planets. Venus and Mercury between the Earth and the Sun, and Mars, Jupiter, Saturn, Uranus and Neptune beyond the Earth. Mercury's mean distance from the Sun is 35,392,000 miles, the Earth 92,700,000 miles, and the outermost planet, Neptune, 2,746,271,000 miles. Mercury goes round the Sun in nearly 88 days, the Earth in 365 days, our year, and Neptune in nearly 165 of our years.

There is a curious law, known as Bode's law, referring to the distances of the planets. Take the series of numbers, 0, 3, 6, 12, 24, 48, 96, each of which, after the second, is double the number that precedes it. Add 4 to each number, and we have the series 4, 7, 10, 16, 28, 52, 100. With the exception of the fifth number, 28, all these are proportional to the distances of the planets from the Sun. Thus Mercury 3-9, Venus 7-2, Earth 10, Mars 15-2, Jupiter 52-9, Saturn 95-4. Now you will see that there is no planet corresponding to the fifth number 28, and astronomers, seeing this apparent discrepancy, set to work to find a planet to fill the gap. An Italian astronomer, Piaggi, was the first to discover such a body. In January, 1801, after many observations, he detected movement in what looked like one of the small stars in the constellation Taurus. It was named Ceres, and was found to go round the Sun between Mars and Jupiter. It is very small, quite unlike the eight other planets. Soon astronomers found other small bodies of the same kind, and at the present time more than 600 of these minor planets, or asteroids, as they are called, have been observed, all going round the Sun in separate orbits, between Mars and Jupiter where there was a gap in the sequence of the planets. Are they fragments of a planet which once occupied that position?

Venus and Mercury, being between us and the Sun, exhibit phases like those of the Moon: they are both seen alternately as morning and evening stars. Venus is the most brilliant of the planets, and when at its brightest, can be seen with the naked eye in broad daylight. Its very brilliance renders it a difficult telescopic object, and the best time to observe it is in the daytime. Venus is 7510 miles in diameter, nearly equal in size to the Earth. Mercury's diameter is only 2962 miles.

Mars is small, its diameter being only 4920 miles, but it appears to be the planet that is most like the Earth when it approaches nearest to the Earth in opposition; that is to say, on the other side of the Sun, so that its surface receives the full light of the Sun, it is still more than thirty millions of miles from us. Powerful telescopes exhibit markings which are called lakes, and seas, and continents, and canals, and at the poles white caps, which are seen to diminish in size at times and are considered to be snow, which melts as the Sun shines upon it. There is much discussion and controversy as to whether Mars is inhabited, whether markings seen are artificial that is made by its inhabitants. Last year Mars was in a very favourable position for observation, and I think the result of observations made was against the theory of canals and inhabitants who made them. Jupiter, the giant planet, more than 80,000 miles in diameter, is a fine object nearly approaching Venus in brilliance. It has a number of dark belts across its disc, with various markings, one of which is known as the large red spot, a large spot of a ruddy hue which varies in appearance from time to time. From the motion of spots and markings on the belts it is found that Jupiter revolves on his axis in a little less than ten hours, the shortest known period of rotation of any of the planets in the solar system. Jupiter, even through a small 3in. telescope, is a beautiful object, the four largest of his moons being plainly seen, and it is very interesting to see these moons passing over the planet's disc, or being occulted, that is, passing behind him, or being eclipsed by him or causing eclipses on his surface. All these phenomena I have seen with a 3in. telescope, the most interesting being, I think, to see a satellite coming out from eclipse. You see a faint speck of light appear in the dark sky near the planet, which gradually brightens, until the satellite, having passed out of the planet's shadow, shines out with its normal brilliance. But I think the most beautiful object of all is Saturn. He is nearly as large as Jupiter, his diameter being 71,000 miles, and on his disc are seen belts something like those of Jupiter, but what makes him so beautiful is the possession of rings. Round the planet are flat rings concentric with the planet; there is the outer ring, then a division called Cassini's division, from the astronomer who first discovered it. Then the inner ring, which has at its edge next the planet a dusky border called the crape ring, from its appearance. The diameter of the outer ring is 172,600 miles. The orbit of Saturn is not in the same plane as that of the Earth; sometimes, therefore, he appears above our orbit, sometimes below it, and so the rings appear to vary in extent and position. At one time, when Saturn crosses the plane of our orbit, we see the rings edgeways, and as they are very thin, they disappear altogether, as far as small telescopes are concerned; then gradually, as Saturn passes above or below our plane, the rings open out and we look up to or down upon them. Uranus and Neptune are so distant that as telescopic objects they have comparatively little interest; with my 3in. I can see Uranus as a very small disc of a bluish colour. I have been talking chiefly of the planets and incidentally mentioned some of their satellites, or moons. Mars has two, Jupiter seven, Saturn ten, Uranus four, Neptune one, and the Earth has one, which is a most useful attendant upon our planet. It gives us light at night, and helps largely in the production of the tides of the oceans. Its motion among the stars, too, is useful in navigation. And it is a most interesting object to study with a telescope; a small one will show a great wealth of detail. Its mountains and craters and plains can be seen; the plains were first named by astronomers, who thought they were seas; there is Mare Serenitatis, the Sea of Serenity, Mare Tranquilitatis, Mare Vaporum, Mare Nubium, etc., and mountain ranges have names: The Alps, the Appenines, Caucasus, etc. All the craters or objects that appear like craters, are named after well-known astronomers and other noted men, Greek, Roman, French, English, Italian. Some of the craters are also called plains, on account of their size; some of them exceed 100 miles in diameter, while the largest crater on the Earth does not exceed 7 miles. The mountains, too, are loftier than any on the Earth, some of the highest peaks being 36,000 feet, while Mt. Everest, the highest mountain we have, it but a little over 29,000 feet. How the moon became as we now see her is an unsolved problem. She possesses no atmosphere; at least, if there is any it is so thin that it does not affect the brightness of a star when occulted. The star remains at its normal brightness up to the instant when it disappears through the passage of the Moon over it.

There is another group of heavenly bodies which I have not touched upon, and will only shortly name. I refer to comets. These visitors are marvellous, and but little is known or understood about them. Some move in orbits, which bring them back in varying periods; some appear, pass round the sun, and are known no more. Their number is considerable. Early this year we had a visit from a notable comet, Halley's, and we in this Southern Hemisphere were greatly favoured, having a fine view of it as it approached the sun.

I have now given a discursive talk about astronomy, which has touched upon a great variety of subjects, in but a poor way, such as an amateur can do. But I hope my remarks may be of some use in showing to some who would like to study astronomy that there are many objects to observe, many branches of study to take up, and that in all that comes under the name of astronomy there is so much to interest and instruct the mind. And, I am sure, many, if they once begin to observe and study the sky at night, and to learn something of the constellations and the movements of the planets, would become fascinated by what they learnt, and would continue the study, lifting their eyes to something above, and better than the electric lights of the city. Many things I have mentioned are really beyond our powers to grasp. What do we know of millions; how can we think of a space of 92,700,000 miles which separates us from the Sun, and a lay mind may be forgiven when it hesitates to believe all that astronomers tell us about distances and magnitudes. But we can see and understand many things they tell us, and so we should believe them in those we cannot understand. There is a wonderful book published in England yearly, two years in advance, for the benefit, chiefly, of navigators. I refer to the Nautical Almanack. Though published two years beforehand, it gives the position of Jupiter's satellites each day, and the exact moment of their transits, occultations and eclipses, and you must remember that we are moving, Jupiter is moving, and the Satellites are moving. It also tells the exact time of the occultation of a number of stars by the moon. Here, again, we are moving and the Moon is moving. The positions of the planets, right ascension and declination, are also given for each day (except those of Uranus and Neptune, which are given for each fourth day) throughout the year, so that if you have a telescope equatorially mounted you can set it to the required position by means of the right ascension and declination circles and find the planet in the field.

Then, the other day, we had a triumph of mathematical astronomy, when two of the astronomers at the Greenwich Observatory calculated the spot among the stars where Halley's Comet was first to appear, and the first discovery of the comet made by a German astronomer by means of photography, showed it less than the apparent diameter of the Moon from the calculated spot. And this comet was returning from a journey far out beyond our farthest planet Neptune, more than 2,746,271,000 miles from the Sun. It was last seen by us some 76 years ago, and in the calculations of its orbit many things have to be considered and allowed for, such as the effect of the attraction of the planets upon it as it passed them on its way out from the Sun and on its journey back.

Astronomers are doing their utmost to perfect their knowledge of the heavenly bodies, and are now paying great attention to astrophysics, which means the study of the physics of the stars, their composition, size, weight, whether they have, as so many of them have, a companion star, what is the size, weight and attractive force of this companion, is one star revolving round the other, or are they revolving round a common centre.

As to our section of the Philosophical Society, there is no reason why it should not in time develop somewhat on the lines of the British Astronomical Association, which is divided into sections for purposes of observations. Some observers take up variable stars, some the planet Mars, some Jupiter, some the Moon, some the Sun. Each section works under a director, and much good work is being done.

There is one thing the study of astronomy does if it is taken up seriously and with intent to learn: it makes man and all the wonders he can achieve appear very, very small. What is the Earth among the millions of bodies which we find out by the aid of telescopes and photography. Any one studying astronomy must surely find his wonder at the marvels spread out before him increasing as he studies. He will find such evidences of majestic law and order governing the movements of the Heavenly bodies, and his very inability to grasp the distances and dimensions of these bodies or the extent of our system must excite in his mind wonder and admiration and lead him to acknowledge the greatness of the Creator and to thank Him for having given us mortals such a measure of understanding as to be able to find out so much about the marvels of creation.

Engineering.

Notes on Two Hydro-Electric Plants in Sweden.

Paper read before the Canterbury College Engineering Society by W. Lancelot Moore.

(Continued.)

Automatic Governors.

The governor proper consists of a pendulum distributing valve, servomotor, double return gear and hand regulating mechanism. The whole is contained in a compact cast-iron casing so constructed as to enable ready inspection. The speed of the turbine can be altered while the plant is running by means of a small hand wheel on the governor, or by a small motor, which is operated from the switchboard. This arrangement is very useful for coupling alternators in parallel as the switchboard attendant has all the machines under his control.

The hand regulation device deserves special mention, as it is very simple, and effective. It is put in gear by simply pulling over a small lever, which at the same time cuts out the automatic gear.

The pressure oil is supplied by a separate pump of the rotary type, which is connected to a large air vessel, which stores enough oil for 6 complete strokes of the servomotor. The pressure used is 170lb per cubic inch.

The $\frac{1}{2}mv^2$ of the generator is 980,000 kgm.

The tests gave results shown by the table below and by diagrams taken by recording tachographs. These instruments are very sensitive, and the readings are correct within a fraction of one per cent. The changes of load were effected by changing a water resistance.

Load on generator K.W. ...	3700	0	3250	1050	2450
Change of load K.W. ...	−3700	+3250	2200	+1400	−1180
Change of load in %	−100	+100	−68	+57	−50
Change of speed in % ...	11·8	6·8	5·8	3	2·8

Electric Equipment.

There are 3 3-phase generators of 3500 k.v.a., and 3 of 3950 k.v.a.; the pressure is 5000 volts, and the periodicity 50 cycles per sec. The full load efft. on test was 96 per cent., with a power factor 0.8. There are 2 exciters, each developing 225 b.h.p. at 600 r.p.m. The voltage is 220. Each set is sufficient for the whole station, including lighting.

The bulk of the power is transformed to 40,000 volts in 3-phase transformers, each of 3500 k.v.a. capacity. These are star connected on both the high and low pressure sides; they are of the usual water cooled oil type. Signalling thermometers are arranged to give alarm at the switchboard should the temperature rise unduly. The efft. on test was 98 per cent., with a p.f. 0.8.

The switchboard is arranged so that the generators may be connected directly to a transformer, or to a low pressure bus-bar. The transformers are connected in parallel on high pressure bus-bars, but these are divided in sections by switches.

A view of the inside of the power-house was shown in our last issue.

A certain amount of power is used in the immediate neighbourhood, hence the l.p. bus-bars. The switchboard proper is placed in a gallery overlooking the generators, but only contains the necessary instruments, and operating handles all being worked at a harmless voltage. The 5000 volt system of bus-bars, switches, small transformers, etc., are placed in a small two-storied building outside the power-house proper. The main transformers, as well as the whole of the 40,000 volt system, are placed in two stories above the machine room. The separate phases of all bus-bars, cables and apparatus are separated by partitions of fireproof material. The distance between the 40,000 volt leads and earth is nowhere less than 10in., and between two phases nowhere less than 20 in. All switches consist of three single-pole switches of the oil type, which are separated by fireproof partitions. These switches are operated electrically from the switchboard, and are fitted with automatic tripping gear for overload or back surges. The oil switches may be cut out of the circuit by means of disconnecting switches operated by an insulating handle, should it be necessary to inspect or repair them.

The generators and transformers are connected by steel armoured cables, the bus bars and all h.p. wiring are of bare copper.

Each outgoing line is protected by two horn lightning arresters with a water resistance coupled in parallel with one of the spark gaps, and also by roller lightning arresters of the G.E.C. type, as well as water jet apparatus.

About one-third of the power is consumed in the neighbourhood, the rest is sent out on two lines, one of which is 56 miles long, and the other branches out six miles from the station into two lines, one of which is 49 miles, and the other 42 miles long. The overhead lines are not duplicated; they are of bare copper, and are carried on wooden poles about 75yds. apart.

The whole of the work, from the very start, was completed within two years, which is very good, considering the severe winters in Sweden, and the fact that the work was never forced. The number of labourers varied from 120 to 800, and on an average 400 hands were employed. The minimum payment for unskilled labour was 4s. 6d. per day for earth work, and 5s. 9d. per day for stone. Skilled labour was paid at from 9s. upwards. Approximately 110,000 cubic yards of stone were blasted out.

The total cost, excluding only the transmission lines, and including the purchase of the water power, offices and housing, amounts to £252,000, which works out at $\frac{252000}{28000}$ = £9 per B.H.P.

Producer Gas from Refuse.

During recent years many attempts have been made to produce gas for power purposes from waste factory products, and last month a successful trial was made in Sydney, scrap leather being used for this purpose. The method adopted was to treat the leather scrap by a special process which converts it into suitable fuel for gas producers. The gas produced had a higher calorific value than that obtainable from charcoal or coke fuels, and the result of the experiment is regarded as highly satisfactory. Further trials are to be made this month, when a 50 h.p. gas engine and suction plant will be run for a week on the fuel mentioned.

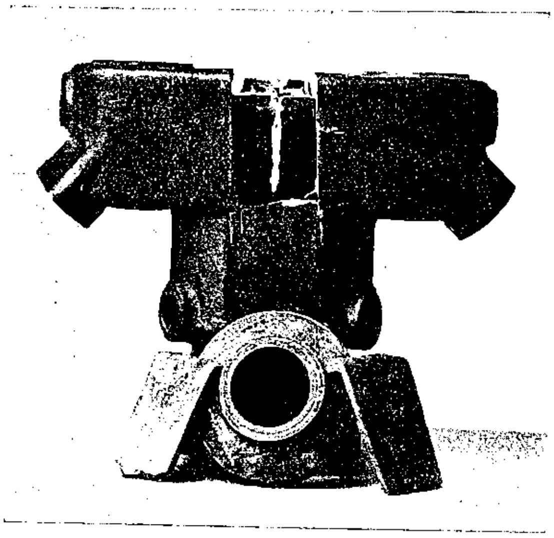
Welding and Metal-Cutting by the Oxy-Acetone Process.

(By G. K. Hansard, Napier.)

Engineering firms have lately shown considerable interest in the dissolved acetylene process for storing gas under small pressure, as by its means it has become possible to carry out welding work under far superior conditions than existed before. The advantages of its use for welding, metal cutting and illuminating have been brought under the notice of engineers by the Acetone Illuminating and Welding Company of Napier.

A mixture of dissolved acetylene and oxygen is used for welding. The oxygen is prepared from a mixture of potassium chlorate and black oxide of manganese, and compressed in cylinders to 120 atmospheres. Dissolved acetylene is acetylene previously washed and dissolved in acetone. Acetone is a liquid which possesses the property of dissolving 25 times its own volume of acetylene for every atmosphere of pressure applied. If the pressure on the gas is released, then the acetone slowly gives off the acetylene it has absorbed. Advantage is taken of this fact, and steel bottles are filled with porous brick which is impregnated with acetone. Acetylene is then forced into the bottles under pressure and dissolved by the acetone. The quantity of acetone the brick will absorb is sufficient to permit of the cylinders holding 10 times more acetylene than a similar sized ordinary gas cylinder would were acetone not employed. All cylinders are compressed to 10 atmospheres so that they contain 100 times their own volume of acetylene at that pressure. The reason for the employment of porous brick is as follows:—It would be impossible to fill the bottle with acetone and then force in acetylene, as space must be left for the expansion of the acetone, which takes place on dissolving the acetylene. This space would contain acetylene under pressure, and this is forbidden by law. This method of storing makes an explosion in the cylinder absolutely impossible, as the pores of the brick not completely filled contain sufficient room for the expansion of the acetylene, which takes place during charging, or during a rise in temperature.

Acetylene is an eudiothermic gas, consisting of hydrogen and carbon, and when used in conjunction with oxygen in a properly designed blowpipe dissociated at the base of the flame, the carbon only taking part in the burning owing to the fact that hydrogen will not combine with oxygen at the temperature at which carbon will do so. The hydrogen consequently remains free and forms a protection to the small cone at the nozzle of the blowpipe where the carbon is burning and which is the point of maximum temperature. In practical



Broken Cylinder Head.

welding the quantities of oxygen and acetylene used are about equal, and the working pressure of both gases varies from 5 to 15lbs. per square inch for welding, and from 20 to 100lbs. per square inch for metal cutting, in the case of oxygen, while the same pressure is retained on the acetylene.

The accompanying illustration will convey some idea of the apparatus employed, and shows the cylinders of oxygen and of acetone gas, the necessary regulators, tubing and blowpipe, the latter being provided with various sizes of nozzles suitable for different classes of work.

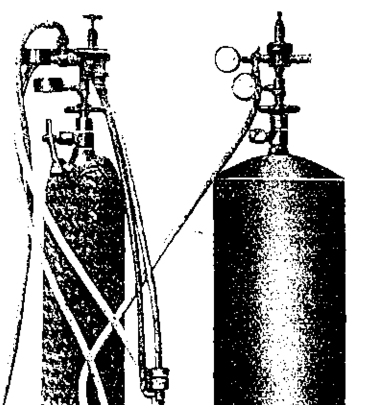
A flame of the exceedingly high temperature of 6300 deg. F. is obtained. This is a great deal higher than the oxy-hydrogen flame, which is limited by the dissociation temperature of steam, whereas in the oxy-acetone blowpipe the temperature is only limited by the dissociation temperature of carbon monoxide, which is much higher than that of steam.

In addition to welding, outfits are supplied for metal cutting by the aid of the same compressed gases in conjunction with a specially designed blowpipe. This blowpipe has two jets, a central jet and an annular jet; the latter is to produce a flame whereby the metal to be cut is heated locally to a bright red. A stream of oxygen is then admitted through the central jet. The plate is completely severed, the cut being barely 1/6in. wide, and having the appearance of a saw cut.

At the Addington Workshops recently there could be seen a ¾in. crown plate of a boiler cut to a curve six feet in length in six minutes, which operation previously took six hours.

Reverting to the welding process, the accompanying illustration provides a good instance of the work which may be done. The photos are of a motor-car cylinder which had a crack right across the crown. To enable this to be welded, the top of the water jacket was turned out and may be seen resting against the cylinder, where will also be seen the two sides of the water jacket, which it was found necessary to remove, as the crack extended down the walls of the cylinder. The crack, which was opened up by chipping, will be clearly seen. After this crack had been autogenously welded, the pieces, which had been removed, were placed in position and the operation completed by welding them in place. The cost of the work, exclusive of the turning, was £2 10s.

The saving of time and money which results from the application of autogenous welding to marine work is very considerable. A job recently done on the s.s. "Kiripaka" in Wellington is worthy of mention. The bottom place of the boiler's combustion chamber had become so corroded at the stay bolts that in some places it was no thicker than a penny. This was filled with new metal to the thickness of the original plate, and then drilled. The new metal, in the form of a wire, being added as re-



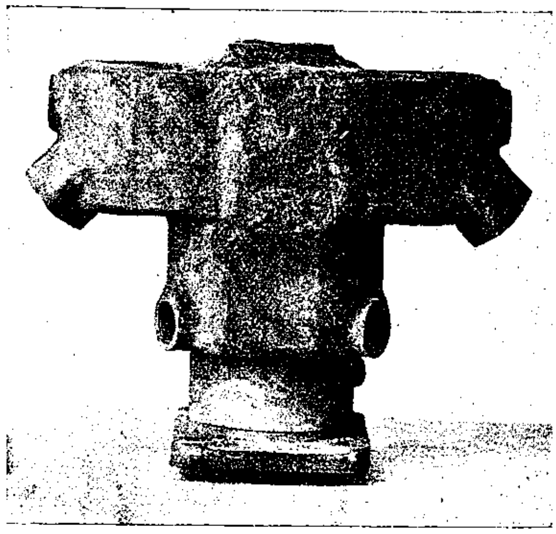
Cylinders of Oxygen and Acetone Gas.

quired. The cost of the oxygen and acetylene used was £8, to which must be added the operator's wages.

In Spain recently the stern post of a vessel was welded in eight hours for £50, at a saving of £600 and 3 weeks' detention of the vessel. Over 1000 cracks in boilers of 80 different vessels were mended by this process at Marseilles in 1907. Broken crank shafts and all descriptions of castings have been repaired with great success, whilst pipes can be expeditiously joined at any angle.

As regards the strength of welded joints, tests have shown that the metal does not suffer in any way. Experiments in bending welded plates show that their strength is not impaired, and welded Yorkshire iron tested in tension failed at 29 tons per square inch. Furthermore, the cost is low. £60 will provide a plant, whilst the cost of recharging a 100 subic foot cylinder of either gas is only £1 13s. 4d.

Despite the fact that it is little more



The Broken Cylinder Welded by the Oxy-Acetone Process.

than a year since this process was introduced into New Zealand, the Government Railway Workshops at Petone, Addington, and Hillside, the Union Steamship Co., of Port Chalmers, and many other engineers have installed the plant.

Blasting and Burning away a great Wreck.

Last of the Quebec Bridge.

A wreck that has been only half cleared away after ten months of unremitting toil must be confessed to be something of a wreck. Ever since New Year's Day of last year a large force of men have been working on the ruins of the great Quebec steel cantilever bridge, which went down in a tangled mass of bent and twisted steel on August 29, 1907. The 10,000 tons of steel were buried in deep and wild confusion, yet it is a remarkable fact that there were no loose ends. Like devoted members of a loving family in disaster, every piece of steel clung to its neighbour with a firm grip when the crash came, and it now takes a blast of dynamite or the oxy-acetylene flame to sunder them. Says Mr. H. P. Borden, a Canadian engineer, in describing this work in *Engineering News* (New York, November 10):—

"The magnitude and difficulties of the job cannot be appreciated unless one has personally visited the wreck and seen this enormous tangle of huge steel members piled high and in utter confusion, yet with no loose ends. Every ton of metal moved, whether eyebar, chord, or post, must first be cut loose from its neighbour or subdivided into many pieces before it can be handled. The various members are twisted and bent almost beyond recognition, yet they are still firmly bound one to the other. Only one broken eyebar has been found in the whole wreck. Before these eyebars can be removed they must be broken or cut in two or three pieces. All the members radiating from a panel-point still have their connections intact at that point. A chord . . . weighing 50 or 75 tons must be broken or cut at either side of this panel-point and then cut into six or eight similar sections, to bring it within the capacity of the derricks. Most of the pieces removed in this way will still have to be broken up into even smaller sections before they have a marketable size as scrap.

"When tenders were called for the removal of this wreck, contractors, as a rule, were entirely at sea as regards the best way of cutting the material or as to the probable cost of such an operation. Both dynamite and the oxy-acetylene flame had been used on work of a similar nature, but for work of such enormous proportions there was absolutely no precedent. The work for the first month or two was, therefor, almost entirely experimental. Various grades and strengths of dynamite were tried, as well as gelignite, but it has been found that a 60-per cent. dynamite gave the most satisfactory results, everything considered. The oxy-acetylene flame has also been extensively used, and has shown some remarkable results. . . .

"The oxy-acetylene torch cuts the steel very rapidly, and leaves a thin, sharply defined slot, not wider than that made by a saw. The torch itself weighs only a few pounds, and, as a consequence, can be used in any point, no matter how inaccessible, so long as it can be reached by the operator."

This torch and method has been fully described in PROGRESS, and is now in the Dominion.

Ethics of the Derailing Switch.

A derailing switch, as our readers doubtless know, is a device for throwing a train off the track if its engineer disregards a danger signal. Naturally it is used only in places where the train would meet a far worse fate if it continued on the track, as when an open draw confronts it. Naturally, also, the derailing is made an innocuous as possible, often by leading the train into a nice, soft sandbank of gradually increasing depth. The editor of *Railway and Locomotive Engineering* (New York, November) queries, however, whether the throwing of a train-load of passengers from the track is the only thing that will save them from disaster. He writes:—

"A locomotive engineer with a derail open in front of him so that the train will infallibly leave the track is in the presence of a most powerful agent for compelling respect for the stop signal given. No one will deny that, and probably no one would, from a theoretical standpoint, say that the object in view by those who put the derail in the track was not eminently right and proper. A stop before an open swing-bridge is imperative and the derail merely automatically and mechanically interposes a severe penalty for the infraction of the rule.

"On the other hand, a derailed train in motion is a dangerous thing. Even if no lives be lost, the engine and rolling stock suffer, the roadway is damaged, and the line is more or less effectively blocked for some time. In certain cases injury to persons may result or even loss of life may take place. Terror is aroused in the minds of every one on the train who is conscious of the derailment, and grave discomfort, if nothing worse, takes place.

"It is a nice point in equity or general fair play, as we may say, whether or not travellers should be subjected to the discomfort and possible danger involved in the use of the derail. Innocent people may be frightened or hurt for the sin of a man they can not control.

"For our own part we believe that the general average locomotive engineer is a careful man, anxious to do his duty faithfully, and that in nine cases out of ten he does not require the drastic penalty of derailment to make him comprehend the seriousness of a situation he may be called on to face. The derail is a good thing to catch a chance-taker, but we do not believe that the rank and file of locomotive engineers belong to this class of railroad men. We are all making progress, and the chance-taker is not finding the modern properly operated railway a good place to do business.

"Something better can no doubt be devised which will be equally effective. In these days of progress, as we have indicated, where sensible men are taking thought of their responsibilities as locomotive engineers and who want to do the right thing, and are trying to do the right thing to the best of their abilities, the situation needs revision.

"A good, workable, reliable, and efficient stop signal will eventually be substituted for the derail. Such things have been invented and have been tried.

On subway and elevated railroads, where snow and ice do not interfere with the operation of stop signals, they are in use. Efficient devices which set the brakes in emergency, and on electrically propelled trains cut off the power, are in daily use, and be it said to the honour of the men running those trains the stop mechanism is rarely called into action. The moral effect of the stop signal is as good as the derail, and the effect, when it does operate, is not nearly so dangerous. Our hopeful prophecy is that the growing feeling which we see pervading all ranks of railroad men—the desire to make American railroads the safest in the world—will in time completely eliminate the chance-taker, and in time the derail will make way for the effective, efficient and harmless stop signal."

NOTES.

Among the failures of the year are Radium and the Gyroscope. The first has done nothing in the direction predicted, but experts are sufficiently encouraged to persevere, thinking that the success obtained apparently with rodent ulcer may ultimately be extended to cancer. The Gyroscope has been much talked of, but the monorail still remains in the land of promise. So does the storage battery.

* * *

"The public scarcely realises," says *The Lancet* (London), "the excessively trying nature of the work which the telephone-exchange operators perform. . . Life at the telephone exchanges is neither a quiet nor a pleasant one. The work is trying and puts a constant strain on the attention, while the rigid self-control is asked for in any one who, during long business hours, has to enter upon incessant dialogues with a public that is generally in a hurry. Recently, Mr. H. Samuel, in answer to a question in the House, stated that, in view of the large number of cases of hysteria and other nervous troubles reported among the operators, an investigation has been instituted."

* * *

Many architects and builders will agree that while specifications relating to the construction and finish of buildings are generally comprehensive and clear, "that portion of them which relates to painters' and decorators' work is just as frequently incomplete, vague, and unsatisfactory." The importance of minutely specifying the work to be done by the painter, and the materials he is to use, is as great as in any other part of the building trade, not only in the case of competitive work, so that those who compete can do so on an equal basis, but in order to ensure good results. Such phrases as "the materials and workmanship are to be the best," or the "very best of their respective kinds," which unfortunately are far from unusual, leave much to be desired, and often encourage the use of inferior goods to the detriment of the durability of the work.

* * *

Three kinds of bench marks were used by the United States Geological Survey in the spirit levelling in Ohio from 1898 to 1908, inclusive, according to a bulletin by Messrs. S. S. Gannett and D. H. Baldwin. The first form was generally used in the vertical walls of public buildings, bridge abutments, or other substantial masonry structures, being a circular bronze or aluminium tablet, 3½ inches in diameter and ¼ inch thick, appropriately lettered, and having a 3-inch stem cemented into a drilled hole. The second form was employed where masonry or rock formation was not accessible, and consisted of a hollow wrought iron post 4 feet long and 3½ inches in outer diameter, split at the bottom and expanded to 10 inches so as to resist pulling from the ground. These posts were sunk three feet in the ground—after having been coated with asphalt—and a bronze tablet similar to the one already described was then riveted to the top. The third form was little used and is now altogether discontinued, being the ordinary split bolt of copper, 1 inch in diameter and 4 inches long.

* * *

Important new departures may, ere long, be looked for in the railway connection between Western Europe and the Far East, and the plans in question appear to be regarded with the same lively interest both in Russia and China. It is a question of bringing Pekin in nearer touch with Europe through the construction of a new railway in connection with the great Siberian railway. This new railway, about which the Governments of St. Petersburg and Pekin have recently been exchanging views, is to proceed from the great Siberian railway in the vicinity of the Baikal Lake, straight through the Gobi Desert to Pekin, and a line of this description will materially shorten the distance between the two capitals. Both Governments are understood to favour the plan, so its realisation is looked upon as almost ensured. The first section of the new line, from Pekin to Kalgan, the last large town before entering the desert, has already been built for some time. The projected continuation, from Kalgan to Lake Baikal, will have to face considerable difficulties owing to the nature of the desert, but the journey by rail through the desert can be done in some 40 hours or less, whilst the caravan transports at present take 40 to 50 days. The projected new line should, according to the plan, be ready as early as the end of 1912, and the journey from Paris to Pekin should then only take 9½ days, from St. Petersburg to Pekin 7½ days. From Berlin to Pekin the distance would be reduced to 9085 kilometres, and the journey should be compassed in 211 hours, or barely nine days.

Mining in New Zealand.

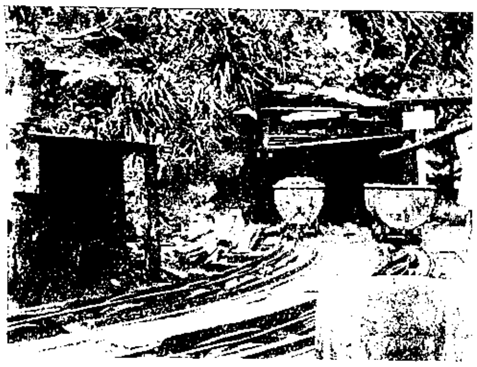
The Denniston Collieries.

(By G. L. Hercus, A.O.S.M.)

Westport Coal is a household word throughout the Dominion, and a short description of the premier mines of the New Zealand field might be of interest to readers of PROGRESS.

The Denniston Coal Field lies at the top of a bare plateau, about 1800ft. above sea level, and is situated about 14 miles from the town of Westport. The Westport Coal Company's Denniston leases comprise an area of 2500 acres, lying between the head waters of the Wareatea and the Waimangaroa rivers, and these leases are worked as two distinct mines, *viz.*, the Coalbrookdale Mine and the Ironbridge Mine, both working in the Coalbrookdale seam. The output from this field has risen from 35,000 tons in 1883, to 347,719 tons in 1910.

GEOLOGY.—The Denniston field is evidently an upthrow from the measures nearer the coast line. It is traversed by several big faults running parallel with the coast line. The age of the coal measures is generally considered lower Eocene. The typical succession of strata of the Buller Coalfield is—



ENTRANCE COALBROOKDALE MINE.

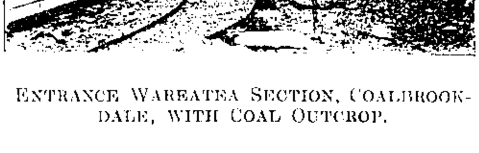
1. Black slatey clays.
2. Brown and grey standstones.
3. Grits and sandstones with seams of coals.
4. Coarse grits and conglomerates.
5. Gneiss or granite.

but in the Denniston field the clays are absent.

HAULAGE.—The great height of the plateau above the level of the railway, and the abruptness of the rise below, naturally afforded a pretty difficult problem in the way of haulage. This has been solved by the construction of an incline from the crest of the plateau where the bins, etc., are situated, to the valley of the Waimangaroa River below at Conn's Creek, from whence a short line of private railway connects with the Government Railway at Waimangaroa Junction, ten miles from Westport. This incline presents a very pretty piece of engineering, and is worked in two sections on the three-rail jig principle. The gauge is the standard Government railway gauge, and railway trucks carrying eight tons each are run down. The lower jig is 50 chains long, with a fall of 864 feet and a maximum grade of 1 in 2 1/5, and is controlled by hydraulic brakes on the cataract principle with two cylinders 13in diameter, with 3in. stroke, operating on a 10ft. 3in. drum. The upper jig is 33 chains long, with a fall of 834 feet, with a maximum grade of 1 in 1 1/3, and is controlled by a similar brake operating on a 9ft. diam. drum.

BINS AND HEAD OF INCLINE, DENNISTON.

BINS AND SHOPS.—The town of Denniston is situated on the crest of the Mount Rochfort plateau, as also are the screening plans, bins, fitting shops, offices, etc. The bins have a storage capacity of 2000 tons steam coal, 700 tons slack, and 500 tons unscreened coal, and are completely fitted with up-to-date screening and picking tables. At the shops, all the light repairs are carried out, and the steel mine tubs constructed. The Company intend extending these shops, and also installing a foundry to do their own light castings. The power for driving all machinery, and also for lighting the works and township of Denniston, is derived from four 170 h.p Babcock and Wilcox boilers, which supply steam to the different units. Owing to the increased demand for power, two additional boilers of the same type are to be added.



ENTRANCE WAREATEA SECTION, COALBROOKDALE, WITH COAL OUTCROP.

SUBSIDIARY HAULAGE.—The surface haulage from the bins to the mines is all on the endless rope principle, divided into two units. The first, three-quarters of a mile long, connects with the Ironbridge underground system, and to the second unit at Ironbridge. It is operated by a 200 i.h.p. engine, geared 7 to 1, working at the Denniston end. The roads are laid on a 2 feet gauge, carrying steel trucks with a capacity of 11cwt. of coal each. This endless rope has a capacity of about 270 tons per hour. The second unit is about a mile long, and is worked by a compound engine, 12in. by 14in. diameter, working at the Coalbrookdale end. The Ironbridge underground haulage, 74 chains long, is operated by a compound Archer engine, 10in. by 16in. diam. working at 120lbs., and connects through an incline, directly with the horse roads and underground jigs, while the Coalbrookdale underground haulage is 55 chains long, operated by a vertical compound Tangye engine, 8in. by 9in., at 120lbs. pressure, and connects with the underground horse roads and jigs in the Coalbrookdale Mine.

VENTILATION.—The ventilation of the Ironbridge Mine is effected by means of two 7-feet Schiele fans, each driven by a 35 h.p. engine, and supplemented by two Roots blowers. The Coalbrookdale Mine is ventilated by means of a Hayes Fan, designed to give 150,000 cubic feet per minute, driven by a 40 h.p. engine. Generally speaking, the ventilation of the Denniston Mines is perfect.

ENTRANCE IRONBRIDGE MINE.

METHOD OF MINING.—Both the mines are worked on the bord and pillar system, with pillars generally 22 yards square, except where excessive roof pressure demands a larger pillar. The headings are driven 9 feet wide, and the bords six yards. The system of pillar extraction is of interest. The pillars are split by a well-timbered heading, six to nine feet wide. When this split is through, the top coal on either side is shot away, and the place gradually worked back. In this way the coal runs down to the men who are practically always under cover, the coal thus being left without any support, and worked up to 17 feet high. There has been some criticism as regards to this method; as, to one not thoroughly conversant with the conditions, it looks unsafe, but the best index of its safety lies in the comparative absence of accidents in pillar workings, and also the fact that the miners in the State Colliery at Point Elizabeth are themselves agitating for this system to be adopted there. All the actual coal cutting is now done by hand. The management installed electric coal cutters, but these proved unsatisfactory, and compressed air pick machines were installed. It has, however, been found that the economic margin is in favour of hand work, and machines have been practically discarded. The air plant is now used exclusively for drainage and haulage purposes.

Drainage.—Except for some small subsidiary pumps, worked by compressed air, all the drainage is effected by means of drives to the open. In the Ironbridge Mine, a stone drive driven 6ft. by 4ft., and 40 chains long, takes all the water into the Waimangaroa River; while the Coalbrookdale Mine is drained by a similar drive into the Cascade Creek.

Labour.—Altogether, 640 men and boys are employed in and about the mines, and the average pay is higher than in any other part of New Zealand. The mines have been singularly free of serious labour troubles, and a good deal of this is due to the treatment of the men by the Company. In Denniston, the Company has spent over £800 in erecting and equipping a club, with billiard room containing two tables, social hall, and library, for the use of the employees. This Club is managed solely by a committee of workmen, and the caretaker is paid by the Company. Here is an example which might with advantage be followed by other big mining companies in New Zealand.

In conclusion, the writer must express his thanks to Mr. Dixon, District Superintendent, and Mr. Brown, Denniston Manager, for information freely and kindly supplied.

Correspondence.

(To the Editor.)

Auckland, January 16.

Dear Sir,—As a subscriber to your valuable monthly, I am writing to ask you or one of your subscribers to place me in communication with someone interested in aviation. I noticed some time ago that an instrument is needed to indicate to the aviator the angle at which his machine is inclined to the earth. During experiments connected with an invention (now protected) I came across a simple elucidation of the question, but have not time at the present to prosecute the matter.—yours sincerely,

ERNEST F. BRESSY.

c/o Post Office,
Devonport, Auckland.

* * *

(To the Editor.)

Dear Sir,—I am getting water laid on to cattle troughs and 400 gallon tank on stand 12ft. high, the water being pumped by windmill from creek about five chains away, the whole elevation from creek to tank being about 60ft. I wanted the plumber to put the delivery pipe into bottom of tank so as to get the pressure from tank on to troughs and garden without a second line of pipes. He objects, on the ground that it was less work for the mill if the pipe was carried up into the top of the tank. I thought the pressure would be the same. Who was right?

J. W. RAMSDEN.

Kumeroa, 18/1/11.

Your plumber is right, though his reason is wrong. It would, as a matter of fact, take a little less work on the part of the mill to pump the water into the bottom of the tank than over the top, the pressure being about 26lbs. to square inch in the former case, to about 28lbs. roughly in the latter, as the water has to be lifted 4 feet further to get over the top of the tank. As a matter of practice, no good plumber would attempt to economise in the piping to the extent you suggest. To begin with, if the water were pumped in as suggested, through the bottom of the tank, it would not circulate freely. Unless the tank were emptied the water that was last pumped in would be first out, the top becoming stale. To prevent undue pressure on mill pump valves while mill is standing, a check valve should be placed some feet away from it.

Architecture and Building.

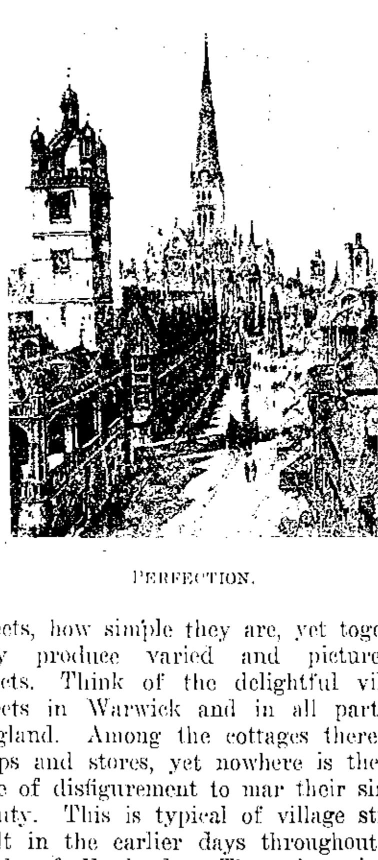
Our Beautiful World.

Man's Work in the Making and Marring of it.

A Lecture delivered to the Christchurch Beautifying Association, by S. Hurst Seager, F.R.I.B.A.

(Continued.)

The English cottage homes erected in the first five centuries of English life were always the natural expression of the wants of the people, so that whatever county we pass through we find the local material built into the homes, full of simple character, and thus becoming objects of beauty always. What can be more beautiful than the simple, half-timbered, thatched cottages of Anne Hathaway at Stratford-upon-Avon, or the cottages at Upton Gray in Hampshire. These are only some of thousands which embellish the natural beauties of the Old World, and in a collection of cottages, forming the village



Perfection.

streets, how simple they are, yet together they produce varied and picturesque effects. Think of the delightful village streets in Warwick and in all parts of England. Among the cottages there are shops and stores, yet nowhere is there a note of disfigurement to mar their simple beauty. This is typical of village streets built in the earlier days throughout the whole of England. There is unity in variety, for the character of them varies according to the local material of which the houses are built. These are the works and form the homes of the simple and unaffected country folk. When we turn to the homes and stores of the merchant princes of London, and the shops and homes of its wealthy burghers, we find this simple work giving place to work equally artistic, but of a far higher standard. Look at Ludgate Hill, as it appeared towards the close of the fifteenth century, that is to say, about four hundred years after the welding together of the Norman and Saxon elements, which form the English nation. The beauties of Nature have here wholly disappeared, but in their places these London burghers erected works of the greatest beauty; with such surroundings the artistic fountains and monuments they erected were highly appropriate, and gave dignity and beauty to the scene. Although there is individual expression in each building, all are in one style of work, and in perfect harmony, and the signs upon them giving the names and occupations of the different owners are all in themselves objects of great beauty. This, then, is the result of five centuries of man's work in accordance with the laws of Nature and thus in harmony with her. Those works still left to us which were erected at that time give the greatest pleasure to the beholder, arousing in him emotions and feelings akin to those which would have been aroused by the natural beauties the city has displaced.

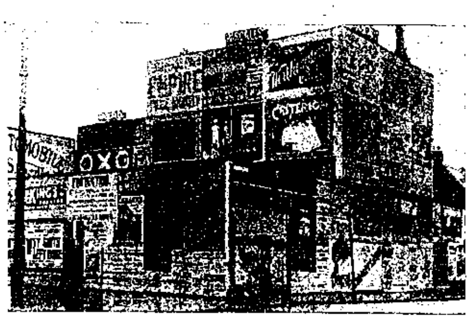
This, then, should be our aim: always so to create our homes and our cities that what we take from Nature we give back in art. But is this the trend of modern thought and feeling? I think not, for with all the noble work of the past which forms the valued inheritance of the present, we are wilfully erecting works which can neither now nor hereafter give a spark of pleasure, and we are disfiguring our towns with ugly and useless announcements.

In this competitive age, it is, of course, absolutely necessary that tradesmen should be diligent in making their wares known, but competition in olden times was the competition in the excellence of the goods offered, while competition nowadays is competition in the loudness with which these goods are declared, and this loudness of acclaim not only absolutely ruins all chance of beauty in the city where it is made, but imposes a heavy tax indeed upon all who purchase the wares. Advertising is necessary, but it can be done artistically, and every one of us should resent very strongly indeed the disfigurement of our towns by ugly and unnecessary signs. Architecture cannot be phonetic; it can only become so by the aid of sculpture, pictures, or writing. In this way many of the old mediaeval cathedrals told nearly the whole of the Bible story, yet they remain works of the greatest beauty, and all the Mohammedan mosques and monuments are covered with extracts from the Koran, adding to the beauty rather than detracting from the excellence of the work. But if our civic fathers want to tell you their office closes at 4 p.m., they put a placard on their wrought iron plates, to the great disfigurement of their building, so that whatever interest the gates have as works of art—and I can assure you the skilful craftsman who made them put his best work into them—is wholly destroyed. The example set by our civic fathers is naturally followed by other citizens, for it is in accord with the commercial spirit of the age in all parts of the world. It has come to be considered a necessity that if you have anything to say to the public about goods for sale or about anything else, you must say it crudely and even rudely, and however much thought is expended on the erection of a building, not one iota of thought is expended in making it phonetic, that is, making it convey to the mind of the beholder the reason and purpose of its erection. The exceptions, unfortunately, are few, but examples can be found showing that large buildings can be covered from top to bottom with announcements of the purpose of their erection without one disfiguring note. In these, all the writing is kept within the architectural lines of the building, and adds to, rather than destroys,

Old Ludgate Hill.
Fifteenth century, showing the homes of the Merchant-princes and their artistic signs.

the decorative effect of the whole. It is astounding to think that when it is so easy to do right, the great majority of citizens all the world over should do wrong: so wrong indeed that in every part of the world now you will find that Beautifying Associations, under various names, are striving to bring their fellows back to a right way of thinking and acting. The strangest part of all is that many of those who are most guilty of disfiguring the towns and countrysides with irritating signs, are men of taste, who provide for themselves homes of beauty.

A striking example of the way in which the world is being disfigured is to be found



The Climax.
Showing what we shall arrive at unless the placarding mania is checked.

at Venice. If there was one view which could be said to be more entrancing than another, it must have been the perfectly unique approach to Venice as seen by Turner and Ruskin in the early forties. From the published engravings you know it to have been beautiful in the extreme. When I visited it I found that just where we expected to get our first glimpse of the poetic city, we had nothing but huge signs on both sides of the railway line, completely shutting out the glorious view.

No words in polite language can adequately express the righteous indignation which every lover of Nature must feel on seeing such wanton desecration, yet while England, France, Germany, and America, are passing laws and striving to kill the monster of disfigurement which is ruining their cities, so apathetic are the Italians, so little do they value their glorious inheritance, that as yet no steps have been taken to prevent the disfigurement of their beautiful and romantic land.

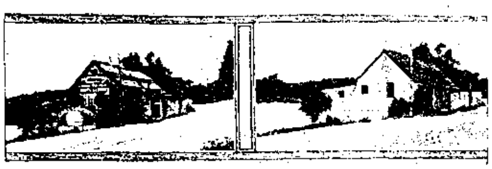
The Work of American Societies.

It is pleasing to find that America, with which we are unfortunately often compelled to associate all that is worst in modern commercialism, has among its citizens an ardent band of workers striving to prevent the further disfigurement of their towns and rural scenery. There the task is extremely difficult, as the Bill Board interest is so strong, and makes ample use of its funds to procure the defeat of every restraint.

The results of the efforts of an American society taken from illustrations in one of their journals are most satisfactory. A beautiful view of the capitol of Nebraska was shut out by a 12ft. high bill board which has now been removed.

A fine view was opened up on the railway by the removal of high bill boards which had previously hidden it.

A simple covered bridge standing in beautiful scenery was disfigured by signs nailed to its entrance. They were removed, and the perfectly satisfactory effect of the simple, unadorned bridge without



Mill Street, Warwick.
Showing the picturesqueness of 15th century Village architecture.

the advertisement was immediately apparent.

All these disfigurements were removed as the result of earnest endeavours on the part of individual members of the Association, showing that improvement in our surroundings is within the power of everyone to effect. Great efforts are made to remove advertisements from the plain walls of buildings, for a plain brick or stone wall in itself is perfectly neutral; it is only when placarded with signs that it becomes a dominant discordant note in the landscape. An illustration is given of a wayside cottage and boathouse, which was a perfect eyesore when covered with advertisements, but became at once a simple, pleasing feature when they were removed.

The question of the neutral effect of a blank wall is an extremely important one, for we find in every town a blank wall at the side of a building when covered with huge signs wholly destroying the effect which might be produced by the architectural features with which its front has been adorned. You get striking instances of this form of disfigurement down every one of our streets: several flagrant examples are to be seen of extremely well-designed blocks of offices and shops ruined by this treatment of its end wall. One of the prettiest views on our Christchurch river is that from Worcester street bridge, to by the erection of a fine pile of buildings for the Y.M.C.A., for which the pleasing effect of which has been added architects deserve full credit. From this point of view nothing can be desired. On the other side, because a blank wall on their older adjacent building exists, the Association have, in accordance with the usual practice, painted a huge sign with letters 10ft. high, and in glaring colours, which quite destroys the pleasing effects of one of the prettiest spots on the river, a spot which both our Association and the City Council have spent money and thought in beautifying.

Ann Hathaway's Cottage, Stratford on Avon.
Showing the simple beauty of English domestic work.

An object lesson is afforded by an exceedingly plain structure, which is the home of the Young Men's Christian Association in Illinois, which had before their occupation been decorated with posters. These they promptly removed, and the building became at once perfectly neutral and wholly inoffensive. But we had till lately a similar example; for close to our Cathedral, and quite destructive of the effect it might produce from the east, was a building which would otherwise have been wholly inoffensive made dominantly assertive by the unwholesome accumulation of ancient, and the irregular display of newly-posted bills. Most certainly our principal approach to the city from the east should not have been allowed to be thus disfigured.

Roadside Boathouse.
Showing the pleasurable effect to be derived from a plain, simple building, and the irritating effect of placarding it with advertisements.

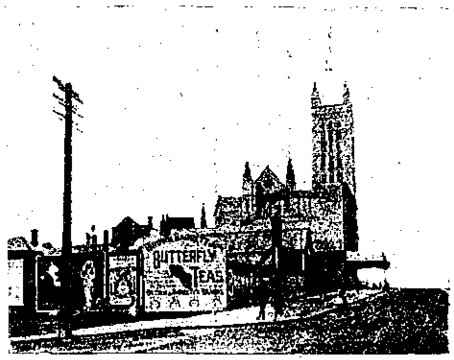
Bill-posting may be Decorative.

If bills are to be posted they can be placed in a decorative way by maintaining the lines of the heads and sills of the windows and forming equal-sized panels of bills between them with a plain simple border. With harmonious colouring and judicious placing, a decorative effect could always be produced. But in order to effect any such change, the bill-posters themselves would have to be instructed in the simple laws of colour and form, which govern the art of decoration. At present, the disgraceful accumulation of old bills and the haphazard placing of new ones destroys, as far as possible, what beauty there is in any part where their operations are carried on. That they have no regard for beauty is shown by the fact that a huge sign is shown in the illustrated journal of the English bill-posters as a desirable "method of beautifying" a village which the inhabitants had taken pains to improve by the laying of a green sward and the planting of trees. Unfortunately, we need not go far from home to find many equally glaring and destructive examples. In Auckland they have built an extremely fine church, spending thereon some £40,000. The design is by a celebrated English Church architect. But the environments are appalling. From the main street the fine tower can be seen only over a mass of glaring signs. Such an approach to Auckland's finest church is scarcely calculated to put us in the right frame of mind for appreciating its beauties. Such a hideous display on the principal streets of the city is a striking illustration of the insidiousness with which the gradual disfigurement of our towns has ruined all sense of beauty in the inhabitants. If it were not so, they would demand, as with one voice, that the whole of it should be immediately cleared away, a simple plainly-coloured fence erected, the signs on the sides of the buildings painted out, and a neutral effect restored.

In Wellington, too, with municipal pride, they have spent a large sum of money in the erection of their fine Town Hall, yet have taken no pains to free it from disfiguring surroundings. But the disfigurements existing in our own town show clearly that we, too, must be awakened from the fatal apathy into which we have fallen. We need to be roughly awakened to the fact that a high bill board does not ennoble the northern entrance to our town, but, on the contrary, it, together with other displeasing features along this route, causes a feeling of irritation in all those whose feelings are not deadened by constant sight of them. Unless we wake from our apathy and determine to do all in our power to stop this wide spreading disfigurement, we shall lose all sense of the beautiful, and become incapable of deriving any benefit from ennobling environments. That we have but little feeling even now for the fitness of things is shown by the fact that we have allowed, right in the heart of our city—in the Square—where stands the Cathedral, around which should cluster all that is best in our life and art, an exceedingly ugly group of discordant signs, and in another part monstrous ones, showing that the artistic feeling which governed the works of our ancestors is quite dead among us, that civic art and the amenities of our cities are considered to be of no importance.

Disfigurement like a deathful parasitical growth is creeping over all our works, so that if not exterminated, our cities, as some portions of those in the Old World, will eventually become nothing but a gigantic bill board. This is what many parts of London have become; the glory of the ancient city has departed, and the climax reached in many parts, where we see the whole of the architecture enveloped in a bewildering mass of signs waving high above us their coloured flags of victory for their conquest over art.

Is this, then, to be our goal? Is this what you want your cities to become, or do you wish them to grow into things of beauty—simple honest beauty—free from all pretence and affectation in their buildings, and reflecting their kindly honest commercial life to the people? Whatever may be our opinion of the commercial life of to-day, it cannot by any stretch of desire be regarded as kindly, and it is this



Church at Auckland.
Showing disfiguring environments.

bitter effort to rise by the fall of others which the glaring and oft-repeated announcements indicate that makes them so extremely irritating. All this useless warfare, this battle of the placards, is carried on at the expense of every one of us, is ruining our cities, and is destructive of all the influence which might be felt from beautiful environments.

It is in the power of each of us to prevent it. All we have to do is to refuse to purchase goods from those persons or firms who have disfigured our towns. We must demand that in all cases announcements shall be made of reasonable size, and shall follow always the architectural

Part of Wellington Town Hall.
Showing Civic grace and Civic brutality.

lines of the building, that none shall be allowed to dominate as they do now the whole district in which they are placed. Much more than this is required, if our cities are to become not only inoffensive, but also beautiful. Sydney, London, Berlin, Paris, and Dresden, and other cities have at last awakened to the fact that cities can become neither convenient nor beautiful if left to the haphazard schemes of individual and clashing interests. In order that they may become beautiful, a love of beauty must be created in us all, an ardent love for Nature and Art. We must demand that our natural scenery shall be carefully preserved, and that all isolated buildings shall be erected in such a way that they will not mar the natural beauty of the scene; that in our towns there shall be such a blending of Art and Nature that the place where our life's work is done, the place in which we have to labour, shall be made as pleasing to us and to those who visit us in the years to come as were the cities of the past. If this is our aim, those German friends who come to us five hundred years hence will be able to say: "It is good to be here, for these people have lived in accord with the best traditions of their race"; but if we allow ourselves to fall away from these traditions, then will our future visitors exclaim: "Alas! the darkness of ugliness has fallen upon it. We have come five hundred years too late."

Hydrated Lime in Cement Work.

(Richard K. Meade in Municipal Engineering.)

As an actual waterproofer, hydrated lime is not surpassed by any of the waxes and paraffine compounds at the present time used for this purpose. Many of these compounds are organic, and in time will volatilize, leaving the concrete porous. Hydrated lime, on the other hand, is inorganic or mineral, and will remain where it is put. As an example of the waterproofing properties of hydrated lime, this was employed upon a large gas holder at Kingston, Ont., which had been practically a failure, owing to the leakage of the concrete wall of the gas holder. Several waterproofing methods were tried, all of which failed, and it was not until this wall was chipped back from 3 to 6 inches by means of pneumatic chisels and a new wall composed of concrete, containing about 18 per cent. of the weight of the cement of hydrated lime had been added, that the tank was waterproof. The addition of hydrated lime to cement makes the latter more plastic and easily trowelled. It also improves the adhesive properties. A mixture of equal parts of hydrated lime and Portland cement makes an ideal mortar for laying brick. The addition of hydrated lime to concrete blocks makes the latter whiter, tougher, and waterproof. Hydrated lime is not only the best but also the cheapest waterproofing compound known, since it replaces so much cement and the only additional cost is the difference between the price of cement and hydrated lime, which is slight, even at the present low price of cement.

In using hydrated lime first cover the bottom of the mortar box with water and add the hydrated lime and more water as is necessary. Some mechanics prefer to soak the hydrated lime at least twelve hours before using, claiming more plasticity in its manner of working.

For Plaster Mortar—First or Scratch Coat.—350lb. hydrated lime, ¼ yard screen sand, 2 bushels hair. Should cover about 100 square yards. Second coat.—200lbs. hydrated lime, ½ yard screen sand. Should cover about 100 square yards. Putty or white coat.—Use about one-half as much plaster to gauge with as is commonly used with putty made from lump lime. If wall is dry sprinkle or dampen with brush before putting on white coat, as labour will be lessened. Float finish.—300lbs. hydrated lime, 1/4 yard screen sand. Should cover about 100 square yards. For stone mortar.—200lbs. hydrated line, 5/8 yard screen sand and add water. For brick mortar.—250lbs. hydrated lime, 5/8 yard screened sand.

Hydrated lime and Portland cement mixture for laying brick and stone.—For hard mortar for these purposes use equal parts by weight of hydrated lime and Portland cement. Add required amount of sand to properly gauge up mortar.

For waterproofing concrete and concrete blocks.—Replace 15 to 20 per cent. of the weight of the cement used in the mortar by hydrated lime.

A Way of Advertising Concrete.

Every year there is a cement show in Chicago to mark the progress of the industry. Last year they tried a competition, a guessing competition, and the winner was to have the material for a cement house. The prize was won by a young lady, and she exercised her rights in due course. These were to select the site and general plans of the building. That done, a prominent architect of the Lake City drew the plans and set the specifications, and the house is being built in the suburb of Wakden, one of the most picturesque of Chicago.

We publish illustrations of the elevation, ground, and first floor plans. Cement is, of course, being used wherever possible. The house is to be a perfect example of what is possible in cement residence construction at a moderate cost. The walls and partitions are being made of hollow cement tile, insuring perfect insulation. The exterior of the walls is to be finished with a rough cast cement plaster coat. The foundations are of solid plain concrete. Red cement tile will be used in the roof, which will be surmounted by two concrete chimneys with round tops.

In general outline the house is rectangular in shape, has a screened porch at each end and a small entrance portico in the centre. Little attempt will be made at exterior decoration.

So much is evident from the drawing. The object, of course, is to show the capacity of cement in the plainest manner and to keep within the limit of an economical design—a great consideration with those who build cottages.

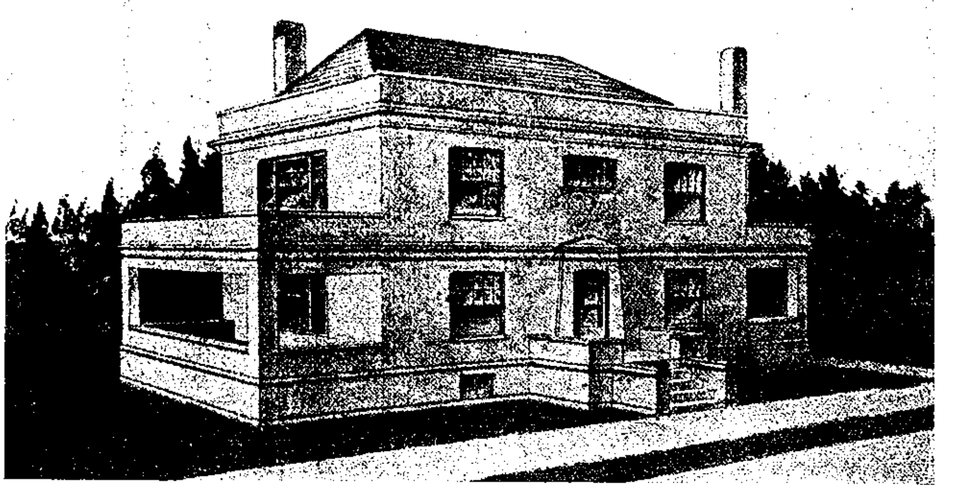
Thus a simple moulding at the second floor level and a moulded cornice relieving the plain concrete wall are the only signs of the ornate. The reinforced concrete floors will be surfaced with a special composition of varying colours in the different rooms. The baseboards are to be of the same material as the floor carried up as a border.

The house will have two fireplaces, with window seats on either side, and a square of red tile in front of each. The fireplace and mantel will be of solid reinforced concrete with moulded decorations. The bookcase and China closet are to be built in and have leaded-glass doors. The dining-room will be unique in having a beamed ceiling with an oval central panel, from which the beams radiate, carrying out the idea of a decoration by means of actual structural details.

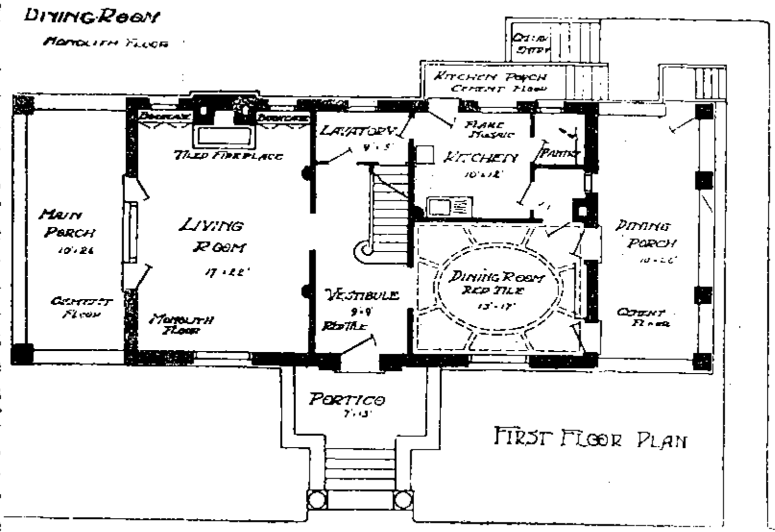
The modern idea of living nine months of the year on the porches of the house rather than inside, has been allowed for in this design by the two spacious porches, one opening off the dining-room and the other off the living-room. These are entirely separate from the entrance portico giving the full privacy of an interior room with the advantage of screened exposure on three sides. The porches open off the living and dining-rooms through two generously big French doors, making each porch a unit with the interior room.

The house is typically modern. It has been the aim to make every line harmonise with its material. In the open doorways, the flat arch is used, and where beams and columns are needed for support, they are plainly exposed. Nothing has been attempted in structure or decoration which does not harmonise in concrete, the aim being to show the highest example of true concrete construction and decoration throughout the building.

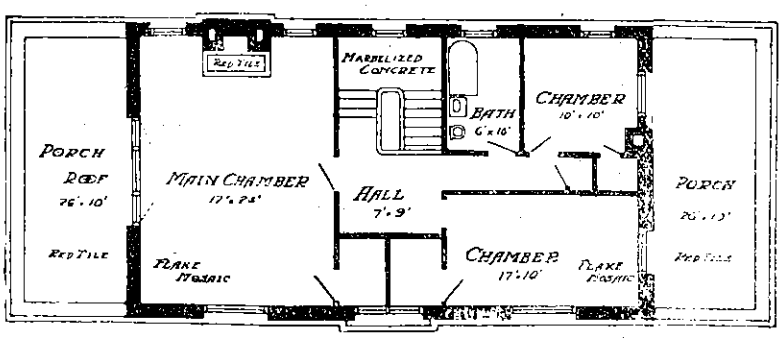
The house is already attracting widespread interest among builders throughout the country, and particularly among prospective home builders in Chicago and vicinity. The process of construction will be watched by scores of interested people, many of whom make frequent excursions to the building site to watch the various stages. Over thirty of the exhibitors at last year's Cement Show have donated the material to be used in the building, and Architect Barton has offered his service free of charge. Among all the parties concerned in the building of the house, the most interested of all is the happy prospective owner, Miss Williamson.



CEMENT HOUSE, WAKDEN, CHICAGO.



FIRST FLOOR PLAN.



SECOND FLOOR PLAN.

Laying Concrete under Water.

The question has proved very interesting in Wellington, on account of the failure of the Dry Dock contract. The practice of laying concrete under water is, however, not new.

In papers and discussions before the Institution of Municipal Engineers, at Brighton, England, the subject of laying concrete under water was introduced. It was stated that satisfactory results had been obtained by depositing dry concrete in bags and letting the water do the rest. Mr. A. E. Fuller stated that the foundations of the groynes on the Brighton front were made in this way, and that after fourteen or fifteen years there was no sign of any ill effect; and Mr. A. E. Prescott gave similar testimony with regard to the construction of sea defence works, and the carrying of sewers out to sea. He had deposited hundreds of tons of cement in the sea, in that manner, with success. Mr. B. A. Miller, on the other hand, had experienced some difficulty owing to the displacement of the bags of cement by rough weather. In making a breakwater, he had dropped hundreds of tons of dry cement in bags into the sea from a hopper barge. He then went down in a diving dress and found that many of the bags lay a little out of place.

Fire Prevention Through Concrete.

The big fire at Campbelltown, New Brunswick, in July last wiped out property to the extent of nearly a million sterling. The U.S. Consul Hoskin, reporting on the rebuilding arrangements now in progress, says that "concrete walls and blocks will in many cases supplant the natural stone for building purposes, as it is noticeable everywhere that concrete withstood the fire test, while natural stone did not."

In commenting on the extensive use of concrete in Philadelphia, the *Public Ledger* of that city says Philadelphia "has adapted itself rapidly to this new type of construction, and as the building code demands certain fireproof features it has become cheaper to erect unburnable buildings than those which can be consumed by fire. Enormous quantities of cement are used in Philadelphia, and the city has a score of big companies which contract almost exclusively for the erection of reinforced buildings. The fact that steel for reinforcement purposes is readily obtained here at reasonable prices has perhaps much to do with its use. A number of big cement manufacturing plants are located in the vicinity of Philadelphia, where cement can be produced the year round at bedrock prices. Vast quantities are used in almost any building, for it has supplanted lime mortar, where it was formerly used. The day has come, in fact, when the builder uses less lumber and more cement. Many of the lumber yards have added supplies of cement to their stocks and make considerable profit from its sale. The day is coming, the dealers say, when cement will be used almost exclusively for the erection of houses, especially those for persons of moderate means."

The rapid increase in the use of concrete in certain connections was once viewed with alarm in the iron and steel trade, as superficially it appeared that concrete was tending to displace iron and steel along certain lines. These fears were dispelled when it became apparent that the availibility of concrete was encouraging industrial operations, and by broadening such operations was indirectly encouraging the consumption of iron and steel along various lines, while directly the use of concrete created a demand for steel, as for reinforcing material and steel sheet piling. – From the *Iron Trade Review*.

NOTES.

AUCKLAND.

Mr. WALKER reports:—House in Wellington Street, 2 storeys, wood built, for Mrs. Ferguson; price, approx. £650. Bungalow, Aickin's Bush, Newmarket, eight rooms, wood built with asbestos sheeting, for Mr. Claude E. Hemus; contractor, Laver, Mt. Eden; price, approx. £890.

Mr. MORAN reports:—Residence at Remuera for Mr. A. H. Shroff, bungalow, wood built, 9 rooms, frontage to Ladies' Mile.

Messrs. WADE & WADE report:—Two wooden buildings at Remuera, both 10-roomed double-deckers. Epsom, wooden house, 10 rooms. Bakery at Mount Roskill in brick. Star Hotel at Newton. Existing wooden portion being removed, brick block is being erected. Hanna's new premises, Queen Street, nearing completion.

EDWARD BARTLEY reports:—New warehouse in Lorne Street for Mr. John Edson. Five storeyed warehouse of brick. Ground floor suit of dentist's rooms, frontage 70 x 50. Alterations to existing premises, which will give access to the new warehouse by a wide corridor from Queen Street through Lorne Street. Corridor and dentist's rooms to be tiled. Imposing elevator to Lorne Street. Two basements below Lorne Street level all partitions are fireproof. Alterations to old building stairway behind present one.

A. & T. Burt, Ltd., warehouse. Old premises pulled down and new ones to be erected divided into three blocks, offices and warehouse in the front; frontage Custom Street W. 50 x 165ft. Two rear blocks engineer shop, blacksmith and iron and brass foundry built brick. Price, £1439. Contractor, W. E. Hutchinson.

Presbyterian Orphanage, Remuera. From competitive plans. Now being erected. Frontage to Meadowbank. Accommodation for 30 children. Slate roof, all partitions fireproof, all on one floor, 2 dormitories 40 x 18 each, lavatory accommodation for each sex, dormitory surrounded by good spacious verandah and connected to administration quarters by corridor, dining-room 50 x 25, matron's room, kitchen, etc, laundry and washhouse in separate block. Contractor, Mr. T. E. Farrow. Price, £3410, exclusive of drainage, septic tanks, and outbuildings.

South British Insurance Co.—Additions and alterations near completion.

Auckland Savings Bank.—Alterations and additions near completion.

Symonds Street.—Two large shops with dwellings, two storeys, brick built. Price, £1738; contractor, Hamon Bros.

Paris Hall, Devonport, for Trinity Church, 76 x 40ft., with stage, and 4 class-rooms, kitchen and conveniences, brick with slate roof. Price, £1860; contractor, E. Morris.

Several villas in course of erection at Devonport.

MANAWATU.

Mr. TILLEARD NATUSCH reports:—

Several works in hand in charge of his Palmerston North branch office. Among these are new offices in brick for Mr. Andrew Guy, Solicitor, in the Square, Palmerston North.

Also renovations and repairs, and extra roof light to billiard-room at the Feilding Club. This work is being carried out by Mr. Kingston, builder, of Feilding.

Mr. Charles Bull is having extensive additions to his residence at Feilding, being chiefly in the form of a fine billiard-room, new entrance hall, and cloak-room, etc. This work is now well in hand.

Mr. Natusch has also plans in hand for further extensive work in the district, particulars of which will be given later.

Messrs. TURNBULL & SONS report:—Work is now progressing for a large residence outside Feilding of 14 rooms.

HAWKE'S BAY.

Mr. TILLEARD NATUSCH reports:—

At Otane Mr. White's house is almost completed, and Mr. Brinson, builder, has commenced work on Mr. Langridge's new house.

At Waipukurau good tenders were received for a new house for Mr. W. C. Hewitt, solicitor, and the work has been secured by Mr. W. Chambers, contractor. The first step towards actual work upon Messrs. Ringland Bros.' new premises has now been made, Mr. Byrne having secured the contract for the pulling down and removal of existing timber buildings now upon the site. Tenders will shortly be called for the new buildings.

Various other works will shortly be advertised.

WELLINGTON.

Mr. TILLEARD NATUSCH reports:—New residence, Tinakori Road, for Mr. A. K. S. Mackenzie, is nearing completion. Mr. McMillan is contractor in charge.

The contractors for Mr. Bull's residence at Hunterville are Messrs. Sollitt Bros., of Palmerston.

The contracts for alterations to Mr. Eric Johnston's house as Goldie's Brae are Messrs. Sykes and Shaw.

Tenders are being called for a cottage residence to be erected in Aglionby Street, Lower Hutt, for Miss Stuart-Forbes.

At Lower Hutt additions and alterations, etc., to stable, new men's quarters, etc., at Keewayden, on the Western Hutt Road for Mr. W. Brown.

Mr. Natusch has plans in hand for two more houses in this popular quarter.

Messrs. TURNBULL & SONS report:—Plans are being prepared by above on vacant section of ground for a factory immediately to the rear of Messrs. Tonks' premises, fronting on Webb Street. The plans provide for building area of 100ft. x 100ft., half of which (100ft. x 50ft.) will be erected as a three-floor building, the remaining half one story only.

The building will be constructed in brick, wood, and steel, and will have all the necessary accessories. The entrance will be either from Arlington Street or Webb Street, made possible by a cartway connecting these two thoroughfares.

Also a residence in half-timber, constructed in Arlington Street, comprising 12 rooms, and another residence in the same style and similar accommodation in Tinakori Road. Each of these residences will cost approximately £1800.

Two semi-detached wood houses in Tinakori Road, each of which has accommodation of 6 rooms, and costing approximately £800.

Also instructions to prepare contract plans and specifications for a 12-roomed house off Wellington Terrace. Tenders to be called.

Patents.

The following list of applications for Patents, filed in New Zealand during the month ending January 20th, 1911, has been specially prepared for PROGRESS.

28737—Maclean, T., Greenhills: Door and window fastener.
28738—Moss, E., Christchurch: Egg-packer.
28739—Hovell, D. de B., Sumner: Furnace draught.
28740—Yarrow, R., Wellington: Rubber substitute.
28741—Piercy, E. C., Aramoho: Hat fastener.
28742—White, S., Mangatoki: Pig-holder.
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28744—Paterson, J., Te Aroha: Milking machine cup.
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28747—Hanlon, M. I. M., and Eland, W., both of Sydney, N.S.W.: Saucepan.
28748—Bruce, J., and Tuck, W. A., both of Wakefield: Horse cover.
28749—Stanley, J. C. W., Santa Cruz, U.S.A.: Wood pulp manufacture.
28750—Howden, A. F., Dunedin: Tobacco cutter.
28751—Stubbs, F., Auckland: Closet flush.
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28758—Chatterton, S., Ellerslie: Cribbage and scoring means.
28759—Ziele, W. S., Sydney, N.S.W., and Ziele, C. W., Christchurch: Match-box opening.
28760—Hamn, L. G., Manaia: Boot sole and heel.
28761—Tobin, P. J., Raetihi: Solder.
28762—Neff, C., and Brandes, A., Hanover, Germany: Liquid treatment.
28763—Lowry, H., Belfast, Ireland: Sewage pipes, removing obstructions in.
28764—Kelly, S. W., Auckland: Carpet roll clip.
28765—Lazarus, H. G., Sykes, G., and Hughes, W. E., all of Wellington: Window sash rattling preventer.
28766—Wunderlich, C. B. S., Grafton, N.S.W.: Butter box.
28767—Schruth, W. A. O., and Mackay, W. R., both of Perth, W. Australia: Coin-freed machine.
28768—Sinclair, R., Sydney, N.S.W. Ammonia and other gas compressor.
28769—Tandy, C., Wellington: Game apparatus.
28770—Rison, A. J., Allen, W. A., both of Hastings: Venetian blind.
28771—Shattky, C. H., Hastings: Railway rail joining.
28772—Fewings, T. H., and Walton, F. H., both of Christchurch: Basket bottom.
28773—Hayes, C. W., Huntly: Sprayer.
28774—United Shoe Machinery Company, Paterson, U.S.A.: Gripper.
28775—Hayes, E., Oturehua: Wire grip.
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28880—Fothergill, G. W., and Rogers, W. H., both of Upper Hutt: Circular saw guard.
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