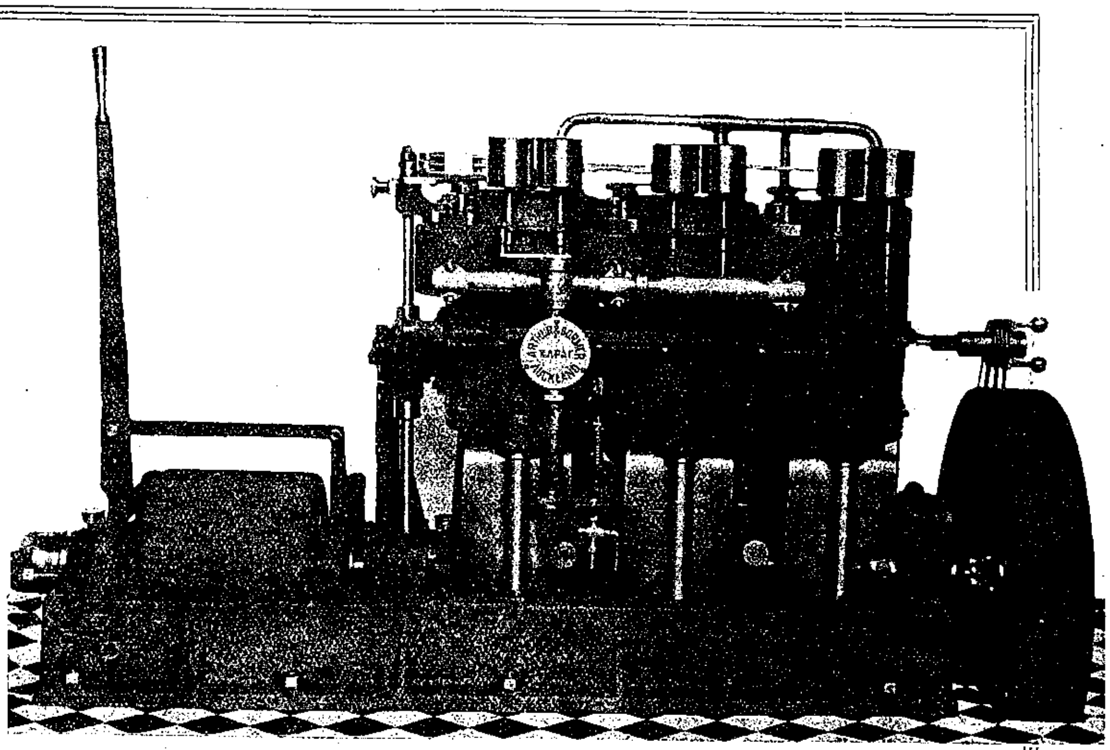

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PROGRESS

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THE SCIENTIFIC NEW ZEALANDER.

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

Official Organ of the Canterbury College Engineers' Society, and the Wellington Philosophical Society.

VOL. VI.—No. 5. MONTHLY.] WELLINGTON, N.Z., MARCH 1, 1911. [PRICE: 9d. per copy; 7/6 per Annum post free, in advance.

Progress
The Scientific New Zealander.

Published Monthly by Harry H. Tombs, 10, Willis Street, Wellington, New Zealand.

ANNUAL SUBSCRIPTIONS:—To any address 7/6, post free.

REMITTANCES should be made by Post Office or Money Order. All cheques, plus exchange, to be made payable to Harry H. Tombs, and sent direct to "PROGRESS" Office, P.O. Box 481, Wellington.

ADVERTISING RATES will be sent on application. The value of "PROGRESS" as an advertising medium is rapidly becoming recognized by advertisers. Circulation considered it is the cheapest advertising medium of its kind in the Dominion.

The Editor will at all times be glad to receive Illustrated Articles on subjects of interest for consideration, provided the articles are short and to the point, and the facts authentic.

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EDITORIAL COMMENT.

Eclipse of the Sun.

In the present year there will be two eclipses of the sun and two penumbral eclipses of the moon. Of these the only one in which New Zealand can take a practical interest is the total eclipse of the sun on April 28 next. It will not be total in the Dominion, however, though totality will take place in New Zealand territory, as we shall presently take occasion to discuss. The magnitude of the partiality in Wellington will be .611. To those living within the area of totality the occasion is always regarded as offering the rare opportunity of witnessing what is generally admitted to be the most imposing of all celestial phenomena. The sight will not be so grand in New Zealand, it stands to reason. Still there will be enough of interest to repay the observer with camera or telescope or even with naked eye if he sets about his work properly.

The scientific reference to the coming phenomenon is: "Invisible at Greenwich. The line of central eclipse begins its course in South-east Australia, where a partial eclipse will be visible soon after sunrise. It traverses the Pacific ocean in a north-easterly direction, crossing the Equator at 154° longitude west of Greenwich, and ends its course in the ocean in latitude about 11° north and west of Central America. In its course across the ocean the path of totality passes through groups of islands from some of which it will be possible to see the eclipse. The most suitable of these is Vavau, in the Tonga and Friendly Islands; long. 174° west, latitude 18° S., where an observing station will be found fairly close to the central line. Other accessible spots are Nassau Island and Danger Island, Log 166° West, lat. 11° S., approximately. Central eclipse begins generally April 28d. 8h. 46min. in long. 148° 33 east of Greenwich, lat. 36° 48 S., and ends April 28d., 12h. 9m. in long. 90° West, lat. 11° 5 N."

None of the other phenomena mentioned above will be visible in any part of New Zealand or the annexed islands.

The last total eclipse visible in the Dominion was seen in the year 1885, and was very completely and successfully observed locally, as the records attest. For the present occasion the Philosophical Society projected an expedition to Nassau or Danger Island. They were to get a ship of the Royal Navy to take them, Greenwich Observatory was to lend them instruments, and the New Zealand Government was expected to do the rest. But when the matter was brought to the notice of Cabinet it was decided not to be worth while, as others were doing the work quite well.

Now this is a hasty conclusion. It is the custom of all civilised communities to take part in these observations. For the simple reason that it is only during the precious moments of a total eclipse of the sun that certain phenomena of the highest importance for the advancement of our knowledge of the sun can be seen and recorded. For this purpose many great expeditions went out from Europe and America to observe the eclipses of the last sixty years, which involved extensive preparations, long journeys to distant lands, great expenditure of time, energy, money, and often hardship, as well as risk of life. Vavau, of the Friendly Islands, is the place selected for the observation by the Australian expedition, which is now ready to start. Nassau and Danger Islands are some nine hundred miles away to the north, and within the territory of the Dominion, as it was enlarged by the proclamation read by Lord Ranfurly at Auckland before the Duke of York on his landing at Auckland from the Ophir. In case of cloudy weather at Vavau the observations at these islands would be invaluable. The status, moreover, of the Dominion requires an independent course to prevent the world from criticising us as given over entirely to the meaner aspect of affairs. The Dominion has, however, come to the time of national life when it is expected to do its share of the work of the international comity. We trust, therefore, that the decision of the Government may be reconsidered in this matter.

For the private observer, of course, there is not so much that he can do that will be of use by observing here, for he will have only a partial eclipse to observe. Last year, when there was a total eclipse of the sun visible from Hobart and Bruni Island, the tourist association of Tasmania undertook to look after the amateurs, giving them practical instructions for observing, and very useful their work proved, even though the observers with camera, telescope and naked eye were for the most part but poorly equipped with astronomical training. We have no tourist association here, but we have the Tourist Department, which could do the same office for the amateurs of the Dominion who are quite likely to take interest in the partial eclipse of April if properly encouraged. We commend the matter to the Government and to the Astronomical Society, which ought to supply the initiative.

ASTRONOMY.

A New Star.

(From "Times" Astronomical Correspondent.)

The close of the year 1910 has been marked by the apparition of a "Nova," or new star, in Right Ascension 22h 32m, North Declination 52° 15′, a position which lies on the boundary line between Lacerta and Cepheus, and in the middle of the Milky Way.

The discoverer of the new body is the Rev. T. H. Espin, of Wolsingham Observatory, Tow Law, Durham; he is a Fellow of the Royal Astronomical Society, well known for the diligent watch that he keeps on the stellar heavens.

It is generally agreed that the outbreak of Novae, of which this discovery furnishes an example, denotes a collision of some kind in the heavens, but there is a difference of opinion as to what objects collide. It may be one nebula or meteor swarm coming into collision with another, or a star with either of these, or lastly one star with another. It is a curious reflection that the actual outburst, of which the news is now reaching us, occurred not less than three centuries ago, and quite possibly three thousand years ago; at least this is the estimate of the distance of the Milky Way given by Professor Newcomb and other authorities.

Astronomical Notes for March.

(By Hon. Director of Wanganui Observatory.)

The Sun is in the constellation Aquarius till the 11th, when he enters Pisces. His declination is now rapidly changing, and he will cross the Equator on the morning of the 22nd, which marks the autumnal equinox for the Southern Hemisphere. The surface of the sun has been almost entirely free from spots during the past month or so, thus pointing to a period well down the curve towards quiescence. The long-sustained activity which made itself apparent in the fine displays of last year has at last given way to the reverse, and the sudden drop is in keeping with previous experience.

The Moon, in her monthly circuit of the heavens, comes into the vicinity of the planets and some of the brighter stars, and serves as a convenient pointer to them. She will be near Venus on the morning of the 3rd, and will be seen in the vicinity of the planet on this and the preceding evening. She will be near Saturn on the 5th, Jupiter on the 19th, to the south of our satellite. Her path through the constellations visible in our evening skies at about 8 p.m. is as follows:—As a circuit in Pisces on the 4th, Aries on the 5th and 6th, Taurus on the 7th and 8th, and near the bright star Aldebaran on the 7th, Geminin on the 8th, 9th and 10th, and nearest the two bright stars Castor and Pollax on the evening of the 10th, Cancer on the 11th and 12th, Leo on the 13th, 14th and 15th, and nearest the bright star Regulus on the 13th, Virgo on the 16th to the 19th, and nearest the brilliant Spica on the 17th, after which she rises late in the evening.

Phases of the Moon in N.Z. mean times:

New Moon	1 day	0 hrs.	1 min.	p.m.
First Quarter	8 days	10 hrs.	31 min.	a.m.
Full Moon	15 days	11 hrs.	28 min.	a.m.
Last Quarter	23 days	11 hrs.	56 min.	a.m.
New Moon	30 days	12 hrs.	8 min.	a.m.

Mercury is a morning star during March, in the constellation Capricornus, rising shortly before the sun at the beginning of the month, in superior conjunction on the 21st, and after that as an evening star close to the sun's place. He will be in greatest heliocentric latitude south on the 10th, in his ascending node on the 29th, and in conjunction with the moon on the last day of the month.

Venus is an evening star in Pisces moving rapidly to the east amongst the stars. It may now be seen, shortly after sunset, in the western sky. Viewed in the telescope its appearance will be nearly circular, as it emerges from behind the Sun's place. She will be in conjunction with the Moon on the 3rd, in her ascending node on the 28th, and in conjunction with the planet Saturn on the following day.

Mars is a morning star in Sagittarius, and is moving to the east amongst the stars of this constellation. He comes into conjunction with the planet Uranus on the 11th of the month, when the two planets will appear to pass one another at a distance of about two-thirds the Moon's diameter. Early risers should be on the look-out for this, which will take place on the evening of the 11th, at 9hrs. 10min.

Jupiter is now an evening star in the constellation Virgo, and close to the border of Libra. He may be found in the south-east at the beginning of the month, rising shortly after 10 p.m., to the north of the bright star Alpha, in Libra. His "belts" are full of interesting detail, the southern hemisphere being particularly active at time of writing, many dark spots being seen with a mass of fine detail, in the large telescope. He is in conjunction with the Moon on the 19th, and will appear close to the Moon on the evening of that date.

Saturn is getting close to the western horizon, and must be looked for soon after sunset. Many fine views have been had of this beautiful object during the present opposition. His fine ring system being well inclined to the line of vision, has made this opposition of much greater interest than those of the last few years preceding it, and will make for the still greater attractiveness of the planet during the next few years. Saturn will be in conjunction with the moon on the 5th, and will be seen east and west of her on the 4th and 5th respectively; the planet will be to the south of the Moon on both occasions.

Uranus is a morning star in Sagittarius, having an apparent motion to the east. He may be easily identified when in the proximity of Mars on the mornings of the 11th and 12th, when he will be slightly to the north of Mars. He is in conjunction with the Moon on the 25th.

Neptune is an evening star in Germini, and will be in conjunction with the Moon on the evening of the 10th.

Meteors.—A radiant in Virgo should be watched in the early morning, for bright meteors, during the middle of the month.

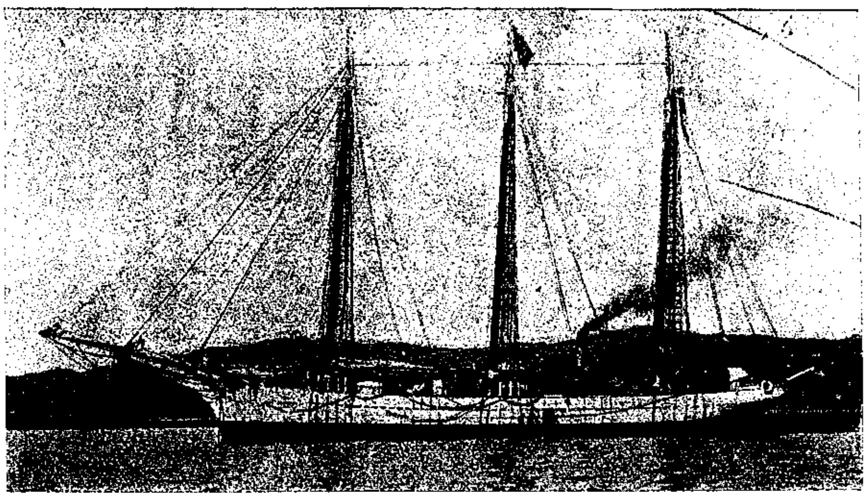
The Constellations for the middle of the month, at about 8 p.m., are as follows:—North: Gemini and the bright "Twins" Castor and Pollux nearest the horizon, with Canis Minor and the bright Procyon over those. Above these, again, is Canis Major and the brilliant Sirius, brightest of all the starry host as viewed from planet Earth. In the zenith is Argo, the Ship (the ancients, in the north, saw it on the southern horizon, a more fitting place for a ship to appear in), and the brilliant Canopus south of the zenith. In the east is Cancer, with Leo nearer the eastern horizon, the bright Regulus being now well above the horizon. Hydra, the Watersnake, and the small constellation Corvis and Crater more to the south of each. Approaching the western horizon is Cetus, and above him the long winding shape of Eridanus—the River—with the fine star Achernar away to the south. Orion and Lepus are now drawing near the western horizon, preceded by Taurus—the Bull—the eye of which—Aldebaran—gleams red in the vapours low down in the north-west. In the south the Cross and the "Pointers"—Alpha and Beta Centauri—have again risen into prominence in the eastern extension of their polar wandering, followed by the Triangle.

Halley's Comet.—By recent advice from the Northern Hemisphere, we learn that some of the largest telescopes have, photographically, registered positions of our late interesting visitor, at a distance of nearly four hundred millions of miles from the Earth. The probability of this being accomplished was put forward in these notes for last December.

ACCIDENT TO THE NAPIER TRAIN.

The Antarctic.

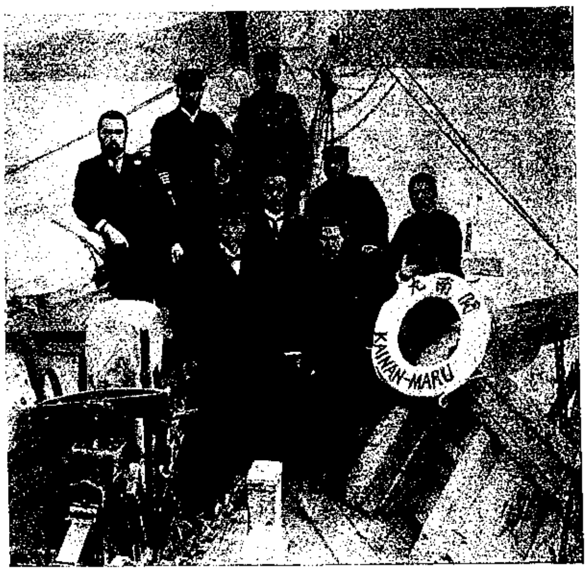
The Japanese Antarctic Expedition.



THE "KAINAN MARU" IN WELLINGTON HARBOUR.

The arrival of the "Kainan Maru," three-masted schooner of some 200 tons, in Wellington in the middle of the month reminded the city of the reports that reached here some time ago of the expedition about to proceed south under Lieutenant Shirase, of the Japanese Army. Critics, we were told at the same time, versed in the conditions of Arctic travel, declared at the time that it would be impossible with a vessel like the "Kainan Maru," the expedition would never get through the pack ice, and thought it certain that in the event of its carrying them through the men could never endure the climate with their light equipment of food and clothing. In fact, it was broadly hinted that the expedition would end in the smoke of gossip. But all this the arrival of the vessel at Wellington made useless. Here she is. The question arose, What is she and how is she provided? The question was asked, but not answered, for it appeared that the Japanese commander and his crew, who might be supposed to know all things, as becomes good Japanese educated outside their native land for the good of their own, were short of just one piece of knowledge, namely, that of the languages of England, France, Germany, Italy, Denmark and Spain. Therefore conversation went on largely in dumb show. The commander and his little wiry staff landed, paraded the streets with languid eyes, bowed low to the officers of the Marine Department, shook hands repeatedly with their Consul, who knew as much about Japanese as the Japs. knew about English and the other European tongues, and making signs managed to impress all and sundry that they wanted to buy food. Having got so far they contrived to utter the word "cow," and thus was established a fairly brisk trade in tinned meats.

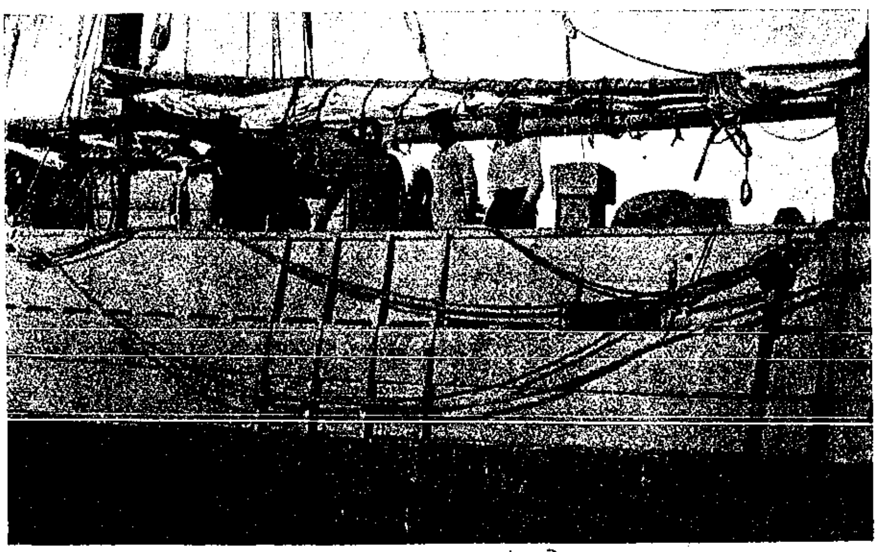
From left to right : MR. HWANG (Chinese Consul), MR. TAKEDA (Scientific Leader), MR. W. T. YOUNG (Japanese Consul).



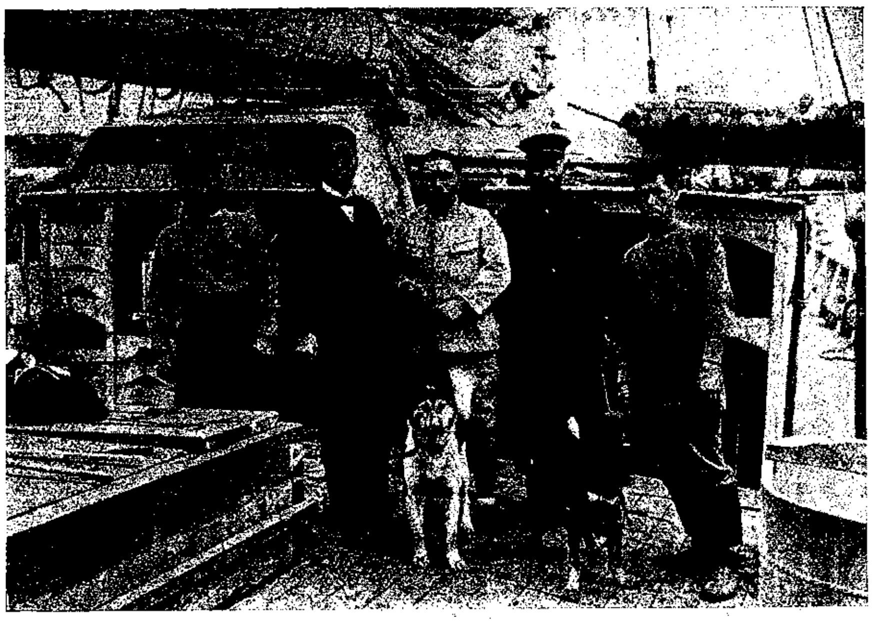
THE OFFICERS OF THE EXPEDITION.
Standing at rear: S Tada, secretary and scientist; Captain Momuru, Lieutenant Shirase. Front, standing: Mr. T. Takeda, scientist; Mr. Z. Tanno, chief officer; Mr. F. Shima, providore. Sitting: Mr. T. Tsuchiya, second officer; Mr. S. Mushiyo, doctor (arm on lifebuoy).

When the Chinese consul, the urbane Mr. Hwang, appeared on the scene, he produced the Chinese character, but the visitors, being as ignorant of the Chinese language as of English and the other European tongues, not much progress was made for a while. But gradually the Chinese character, with the assistance of odd words which seemed to turn up out of the mouth of Japan with opportune accidentality, helped matters, until quite a comprehensive knowledge was acquired of the ship and her company and her food and clothing equipment. But very little transpired about the voyage or the expectations of Antarctic achievement. About the latter, it transpired that the Japs. have the idea of getting to the "top of the Pole," as they contrived in one of their moments of accidentality to call it, somehow and from somewhere in the neighbourhood of King Edward VII. Land. But this seems to be as undecided as the English in which it was slowly conveyed.

The ship thus received and its crew thus communicated with, departed in due course.



"KAINAN MARU"—DETAIL OF REINFORCEMENT.



MEMBERS OF THE PARTY (showing the splendid dogs and their kennels.)

But before it got away, a curious thing happened—as Rider Haggard remarks more than once in the course of his hardly less veracious narratives. Some officers, to the number of half a dozen, having to wait for a remittance, came ashore to while away the time, as, indeed, often happens to remittance men, and being on shore experienced the further customary desire to spend money. They chose literature, not beer, and they satisfied their literary thirst by paying a visit to the book shop on the Queen's wharf, where they bought a number of English novels, including a dozen of Mr. Jacob's sea stories, about which and about English literature generally they conversed in English in a leisurely and finished style, which greatly impressed the worthy bookseller. He, when the Japs, were hull down over the horizon, communicated his knowledge of their proficiency in the language which for so many days, and before so many people, they did not understand. What this portends it is not given to every man to predicate. Add that the ship's log was written up daily in English, and the mystery is complete. Anyhow, the Japs. are gone, and they are, according to their own statement, bound for the South Pole, which they appear to expect to reach on "top" before the bulky and better found venture of Captain Scott.

The ship was sixty-seven days coming from Kobe; she did not call, as intended, at the Sandwich Islands, she was here exempted from port dues, and her people were allowed to land without the penalties or securities required under the law in such case made and provided. The dietary scale consists largely of rice, which, Mr. Shackleton declares, is insufficient. But the commander has been three years in the Arctic travelling among the Esquimo, and may be said to have some knowledge of the business of Arctic voyaging. Certain it is that his ideas of comfort and necessity are very different from those of his rivals who started the other day in the Terra Nova.

The ship turns out to be quite as iceworthy—to coin a word—as is desirable or necessary. She was built of wood not long ago, and when acquired for the expedition the original hull, 3in. in thickness, was strengthened with a sheath of 3 inches, faced with ¼in. iron plates. The hull is similar in design to that of the ships which have preceded the "Kainan Maru" in Antarctic exploration. The vessel is schooner-rigged, her three sturdy masts being strongly braced. Low bulwaks and deck-houses give her a curiously squat appearance, but everything seems strong enough, even for the ugly green seas which prevail in the Southern Pacific. The length of the vessel is 108 feet, her beam 24 feet, and gross tonnage 204. She has a compound surface-condensing engine, built in Japan, to provide auxiliary power, but the chief means of locomotion is by the three fore-and-aft sails.

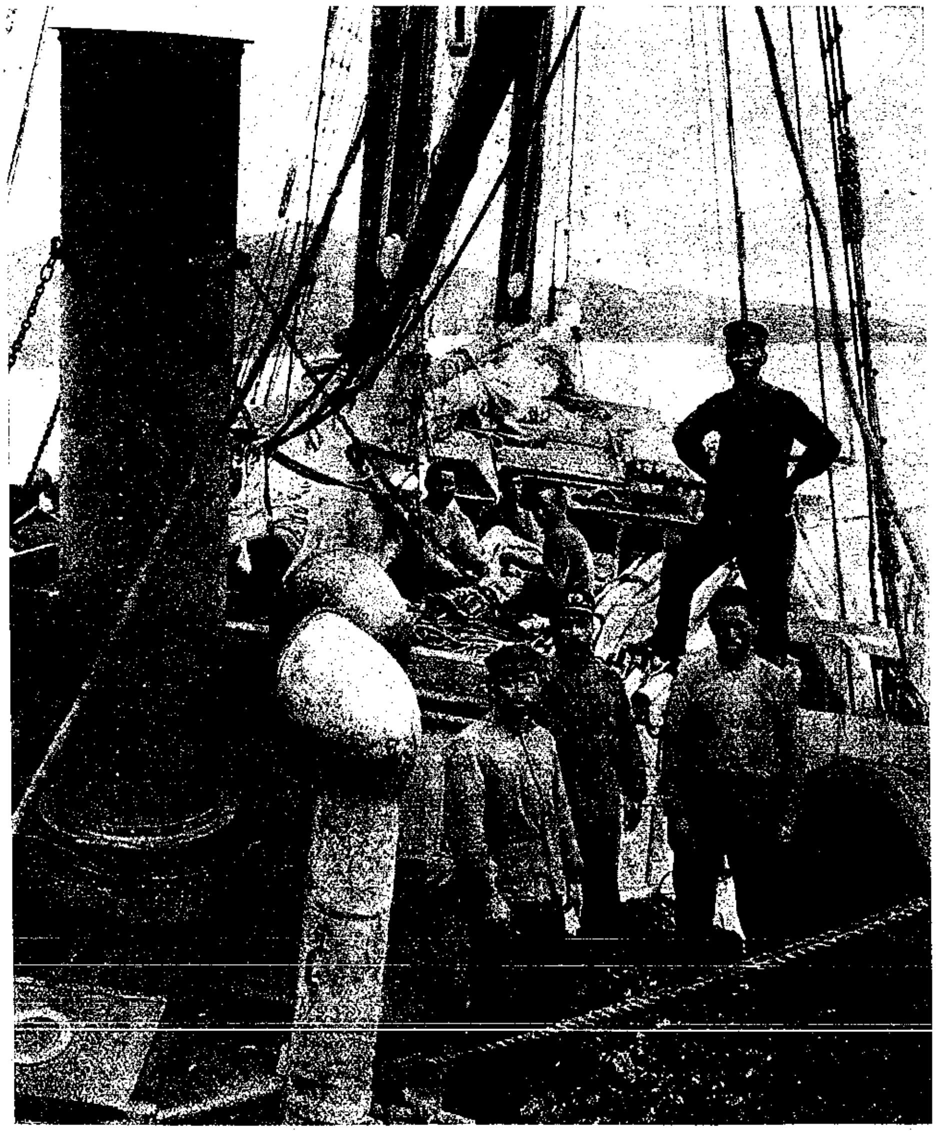
The owner is set down as "Shigenofu Okuma." This is the well-known Count Okuma, late Prime Minister of Japan, and Minister of Foreign Affairs. It is this influential backing which has enabled Lieutenant Shirase to carry out his plans to the present point.

All the equipment has been provided in Japan. There are six sledges, and it is intended to use dogs in hauling them, twelve having been brought from Manchuria for the purpose. Sixteen others died on the voyage from Japan. Besides this, there is a tremendously strong but shallow boat, twenty feet long, for use in loose ice. So far as could be understood, this, apart from foodstuffs, completes the equipment.

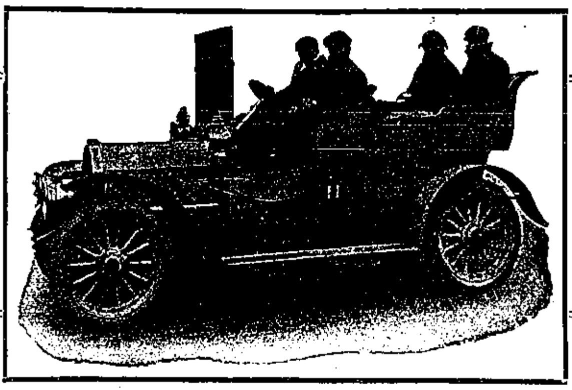
An inquiry was made regarding the scientific equipment, and the newspaper representative was shown seven barometers, including an up-to-date English aneroid with a magnifier on the rim to facilitate easy reading of the scale. A wind-gauge and a microscope, with the usual navigating instruments, completed the collection.

The scientists and navigators are just as uncomfortable and cramped in their quarters on the "Kainan Maru" as were the Britishers who took part in the Shackleton expedition. A tiny chart-room is situated aft, facing the steering wheel. One cannot stand upright in it, unless it is by the device of walking down a step of the companion-ladder leading into the main cabin below. Here the visitors, official and newspaper, were introduced to all the members of the expedition, the early arrivals departing to make room for the colleagues who followed. Lieutenant Shirase and two or three of his principal assistants enjoy the use of tiny cabins, but the majority of their colleagues find sleeping accommodation in dark bunks along the ship's side, just off the saloon. Luxury is not a feature of the "Kainan Maru," neither does there appear to be a superfluity of equipment, but the men who stood around the little cabin looked healthy, determined, and intelligent, and they will probably do a great deal more in the Antarctic than has been prophesied of them by some of the Japanese newspapers.

The chief officer is Mr. Z. Tanno, late of the steamer "Kagashima Maru." The second officer is Mr. T. Tsuchiya, late of the "America Maru" and "Otaru Maru." He has visited Sydney and Melbourne in the Nippon Yusen Kaisha steamers. The engineer is Mr. K. Shimigi, late of the "Hongkong Maru." The scientific leaders of the expedition are Shirase, the commander, S. Mushiyo, the doctor and second in command, T. Takeda and E. Tada, scientists, and T. Shuna, who is responsible for the equipment and the provisioning.



"KAINAN MARU" LOADING COAL.

Motors  Motoring

OLYMPIA.

Progress in Motor Body Construction.

(By H. Waymouth Prance, A.I.E.E., A.M.I.A.E)

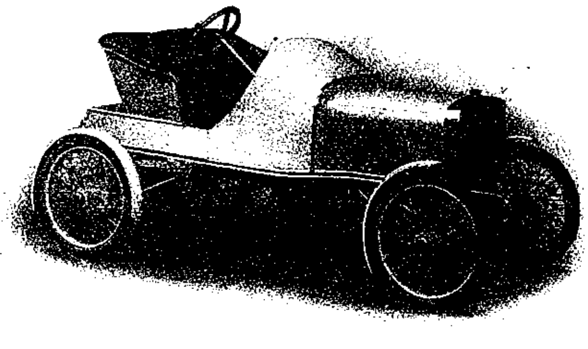
At the time of the Olympia Show one annually looks round to see what progress has been made in the various branches of the motor world, and in late years the department with which I propose to deal in this article, that of motor body construction, has been noteworthy for the vigorous strides which have been made, and for the striking innovations which have taken place. In order to best gauge the progress which has been made it is advantageous to consider the ends and ideals which are being aimed at in the perfecting of bodies for motor vehicles. As in all other motor matters, the final design is one of compromise, but this compromise is made up of several independent features, each of which must receive its due consideration in the course of the development.

First among these aims may be mentioned comfort, the primary object of the body-work being the carrying of the passengers with as much comfort and convenience as possible. Appearance also is an important factor, whilst lightness and strength, features which have distinct bearings one upon the other, enter largely into the calculation. In these days of the popular car, wearing capabilities and moderation of price also have to be reckoned with, whilst, controlled perhaps by wearing capabilities, is the essential feature of noiselessness, and abiding the factor of appearance is that of the desirability of low wind resistance.

Having briefly reviewed the factors upon which progress must be based, it is interesting to consider the stages of development since the early days of the motor vehicle. Taking the horse-drawn carriage bodies, generally of the dog-cart type, as an ideal, the motor body builders produced the uncomfortable motor vehicles of the nineties. Developing to a further stage, the tonneau body became popular, and in striving to add to the appearance of the ungainly looking vehicle then in vogue the Roi-des-Belges body was produced. At this time came the period of a striking innovation, the side-entrance body, which immediately became popular and ousted all former designs.

Up to this period the comfort of the passenger had not received serious consideration, beyond the providing of well-sprung upholstery, whilst the driving seat remained as in the very earliest days of the motor vehicle, the driver being practically without any protection other than that afforded by a low dashboard of the horse vehicle type. Between this period and the development which was shortly to take place a few body builders commenced to add doors to the front seats, but these for the most part were exceedingly low and of very little use in affording protection to those occupying the front seats.

Last year's show will always be remembered for the next development in the progress of motor body building, the popularising of the torpedo, flush-sided, and boat-shaped bodies, as they are variously called. From this it must not be understood that torpedo bodies have not been built before, designs indeed of this type having appeared on numerous occasions, but it was not until the display of the 1910 models at Olympia was made that these bodies were to be found upon practically every make of chassis. Undoubtedly competitions and road races such as the Prince Henry and Tourist Trophy events have had their influence in the development of motor body construction, and it is noteworthy that low-pitched bodies with high doors and practically flush sides were to be seen in these competitions long before the body of the pleasure car had reached development on these lines.



The Cheapest Car in the Recent Olympia Show.

At the Olympia Show now in progress many bodies—which for the sake of conciseness may be termed torpedoes—of excellent design are to be seen, this type being practically universal, whilst the lines have also invaded the realm of the closed body. It must not, however, be taken that finality of the torpedo design has by any means been arrived at; certain points at which, apparently, different body builders are at variance still remain to be decided, whilst further development in the reduction of wind resistance and the improving of appearance is readily possible.

As an example of this it will be noted by those inspecting the exhibits that certain of the torpedo bodies are narrower at the rear than at the front, whilst some are of the same width throughout, and instances are to be seen of those which are wider at the rear than at the front. It would be without the province of this article to discuss the stream-line effects of these various forms, but it is obvious that there must be a best among these as regards non-wind-resisting and non-dust-raising properties. Concerning this latter point it is perhaps worthy of remark that few makers, although very pronounced regarding the merits of their flush-sided bodies, have made any attempt to obtain flush underlines, a feature which has not as yet received the attention which it deserves either upon the road or the racing track. It is also worthy of note regarding these properties of wind resisting and dust raising, that no disc wheels, such as have become so popular at Brooklands, are to be found upon the stands.

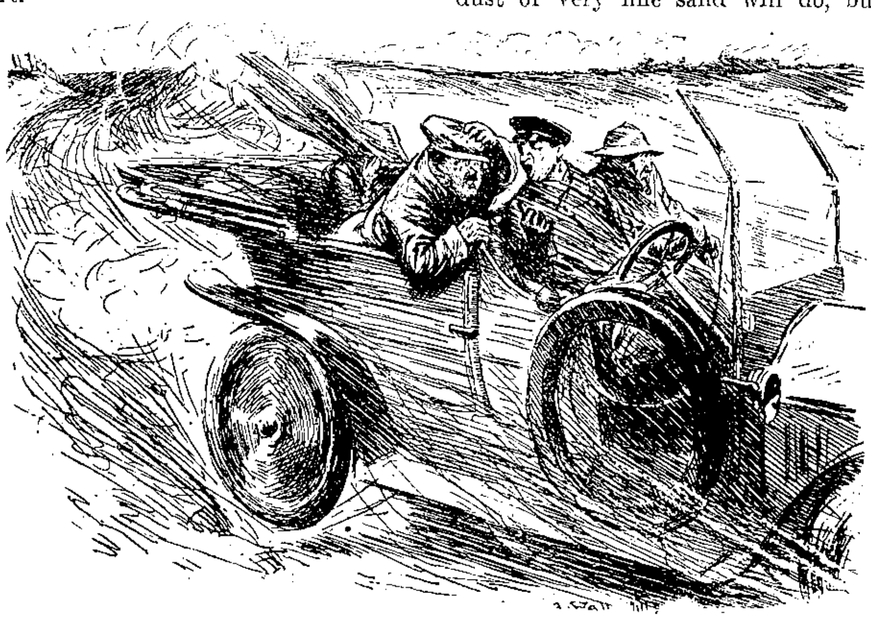
Perhaps among noteworthy developments of this year's Show may be mentioned the provision of access to the driving seat from either side, a point which is of very considerable added convenience, the popularising of the two-seated coupe, and the development of the fully open or fully closed double-purpose vehicle.

Of the latter the cabriolet body is to be found in various shapes, and it is interesting to note that of the many examples shown several are to be found which are considerably lighter than have been the majority of these bodies since they came into prominence a short time back.

Of closed bodies of the limousine type development would appear to be restricted to the further added luxury of the interiors and the production of fancy lines such as instanced by the postchaise bodies shown upon some of the stands. Ventilation of closed bodies is now receiving some attention, and examples are to be found of roof ventilators and of sliding roofs. This attention to the proper and efficient ventilation of large enclosed cars, the interiors of many of which more closely resemble ladies' boudoirs than travelling vehicles, may be marked down as a distinct step in progress.

Of hard-wear bodies very little development has taken place, judging from the exhibits at Olympia, and in the course of my examination I did not notice a single example of the matt surface unvarnished body with painted metal work, for which there would appear to be a certain demand. An example of painted metal work, in which the head lights, side lights, horn, acetylene generator, wind screen frame, hood irons, etc., are painted and lined to match the body, is to be seen, and gives the appearance of remarkably smart and serviceable finish, but in this instance both the body work and metal work are highly varnished, as usual.

Tool space and lockers have, in the bodies shown this year, been given ample consideration, and in this respect the progress is distinct over former years. Body fixings remain much as before, and the insulating of vibration and twisting strains has not received the attention which it doubtless will in the course of time. Summarising, then, the Olympia Show of 1910 is remarkable for the further development and popularising of the torpedo body and for the many varied examples of bodies of all types based upon the lines of this design which are shown, whilst the adoption of the double-purpose body, the popularising of the coupe, the furnishing of ample locker space and the provision of access to the driving seat from either side, are each points which mark the progress displayed at an Exhibition which may truly be said to be a triumph of the coachbuilders' art.



REASSURING.
Terrified Rider (in hired Motor-car): "I say—I say—You're going much too fast."
Chauffeur: "Oh, *you're* all right, Sir. We always insures our passengers."—*Punch*

Useful Notes.

("Motor-car Journal.")

It is bad practice to sit in a car and allow the motor to run for an indefinite period. Stop the engine and start it when ready to go, thereby saving the petrol and oil, besides unnecessary wear and tear on the engine.

* * *

There is nothing so important to motorists as the ability to analyse noises. When the engine is in good running order it runs along with a steady quiet hum that is musical to the ear of the driver, there being no variation in the sounds as long as everything is going along all right. The moment, however, that some part refuses to perform its function properly, or is not receiving its requisite amount of oil, the engine begins to "talk" and its various protests and noises convey to the trained ear in many cases the exact cause and location of the trouble.

* * *

In the event of a stoppage in the petrol pipe from the tank to the float-chamber of the carburettor, the union may be unscrewed and the rubber end of the tire pump connection pushed over the end. A few sharp strokes of the pump will usually remove any grit or debris in the pipe.

* * *

Carburettors in which adjustment is provided for the amount of petrol supplied to the jet very often require readjustment when a different grade of motor spirit is used. This should be carefully noted, as frequently erratic running arising on this account has been wrongly attributed to other causes.

* * *

In lubricators, where a gauze is used to filter the oil to the suction pipe of the little pump, close inspection will generally reveal that the gauze has become choked, and that little or no oil is reaching the pump.

* * *

In the case of a slipping leather cone clutch a little Fuller's earth will prevent the trouble for the time being; when the car reaches home a good dose of castor oil well rubbed in will make all good. If no Fuller's earth can be procured, a little dust or very fine sand will do, but care should be taken to clear away all traces of the same on arriving home.

Motors for Exploration.

Among the good things done and projected by a Labour Government of Australia, is the exploration of the Northern territory which Labour recognises must be filled with a white population soon, if it is not to be swarmed over by Chinese and Japanese hordes hungry for land. The Queensland Government has in this matter recognised the motor-car as a most valuable preliminary auxiliary, where prospecting has to be done for national purposes. Therefor, for that Government's explorations of the Transcontinental Railway route a motor-car is being requisitioned for the trip of about 4,000 miles, which it is expected will have to be made. A special body has been fitted to a Talbot car, designed to give a maximum accommodation with a minimum of weight, the latter being essential on account of the large amount of petrol, oil, stores, etc., required for the trip, it being anticipated that the car will have to travel between 600 and 700 miles between replacement of supplies.

MOTOR CYCLE NOTE.

It is really a most remarkable fact that the sport and pastime of motor cycling—which for a year or two appeared to hang fire in this country—has so rapidly regained its lost ground and reached the pominent position it holds to-day. When one seeks for a single main reason to account for this, none is forthcoming; but by looking back, and comparing the present-day mount with its antediluvian sire, one can see the many small contributory causes which in the aggregate were sufficient to hold the sport back until they were overcome. We know to the full how unpleasant a side-slip is with even the modern low frame motor cycle, from whose saddle it is now possible to slip as the machine slips, and so avoid coming a cropper with the machine. What it was like to have a fall with the old-time machine, with its lofty frame and high centre of gravity, is now luckily only a memory. In those days the trouble was not over with the fall, for even after picking the machine up it was a Herculean task to get it going afresh. And then, again, the tire troubles. Non-skid tires were not obtainable, while the canvas in the ordinary variety was a continual source of trouble. With the present day scientifically constructed "Dunlop" studded cover, tire troubles are fortunately few, whilst thousands of miles can now be ridden on one cover, even when fitted to the driving wheel of a powerful motor cycle. Moreover, those early machines were under-powered, and the process of evolution came to a dead halt until manufacturers realised that what was necessary was to give the machine sufficiency of power to fulfil the demands of the road.

MOTOR BOAT NOTES.

CHAS. BAILEY, Junr., reports:—Mission schooner, 56ft. x 15ft., fitted with 30-40 h.p. Kelvin engine, for missionary work Solomon Islands; to be completed in April. Launch for Tongan Government, 40ft. x 9ft., fitted with twin screw, two 14 h.p. Anderson engines; surf-boat type; aft of engine room 8ft. cabin, fitted with bunks and swing back cockpit 7ft. long, fitted with lockers under seats for benzine; tonnage 5¼. Two whaleboats for Mellanesian Mission, making 40 boats, built by above, of same type. Tuck-stern launch, 35ft, 8ft. by 2ft. 6in., fitted with 14 h.p. Anderson engine, for the Hon. J. G. Smith, for use in the Kaipara harbour. Launch, 35ft. x 8ft., fitted with 16 h.p. Sampson engine; first engine of its kind to be used in New Zealand; for T. J. Storey (to be used in connection with farm in Piako). Launch, 80ft. x 35ft., sister ship to Mr. Bailey's Phyllis, engine not decided on, for Mr. J. Cambell Hay, Christchurch. Repairs to Viking yacht, to be completed middle of March.

Messrs. HOILAND & GILLETTE.—Amongst orders for month—Zealandia, 12 h.p., for N.Z. Portland Cement Co., Limestone Island. Zealandia, 9 h.p., for Mr. Blackwell, Onehunga. Boat just finished by Mr. Lehoquet. Zèalandia, 9 h.p., for Mr. Bateman, of the Thames, for fishing purposes. Mr. Lemmo, of Thames, is also fitting up a 9 h.p. Zealandia into fishing boat. Zealandia, 6 h.p., for Mr. Sanford, Auckland, and 6 h.p. Zealandia for Mr. Molloy, of Waiuku. Zealandia, 3 h.p., for Mr. Smith, Manakau. Zealandia, 4½ h.p., for Mr. Burfield, of Auckland, for pleasure launch. Zealandia, 3 h.p., for Mr. Davis, of Koutunua, for pleasure launch. Zealandia, 3 h.p., for Mr. Andrews, of Auckland, for pleasure launch.

Messrs. COLLING & BELL report: A 25ft. launch waiting the fitting of a 5h.p. Doman engine, and a 30ft. cabin launch with a 10 h.p. Doman. An 18ft. launch for Mr. Twinam is nearing completion, and is to be fitted with a 3 h.p. Little Giant engine. A 20ft. launch for Mr. Foster, open, to be fitted with a 3 h.p. Perfection engine.

Messrs. Colling & Bell are also getting out for stock engines from the H. C. Doman Co. that are being bade to their specification specially to meet the requirements of New Zealand. They will have a bore of 6in. and a stroke of 8in. only, 325 r.p.m., making them the ideal engine for the heavier cruising or working vessels. They are fitted with all the latest improvements in lubrication, ignition, and reverse gear, and can be handled from steering wheel. They are being made in 6, 12, 18 and 24 h.p., which are extra to their regular sizes (5 to 200 h.p. medium and slow speed).

Electricity.

Control of Weather.

Future Electrical Marvels.

In his inaugural address to the Institution of Electrical Engineers, Mr. S. Z. de Ferranti, the President, discussed coal conservation, home-grown food, and the better utilisation of labour. He said it was assumed by many people that the climate of Britain was largely unsuitable for the purpose of growing food. This was largely a misconception, as crops, both large in quantity and of good quality, could be produced in this country.

It would be a desirable thing, he said, if, instead of the dark weather that we now often experienced owing to cloud obstruction, we could have continuous sunshine at certain times of the year. The amount of sunshine would, no doubt, be largely increased by the abolition of all smoke in the air. At present it was considered quite right and reasonable to canalise rivers and make great works for adding to the fertility of countries by means of irrigation, but he believed the time would come when it would be thought no more wonderful largely to control our weather than it was now thought wonderful to control the water after it had fallen on the land. He thought that it would be possible to acquire knowledge which would enable us largely to control by electrical means the sunshine which reached us, and in a climate which usually had ample moisture in the atmosphere to produce rainfall when and where we required it.

To Command the Clouds.

It seemed to him that it might be possible, when we know a great deal more about electricity than we do to-day, to set up an electrical defence along our coasts by which we could cause the moisture in the clouds to fall in the form of rain, and so prevent these clouds drifting over the country between ourselves and the sun, which they now blotted out. It also seemed to him that it would be possible when more water on the country was required to cause the falling of rain from the clouds passing over the highest part of the country, and so produce an abundance of water, which, properly used, would greatly add to the fertility of the country.

Dealing with the question of the rapid rate at which our coal supplies are being used up, Mr. Ferranti's strong point was that coal could be used more efficiently for the production of electricity than for any other purpose. For the production of heat in our fires or for the production of energy by steam, he stated that usually less than 10 per cent. of the value of the coal was used. Even in the steam turbine the maximum efficiency can only be put down at about 17 to 18 per cent. The big gas engines, fed by gas producers, give something like 25 per cent. In coal fires and steam engines whose boilers are heated by the direct burning of coal, all the by-products of the coal, such as the ammonia, which, in the form of sulphate of ammonia, is so useful to the agriculturist, are lost. The labour required for distributing coal to all parts of the country and for clearing away the ash is enormous.

Electricity as Universal Provider.

"We are, therefore, forced to the conclusion," he said, "that the only complete and final solution of the question is to be obtained by the conversion of the whole of the coal which we use for heat and power into electricity, and the recovery of its by-products at a comparatively small number of great electricity-producing stations. All our wants in the way of light, power, heat, and chemical action would then be met by a supply of electricity distributed all over the country." His proposal, or, rather, his suggestion, was that 100 generating stations, each having a capacity of 250,000 kilowatts, should be erected in suitable parts of the country. Each should be situated in some place where both coal and water are readily available. By using the best and most economical means of producing electricity the power could be distributed at an infinitesimal cost. The by-products would be saved for the farmer, and the cost of labour would be enormously reduced.

The electrical supply to houses or factories would furnish all the heating or power required. In fact, it might be called the all-electrical idea. He concluded by saying that he believed that this idea, with its far-reaching changes and great benefits, would become an accomplished fact in the near future.

An Electrified Commonwealth.

A commonwealth that is to be run by electricity, while the electricity, of course, is all produced and controlled by a single beneficent corporation, is enthusiastically described in *The Engineering Magazine* (New York, December) by Sylvester Baxter. Mr. Baxter presents what the editor pleasantly terms in his introductory note "the amiable aspects of industrial centralization," leaving it to others to picture some of the unamiable ones—if such there be. The commonwealth in question, which is none other than Connecticut, the "land of steady habits," is not yet completely electrified; but she is "on the way," according to Mr. Baxter, and he is convinced that in the process her habits will become even more steady, under the guiding hand of electricity and electrical corporators. Speaking less lightly, Mr. Baxter presents certain undoubted benefits arising from the co-operation, due to common control, of steam and trolley roads, and he predicts that when this control extends to other electric industries, additional benefits will accrue. He contrasts Connecticut with Massachusetts, where common ownership of these two classes of roads is not now legal, and where the interests of transportation, he is sure, are suffering thereby. Says Mr. Baxter:—

"Common ownership of primary and secondary railway systems makes possible a most admirable flexibility in operation. In nearly all the older parts of the country the haphazard building of unrelated pieces of independent lines in the same territory, eventually absorbed by a common interest, has led to the retention of much superfluous trackage. A most eminent authority has pointed out that were New England to be provided with an entirely new railway system a vastly superior service might be given with a reduction of the existing trackage by at least one-third. The waste from such unnecessary construction, perpetuated in operating and maintenance charges, is prodigious. It entails a corresponding burden upon the public.

"In Connecticut the problem of utilizing some of this superfluous trackage has been solved by electrifying it and transferring it to the Connecticut Company for operation on trolley-line principles. At night the local freight service is performed by the steam-line organisation. In developing a trolley service in the same territory as the steam line it is occasionally found desirable to build a new trolley line parallel with the steam tracks. The company apparently thus competes with itself. But the conditions of service and operation are so different that in reality the parallel trolley line is an auxiliary, a feeder, rather than a competitor in any true sense.

"Again, unnecessary duplications are thus avoided. For example, the trolley-cars start from the railway station of a certain busy manufacturing city and enter upon an electrified old steam line that has been next to abandoned—previously operated only because the law required it—and at another city they again enter upon the streets and proceed to the business centre. Here other trolley-cars run to the station and enter upon other steam tracks, electrified for a couple of miles, thereby saving that much parallel construction. Departing from the steam tracks, the trolley service runs over a new interurban line, substantially built according to steam-line principles. This line cuts across country by its own right of way, returning at intervals to the high ways for the sake of passing through towns and villages. Entering the capital city of the State, the cars traverse the business centre and cross the Connecticut over a noble commemorative bridge of granite, lately built. Here another interurban line continues the service; its trolley-cars proceed to the station and there enter upon the steam-car tracks—this time those of one of the great double-track main lines of the system with an extensive traffic of its own in both passengers and freight. For some miles this main line has been electrified; the trolley-cars stop only at the regular stations, and fares are charged according to the five-cent zone principle of electric-railway practise. At the first junction point the trolley-cars pass from the main line on to an electrified branch of the steam system to an important mill-town; here they take to the streets and thence run across the hills by a long interurban line to an attractive country town of considerable importance.

"The economy of this procedure is manifest. Common ownership of steam lines and trolleys has made it possible to utilize long stretches of the primary system also for the secondary service. Otherwise there would have been costly duplications, or, owing to the expense, there might have been attempted no secondary service at all. By thus averting outlays mounting into many hundreds of thousands, money has been saved for other improvements demanded by the public interest."

Going on still further in the same line, the writer advocates an efficient co-ordination of public service functions as the next great forward step in the economic world. He finds significant in this connection the circumstance that the first decade of the twentieth century is marked by the development of the new technical calling—production-engineering. He says:—

"Production engineers have worked wonders in promoting the efficiency of individual industries and of commercial or mercantile activities. The co-ordination of operations within a given enterprise, say a great factory or department store, is one of the chief factors in such work. It is particularly notable that production engineers have effected great economies in the workings of certain bureaus or department divisions in the national Government at Washington. A sign of the times is the new appreciation of efficiency in connection with governmental operations—as witnessed by the favour with which the proposition for the appointment of a permanent Director of Posts, or general manager of the Post Office Department, with a possibility of saving many millions a year in the conduct of the service by the adoption of up-to-date business methods, is now looked upon among Congressmen.

"True economy will come with wise expenditure. Liberal expenditure, when well directed, begets liberal returns. Hence there is an immense field for production engineering in governmental service—national, State, and municipal. And just as in the conduct of a city great efficiency can be achieved by thoroughly co-ordinating the operations of individual departments and introducing the spirit of team work among them, so not only in the public service industries of city, State, or nation are there immense possibilities in the ways that we have been considering, but ultimately in the establishment of economical and scientific interrelations among all the diverse factors of trade, communication, productive industry, and finance. It is along such lines that the twentieth century seems destined to work out the great problems of efficiency and conservation that, broadly considered, comprise the most vital elements of human well-being and progress:"

Local Industry.

An Economical Process.

(By Ernest G. Osborn, Ashburton.)

Gas Firing a Lime-Kiln.
New Installation at Mount Somers.

Few people realise how large an amount of fuel and money is wasted annually—equivalent to many millions of pounds—by the use of unsatisfactory arrangements in furnaces, fire-boxes, and kilns, by which a large proportion of the heating power of the fuels is lost instead of being utilised. The prevention of smoke, and its conversion by combustion into useful heat, is a problem which has reached great importance during recent years, and its solution, or attempted solution, has placed on the market inventions which endeavour to secure the complete burning of the gases contained in smoke. There are thousands of tons of good fuel going to waste every day from the huge smoke stacks of the manufacturing towns of the world, and owners of factories are beginning to realise the calorific value of the gases that daily go to waste.

The Smoke Problem.

The smoke problem is readily solved in most instances by the use of what are known as gas-producers in place of direct firing, though it is noticeable how slow some firms are in taking advantage of this method of overcoming their difficulties. One of the most successful gas-producers yet placed on the market, especially adapted for use in limekilns, is that invented by Ernest Schmatolla, the German engineer whose research work in gaseous engineering has made him world-famous. After years of unsuccessful attempts, he has invented a gas-producer which fulfils all that the man at the limekiln requires. One of his furnaces was recently installed at the Mount Somers limekiln, and so far it has given excellent results.

The writer, when visiting the kilns, was struck with the simplicity of the Schmatolla process for converting the crude limestone into quicklime.

The Old and Tedious Process.

The output of quicklime under the old process was from three to four tons daily, while the new kiln produces ten tons of the purest quicklime every twenty-four hours. Formerly it was the rule to fill the kiln in layers of coal and limestone placed alternately, to set fire to the bottom of the pile, and to leave the kiln to burn almost how it pleased. The amount of coal used was more than double that used by the new kiln. The smoke from the former kiln rolled down in great volumes to the valley below, and being mixed with the gases set free from the limestone, was obnoxious in the extreme. As was inevitably the case by placing the coal in contact with the limestone in the old kiln, the quicklime produced was very impure, being mixed with an inconvenient percentage of coal dust and ashes. The heat produced in the former furnace was just about one-half of that produced by the Schmatolla gas-firing method, and the consequence was that a large quantity of the limestone was only partially converted into quicklime.

The New Process.

To understand the working of the Schmatolla gas-producer, it is necessary to be able to explain the action of burning coal. When fresh fuel is thrown into an ordinary fire the gases contained in it escape suddenly, and as there is seldom enough air provided to complete the combustion of these suddenly evolved gases, the greater part of them escaped unburnt. Smoke is mainly composed of hydro-carbons of high calorific value, and in the old kiln they were allowed to escape. On the other hand, if the evolution of these can be regulated and spread over a longer period of time, the combustion is rendered more perfect, and the amount of smoke produced is greatly diminished. Unfortunately, with an ordinary furnace or fire-box, it is impossible to thus regulate the evolution, and the gases perforce escape as smoke.

With a properly constructed gas-producer, however, the evolution of the gases is perfectly regular, and is quite independent of the stoking, so that the fuel delivered to the furnace is practically complete in combustion. The principle of Schmatolla's producer is—by a very gradual heat—to expel the gases from the coal, and to cause them to be burnt in a part of the furnace independent of the part where the stoking is done. If the supply of gases from the one part is well regulated, complete combustion is assured in the other part. Once the fuel has entered the stoking doors, every particle of it is used for heating purposes, whereas under the old arrangement 50 per cent. of the best of the heating power of the fuel was lost.

How the Smoke is Consumed.

In order that the smoke escaping from the first heating of the fuel may be completely burnt, it is led by a series of layers of coal through three separate "zones" of glowing fuel. In passing through the first layer of red-hot ashes, the most easily combustible of the gases in the smoke are consumed, while the second and third deal with those gases less easily burnt. By the time the gases reach the top layer, they have been broken up into their respective constituents, and one of the most valuable of these is carbon monoxide. The flame of this gas is one of the hottest known, and this gas forms one of the best of the calorific agents in the furnace. It produces a great heat—just that heat suitable for burning limestone.

The Gas-producer.

The gas producer is of square section, and the stoking is done through a number of small charging holes on the surface.

The advantage in having a number of charging vents lies in the fact that one large hole would allow a sudden escape of gas from the furnace every time it was opened. Each hole is fitted with a movable cap, on top of which rests a coal bucket. Removing the caps allows the coal to drop into the furnace below. A regular heat is produced in the furnace by stoking regularly, and keeping each layer of fresh fuel to a certain depth. It is most necessary to introduce a good air supply into the furnace, or the complete combustion of the gases will not take place. An air blast is generally used in the Schmatolla kiln, and this method has worked successfully at Mount Somers.

The Old and the New.

Mr. Malcolm Lean, the manager of the Mount Somers kiln, told the writer that the new method of burning the lime was in every way more satisfactory than the former method. In the first place, there was the increased output, and secondly the saving in the coal consumption. They were the two greatest improvements. Then there was the cleanliness of the Schmatolla method, and its production of purer lime.

The installation of this type of limekiln is the third which has been made in the Dominion. The other two are at Dunback, Otago where they are working satisfactorily.

Oceanic Portland Cement Company.

Limestone Mountain.
Possibilities of a Great Industry.

Portland cement may be made from a great variety of materials with equally satisfactory product, but by far the best combination of materials is the mixture of what is known as "cement rock" with crystalline or "white" limestone. These materials must contain lime, silica, alumina and iron oxide in certain narrowly defined proportions and must be free from any considerable quantities of such deleterious ingredients as magnesia and sulphur. The cement rock of Limestone Mountain (western edge of Whangarei Harbour), and the white limestone outcropping at its base show a composition unrivalled by any other known deposits of similar materials in any part of the world. The third necessary raw material of great importance is the coal. There are very strong indications that coal will be found underneath this property, but if such is not the case the suitability and proximity of the coal from the adjacent fields of Whangarei and Hikurangi insure a good supply at a reasonable cost.

This is the famous "Limestone Mountain." It covers about 500 acres, and contains not less than 500,000,000 tons of stone: enough to furnish all the Portland cement works in the world with stone for the next fifteen years at the present rate of manufacture, or New Zealand for the next 4000 years.

The above stupendous figures at once set at rest any possible doubts as to the quantity of the deposit, while the quality is assured by comparison of its analysis, not only with those of similar stones in use in other parts of the world, but with analyses of the stone used in producing a high grade cement at the adjacent Limestone Island works.

The natural advantages of this wonderful deposit are:—The practically unlimited supply; unsurpassed quality of the stone; presence of both stones on the property reducing the cost of production below that of existing works in New Zealand; proximity of coal supplies; railway with three miles; 15ft. water alongside at low tide; a good supply of water; within reasonable distance of an almost certain future supply of cheap electric current; an excellent site for the works, with room for any possible future extensions.

The artificial advantages of the place must, of course, depend upon the erection of very large works and markets.

The consumption of cement in New Zealand for 1905 was 60,000 tons, and for the present year will reach the amount of 100,000 tons. Assuming that this rate of increase holds good, the quantity of cement used in 1915 would be 170,000 tons. But, as a matter of fact, the rate of increase is itself increasing so that there is little doubt that the amount of cement used in New Zealand will reach 250,000 tons in 1915. Further than this, if the selling price of cement can be reduced by a few shillings per ton export markets will be opened up which will enable the New Zealand product to enter the markets in Australia, the Philippine Islands, the entire west coast of South America, and perhaps even the western coast cities of the United States. In Professor James Park's book on "The Geology of New Zealand" (1910) the following statement appears: "Concrete is the coming building material of the future; and New Zealand, with its enormous deposits of limestone and clays in juxtaposition, its waterpower and coals, its long seaboard and deep harbours is destined to become the centre of cement manufacture for the South Pacific.

Forest Fires.

The Forest Department of this Dominion should take notice:—

The editor of the *Statesman* (Calcutta) has lately declared that some things are done better in India than in America. These downright words were inspired by the recent disastrous forest fires in Montana, Oregon, Idaho, and Minnesota. Such fires would be practically impossible in India, we are assured. The Government of India spends 14s. a square mile per year for protecting the forests, and labour is so cheap that this sum provides a vastly more numerous fire-patrol than our Government might think it could afford for this service, but this editor thinks we spend more than we do. He says:

"Protection of forests from fire in India has been a serious concern of the Forest Department for the last thirty years, and elaborate measures with this object in view are in force at a considerable cost to the State. The system consists generally of the isolation of the protected area by removing all inflammable material from the vicinity of its boundary, and in regulating the kindling of fire in its neighbourhood. This is carried out by means of what are known as 'fire lines' on which all vegetation is cut and burnt, combined with the enforcement of rules under which patrols prevent, except under certain restrictions, the kindling or carrying of fire. Inside the reserve other fire lines are prepared in order to localize any conflagration that may, in spite of precautions, cross the boundary, or may be produced accidentally or wilfully within the forest. These lines are designed in such a way as to form bases for counterfiring, or when the climate is more moderate, to permit of other methods of controlling the flames.

Now this system of insurance against forest fires really works, as is evidenced by the following facts and figures. In comparison with the 300,000 square miles in the National Forests under the control of our Government.

"There are over 200,000 square miles of forests under State management in India, and the average extent burnt in ordinarily favourable years is only about 75 square miles. Even in 1908, when the conditions of extreme drought experienced in the previous year, lasting up till the end of June, 1908, brought about a disastrous season of forest fires, the total extent burnt was not more than 344 square miles, and the worst season in recent times prior to this was in 1895-96, when 326 square miles of fire-protected forest were burnt. . . ."

"The neglect of precautions against fire in North America is notorious. Little is attempted in the way of fire-lines, and a recent official report urged that it was certain that loss by fire could be virtually eliminated if appropriations for the forests provided adequate means of communication and sufficient protective force. But apparently there is no inclination to provide the required appropriations. The result is that in extremely favourable years in the United States, as in 1906 and 1907, the area of forest burnt is about one acre in 1000, whereas in India it would be about one in more than 3,500. There are no reliable statistics available, however, of the enormous destruction of forests by fire which occur in North America in ordinary years, and the recent extensive conflagrations in the Northwest of the United States are by no means the worst fires of recent times. . . The cost of the emergency measures for coping with the flames should have been considerable enough to warn Mr. Taft and his Government of the economic wisdom of establishing a more efficient system of protection, even if the cost is great."

That "Mr. Taft and his Government" are quite alive to the seriousness of forest fires is proved by the words of his recent message where he urges new measures of protection. In estimating the losses in the Northwest, the President remarks:

"The fires were so extended that they covered a range of a hundred miles, and the Secretary of Agriculture estimates that standing timber of the value of £5,000,000 was destroyed, while seventy-six persons in the employ of the Forest Service were killed and many more injured."

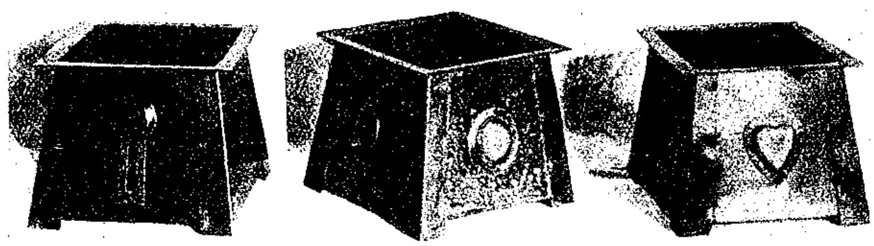
The steel square is a much more familiar tool to American than to British carpenters. It is a pity that the British carpenter should not be more familiar with its use, because it is a neat and time-saving appliance, enabling the user to obtain every bevel in the cutting of every roof, and to do this on the ground as easily as on the top of a building. A little book explains the use of the tool in roof construction, and is so clearly written and illustrated that the workman who has never handled a steel square may acquire a working knowledge of the subject without any other aid.

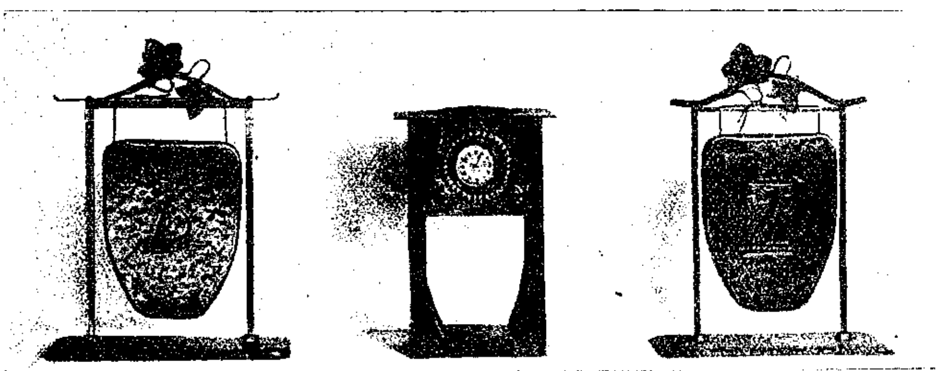
The Home Worker's Page.

Repousse Work.

(By Chas. Clark, Gold Medallist and Special Gold Medallist.)

We will now suppose the reader has sufficiently advanced from what he has already gleaned from the previous articles to be able to proceed a step farther, namely, to add further and higher relief. You have gone so far as tracing your design on the copper and beating down the background, as explained in the last chapter. It is now necessary to remove the copper from the pitch block. This can be easily done if you insert a cold chisel or some other wedge-shaped tool between the copper and pitch block and work all round the edge of the copper until it is free. Having done this, clean the back of copper with oil and heat as previously explained and straighten out the copper evenly if it has become buckled. To do this you may have to reanneal it and hammer with your wooden mallet on a small wood block. Now warm your pitch block until it flows quite even and place your copper face side down (that is, the side that has just been worked should lie next the pitch) pressing well down, so that every portion adheres to it, and not allowing any air bubbles or spaces to occur between copper and pitch. The effect of these is fatal, in the shape of very





ugly marks in the raising, which will be hard to obliterate. Without waiting to get quite cool, start at once to raise those portions that are to stand out in highest relief, by hammering them into the cement, using the largest tool that you conveniently can, say for instance numbers 3, 7, 8, 9 and 10 of Gawthorp's brass raising tools. If you require anything larger than the above, you can easily procure some brass rod, and with the aid of a file and emery cloth you can make tools to suit your work very easily.

Proceeding with the raising, as I said before, you commence at the places that ought to be in the highest relief and work outward toward the edges, and up to the traced lines on your design, holding the tools in the same manner as when tracing but more perpendicular, and allowing them to slide slowly along in the same manner as you did when tracing without lifting the tool from the metal. Do not attempt to do all the required raising at once, but give a slight raising all over the design first, then going over and over again if necessary, giving it a further deepening where required. The whole process of raising must be proceeded with slowly and thoughtfully, endeavour to imagine the effect you are producing on the reverse side. If you are not sure of the effect you are producing, it would be advisable for the first few times to take the copper off your block and examine your work. You will then discover where you will have to do more raising to give your design more form. If you fail to do this you will probably go on beating or raising where it is not required, and so spoil the effect of your design, which cannot afterwards be erased. To sink even a simple hollow without bruises requires a lot of practice; therefore do not be too ambitious at first, but try and overcome the raising on simple forms of design before attempting anything intricate.

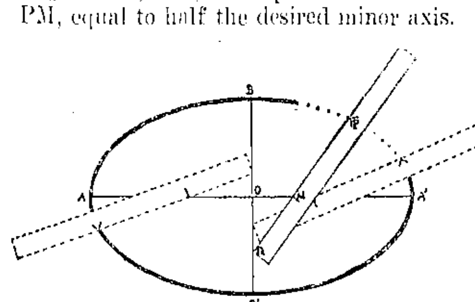
The best advice I can give you for clean, smooth work, is to use the largest tool, and hold it firmly down on the copper, not allowing it to chatter between your fingers; then with the same frequency of hammer blow as in tracing, and the same uniformity in weight of blow, allowing your tool to travel automatically as in the tracing, you will find a nice, clean piece of raising without the bruises that will astonish you. All bad work is produced by not having a firm and determined hold of your tool. In raising the stems of flowers or similar stems where the lines of tracing run parallel, use a tool a shade less than the width between the lines and work the tool along similar to the tracing, and a nice clean indulation will follow.

If you want to give a design a sharp set up from the background, such as the edges of leaves or flowers, you raise in the same way as before described, and then, taking your tracing tool, go all round the leaf or petal near to the traced line that was made on front side, making a deep, sharp, continuous line of even depth. This will give your design a very different effect when viewed from the front.

So far we have done all the raising in high relief from the back, so take copper off pitch, clean it and examine for any portion that requires correction in form. If any alteration is necessary, put on your pitch block again, face side up, being careful to have all the hollows or raised portions filled with the pitch by filling up level with the ground before fixing to your block. This done, you can remodel your design by again beating down any portion necessary to give correct form, or beating down any portion of the background that has been drawn up in the raising.

A Simple Method of Constructing an Ellipse.

On a straight-edge or ruler mark off a distance QP, equal to half the desired major axis; also, from point P, a distance PM, equal to half the desired minor axis.



Referring now to the drawing, we construct perpendiculars AA' and BB', and lay the ruler down so that the points Q and M fall exactly upon these perpendiculars. The point P will then fall somewhere on the curve of the proposed ellipse. By shifting the ruler about, in such a way that Q and M always fall on lines AA' and BB' respectively, the mark on the ruler at P will give the position of any number of points, which afterward may readily be joined by a continuous line.

Miscellaneous.

The World's Figures.

A Comparison of the Sextal and Decimal Scales of Notation.

A Paper read before the Wellington Philosophical Society, on July 3, 1907, by C. W. Adams.

(Abstract.)

It is admitted by all who have studied the subject, that a duo-decimal notation would be much superior to the decimal notation at present in use, as 12 can be divided by 2, 3, 4 and 6, while 10 can be divided only by 2 and 5. But the duo-decimal notation would require the addition of two new characters for 10 and 11, as 12 in the duo-decimal scale would, of course, be represented by "10," and would be called "ten," as in any scale of notation, the base is always represented by unity followed by 0. It has been ingeniously suggested that the two new characters (for 10 and 11) would not require the invention of any new forms, but could be represented by two of our present figures turned upside down, in the same way that we at present represent 9 by a 6 turned upside down.

The two figures selected would be 2 and 3: A 2 reversed becomes Ƨ, which is the first letter of "Ƨen," and 3 becomes Ɛ, which is the first letter of "Ɛleven." This gets over all difficulty as regards symbols, but there is an insuperable difficulty in regard to nomenclature, which most writers on the subject seem to ignore.

Firstly, we should have to invent new names for 10 and 11, as "ten" would be appropriated for "12": and "eleven" and "twelve" would mean 12+1 and 12+2, and so on up to "nineteen," which would mean 12+9; but what should we call 12+Ƨ and 12+Ɛ? and what should we call 24+Ƨ and 24 +Ɛ, and so on? In fact we should have to invent new terms for two numbers in every twelve, in any consecutive numeration. Besides which the difficulties of the first four rules of arithmetic would be greatly increased. So the duo-decimal system of notation may be dismissed from our consideration.

But in considering the claims of 6 as a base of notation, there are no fresh symbols to invent, nor any fresh nomenclature. We should merely have to discard the figures 6, 7, 8 and 9, as all the figures required in the sextal rotation would be 1, 2, 3, 4, 5, and 0. These six figures would have the same names as at present, and 6 would be represented by unity followed by 0, and would be called "ten." So also $2 \times 6 = 20$, $3 \times 6 = 30$, $4 \times 6 = 40$, $5 \times 6 = 50$, and 6×6, or $6^2 = (10)^2 = 100$.

The counting from 1 to 100 in the sextal notation would embrace only 36 numbers, and would be as follows:—1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 15, 20, 21, 22, 23, 24, 25, 30, 31, 32, 33, 34, 35, 40, 41, 42, 43, 44, 45, 50, 51, 52, 53, 54, 55, 100.

Now just consider the wonderful simplicity of all calculations.

The troubles of the multiplication table would entirely disappear. The little children could then master it in less than a quarter of the time now spent on it; as taking the present multiplication table of 144 squares, the new tables would comprise only 36 squares cut out of the easiest corner of the old table.

MULTIPLICATION TABLE IN THE SEXTAL NOTATION.

1	2	3	4	5	10
2	4	10	12	14	20
3	10	13	20	23	30
4	12	20	24	32	40
5	14	23	32	41	50
10	20	30	40	50	100

In studying this table, it must be kept in mind that 10, 20, 30, 40, 50, and 100 in the sextal notation, are respectively equal to 6, 12, 18, 24, 30, and 36 in the decimal notation.

In some games of cards, the smallest numbers are thrown out, retaining only those of the higher denominations. But in the sextal notation we use (excluding unity) only 2, 3, 4, 5, four small figures, while in the decimal notation we use double the number, including the figures 6, 7, 8, 9. The sextal notation is not quite so concise as the decimal, as a number expressed by 4 figures in the decimal scale would, ordinarily require 5 figures in the sextal notation; but this slight want of conciseness would be more than counterbalanced by the simplicity and ease with which the calculations would be made. If the French had introduced this great reform in the 18th century, instead of their absurd metric system, they would have covered themselves with glory. It is not too late to make the change even now. Both systems could be taught for a time in our schools, and when it was seen how much easier and simpler the new system was, the old one could be dropped, and the new one adopted.

Taranaki Oil.

After many years the Taranaki oil people are on the verge of getting the subsidy offered for the first production of a given quantity of oil from New Zealand soil. There are now five wells, two of which are flowing, and of these one has a remarkably fine flow as flows go, and the value of the oil won is three times the value of oil won anywhere else. Here is an industry which may be about to circulate unlimited wealth from the country, which in some respects is already the richest in the Dominion. It is the best news published yet from the Taranaki centre of the oil industry. At such a moment it is worth remembering that it is not the only oil district in the Dominion. Poverty Bay has oil. It is true that the district has also rather an unfavourable reputation by reason of the failure of certain men to make good on the oil indications. But that was the fault of the men, not of the oil-field. The oil-field may be good, bad, or indifferent; that is not the point, so much as the fact that the men did not spend money enough in exploring their property. They tried to grow rich on almost nothing. They spent enough to ruin themselves, but being only the smallest potatoes, and having a marvellous fund of ignorance of all matters that oil men ought to know, they naturally came to desperate grief. In short, they spent enough to ruin them, but too little to exploit the industry. The industry is ready for further attempt. In the Greymouth district an attempt is being made on a very different scale. Mr. Ziman and his friends have put down some thousands of pounds, and in a short time the plant they are importing will give a good account of itself, as everybody in the district hopes. As the name of Ziman is a guarantee for well-directed shrewdness, the public may look forward to the out-turn at Greymouth with a certain amount of confidence. It is refreshing to get hold of a question of this kind. There is much talk of diminished credit, and some squeaking about a vanishing Waihi. Thus the talk of an increasing oilfield in one place and of increasing possibilities of oil in two others comes as a welcome counter irritant. We should be disposed to back the counter-irritant.

Pure Radium at Last.

The announcement is made that Madame Curie and M. Debierne reported on Sept. 5th to the Paris Academy of Science that they had at last succeeded in obtaining metallic radium. What has been called "radium" ever since its discovery is not the pure metal but some one of its salts, generally the bromide. Says *The Lancet* (London) commenting on the news:—"It is interesting to record that it is a little over a hundred years ago (1807) when a similar announcement was made in regard to the isolation of the two now familiar metals, potassium and sodium, by Sir Humphry Davy, and apparently Madame Curie and her colleague have isolated radium by the same agency, namely, electricity. They prepared an amalgam of mercury by the electrolysis of a radium salt. The resulting amalgam was next placed in a quartz tube and distilled in hydrogen under pressure and high temperature. The mercury was then found to have left a thin coating of brilliant metal behind which proved to be radium. As might be expected, the metal acts with great energy; it decomposes water, oxidizes rapidly in air, is attracted by iron as though by some magnetic property, and burns paper when placed in contact with it. Radium is thus no longer a hypothetical metal."

Origin of the "West End."

Explanations of the tendency towards the formation of a "West-end," so clearly marked in almost every city (where the natural formation of the site does not forbid it), have been frequently attempted; the most usual is to regard it as a question of the prevailing wind, a solution which I have always felt to be doubtful. My own conclusion is that, the time of leisure and recreation coming towards the latter end of the day, man naturally turns his steps towards the brightness of the evening sky. Try the experiment; place yourself at four or five o'clock where the conditions in all directions are fairly similar without any preconceived intention, and see which way you feel naturally inclined to move. Will it not be westward?—Mr. H. V. Lanchester, F.R.I.B.A.

The Amateur Photographer.

Photography Simplified.

With Notes on Pinhole Photography.

(By Barclay Hector.)

(Continued.)

Direction 3—Making the Exposure.

Find, from the tables given later on. *et seq.*, the exposure necessary. Take the ground glass carrier out of the back of the camera and insert the dark slide in its place. Look again, to be quite sure that no light is passing through the lens to the inside of the camera. Look also to see that the shutter is set for the speed, and that the stop is correct. Pull the slide out of the dark-slide, but, before doing so, cover the camera and dark-slide with the focussing cloth; *be careful not to cover the lens.*

We will suppose that 1-10th second exposure has been given with stop 11. Now, without moving the camera, reverse the dark-slide, alter the stop to 16, and the shutter speed to 1-5th second, and take another picture.

Direction 4—Developing and Fixing.

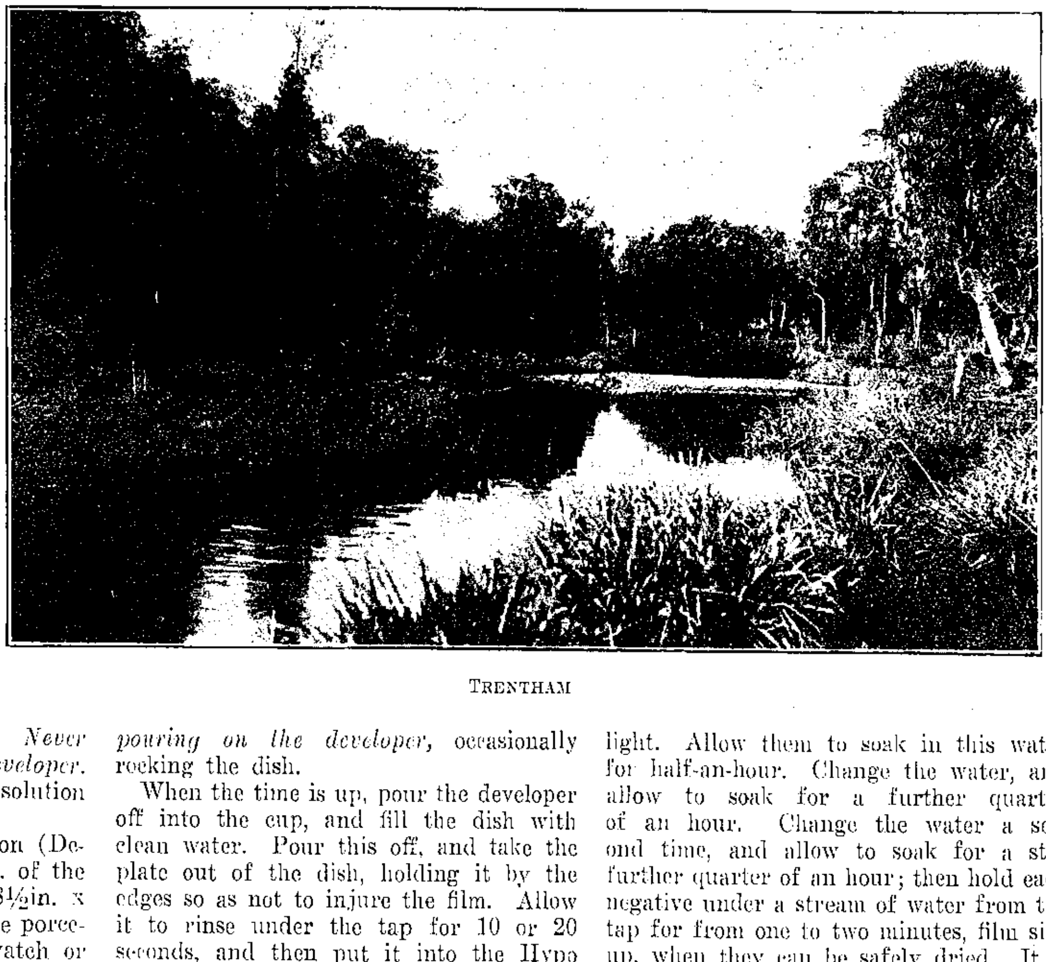
Having taken these two pictures, return to the dark-room, and mix up the following solutions:—

1. Boroughs and Wellcome's Tabloids, according to the directions given in box . 3 ozs. (called "Developer")
2. Hypo .. .. .. 2 ozs. Water .. .. .. 10 ozs. (called "Fixer").

To dissolve the Hypo quickly use warm water, or suspend it (in a muslin bag) in the water. *Never let Hypo solution get into the developer.* After putting the hands into Hypo solution make a practice of washing them.

Put the 3ozs. of the No. 1 solution (Developer) into a cup, and the 10ozs. of the No. 2 solution (Fixer) into the 8½in. x 6½in. Xylonite dish. Wash out the porcelain dish (5in. x 4in.). Put a watch or clock near the ruby lamp (which need not be lighted until now), close the door, and take the first plate from the dark-slide and place it in the 5in. x 4in. dish, *film side up* (be careful about this), and keep well away from the light. Take the dish in the left hand, the cup in the right. Note the time on the seconds and minutes hands of the watch, and pour on the developer. *Do not wet the plate before pouring on the developer.* The developer should be poured on with one even flow from the corner, and the dish immediately rocked (not jerked) a few times, all the time keeping the dish well away from the light. In, say, 20 seconds take the dish nearer to the light and examine it quickly to see if there is any sign of the image. The sky, being the lightest part of the view, will show first (as a dark patch) on the negative. Directly any sign of the image is observed, note how many *seconds* have elapsed since first pouring on the developer. Multiply this number of seconds by 14, which is the factor for this particular developer, and develop for as long as this number of seconds.

For instance, supposing the image appears in 30 seconds after the developer is first poured on, we multiply 30 seconds by 14, or 420 seconds, or 7 minutes, and we develop for 7 minutes *from the time of pouring on the developer,* occasionally rocking the dish.



Trentham

When the time is up, pour the developer off into the cup, and fill the dish with clean water. Pour this off, and take the plate out of the dish, holding it by the edges so as not to injure the film. Allow it to rinse under the tap for 10 or 20 seconds, and then put it into the Hypo solution (No. 2 in the Xylonite dish) *film side up.*

The plate must remain in the Hypo solution until and for some time after all the milky white showing on the back, or glass side, has disappeared. It may take anything from 3 to 20 minutes, or even more, according to the temperature of the room and of the solution. Do not be in a hurry to take the plate out of the Hypo, because we have a dish which will hold four plates at the same time, and whilst this plate is fixing we can proceed to develop the second.

Proceed with the second plate exactly as with the first, using the same lot of developer.

When the two plates (now negatives) are taken out of the Hypo they should be identical, except that the second will be "sharper," and perhaps there may be a slight variation owing to the developer in the second case being less active; but the difference will be hardly perceptible, and will make no difference in the printing values. But I do not advise using the same lot of developer for more than two plates.

Direction 5—Washing Negatives.

When the negatives are thoroughly fixed, transfer them to a basin of clean water. They may now be taken out into the daylight. Allow them to soak in this water for half-an-hour. Change the water, and allow to soak for a further quarter of an hour. Change the water a second time, and allow to soak for a still further quarter of an hour; then hold each negative under a stream of water from the tap for from one to two minutes, film side up, when they can be safely dried. It is a good plan to lightly wipe over the face (film) of each negative with a wet tuft of cotton-wool.

Direction 6—Drying Negatives.

To dry, stand the negatives on edge, and on blotting-paper, against the wall or against the leg of a chair, where there will be a thorough draught, but out of the dust. Lean them so that the glass side is uppermost. *Do not put negatives in the sun to dry.*

Any little pin-like holes can with care be blocked out with a soft pencil when the negative is dry.

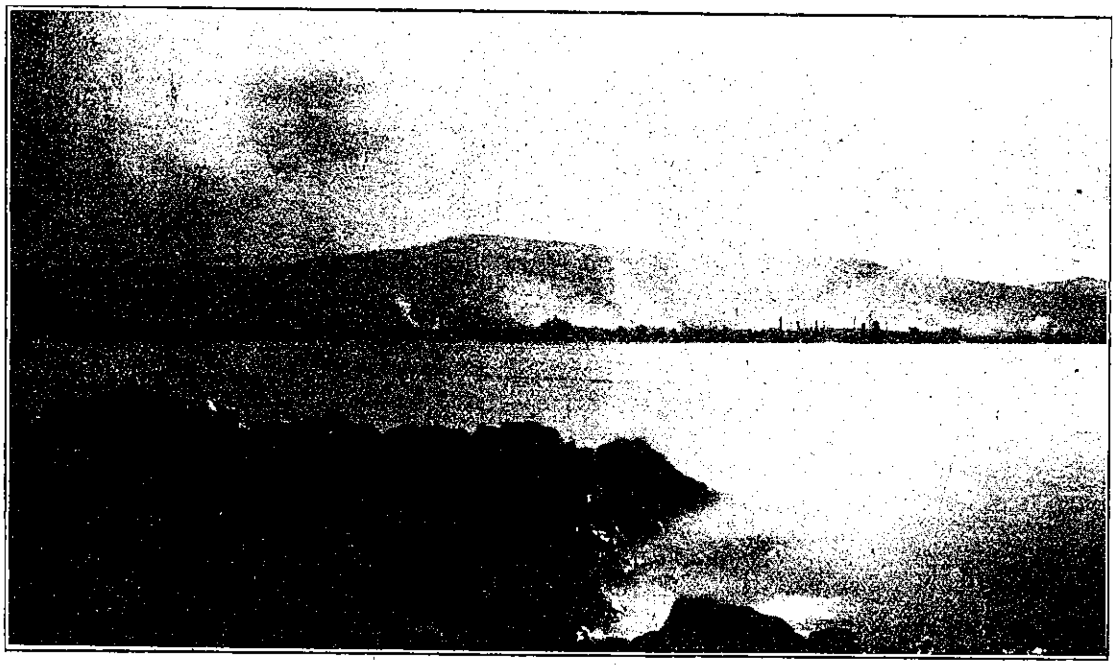
Printing from the Negative.

Printing on Seltona paper is done in daylight, as follows:—

Place the negative in the printing frame with the film side towards the hinged back of the frame. In dull daylight take a piece of paper from the packet. Put one corner between the teeth for a few seconds, and then open the teeth. The film will stick to the teeth. Put the film side of the paper downwards in contact with the film side of the negative, and put the hinged back on the frame. Now carefully clean the glass side of the negative with a piece of rag moistened with methylated spirits.

Place the frame in a bright light, *not sunlight*, and from time to time unfasten one-half of the hinged back of the frame and examine the print by lifting it away from the negative. Do this in a weak light. The proper depth to which to print can only be learnt from experience, but as a rough guide I would suggest printing half as dark again as the finished print is wanted. The print loses very considerably in depth in the subsequent operations.

Several tones may be obtained on Seltona paper, as follows:—



Taken with $\frac{1}{50}$in. Pinhole at 8 inches from Plate. Exposure 8 Seconds.

1. Warm Brown Tones.—In a basin, wash the prints rapidly for a minute or two (only) in several changes of water, and then place them one by one direct into the following fixing bath, using the Xylonite dish for the purpose:—

Hypo	2 ozs.
Water	20 ozs.
Bicarbonate of Soda ..	A pinch.

Fix in this solution for 15 minutes, keeping the prints in constant motion, so that they will not stick to one another. (For washing see later.)

2. Dark Brown, Purple, and Blue Tones.—In a basin, wash the prints rapidly in two changes of water, and then place them one by one in the following solution for 5 to 10 minutes, according to the tone required:—

Common Salt (not "Cerebos")	1 oz.
Water	12 ozs.

Rinse for a few seconds in clean water, and then fix in the following bath:—

Hypo	2 ozs.
Water	12 ozs.

Fix for 10 to 15 minutes. (For washing see later).

3. Nut-Brown Tones.—Put the prints one by one direct into—

Alum	1 oz.
Water	10 ozs.

Rinse, and fix in the Hypo solution as in 2. (For washing see later).

4. Darker and Bluer Tones.—Put the prints one by one direct into the Salt solution, as in 2, and fix in the Hypo solution as in 2.

(Note.—The stronger the salt solution the deeper the tone.)

Washing the Prints.—Place the prints, after fixing, in a basin of clean water, and after soaking for two or three minutes pour the water off and add fresh. Then wash for an hour in running water, or ten changes of water.

Drying the Prints.—Hang up to dry; use clips, or pin by the corner to a shelf. The surplus moisture may first be removed by putting the prints between sheets of fluffless blotting paper, but do not leave them to dry between the blotting sheets.

Mounting the Prints.—Soak the prints in water until quite limp, blot the surplus moisture off, and then mount with "Gloy," and put under a book, but first of all put some waxed paper over the print; do not put much weight on until the prints are nearly dry.

Notes.

It is important to use fresh Hypo solution for each batch of prints.

Always keep the prints moving in the solutions and washing waters.

A fast stream only of water over the face of the prints will not get rid of the Hypo; the prints require to be soaked, so as to dissolve the Hypo.

In the first washing (before toning or fixing) always immerse the prints face downwards, and do not use too much water.

Notes on Exposure Tables and how to use them.

The exposures given are calculated for the summer months in New Zealand:—For 9 a.m. to 3 p.m., from 1st October to 31st March; for 7 and 8 a.m. to 4 and 5 p.m., from 1st November to 28th February. It will be seen that a separate exposure table is given for each subject, or group of subjects, most likely to be met with. Under each set of subjects will be found:

(1) The time of day.
(2) The light condition at the time of making the exposure.
(3) The exposure necessary (using Imperial Special Rapid plates*) for any one of four stops (8, 11, 16, 22).

Time of Day.—Of course photographs can be taken after 5 p.m. and before 7 a.m. in the summer, but I have not thought it worth while to include earlier or later hours. The exposures after 5 p.m. would be very much increased according to the redness or yellowness of the light.

Light.—This means the light generally, and not necessarily shining directly on the object or view being photographed. What might be a dark object with little reflected light shining on it would probably be a light object with all and a direct light shining on it; and this would determine the subject to be photographed, and would be found under the particular subject heading. "Bright sun" means the sky quite or nearly free from clouds. "Light clouds" means a fair proportion of light, or very scattered dark clouds in the sky, but the sun not obscured. "Diffused" means that the sun is obscured by clouds, but there is still enough light to cast shadows. "Dull" means the whole sky clouded over. "Dull" must not be confounded with *gloomy*, which is a very much darker state.

A photograph can be taken when it is gloomy, but I do not recommend beginners to attempt it, because under this condition it requires a certain amount of dearly-bought experience.

Exposure.—It will be observed that the exposure for Stop 11 (or F. 11, as it is called) is in each case double that for Stop 8 (or F. 8); so too is the exposure for F. 16 double that for F. 11; and so on. Also, if you examine the ground glass of the camera when the aperture is F. 8 (*i.e.*, the aperture of the lens being 1-8th of the focal length of the lens), and then stop the lens down to F. 11 (the aperture of the lens being 1-11th of the local length), you will find that with the latter there will only be half the intensity of light owing to the area of the opening being smaller by one-half. Therefore we conclude that with half the light we give double the exposure; with double the light, half the exposure.

*The tables may also be used for the following plates:—Ilford "Amauto," Ilford Special Rapid, Imperial Orthochrome. Any other plate whose speed number is 1-16th in column I. of Burroughs Wellcome's Diary.

In the Gordon-Bennett contest for 1910 France put up two types of flying machines, the Bleriot and the Antoinette; America put up three types, the Wright, the Curtiss, and the Hamilton; England put up nothing. This was written to bite into the minds of British readers.

Engineering by Land and Sea.

Wireless.

(From Our Own Correspondent.)

PARIS, December 23, 1910.

In the main hall of the "Societe des Ingenieurs Civils de France" yesterday afternoon a distinguished company watched a demonstration by Professor Cerebotani, of Rome, of some new apparatus in connection with telegraphy, and more especially wireless telegraphy.

Among those present were: M. Bordelongue (Minister of Posts, Telegraphs and Telephones), Captain Brenaud, chief of the wireless station of the Eiffel Tower; M. Eiffel constructor of the tower; and official representatives from all the Ministries. The demonstrations were conducted by MM. Cerebeland and Salaignac.

Professor Cerebotani, who has pursued his studies for some time in Munich, has shown that the possibilities of wireless telegraphy are little short of incalculable. For instance, he has what he calls his pocket apparatus. This fits in a case little larger than a case for field glasses, and could, therefore, be carried with ease by an officer on active service.

Contact with the earth being easily established and an antenna formed by a piece of wire attached to the nearest tree, the officer is instantly in touch with his base, no matter how far away he may be. It is obvious that such an apparatus is of immense interest to army authorities.

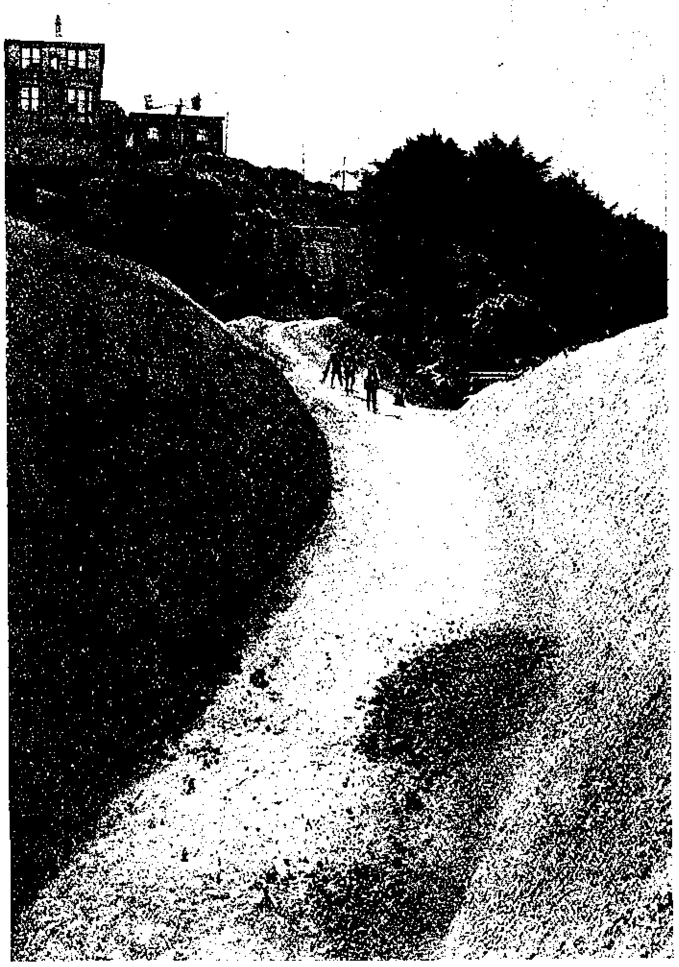
Then there is the little "teleimprimeur," a simple little instrument with a keyboard like a typewriter, which can be fixed to any telegraph or telephone installation. This transmits messages which appear on printed slips at the other end, but it has the advantage of being infinitely more simple than anything yet invented and, besides, can be used with wireless.

This is interesting the railway officials in particular, since such a machine can be put at the disposal of all signal men, pointsmen, station masters, and so forth, permitting them to communicate quickly and accurately with the head office. It is also exceedingly useful for small, out-of-the-way post offices, since no special training or practice is necessary to operate it. Professor Cerebotani has also a marvellous instrument in the Telautographe, also a most simple apparatus, and one which can be fixed to any telephone or telegraph line without trouble or derangement. By this a signature, a drawing or a holograph manuscript written with a pencil fixed to a flexible carriage is copied exactly on a machine at the other end. Hence a man in Paris could sign a document in Algiers, or a signature in Algiers could be verified from Paris.

Curiously enough, the greater the distance the better the machine works, and as the operator at the one end uses the pencil, so automatically at the other end does the pencil trace out lines. The working of this yesterday brought murmurs of admiration and wonder from the experts present.

One of the most interesting of these almost magical instruments was one planned to preserve secrecy in wireless messages. So far a message sent out by a wireless station is received by all stations within a certain radius, though it be only intended for one of them, because the Hertzian waves sent out affect all receivers alike. This new machine, however, allows each of a large number of stations to have its indentification number, and when the Hertzian waves are set a-going with the transmitter at a certain number only the station bearing the corresponding number can receive the messages. All the others are cut off by a short circuit arrangement.

It is impossible to describe in detail all the instruments shown by Professor Cerebotani, but it is safe to say that even the most expert of his visitors yesterday came away profoundly impressed with what he had seen.



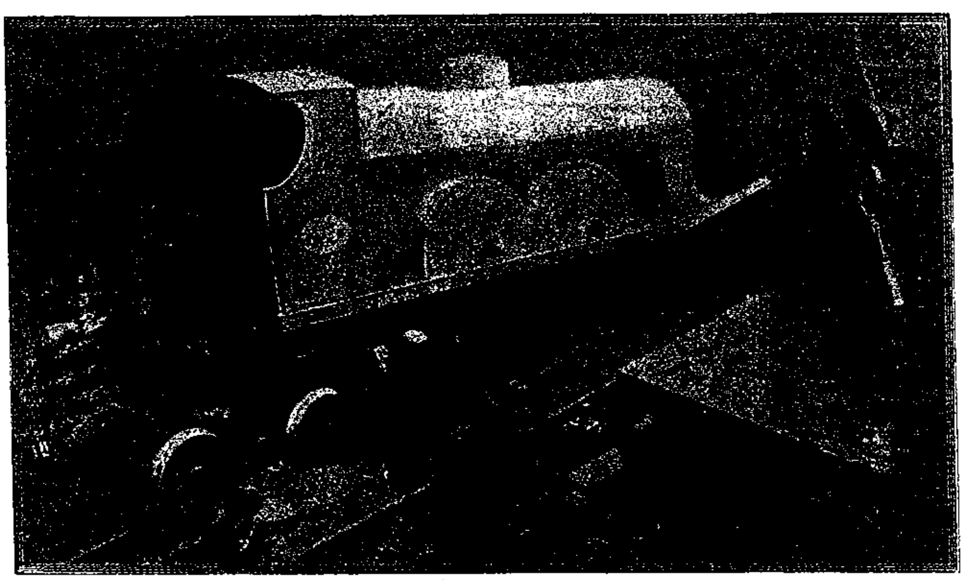
WADESTOWN TRAMWAY, SHOWING HEAVY CUTTINGS.

Wadestown Tramway.

We show a couple of views of the work going on upon the Wadestown tramway. It is a scheme which illustrates the methods by which Greater Wellington is being pushed ahead. The district is a very attractive residential district, and tramway communication will be just the spur required to send it ahead as a refuge for people flying from high rents and stiff rates. Another auxiliary is a water scheme, and already the Council has built a tank on the top of the Wadestown hill, from which the water pipes will soon be reticulated. When drainage is added this suburb will boom.

Railway Accidents.

A recent accident on our railways which came to nothing in the way of damages, comparatively, serves to remind readers of the contrast presented by late accidents in Europe and America. The moral is that trains ought to carry a supply of tools for breaking up wreckage to free the victims pinned down by broken stuff; that carriages ought to be built of steel and strong enough to resist telescoping, which is the cause of these terrible happenings; that electricity ought to be the invariable light on railways; and steam the only warmer.



DERAILED LOCOMOTIVE.

Machinery Made of Muslin.

Those who know that for years paper has been used in the manufacture of car-wheels will not be surprised at this heading. Any material of this sort, used for such a purpose, must of course be cemented, layer by layer, into a mass and consolidated by pressure. In a paper read before the National Machine Tool Builders' Association in New York recently, and printed in *The* [illegible] (New York, November 10), Mr. John Riddell tells of some noteworthy results that have been obtained with muslin gears and pinions which are not only very strong, but almost noiseless. This latter feature is of no small importance. The machine-shops of to-day are much noisier than those of ten or twenty years ago, owing to the fact that the machines for cutting and planing iron are run from three to six times as fast as formerly.—

"These gear noises are very unfortunate, but we hope by improved machinery and the use of various other materials which have recently been introduced, that this trouble will gradually disappear.

"We have at the Schenectady works introduced gears and pinions made of a high grade of muslin which have been applied to a great variety of uses. We have used one of them on a boiler-maker's punch and shear which previously gave considerable trouble, not only on account of noise, but in the actual breaking of the gears; due to excessive back lash and fly-wheel action on the machine. We had such wonderful success with that particular pinion, which has been running now for some two years, that we gradually extended the use until now we are using them on two 10-foot planing-machines, which are operated by electric motors and compressed-air clutches, as intermediate pinions for the reverse motion. Heretofore we have tried various substitutes, including bronze, which would go to pieces in two or three weeks; steel would last longer, but made an intolerable noise; rawhide would seem to shrink and burn out quickly, and we very seldom could find anything that would stand the work longer than three or four weeks at the most."

Mr. Riddell goes on to describe an exhaustive test made with these cloth pinions in which so severe a shock was applied as to break nearly half the teeth in a gun-iron pinion, while the muslin pinions were uninjured. He concludes:—

"I point this out to show the actual strength of pinions made of this material. So we have reason to believe that with time the noises in machine-shops will gradually disappear as they came, without, however, a corresponding reduction in output."

Concrete Tanks.

Concrete tanks are rapidly supplanting reservoirs and cisterns of every other type. Wood decays and iron and steel will rust. Concrete is the ideal material for tanks when they are properly constructed. They are described at length in a bulletin issued with the above title by the Association of American Portland Cement Manufacturers, Land Title Building, Philadelphia, Pa. The bulletin sets forth the advantages of concrete for the purpose specified and then presents working drawings, tables, etc., in conjunction with general descriptive matter illustrating proper methods of construction. It is one of the especially valuable books issued by the Association, as it meets the needs of thousands who are not contractors, but who require improvements of this character.

The Motor Ship.

Rumours, old, new, and oftentime ridiculous, have been circulated recently in the press with regard to the British Admiralty laying down a "motor battleship." The scribes, without waiting for the internal combustion engine to be fully tested in small warships, must needs discuss the "motor Dreadnought" straight away. It is known that a good deal of quiet work has been done in England and Germany with various types of internal combustion engines, and in placing an order for a 9000 ton vessel, with Diesel engines, giving 3000 h.p., the Hamburg-America Line has undoubtedly hastened in progress. The development of motor ships has, however, been going on for several years steadily. There are 2000-ton tank lighters, driven by motors, in the River Volga. In the States, also, there are big motor vessels.—*Maritime Review.*

In England the Admiralty have gained valuable data from several small vessels, and Messrs. Vickers, Sons and Maxim are said to be developing a 2-cycle engine, of which great things are expected. We are thus on the threshold of a very interesting period in naval architecture. Much has yet to be learned as to the most suitable form of engine, and at present there is choice of heavy oil engines, motors of the Diesel type, and suction or producer gas engines.

The name of Mr. Thomas D. West, of Cleveland, Ohio, has long been familiar to foundrymen on both sides of the Atlantic as an authority on foundry practice, and on the peculiarities of cast iron in particular. Mr. West is at present engaged in an inquiry as to the real cause of the globules which occur in gas cavities, of the solidly encased shot iron observed in other cases, and of hard streaks of white iron which are at times found inside of grey and soft iron. But little is yet known as to how these mischances arise, nor as to the best methods of avoiding them. Mr. West is accordingly collecting and studying samples of the defects enumerated, and is anxious to secure specimens from British as well as American sources. He is, therefore, making an appeal to foundrymen in this country to send him interesting samples of the defects enumerated, together with as full data as practicable as to the conditions in which they made their appearance. The character of the pig iron and of the scrap should be stated, also that of the fuel and flux, as well as particulars of anything unusual occurring during the heat. If possible, an analysis of the casting should be added, but in any case the specimen should be accompanied by a statement as to the grade of casting produced, whether medium, soft, or hard. A rough sketch of the casting, having marked on it the location of the sample, would, Mr. West says, prove valuable, as would also particulars as to the character of the mould, and of the methods adopted for gating and pouring. To these data should be added a statement as to the conditions in which the metal was tapped, and in which it was poured, whether hot, medium, or dull. Mr. West intends to make the results of his inquiry the subject of a paper to be read before a leading technical society. His address is 10,511 Pasadena Avenue, Cleveland, Ohio.

The Mastery of the Air

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

Flying and Common Sense Aspects.

(By Peter Ellis.)

Wings.

Why should many intelligent people think it incredible that men will eventually fly through the air safely and pleasantly by means of machinery? True, there have been many sad accidents, and it takes a lot of skill and courage at the present juncture to fly at all; this is not surprising, seeing that this field of enterprise is new, and that we have yet to gain much necessary experience for its full fruition. An envelope of air surrounds our earth and belongs to it, and in common with its kindred substances it is attracted thereto, or in shores; in fogs, collisions may be dodged by

Fig. I.

Fig. 2.

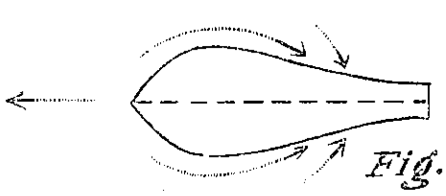


Fig. 3.

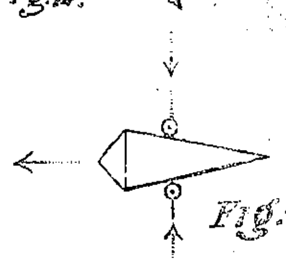


Fig. 4.

other words possesses weight; it is fluid, and bodies heavier bulk for bulk will fall through it to the earth, but if lighter, will rise, hence the terms "heavier than air machines" and "lighter than air machine." Flying animals and birds are heavier than air," nevertheless they "fly" by means of their natural propellers or wings. Natural living force is employed to overcome their lack of buoyancy and to propel them onward. There is nothing really wonderful in this fact, since the air is not imponderable and can, within limits, be used as a fulcrum to work upon; therefore, given the power, and the machinery (the same being properly applied), we are likely to fly as truly and as safely as many of the winged creatures. Why not? If not, it will be because the machinery is defective, or the power lacking, or misdirected.

The genius of man has overcome greater difficulties. Of course in flying, we are immersed in air like fish in water, and cannot float upon its surface like a ship at sea; there are serious dangers to guard against, but there are compensating advantages; we may be troubled with high winds, but there are no rocks or quicksands; we may meet electric storms, but there are no sand-bars or treacherous over and under tactics as well as sideways. Look again at the birds, and note their life of freedom and delight, compared with other fauna compelled to walk the earth. There is a glorious day dawning when men will be wise enough to know how to exercise the privilege of navigating the air of Heaven and enjoying its ethereal environment. Who knows what heightened inspiration they will draw from such a source, and how its exhilarating effect will influence their welfare and moral being? As yet we are in the twilight, the sudden glare of noonday success would probably overwhelm us.

The wings of most heavy birds are used as propellers rather than planes; they are somewhat analagous to the propelling fins of some fish, their action being similar. It may be noted that both fish and birds travel with their obtuse end foremost, and the birds' wings, when in the act of propelling, trap the air between the wings and the body, and, closing quickly, project the air backwards and downwards, the reaction forcing the bird onward and upward (see Figs. 1 and 2).

It is not generally noticed that bodies immersed in a fluid, under certain circumstances, move with the least resistance big end foremost, but we can see instances everywhere. The old Dutch sailing ships had very bluff bows, probably because it was found that the water rapidly closing in aft, helped to propel the vessel forward, as shown in Fig. 3.

Anyhow, all fish and birds are built that way. It is easily seen that pressure exerted on the sides of a wedge-shaped body must move it forward, as indicated in Fig. 4.

A thorn in the flesh always works out for the same reason.

Returning to the bird's wing, it is admirably shaped to gather the air between it and the body, viz., wide and rounded in front, concave underneath, and pointed in the rear. Mechanical flight, however, is unlikely to be performed in any other way than by rotary propellers.

Dangers of the sport not excessive.

Many intrepid airmen have lost their lives or been greviously injured since flying came into vogue, but compared with the number who perish annually in the pursuit of pleasure—alpine climbers, etc.—the number is comparatively small, as records testify. The tremendous field of usefulness which opens up before the "Conquest of the air" makes flying one of the noble professions, and we are much indebted to its brave pioneers. It is just possible that even the birds will be superseded in flight, since very high speed of travel is probable with improved machines and motors.

Licensing of Airmen.

London, January 3.

Fifty pilots' certificates were granted British airmen during 1910.—*N.Z. Herald*, Jan. 4.

Need for Experiment.

Practical experiments by clever inventors are more likely to solve the problem than "laborious scientific investigation," as generally obtains in the evolution and development of most of our useful appliances, leaving the scientists to finally elaborate their theories after the accomplishment of the facts. The perfection of the bicycle is a case in point. There is no scientific equilibrium about it, only expert use makes it stable, yet it has become almost a necessity. Fortunately for the progress of the world, the practical inventor is wilful, and sometimes "puts the telescope to his blind eye." We may not have had railways and steamships and a thousand other things but for this wilfulness. Not that science should be ignored, but it has also to evolve, and until all is known that can be known, much of its teaching is not infallible. Real scientific facts, of course, are incontrovertible, but their combination and application to any particular subject may be all awry, until a practical fact unravels the tangled skein.

Still Many Imperfections.

London, January 3.

The Times, in an article on aeronautics in 1910, declares that flying is largely empirical. The ship, the bird, the submarine, and the dirigible all inherit a tendency to keep right side up, but the aeroplane does nothing of the kind, and turns turtle on the slightest provocation.

The problem of equilibrium must be solved, after much laborious scientific investigation of each of its component problems before the aeroplane can rank as a scientific machine.

We publish in another column some valuable expert opinions on the future of flying. But none of these touch the question of still equilibrium otherwise than through speed. The equilibrium maintained by the albatross and the buzzard with still wings against a gale has often been observed but no inventor has yet made it his object.—Ed. P.

Across Sahara by Aeroplane.

The French Minister of War has just decided that the National Aerial League shall be authorised to obtain from officers of the Army Geographical Service all needed information for the perfection of their plans to cross the Sahara Desert by aeroplane, and Captain Boue, chief of the geodetic brigade of the Tunis-Tripolitan frontier, has been placed in charge of the matter. Says *La Nature* (Paris, October 8):—

"The League has sent to this officer a methodical series of questions on the nature of the ground, bodies of water, landing-places, stations for supplies, etc. Captain Boue has also been furnished by the League with a Daloz anemometer with which he is to study with precision the winds of the region. Captain Noirel, chief of the geodetic brigade of Casablanca, who is about to start also, is now preparing with the League a similar plan for the region of western Morocco. This marks a useful departure.

Falls from Great Heights.

These days of aviation accidents are giving a sad importance to the subject of falls from great heights, and the experiences of men who have survived such perpendicular air-trips are being investigated to find what their sensations were. It appears from these investigations that the spectators suffer more distress than the victims. As Livingstone found, when his arm was chewed by a lion, he suffered no pain at all, and found time for casual reflections on what might happen next. The classics of the subject are not as ample as might be expected, but an editorial writer in *The Lancet* (London, October 15) has unearthed a number of instances and publishes a brief account, which we quote below. He says:

"Writing in 1841 of a fall from an immense altitude which did not result in death, a French observer, M. Manzini, declares that he had searched in vain in the annals of science for a similar case. We can well believe it. The victim or patient was a *tapissier,* who had been engaged in putting up decorations, on the occasion of the belated obsequies of Napoleon the Great, in the lofty dome of the Church of the Invalides in Paris. When busy moving a ladder on the top of a high scaffolding he overbalanced himself, and, in obedience to some obscure instinct, jumped clear of the ladder and the platform, crying to his fellow workmen, as only a Frenchman would, '*Tiens, me voila parti!*' With these cheerful words on his lips he fell 82 feet, bounding in one place off the roof of a little dome, which caused him to describe a second parabola in the air, and, landing finally, feet first, on the slate roof of a small sacristy. Crashing through the slates, he landed astride a rafter, where he was found sitting, surprised but coherent, for he was able to give his name and address when asked for them. He had no recollection of this, and became unconscious when put to bed shortly afterward under the care of the great Pasquier. His insensibility lasted a very short time, however, and he made an extraordinarily rapid recovery, having sustained no apparent injuries either external or internal. Manzini also records the case of his own fall from a great height when a child, and the effect on him of the rapidity of his descent, also the anguish of recovering his breath after it. Others, however, describe their sensations during a tremendous fall as being far from disagreeable. Thus some nine years ago Professor Heirn, the geologist of Zurich, described 'the flood of thought' that traversed his mind during a typical Alpine fall, which began on an inclined plane. He saw beautiful scenes of his past life as he fell, and reflected rationally on his death or the chance of escape. He felt no pain on striking the ground, but he heard a thud, which was the impact of his own head on a rock. Another Alpine faller thought about his insurance and his family. 'Of the losing of my breath, of which people talk, there was no suggestion, and only the heavy fall on the snow-covered ground caused me to lose suddenly and painlessly all consciousness.' Both these Alpinists insisted on the absence of anxiety from their minds when falling, while one certainly describes sensations similar to those felt by the drowning.

Among classic English falls may be mentioned that of a steeple-jack, who in 1800 fell from the top of the Church of St. George in Bolton-le-Moors to the ground, the whole distance traversed being some 120 feet. The man's skull struck some sheet lead upon the earth and left its impact upon it, but though this fall was quite unbroken as in the previous cases by scaffolding, rocks, and so forth, the man was only slightly injured and resumed work in a few days. Recently a man with his boots on fell from the top of a cliff at Dover, the height of which was afterwards found to be 400 feet. He was picked up floating insensible in some five feet of water, but his boots were off, which proves that he must have retained sufficient consciousness on reaching the water to enable him to draw his boots from his feet. Both these cases are well attested.

Some Tall Falls.

Mr. Hamilton's further reminiscences are interesting:—

"I had one very serious fall from a glider at Ormond Beach on January 14, 1906. My glider struck the flagpole on the bath-house in front of the hotel and I was hurled to the broad-walk sixty feet below. I struck the walk on my chest and with such force that I broke one of the planks. If I had landed on my head I would have been killed instantly, but as it was I got off with nothing more serious than a couple of broken ribs and a few dislocations. I was laid up in the hospital for three months, but that was due more to the shaking up I got than to anything else.

"While I was learning to fly at Hammondsport I had three falls which bruised me a bit. One was of at least sixty feet, and I broke my right kneecap. It soon healed, but occasionally it gives me a little bother. The other falls were of about fifty feet each. They shook me and bruised me, but didn't break any bones.

"The most serious fall that I have experienced since taking up the flying game took place at Seattle, where I was giving an exhibition flight last April. I was flying over Lake Washington, at least 225 feet above its surface and perhaps 300 feet—for I was away above the tops of the trees, and Oregon pines are nearly 200 feet high—when one of the wires that controls one of the planes jumped its pulley. It caused me to lose my balance and the machine turned over three times and fell into the lake. Instinctively I doubled up to take the water, but as we struck the water my head struck a heavy pole on the machine and I was knocked unconscious. I was rescued almost immediately, but it was three hours before I regained consciousness.

Wellman's Atlantic Attempt.

A Chicago engineer sums up against Mr. Wellman very severely. He says:—

"From a technical point of view, the attempt was utterly reprehensible and the result a mortifying series of failures to realise anything resembling calculated performances. Indeed, in a province where determinations must be largely empirical, the attempt was made on assumptions wholly theoretical and untested by trial. By such data as are available many of the elements of the project were apparently unsound. It was wholly unproved that the 'dirigible' could be directed under probable conditions of mid-Atlantic weather. Zeppelin's experiences indicated that it could neither be directed nor maintained afloat for the time necessary to drift across the ocean. Common sense suggested that a dragging tail relatively enormously heavy and varingly submerged in a rough sea would not be an 'equilibrator' but decidedly the reverse. Success under peculiarly favourable conditions was not an impossible contingency, but would have proved nothing of value. Mr. Wellman, his companions, and a sympathetic world are to be congratulated that by an almost incalculably fortunate chance there was no tragedy. Atlantic shipping is to be congratulated that the string of flimsy gasoline tanks was not dragged destructively across some luckless vessel, with results too hideous to contemplate. In brief, we may thank God it was no worse."

Mountain Sickness of Aviators.

Mountain climbers tell us that at great altitudes disagreeable physiological symptoms manifest themselves. Some assert that these can be detected at heights of a few thousand feet, and many say that they are unable to live in cities like Denver, Col., which its citizens are fond of reminding us is "a mile high." What would be the result if, instead of attaining these altitudes from sea-level by the slow process of climbing, we could be transported from one level to the other in a few minutes? This is precisely what happens in a lofty aeroplane flight, where the ascent takes but a short time and the descent is made in four or five minutes from an elevation of perhaps 8000 feet. We know that quick transition from high to low pressure in the caisson of a subaqueous tunnel may have fatal results. Something of the same sort occurs in aviation, and may account for some of the mysterious accidents (we are told by a writer in *The Lancet* London, November 5). This new problem of the physiological effects upon the aviator seems to have attracted little notice, he remarks. We read:—

"The rapid ascent to great altitudes exposes the body to conditions different from any terrestrial ones. Mountain-climbing offers some analogy, but it differs in the fact that the transition from the high atmospheric pressure of the sea-level to a low pressure takes place much more slowly. In the *Gazette Hebdomadaire des Sciences Medicales de Bordeaux* of September 25 Prof. R. Moulinier has reported some interesting observations on the blood-pressure of aviators who have ascended to high altitudes."

On alighting after ascending to a height of four or five thousand feet, the aviator's hands and feet are blue, his eyes are bloodshot, and his pulse is high. He has headache and ringing in the ears. Sometimes there is a tendency to sleep, and this may be felt even during flight. After the flight the blood-pressure is always increased, sometimes by 30 to 40 per cent. To quote further:

"This increase in pressure is all the more remarkable as the aviators were athletes in full training. The rise was less marked in aviators who were fatigued. These showed palpitation of the heart and marked acceleration of the pulse (108). In one case (symptoms) . . . of functional insufficiency of the heart, and vertiginous movements, were observed in an aviator who, after a flight of an hour, had reached the height of 1000 meters (3200 feet. No rise in blood-pressure was found in aviators who flew at low altitudes, such as 100 to 150 meters. As to the cause of the rise in blood-pressure, Professor Moulinier puts forward the hypothesis that it is due to the sudden descent to earth in four or five minutes from a height of 1000 to 2000 meters which was attained in 20 to 25 minutes. . . . In the short time of the descent the circulatory system had not time to become adapted to the change of pressure. He therefore advises aviators to descend more slowly. He also points out the dangerous fatigue to which flight at high altitudes exposes the circulatory apparatus by provoking increased and irregular activity of the heart and vessels. A sound heart and supple arteries are absolutely necessary to an aviator. The list of distressing fatalities to aviators has become comparatively long in a very short time. The accidents are always attributed to some mechanical cause—some breakdown in the machine or unexpected current of air. No doubt this is usually true, but it seems to us quite possible that in some cases the breakdown is personal, not of the material at all.

England and France.

For every aviator in England let us say there are ten in France. For every constructor of aeroplanes in England let us say there are a dozen in France. For every originator of a new type in England there are a score in France. For every builder of aero engines in England there are a dozen in France. For every original type of aero engine attempted in England there are half a dozen in France. There is no need to cavil about the exact figures. I have put into other words the simple fact that France is immeasurably ahead of England in the struggle for the conquest of the air.—J. C. Mort in *Aero*.

Notes from Paris.

(From Our Own Correspondent.)

Mr. Orville Wright in Paris.

Mr. Orville Wright has arrived in Paris from Berlin. He does not expect to be in France more than a few days, before returning to America.

In conversation with newspaper correspondents Mr. Wright said: "I have come to Paris simply to renew contact with the French Wright Aeroplane Company, and to acquaint it with the newest improvements in our American machine. I shall, of course, talk over general business matters with Mr. Hart O. Berg, representative of the Wright Company in France. Beyond this, I have no other plans, and do not contemplate making any flights in France. The report that I intended to endeavour to win the Coupe Michelin while over here is as unfounded as the statement that I was to be engaged by the German Emperor as instructor of a military school of aviation." Referring again to the improvements in the latest type of Wright biplane, Mr. Orville Wright said that there was nothing radical about them. Constructional details had been modified, to the general improvement of the machine. Questioned on the subject of the suits brought by the Wright brothers in America against the Curtiss Aeroplaning Company for the alleged infringement of the Wright patents, Mr. Wright said: "I thing no one has any doubt as to the result. We ourselves are confident of winning. As to the similar cases pending in France against French aeroplane constructors, that is the affair of the French Wright Company, and I can say nothing about them."

On the future of aviation, Mr. Orville Wright said: "Ten years ago my brother and I never dreamed that aviation would develop to the extent it has done at the present day. We never thought flying would become so safe as it is really now. Flying to-day, provided the pilot exercises proper care and skill, presents almost no danger at all. Besides being a magnificent sport, aviation, I believe, has a great commercial future. It is difficult, however, to say yet in what direction the industrial side of flight will expand. Transport must naturally be cheaper by water than by aeroplane.

"There would be great progress made in passenger carrying aeroplanes, and there is no reason why machines should not be built for ten or twelve passengers, although at present there is no demand for such. In cross-country travelling the flying machine will always be superior to the road machine. An aeroplane travelling at a high speed is much safer than an automobile rushing along the ground at the same speed. The time will come when people will charter an aeroplane on occasions when they would now hire a special train, and the aeroplane will be decidedly cheaper. No doubt aeroplanes of the near future will have comfortable sheltered quarters for passengers."

New Aerotechnical Institute at St. Cyr.

Although not yet formally inaugurated, the Aerotechnical Institute founded and built by M. Henri Deutsch (de la Meurthe) at St. Cyr for the University of Paris, has already been taken over by the university authorities.

The construction of the institute and its installation were recently completed; and only the arrival of the working staff is needed for the building to be declared open to all who wish to make use of it.

With a view to making the institute as perfect as possible in the service it is destined to render to inventors and to everyone engaged in aeronautical research and experiments, a "committee de perfectionement" was formed under the presidency of M. Liard, vice-rector of the University of Paris.

The duty of this committee will be to examine how best the institute can be made to fulfil the objects of its creation, and generally to supervise its organisation. M. Henri Deutsch de la Meurthe and M. Appell, dean of the Faculty of Science, are the vice-presidents, and the members include M. Bartheu, vice-president of the Aero-club de France; M. Bleriot; M. Kapferer, and a number of other aeronautical engineers and professors.

The site of the buildings and grounds occupies an area of 72,000 meters.

It is intended that the institute shall be a perfect aeronautical laboratory, where constructors and inventors shall find everything they can possibly need for their researches and experiments, with an efficient technical staff to aid them in solving the difficult problems involved in the conquest of the air.

Experimenters will have the use of an electric locomotive and a railroad 1400 meters long to enable them to carry out practical tests, impossible under other conditions.

M. Maurain, one-time Professor of the Faculty of Science of Caen, has been appointed director of the Aerotechnical Institute. Besides the endorsement of M. Deutsch, the institute will benefit by State subvention. The inauguration will take place very shortly.

Automatic Regulation of Stability.

The manoeuvres of a pilot aboard an aeroplane are, notwithstanding the improvements of late, still very complicated. The steering wheel and various levers for ascending and descending occupy the hands of the aviator, with his feet he commands and controls the rudder of direction.

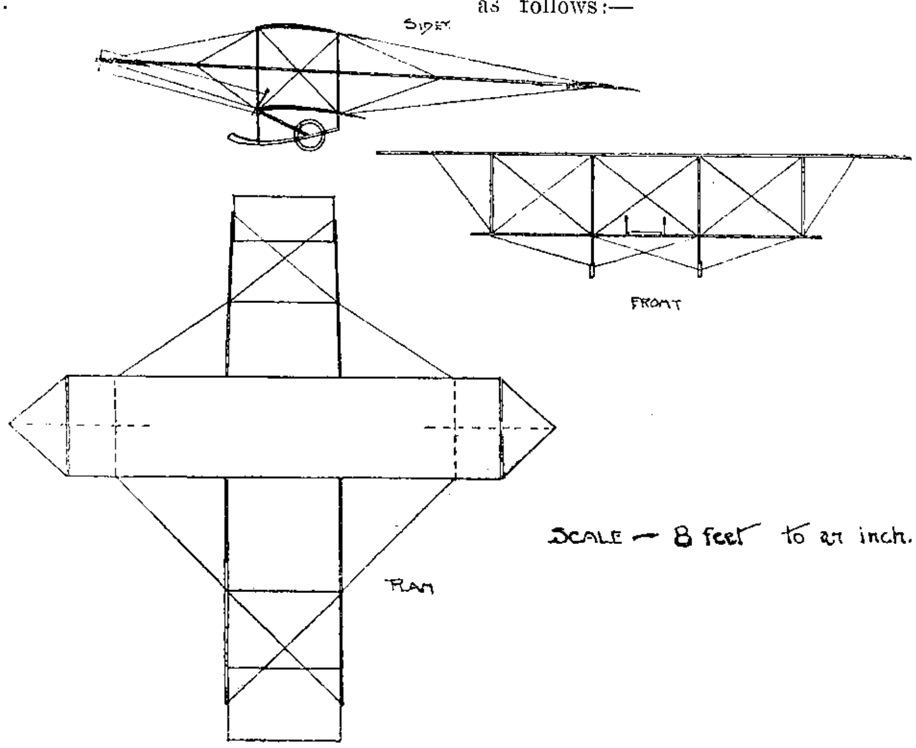
Now, one of the most delicate movements, one requiring the utmost attention, quick acting and an absolute presence of mind, is the one of rightening the machine when, surprised by a sudden gust of wind, it heels over to the right or left. Ninety per cent. of all accidents are due to the aeroplane toppling over, the pilot not being able to righten the machine. Therefore, it will easily be understood of what importance an automatic regulation of an aeroplane's stability would be.

It seems as if, after long and exhaustive experiments, M. Charles Mootz, a Parisian inventor, has succeeded in solving this problem. The system of his appliance is shortly as follows:—

Supposing that the lower parts of an aeroplane, instead of being firmly connected with the upper structure, was simply suspended from the latter during the flight, in order to allow them to move freely, the result would be that by its own weight the lower parts would always rest in a vertical position, whatever may be the inclination of the aeroplane one way or the other.

This M. Mootz employs in effecting the automatic regulation of stability. Side-rods connect the mountings of the lower parts with winches placed right and left of the aeroplane. These winches control directly or indirectly the various movable planes. Owing to this arrangement, if the aeroplane flies in a normal position, the various planes also occupy a normal position; but as soon as the machine heels over to one side or the other its displacement causes the siderods, winches and other means of control to act, whereby the canvas planes are forced back to a normal position effecting the rightening of the machine. If not in flight, the lower structure can be rendered rigid by means of a brake.

Very shortly the invention of M. Mootz will be applied to several aeroplanes in order to test its merits; experiments made with models have given general satisfaction.



STEVENSON'S GLIDER.

The Future of Aviation.

What the "Times" says.

No one should be deceived by the advance which has been made in man's ability to fly, into supposing that the aeroplane is shortly going to become the recognised vehicle of any one who can afford to buy it. Much laborious research has yet to be devoted to solving the mechancial and meteorological problems involved in flying. Perhaps in ten years'.time a machine will be constructed whose cylinders will not miss fire, which will start certainly and without assistance, and land safely, in any reasonably level space 100 yards long, which will be able to cope with the unexpected eddy, and which will not come to pieces in the air. And perhaps by that time we shall have a knowledge of aerial conditions in some degree comparable with that which we have at present of the sea, so that an experienced pilot will be able to find his way with confidence among the unseen obstacles to the earth.

Meanwhile it is a risky thing to prophesy concerning the aeroplane of the future. It is certain, however, to be built far more strongly than it is to-day, especially as regards the landing apparatus. The number of cases in which, after successful flights, machines have come to grief in the act of alighting is legion. Then it is quite likely that the aeroplane will have very flexible wings, more resembling those of a bird. Finally, while there will probably be a reaction against engines of enormously high horse power, some means will have to be devised whereby one can instantaneously accelerate on emergency, so as to be able to avoid dropping when a following gust catches one at the edge of a *tourbillon* and, by neutralising the resistance of the air, deprives the machine of its support.

What Mr. Grahame-White says.

The advancement of the aeroplane has been checked by three defects in the machines themselves. These I may enumerate as follows:—

1. Inability to combat winds.
2. Constructional weaknesses.
3. Unreliability of engines.

These defects, which made aeroplanes mere playthings in their early stages of development, are already being overcome in an altogether surprising way. That they will be completely overcome, and that flying machines will be of practical and everyday use, is my firm conviction. Take flying in winds as a first example. With the aeroplanes we had in the beginning it was only possible to ascend when the wind was as low as four or five miles an hour. Now I find it quite possible to remain in the air, and control my machine, in a wind of 25 miles an hour. From this, to the ability to fly in even stronger winds, it is merely a question of greater speed. I have become an ardent advocate of high-speed flying. Speed gives you power to overcome the attacks of sudden wind gusts, which are the airman's peril. On a high-speed monoplane, for example, you dash through an adverse gust in the same way that a fast torpedo-boat destroyer thrusts her way through an opposing wave.

Therefore, in my constructional work, I shall devote earnest attention to a high-speed machine. Problems have to be overcome, naturally—chiefly those concerning the strength of supporting planes when driven at exceptionally high speeds through the air. A far greater weight and rigidity of construction is, however, bound to come. With it will dawn the era of aerial travel at speeds of 100 miles an hour. At such a speed it will be possible to pilot a machine through anything short of an actual gale. When we have this machine—which it is my intention to strive for constructionally — regular aerial services, from point to point, will become not only possible, but profitable.

Engine problems are solving themselves. With the scepticism with which some people always view a new idea, it was contended, in the infancy of aeroplanes, that no petrol motor would stand the strain of propelling an aeroplane, because of its necessary lightness and the high speed at which it would have to be run. The answer to these critics has been overwhelming. Even while our aeroplanes, and particularly our propellers, are admittedly imperfect, thereby imposing upon an engine the most difficult conditions, flights of three, five and six hours are already evoking no particular comment. To a certain extent, indeed, the duration of a flight has now become purely a matter of petrol-carrying.

I have not the slightest fear, therefore, as to the success of the flying machine engine. Its reliability has already become remarkable. Since the famous London to Manchester flight, in April last, I imagine that I have flown, from day to day, as regularly as any one; and I have already been taught to be quite surprised should my engine manifest any fault or failing. From the point of view of propulsion, therefore, which is its most important aspect, the aeroplane's future is assured.

And now there is the question of safety. Here, I know, I am face to face with a very grave misconception. People generally have come to the conclusion that flying is highly dangerous, and will always remain so. I, as a practical flyer, say that there is very little danger in it now, and that in the future there will be no more risk in an aerial journey than in moving from point to point in a railway train. At present, reckoning expert flyers and pupils who can pilot a machine off the ground, there are estimated to be 3000 airmen throughout the world. To teach these men to navigate a new element, with crude, experimental machines, and absolutely no *data* to go upon, what has the death-roll amounted to? Less than 30! And, in this particular connection, it is significant to recall, as a comparison, that nine men were killed in one of the great motor-car races. Analysing the deaths that have taken place, it is possible to draw a practical lesson from each. Thus, the set of circumstances which brought about any one of these fatalities is not likely to occur again.

Inexperience, foolhardiness, and constructional weakness in machines have been responsible for practically all the accidents which have taken place. Given a good machine, a careful, well-trained pilot, and proper weather conditions, flying is already as safe as motoring; and very soon it promises to be safer. The dangers which now exist when a man flies will speedily be overcome by the introduction of stronger, speedier machines, and the adoption of engine systems whereby a compulsory descent, owing to mechanical troubles, will be obviated. The air is absolutely free and unimpeded. Once we have definitely conquered our enemy the wind it will offer an absolutely ideal medium for high-speed traffic, besides providing a traveller with the most delightful way imaginable of getting from point to point.

Next summer, practically for the first time in a complete and finished way, people will be able to enjoy the sensations of air travel. Ready for trials in the spring will be the first of a type of machine one might call "the air-car." It will be a strongly-built monoplane. A 100-h.p. engine will propel it. It will have a body like that of a motor-car, with four comfortably padded seats, well protected from the wind. There is no reason at all why any wealthy motorist should not purchase such a machine as this, have an "aerial chauffeur" instructed to pilot it, if he does not want to learn to drive himself, and enjoy aeroplaning in a thoroughly practical way.

In its sporting aspect, I forsee that flying will enjoy an even greater vogue that motoring. The reason is not far to seek. Motor-car driving, even in its most favourable aspects, cannot be compared with flying. There is a sense of freedom —an exhilaration—in passing swiftly through the air that never comes to one when driving a car. I speak from experience again, having done more than a little motoring. Directly a more convenient, less bulky machine can be produced, what one might call the public demand for an aeroplane will begin.

The demand of the age is for high-speed travel. The possibilities of land locomotion, in this respect, are almost exhausted. So, too, are those of sea transit. And now, conveniently to hand when mankind wants it, is air travel. I do not see one insurmountable difficulty in the way of completely revolutionizing, by means of the aeroplane, all existing methods of communication.

What Mr. Ledeboer says.

The majority of aeroplane accidents can with certainty be ascribed to either of the two causes enumerated by Mr. Grahame-White — foolhardiness or inexperience of the pilot or structural weakness of the aeroplane. Against the former it is difficult to devise a remedy, save that derived from increasing familiarity with the conditions of air-travel and the consequent correct appreciation of its dangers. But structural weakness, while being by far the more prolific cause of grave accident, is always avoidable and usually inexcusable.

It is not beyond the bounds of engineering knowledge to-day to provide a structure that combines the requisite lightness with an ample margin of safety in strength. Nevertheless, it may be said, without the slightest exaggeration, that a large number, if not indeed a majority, of the aeroplanes that are successfully flown to-day possess little, if any, margin of strength. Mr. Grahame-White advances the view that stability will be attained by increase of speed, that an aeroplane flying at 100 miles an hour will successfully negotiate "anything short of an actual gale." To this view I take the strongest possible exception. Not only will stability be in no wise furthered by striving after enormous speeds, but a new danger caused to arise—it is impossible to predict or to calculate from existing knowledge the strains which at high speed grow enormously, to which would be subjected an aeroplane flying at 100 miles an hour and suddenly struck by an opposing gust of 40 miles an hour.

There is only one direction at the present time that will lead to the attainment of fruitful results; this is the production of an aeroplane that shall possess greater, and possibly automatic, stability. Moreover, by the evolution of a low-powered slow-speed machine a greater step will have been made in the development of aerial navigation than by the attainment of a speed in excess even of 100 miles an hour.

What the "Aero" says.

The forecast of this authority is preceded by a very striking sketch of the year just ended which is very interesting.

"This being the last issue of *The Aero* for 1910, and the last issue of the current volume, it may be well to review briefly our present position in aviation as compared with our position this time last year.

At that period we had in England practically no bona fide aviators. Mr. Moore Brabazon had done a little flying in France, and had won the prize for the first circular mile at Shellbeach. Mr. Cockburn had done some flying in France, and so had Mr. Grahame-White. Mr. Ogilvie had flown at Camber, and Mr. Cody had then the honour of being the only man domiciled in Great Britain who had made anything like a prolonged flight, his flight of 40 miles across country in 66 minutes on Sept. 8th, 1909, being not only a British record, but a World's cross-country record. A few others had just made short hops, but nothing more. Apart from them, we had not one who could really be called an aviator.

To-day we have 38 aviators who have actually qualified for their Royal Aero Club Certificates, and besides them there are twelve British aviators who possess French certificates, but do not possess British certificates, so that we have in all actually 50 aviators at the end of this year.

This places Great Britain actually in second position as regards the total number of aviators belonging to any one nation.

It is true that France has now just over 300 certificated aviators, but from the 300 must be deducted quite a fair number of aviators belonging to other countries, who have qualified in France, just as the twelve British aviators who do not possess British certificates have qualified. These include Belgians, Dutchmen, Italians, Danes, Peruvians, Russians, a Japanese, and even a few Germans, so that probably the number of French subjects owning certificates is something between 200 and 250. Thus we have still a very large amount of leeway to make up before we can even give France a run for her money.

Nevertheless, if things progress as well as they are doing at present, next year should see the gap very materially decreased, for by the time our men have learnt to rise superior to British weather, and by the time our constructors have learnt to build machines which will not only assist aviators in doing so but are also able to deal adequately with the topographical peculiarities of the surface of Great Britain, we shall doubtless produce a breed of aviators superior to anything the Continent can find.

As Captain Sanders so appositely remarked recently, "A smooth sea never made a good sailor," and it is quite possible that our much abused climate may in this way ultimately be the salvation of Great Britain from a foreign invader, even as the severe training our West-country seamen received some 400 years ago was the salvation of the country a couple of generations later from the Spanish Armada.

The Meetings of 1910.

During 1910 there were held some 30 aviation meetings, of which about one-third were in the United Kingdom. The finest show of flying was at Rheims, where as many as 18 aeroplanes were to be seen in the air at one time. The most noticeable feature of many meetings was the amount of money lost over them by their promoters. This, no doubt, was largely due to bad weather; it was also due to the fact that, for the ordinary public, flying, when nothing sensational happens, is about the dullest thing to watch in the world. All but persons financially interested in promoting meetings are agreed that the days of the smaller type of meeting, at all events, are numbered. For the sake of the progress of aviation it is to be hoped that this is so. Even if the public would continue to pay for seeing what it can see perfectly well for nothing, the time has come for the circus-tricks and unnecessarily dangerous competitions which now form the popular attraction at many meetings to give place to more serious scientific investigations. The idle crowd is delighted when an airman makes a series of dives, like Kipling's "webby-footed" amphibian Challong, who "swam round and round the ship, sayin' 'dam,' for to please the men"; it is thrilled, as are the spectators at a bullfight, during any contest of an obviously dangerous kind. But the gate-money point of view, with the increase of foul driving and the official favouring of local competitors, which have been freely complained about at many meetings both at home and abroad, have spoilt the game. Rheims is likely to remain the constructor's Mecca, but for the most part the attention of racing men in 1911 will be concentrated on cross-country flights such as that proposed for the *Daily Mail* prize of £10,000 in England and that round the principal capitals of Western Europe.

At Bucmar, Paris, M. Farman is now carrying passengers, one at a time, in his latest aeroplane. For the present he has one tariff and one route for aerial excursions. For two hundred francs (£8) the passenger is taken, either by the constructor himself or by his chief pilot, for a circular flight of six or seven kilometres, giving glimpses of the surrounding villages. The trip takes about ten minutes to complete. The seat is roomy, and M. Farman says he has never known an individual to be nervous. Next spring his intention is to take larger trips, say to Blois, Nantes, Orleans, and other places, at a tariff to be fixed.

How the invention announced the other day of a seven-seated aeroplane will affect the project it is hard to say.

British Industry in 1910.

General.

"The Times" Review.

The reviews of the British engineering industries not only tell the story of a distinct revival of trade, but they point to the fact that the British manufacturer is keeping well abreast of the times in the important branches of manufacturing which form the basis of our wealth and strength as a nation. The article and reports show that our industries are in a soberly prosperous condition, and demonstrate beyond a doubt that England, following the excellent advice of His Majesty King George, has awakened, and is at the present moment awake and taking a very active part in all the great engineering achievements of the times. A perusal will dispel much of the nonsense we have grown accustomed to hear of the decline of British industry brought about by reason of the refusal of our manufacturers to avail themselves of recent inventions and to adapt themselves to modern requirements. While here and there an industry has not fully recovered from the depression which has so long hung over our manufacturing districts, the great majority of trades report a sensible revival, with decidedly optimistic forecasts for the New Year. In not a few instances the revival has actually begun, and the order and contract books testify to the probability of a record year for 1911.

Probably the most gratifying feature of our reports is the fact, which is emphasised by many of our correspondents, that Great Britain is retaining her strong position in foreign markets. There are numerous references to South America, South Africa, the Colonies, India, China, Japan, and not infrequently to the Continent. Wherever there is a neutral market—that is, a non-manufacturing country where the high tariffs have not been formulated, as in the United States, Germany, and France, with a special view to keep out our productions—the British manufacturer is able to hold his own. A correspondent points out that even in Cuba and Porto Rico, where American sugar machinery enjoys a preferential rate, planters look upon British machinery as the best and cheapest, and that important shipments have been made. On the West Coast of South America practically all the railway building is in the hands of the British. Representatives of the Governments of these countries have recently stated to a special correspondent of *The Times* that they prefer to deal with British engineers and contractors, for the reason that they have never had any trouble with them—something that cannot be said of our American and German competitors. A few years ago in Bolivia the extension of the railway system was placed in the hands of Americans and one road was built. The work was not very satisfactory, and has subsequently been turned over to a British company, and all the new construction, including several important branches, is now in the hands of the British. English engineers and contractors have at the present time nearly £20,000,000 worth of railway construction work in progress of completion in three of the West Coast South American Republics. It is unnecessary to mention the tremendous importance of Brazil and the Argentine as fields for the exports of British manufacture and engineering. There are many who believe that South Africa will soon be equally important, whilst China, when once fully aroused to the necessity of modern methods, bids fair to be an even more extensive field of operations. Travel where you may in these countries you will only find one opinion in relation to British goods, British manufactured articles, and British engineering undertakings—namely, that they are the best in quality; that the work is uniformly well done and, moreover, that it lasts. The engineers of other countries may do the work cheaper, but the British do it the best.

Particulars.

In spite of unfavourable conditions, British shipyards have produced a large amount of new shipping in 1910. It is stated that 1,164 vessels of about 1,317,400 tons gross have been launched, as against 1102 vessels of 1,159,000 tons in 1909 and 1318 vessels of 1,033,000 tons in 1908, the British output in tonnage for 1910 being about 56 per cent. of the world's output of new ships. The German output has been 310 ships and not quite 218,000 tons. On December 31, 363 mercantile vessels were under construction in the United Kingdom, having an aggregate tonnage of 1,131,500 tons (gross), as against 331 vessels of 913,400 tons at the same date in 1909. Warships in hand in 1910 at the same date were 66 in number, with an aggregate displacement of 289,500 tons.

The Two Largest Ships Afloat.

A short time ago the "Olympic," of the White Star Line, was launched by Messrs. Harland and Wolff, and when her sister ship the "Titanic" follows they will be the two largest ships afloat. This distinction, however, is likely to be shortlived, as orders have been placed for two still larger Transatlantic steamships; one order has been given by the Hamburg-American Company to the Vulcan Shipbuilding Company, of Hamburg and Stettin, and another by the Cunard Company to Messrs. John Brown and Co., of Clydebank. Before the year 1911 is far advanced both these new vessels will probably be laid down.

The Iron and Steel Trades.

Notwithstanding the fact that improvements have been noted in several directions in the iron and steel trades as compared with the preceding twelve months, the year 1910 was, speaking generally, disappointing. Higher prices were quoted for certain classes of material, but the optimistic views which prevailed during the earlier months of 1910 were not justified by subsequent events, while labour troubles threw a shadow which has only recently been dispelled.

The output of pig iron, which amounted to nearly five million tons in the first half of last year, and should be about double that figure for the twelve months, was well above the average, and, indeed, the output was the largest since the "boom" of 1907.

Where Great Britain Leads.

It is satisfactory, however, that in certain classes of manufacture Great Britain is maintaining her supremacy. The tinplate industry of South Wales has enjoyed a period of prosperity which has required the erection of many new mills, and the present position recalls the days before high American tariffs were enacted. The canning industries still place reliance upon the British manufacturer. In the production of high-speed steel Sheffield still maintains a pre-eminent position, and the past year witnessed a substantial demand for the best Sheffield tool and crucible steel, a preference displayed after attempts had been made to fulfil requirements elsewhere, and in spite of high tariffs the United States have been one of the best customers for these special Sheffield productions. The improvements made in the manufacture of these varieties of steels is a subject of general congratulation, and the successful attempts made to produce an even better class of material in tool steel capable of higher speeds and greater feeds explain the revival in the demand for British material of this class. Another branch of the manufacturing industry in which Great Britain is making headway is in the machine tool trade, a result largely due to the greater attention now paid to the requirements of users and to the production by certain firms of trustworthy low-priced machines which have met and overcome the competition of American manufacturers.

Electrical Progress.

Electrical science during 1910 has proceeded steadily, but the advance has been characterised chiefly by improvements in apparatus and machinery applied to industries and traction, with little to record respecting new phenomena. If there is a dearth of electrical discovery, there is also a decided increase in the extent to which scientific methods have been applied to perfect the designs of parts and details of electrical equipment. The year has thus revealed the general character of the results proceeding from the growth, during the last decade, of science teaching in the schools, of the extension of technical colleges, and of the increased facilities for research in the testing rooms and laboratories attached to industrial works and factories. The stereotyped technical course, with its carefully planned series of set experiments, is in fact producing useful testing-room manipulators, but the evidence of the year's product from the colleges in regard to original investigations suggests that the stereotyped course tends to stultify initiative in electrical research, that there is a limit to the number of discoveries which can be forced into existence by the multiplication of research laboratories, and that the future field of successful scientific research is to be looked for to an increasing extent in the industrial workshops of the world.

Telegraphy and Telephony.

Of the inventions that have appeared in 1910, one of the most remarkable is the telephone relay, which is due to Mr. S. G. Brown. In this instrument he makes use of the fact that the electrical resistance of a microscopic air-gap between two platinum points, forming a miniature electric arc, is extremely sensitive to changes of length, of the second and higher orders of smallness. These changes are effected by the movements of a diaphragm, and he is thus able to magnify feeble telephonic currents. The proposal to extend the use of automatic telephone exchanges has been freely discussed, and the link between telegraphy and telephony has been strengthened by applying the telephone in many country offices for receiving and transmitting messages handed in as telegrams. The relative position of this country in facilities for telephony can be realised from the fact that the numbers of inhabitants to each telephone are now estimated to be—for Great Britain 77, for Germany 71, for France 202, for Italy 625, and for Spain 955.

The Gas and Oil Engine Industry.

The year 1910 will rank as one of the most prosperous within the annals of the gas and oil engine industry. The volume of work had been falling from 1906 onwards, but the corner was turned in 1909, and in the past year there was an abundance of work.

As regards gas engine design, the most interesting feature is the widespread adoption of governing by varying either the quality or quantity of the gaseous mixture in place of the hit-and-miss system of governing which was formerly prevalent in this country, and which persisted here long after Continental engineers had employed other methods. Improvements in oil engine design are moving, as might be expected, in the direction of the Diesel cycle, as being more economical in fuel consumption than any other type.

Aeronautics.

The year 1910 has been notable, as regards airmanship, for the development of the high-speed monoplane. By increasing engine power from 50 h.p. to 100 h.p. flying speeds have been made to rise from 50 and 55 miles an hour to 65, 70, and even 75. Apart from their value in winning speed prizes, these increased rates of travel through the air have enabled airmen to combat higher winds. At the beginning of the year winds of a greater velocity than 10 or 15 m.p.h. could not be negotiated. Recently, however, many flights have been accomplished in winds of 20, 25, and even 30 m.p.h.

Although the monoplane has swept the board, by reason of its velocity and power, in the majority of contests, and particularly in those for speed and high-flying, the biplane has—by structural improvements affecting its weight-carrying capacity, its landing gear, and its general method of control—more than held its own, notably for military purposes, for long-distance cross-country flying, and for the pleasure flights of amateurs. Military authorities have expressed their approval at the constructional feature of the biplane which permits a completely unimpeded view of the ground below from the pilot's seat—a privilege not enjoyed by the monoplanist.

The Industry.

Industrially the year has seen many new factories opened. In this connection it is interesting to record that an expert estimate places the number of aeroplanes in the world at 3,000. One French factory has now an equipment to produce 800 machines a year. Government orders are having a stimulating effect upon the trade. Large numbers of skilled men are, in addition to work at the factories, employed at the many flying schools. An increasing amount of capital is being sunk in the industry. The military significance of airmanship, and the valuable prizes to be won in the current year, are largely responsible for this, as is also the belief that there is an important sporting future before the aeroplane.

Finally, reference should be made to England's progress during the year. Both in the production of skilled airmen and in practical construction leeway is being rapidly made up. A trustworthy estimate places the number of manufacturers in England who are now interested in the production of aeroplanes, engines, and propellers at more than 20. The capital already invested in the new industry in this country is certainly much in excess of £100,000.

MEDICAL.

Chemotherapy: The Latest Medical Marvel.

Ever since we knew that many diseases are parasitic in origin, we have been looking for substances that will kill the parasites without harming the organism on which they prey. If there were any one such substance, we should have a panacea—a "cure-all"—and the last word would have been said, at any rate so far as this type of disease is concerned. But parasites are many; some die easily and some resist obstinately. Some yield only to treatment that is also fatal to the patient. In the case of malaria, where the parasite is a low-grade animal instead of being a simple plant like the bacteria, quinine has proved to be the substance we want—it is fatal to the plasmodium, as it is called, and will not kill the sufferer. Until recent years, however, there has been no systematic hunt for chemical substances that will do for other diseases what quinine does for malaria. The successes of serum-therapy have been so great and the investigations connected with it so fascinating, that it has thrown into the shade a class of remedies that is really more obvious. Now, however, the medical world is ringing with the praises of the so-called "606"—a coal-tar compound that is said to be instantly fatal to the dreaded *spirochaeta*, the germ of the worst of human blood diseases. The discovery of this compound comes as an incident in a long series of chemical researches carried on by Dr. Paul Ehrlich, a German physician and chemist, and by his followers. They have devoted themselves wholly to the parasites belonging to the animal kingdom—the two already mentioned and the trypanosome of sleeping sickness, and their discoveries are based primarily on the fact that some of the coal-tar colours stain the disease-germs readily, while others do not. They have assumed that when this selective staining action occurs, the germ will be more apt to succumb to the chemical agent; and apparently, they are right. Says Dr. H. Schweitzer, writer in *Science* (New York, December 9), on this subject:—

"Chemotherapy can perhaps best be described as the science dealing with the treatment of internal parasitic diseases by means of preparations synthetized with the object of combining the maximum power of efficiency in the destruction of the greatest variety of protozoa with the minimum poisonous action upon the patient's tissues, this combination of properties being primarily established by animal experimentation.

"In contradistinction to chemotherapy, serumtherapy is the method of treating bacterial infections by means of antibodies generated by the diseased organism itself.

"If, as seems improbable from the brilliant results reported in such abundance by many of the greatest authorities in the medical world, the new remedy should suffer a setback through later observations of serious after-effects, it would not services which Ehrlich and his pupils detract in the least from the magnificent have rendered humanity. Such vast progress has already been achieved in chemotherapy that it will necessarily be only a matter of a short time when it will become possible to definitely arrest the ravages of such terrible diseases as syphilis, recurrent fever, and sleeping sickness. Perhaps cancer, the cause of which has been ascribed by some investigators to organisms resembling the spirochaeta of syphilis, will also be found amenable to chemotherapy.

"This marvellous success of modern therapy is, in a large measure, due to synthetic chemistry, which in the past has already rendered invaluable assistance to the medical practitioner by furnishing him such efficient remedies as antipyrin, phenacetin, trional, veronal, hexamethylentetramin, and aspirin. How, in the light of these positive advances, can we explain the attitude of those few who are still opposed to progress in medicine to which our science has chiefly contributed? A few years ago when we celebrated the birth of synthetic chemistry by commemorating the fiftieth anniversary of Perkins' discovery of the first anilin colour, one of these obstructionists stated in a discussion that he believed very few useful drugs had been put out by the manufacturing chemists, and that we should be better off if Perkins had never discovered coal-tar products. The anilin colours were cheap and gaudy and did not last, and the coal-tar drugs were in the same class. He believed the good that coal-tar products had done was being neutralised by the harm.

"In fact, it is no exaggeration to say that there is scarcely a department in medicine that has not directly benefited through the discovery of the coal-tar products and especially of the anilin dyes. It has provided the anatomist and pathologist with the means of staining various tissues and thus of studying not only their normal structure but the alterations caused by disease. It is the foundation upon which has been built the modern science of bacteriology, enabling the investigator in this field to distinguish between the different disease organisms and to determine their presence by various tests, and now it bids fair to equip the physician with the most potent weapons in the warfare against disease."

Architecture and Building

The Humane Aspect of the Arts.

(Paper read at Toynbee Hall, by C. F. A. Voysey, Architect, 23 York Place, Portman Square, London, W.)

We must remember that it needs many kinds of men to make a world; and it is the variety in thought and feeling, in temperament and outlook, that draws us together. Nevertheless, you must be weary of hearing first one artist and then another expatiate on his particular system for creating art and artists, or the importance of this or that kind of study.

But may we ask, what is it that we value and reverence most? What are the objects of universal sympathy and approval? What are the imperishable verities of human life? Surely they are human thoughts and feelings, the moral sentiments of love, reverence, purity, truth, unselfishness, grace, dignity, refinement, and many more which we all know and, happily, all possess in varying degrees. Fortunately in varying degrees, for we could not commune with one another were we all alike. There could be no argument, and consequently no progress, were we equally endowed.

Surely it is clear enough that Art is the manifestation of human thought and feeling. Hence its infinite complexity, and its constant change and development. The thoughts and feelings of one generation are never quite in tune with the next. Although moral sentiments are everlasting and universal, their order of importance and degree of intensity must vary with each individual. Heredity, environment and training increase the inequality of our thought and feeling; custom, nationality and climate also act in the same way. We are not all susceptible in like degree to outside influences.

Therefore we are in danger if we rely, for the manifestation of our own thought and feeling, on the expressions of others, no matter how venerable; we become insincere and careless of the truth.

If we concentrate our thought and attention on any particular school, such as the Impressionists, the pre-Raphaelites, the French, Italian, or Dutch, we are led to attach more importance to the means than to the end. Methods are studied while motives and main principles fade into the shade. Conventions are established and made the lines of least resistance, until they become so polished by thoughtless imitators, that we slide downhill without knowing it.

The mechanical appliances for saving labour and money have absorbed so much attention, that we have starved our spiritual nature. The charms of thought and feeling and ultimate improvement of character, are hidden by the battle-cries of contending parties. One will say that the Renaissance art is the only true art, Titian the only true painter, and Michael Angelo the only light for sculptors to follow. Just as in theological controversies religion is lost altogether in the babel of creeds. The arts are in a terrible maze and confusion. We ask how shall we make this thing, instead of why. Yet why is the more important. You answer obviously, to feed my starving family. But that we might do better as scavengers. That cannot be the whole reason. And if each man will ask and answer this question truly and thoroughly for himself, he will come to appreciate what is really entitled to the term art, and what is not. He will see that the love of beauty is implanted in the human breast to lead us on in the improvement of personal character. Art being the manifestation of thought and feeling, beauty must depend on the quality of the mind and heart of man.

We need to encourage each other in the belief that the beauty of the thought and feeling we have to manifest in our work is far more important than the system or manner of our expression. Grace and refinement, dignity, strength, repose, directness and truth, are all elements of moral character which can be expressed in our works. Possess those qualities, or have real love for them, and they will surely find expression. You cannot help expressing in your work the thoughts and emotions that are uppermost in your mind.

It is materialistic, theistic, socialistic ideas that make our modern objects so repulsively ugly and void of spiritual grace, reverence, delicacy, fitness and truth. Our modern clock, for instance, looks as if it were made for money, made to look better than it is, to catch the ignorant taste for pretentiousness and sham. It wags its ugly tongue with rude haste and stabs you with a harsh strike. Where are the peaceful, slow tick and deep vibrating tones of the old clocks, and the gentle, loving reminder of the soft, melodious gong?

It is because we no longer think of moral sentiments in connection with every-day objects that we have allowed them to degenerate into hideous offences. Sound, smell and sight, all are enemies to our better nature instead of sympathetic servants in league with mercy and loving-kindness.

Moral force alone makes art fruitful. Therefore all lectures and essays on the various means of expression are of very minor value. Practise, friend, the faculties you have, give rope to your better nature, leave conventions, and all forms of insincerity behind; be content to do the little insignificant daily duty unnoticed and unrewarded except by the thought that it truly expresses those moral qualities which you aspire to. Melody and harmony are Divine universal qualities appealing to us all. Should we crowd different materials, colours, forms and textures together in jostling confusions if we were trying to express melody and harmony? Should we try to make anything look better than it really is, if we were endeavouring to be true, or express truthfulness and fidelity? Should we imitate qualities naturally belonging to hand labour by machinery, and make believe the work is wrought with more care and exertion than it is? Deceptions are infinite in kind and degree, and poisonous to the character of a people; till at last they grow indifferent and think it does not matter how much they are deceived as long as they are pleased. Pleasure is then made the standard by which to measure our art and our conduct. Whither will it not lead us?

Simplicity in design is analogous to sincerity in character. The desire to be simple is born of the desire to be true. Complexity and duplicity are first cousins. True richness of design is quite compatible with simplicity, but elaboration and complexity are not. True richness requires that the reality shall be as true as the appearance. Things must be what they seem. And the richness must arise from the nobility and profusion of thought and feeling. True richness depends on quality, colours and textures will often produce not quantity. Accumulation of forms, what the ignorant and superficial will mistake for richness. But careful observation will quickly dispel the delusion, and then will follow our contempt and disgust at the fraud that has been played upon us.

This constant testing, trying and proving of art in the crucible of moral sense will lead to peace between mortals; we shall fight less vehemently one with another for contending methods or styles. Common interests in common qualities will take the place of partisan advocacy of particular processes. We shall rejoice in tracing the thoughts and feelings alive to-day in the manifestations of ancient times. No matter what race or nationality, the same sweet songs are chanted in a thousand languages.

If we are bent on being true men, we shall not remain content to utter foreign languages, copy foreign expressions, and pretend to feelings we know not of. Revolt we must against convention that is merely conformity without sincerity or understanding.

Custom or convention are powerful forces encouraging insincerity. We like to be regarded as learned and correct according to established standards of propriety; and many a man acts conventionally because it costs too much effort and involves too much sacrifice to think out a course for himself.

It is much easier to repeat the symmetrical arrangements in the parts of your architectural elevation which have been used before, than develop your building from the practical requirements of plan. A well-dressed man is one who is most fitly clad for his station and occupation. And so with architecture. The manner of a Grecian temple applied to the gin palace of a great city, is insulting to human understanding.

The silly sentiment of men which is excited by certain periods, affects their taste and judgment until they lose all sense of proportion and fitness. In some of the modern books on Renaissance art are given examples of building which, if carefully analysed as to their proportion, rhythm, repose of outline, composition and true expression of purpose and fit expression of their use, will be found totally wanting in these qualities. They are blindly admired on account of their associations, not because they are a true expression of our thought and feeling. The modern Renaissance architect does not make his elevation an expression of his plan, but subdues his plan to fit his elevation.

The same love of truth does not exercise that amount of control that the Gothic builders felt. The first step in the creation of all true art must be the determination to be true. No beauty can ever blossom from the tree of deception. And as long as we are reviving the examples of past ages, and digging among the ruins of antiquity, this loyalty to personal integrity is being neglected. We are growing content with the imitation of good manners, the imitation of right feeling and the imitation of conventional standards. Collectivism is affecting character, and we are crying out for a national style, which only leads to selfish convention, and are thereby becoming like machines; machines for making money, and not always able even to do that. If we would return to our better instincts, it must be through individual effort at personal thought and feeling, set free from the chains of an easy-going conventional respectability. And the more we look for those expressions of thought and feeling which we all admire, the less we shall be degraded by the machine or absorbed by the sense of our own importance.

Public schools are merely manufactories for the production of stereotyped individuals; souls are turned in the lathe of convention until they all think and feel alike, and great armies are yearly pitched into the market to reproduce what was once done because it was wanted, but now wanted no more. We are making machines out of human beings as fast as we can, because it is forgotten that human character is the only thing worth making, the only thing that is really productive. If you developed *that* in the art student, it would not matter if he followed an artistic craft or not, he would still be helping in the creation of beauty of some kind, and would certainly appreciate the work of others. But if instead of character you train one or two faculties for imitating something that in a few weeks the world will cease to require, you have only made so many machines that are out of date, swelling the great army of the unemployed.

The conclusion is that the exercise and cultivation of the moral sentiments being of universal importance, if made the basis of artistic training, would fit the student to any duty circumstances might seem to direct; whereas the training in the technical methods of the past, while valuable and useful in their place, will not do instead.

The old apprenticeship system, while remembering and recognising the importance of personal character, was governed by economic laws in a way that no unwieldy State control of education can ever accomplish.

The spirit of man needs nourishing as well as his body. In our anxiety to preserve the one we are losing the other. And it seems quite possible to blend in all technical training the cultivation of moral principles and teach the student to look first for the thing expressed and then the method of expression afterwards. And by this means cast from us for ever the idolatry into which we have fallen.

New Parliament House.

Sir,—The Government having decided to throw open the above to public competition is a step in the right direction. Objectionable restrictions spring up, however, in this as in the majority of competitions promoted by public bodies. The true spirit of competition is to discover new talent in the profession, as witness the London County Hall competition, which brought to light an unknown man, and not the spirit of something for nothing. The Competition Reform Society, promoted by the Institute of British Architects, has been most successful in purifying competition methods. The membership, which includes all the best London and provincial architects, pledge themselves to refrain from giving any assistance, thus rendering a competition largely abortive, until the conditions supplied to architects are approved by the society. The new Parliament House conditions, just issued by the Government, contain this clause: "The Government reserves the right to adopt or reject any of the designs, to dispense with architect's supervision, and to carry out the work under the supervision of its own officers." This clause is identical with the most serious one the institute has had to deal with, and I feel sure that the Government architect can have no sympathy with it, being himself a fellow of the institute. To explain: A building is to be erected, and the best scheme is required. Architects are invited to send in plans for a building costing, say, £100,000. These will take weeks to prepare, and will cost each architect anything from £100 out of pocket expenses. If 50 architects compete the Executive get at the lowest estimate £5000 worth of work and ideas, for which they offer an average of about £1000 in prizes. The Government prizes in this instance are more generous, perhaps, only showing more plainly their ultimate intention. An architect runs a big risk (however trustful of his own ability he may be) against seeing any return whatever for his outlay, therefore he must see that the inducements offered are sufficiently attractive, or he will refrain and leave the competition to a few irresponsibles. I would suggest the following, which I recommend to the notice of the New Zealand Institute: Remove the objectionable clause and make it absolute that the author of the designs placed first be appointed architect to carry out the work on the usual professional terms. Pay premiums of, say, £500, £250, and £100 to the next three placed in order of merit by the assessor, and add: "If through any cause the Government decides not to go on with any of the schemes placed by the assessor they will pay the authors of the three designs in order of merit £500, £250, and £100 respectively, and will return all plans, whether entitled to a premium or not." Or this: "Preliminary plans and sketches to a small scale in pencil to be submitted, from these a certain number, say six, to be selected, and the others returned. The selected six to be fully developed and finished by the authors, each to be paid, say £300 for his work. The six schemes, under *nom de plume* or numbered, to be then submitted to an independent assessor of repute for adjudication, the one placed first to be appointed architect to carry out the work, etc., as before mentioned." This is the latest, and I think, the best method. Who of us architects has not visited some exhibition of competition drawings (witness the Town Hall here), and our hearts ached at the sight of the vast number of beautiful and elaborately finished drawings, the result of hours of thoughtful study and days of infinite pains, useless labour all, after the decision is given, and not worth more to the author than so much waste paper. We have to run the risk of faulty judgment, of prejudice in style, of preconceived modes of planning, and even of crooked business in making of awards, so, I think, I can speak for the whole of the profession when I claim for them a fair field, no favour, and a generous reward for the fortunate one who comes out on top.

HAROLD MATTHEWMAN.

Here and There.

(Compiled for PROGRESS.)

Apropos the smoke nuisance. "What you require in Leeds is not architecture, but a hose pipe." That is what the late Frank Bedford said to the Secretary of the Leeds and Yorkshire Architectural Society, when he was asked to lecture before the Society on an architectural subject. Mr. Sidney D. Kitson, F.R.I.B.A., who told this story in the course of his presidential address the other day, admitted that, while the reply was "not aggressively polite," it contained some germs of truth. He might have added that many cities besides Leeds need to exert themselves to secure cleanliness—less smoke in the atmosphere and less mud in the streets. Good artitecture may, and often does, exist among dirty surroundings. But its permanence and the appreciation of its beauty depend not a little upon the success of efforts made to mitigate the smoke evil. Sometimes in London we are startled by the discovery of unsuspected excellence in a familiar building; this generally means that its facade has just been treated with the sand blast.

* * *

"Capping" is not the only excuse for rowdyism among the cultured. Neither is there but one way for the *Illuminati* to meet it. There is, for example, the

"Stout" method, which, being followed all round in this Dominion, makes matters worse. And there is John Burns' way, which makes them better. Here is an instance:—On the occasion of Mr. Burns' visit to Liverpool the students of the School of Architecture perpetrated a rather elaborate joke. Attired in their working overalls and wearing "artistic" ties, vastly exaggerated in size and colour, they presented him with an "illuminated address" of welcome. The "address" was carried by two students and bore a huge seal. It was embellished by quaint caricatures of Mr. Burns, and recited his claims to their approval. One was that his ability is so great that it is rumoured he is even able to fill up Form IV. Another was that he has had the signal distinction of being photographed between Lord Lansdowne and Mr. F. E. Smith. The address also congratulated the President of the Local Government Board on his "uncontrollable appetite for work." Mr. Burns made a humorous reply to what he described as "the most artistic practical joke I've seen."

* * *

Those who dream of fireproof houses will be glad. The growing use of ferro-concrete for civic and commercial buildings is very apparent. But it is only occasionally that we find this form of construction chosen for domestic buildings. Yet it is quite possible that an appreciation of the fire-resisting qualities of ferro-concrete may lead to its being more widely used for dwelling houses also. The writer of the Engineering Notes in the *Daily Telegraph* (London), draws attention to the fact that the purchaser of one of the mansions at the corner of Upper Grosvenor Street and Park Street, London, was influenced in favour of ferro-concrete because he was advised that this form of construction constituted the most complete fire-resisting structure known to science. In these mansions, not only the floors, but also the whole of the staircases and roofs consist of ferro-concrete.

* * *

Architectural enterprise in original design did not pass away with any of the great architects. A change in the design of the Liverpool Cathedral gives a local critic the opportunity to illustrate the subject in one of the local papers. The two towers, at best dividing the interest and at worst producing a confused outline through their mutual overlapping, are gone. In their place one huge tower, of unexampled grandeur, is to be reared astride the nave, two and a half bays of which it will absorb. Already between the aisle arcades there is a space of 53ft. 6in., measured between the centres of the piers. Professor Simpson suggested that, as in several Italian cathedrals, this width might be increased. The genius of the young architect has evolved a bolder idea. His tower is to be over 100 feet square, measured in the same way, and will give a clear internal breadth of 83ft., the full width between the outside walls. When it is remembered that the central tower at York is but 65ft. square, though it is the largest in England, the courage of the proposal will be perceived."

* * *

Town planning is derided by many, chiefly by Dives, who thinks that Lazarus ought not to be deprived of his accustomed life shortness, wherein is Dives logical, for he argues to himself (no doubt) that the sooner the poor man gets out of a world where he is badly off, the better it must be for him. Happily the day of Dives is passing, like the days of other dogs before him. Town planning, says Dives, is a costly luxury. As a matter of fact, it is more often the absence of town planning which in the long run proves most costly. Mr. Henry R. Aldridge refers to this point in a recent article: "The ultimate cost of bad planning," he says, "to Municipal authorities and to private owners will certainly reach a total of scores of millions of pounds. During the past twenty years vast sums have been expended on street widenings, which would not have been needed if the lines of traffic had been considered, and an intelligent foresight exercised by those responsible for the development of estates in the past." One reason why so many houses in the older suburbs are empty is no doubt the superior attractiveness of the better-planned "garden suburbs."

NOTES.

AUCKLAND.

Mr. MAHONEY reports: Brick church at Hamilton. Sketches for premises for Bank of New Zealand at Pukekohe. Small concrete church at Tuakau. Tenders for wooden villa at Ponsonby, 10 rooms.

J. CURRIE & SONS report: Tenders being called for a two-storeyed brick factory in King's Drive. Tenders being called for an eight-roomed residence, Mt. Eden.

Mr. GOLDSBORO reports: Office and store for Dalgety & Co., Custom Street, Auckland. Just completed, Hellaby's abattoir and works. Two residences Remuera, 14 rooms each. Wood and brick; contractors, O. E. Farrow and John Row. Two-storeyed residence at Epsom; contractor, J. Sayers. Two-storeyed house, Parnell, and bungalow, Parnell; contractors, Brook & Sons. Manurewa, Public Hall, camerated concrete; contractor, W. Firth.

Mr. EDWARD BARTLEY reports: Plans being prepared for alterations and additions to Masonic Lodge, Devonport. Plans being prepared for 7-roomed residence, Remuera. Accepted tender for Mr. John Edson's warehouse, alterations and additions to same, fronting Lorne Street; price, £6444; contractors, Grevatt & Son.

Correspondence.

Rough Cast.

(To the Editor.)

Christchurch, Feb. 18, 1911.

Sir,—Being somewhat exercised in mind regarding the merits and demerits of rough casting, I am taking the liberty of seeking your advice, which I feel sure you will readily impart.

1. Half the people I have spoken to about the matter say that rough casting on wood lathes is quite satisfactory if done properly, and the other half—many of whom are practical men—say: "Don't have it on any account." One technical paper I read condemns the use of metal lathing, for the reason that in course of time is rusts through, with the result that pieces of plaster drop off. The same paper advocates metal lathing made of "ingot iron," and then coated with a mineral paint. What is your opinion of this?

2. I have just read a booklet dealing with "Keylock" interlocking steel lathing, and the inventor claims that 90 per cent. of the lathing is embedded in the covering matter, and that if the remaining 10 per cent. should corrode, the stability of the wall will not be affected. That is a point on which I should like independent advice. A chain is no stronger than the weakest link, and if the 10 per cent. of uncovered lathing corrodes at the vital place, i.e., where it is fastened with nails to the studs—which seems to me very probable—then the whole thing would certainly be affected, and very seriously at that. Judging from the information I have collected, I have concluded that rough casting on brick work or concrete blocks is the ideal method, although considerably dearer than lathing.

3. Another point on which I seek information is regarding the best method of waterproofing. In a recent issue of your journal I read an article re "Hydrated Lime in Cement Work," which seemed to me to be a solution of the waterproofing question. Can "Hydrated Lime" be procured, or is it merely a process than can be adopted by the plasterer?

4. I contemplate having a house erected with walls merely 3in. thick and 10 feet high, of concrete blocks rough cast on the outside. Reinforcing would be done by means of crimped wire running horizontally. Would that be strong enough or would you advise 4in. blocks for the outside walls?

5. I am not a builder, and in raising these questions I have no "axe to grind," but simply desire to find out the best method of building a satisfactory home. Thanking you in advance,—Yours faithfully,

BUNGALOW.

1. Metal laths make a much stronger job than wood. Wood laths are durable only if the wood is a really good one, such as oak or jarrah. Painted metal laths are unreliable, as the paint often peels off before the plaster is applied.

2. It is essential that metal laths should be as completely embedded in the plaster as possible to prevent corrosion. Good metal laths must be of thick metal, say 18 or 20 gauge, with a mesh say ½in. x 1½in. A smaller mesh is not so good, because the plaster cannot be applied to

a large mesh without embedding the metal, while with a small mesh the plaster can be applied with only just enough key to hold it on and nearly all the metal can be seen from the back.

3. Waterproofing precautions of special nature are not necessary with rough cast on wood framing, as the construction is practically that of a hollow wall. Hydrated lime can be procured from Francis Holmes, Wellington. (See our advt.).

4. A concrete block wall 3in. thick would not be satisfactory. If suitable shingle is available, blocks with sides 2½in. or 3in. thick, and with a cavity, say 4in. wide, would make a good job. The blocks would be like long boxes without top or bottom, and with sides and ends 2½in. or 3in. thick, the whole wall being 9in. to 10in. through. Where special strength was required, the cavities could be filled solid as the blocks were built up, and left hollow elsewhere.

5. Good rough cast is better than indifferent wood, and is more draught proof and waterproof. Good brick or concrete is the best, and lasts literally ten times as long. The cost of a cottage such as recently illustrated in our columns would be less than 10 per cent. dearer than wood. The cost of upkeep would soon reduce this, and in 20 or 30 years the wood building would be practically valueless.—Editor.

Scaffolds.

The care of scaffolds taken by one of our statutes is a thing of the goodness of which one is reminded by the following paragraph from *The Builder*:—A curious scaffolding fatality, illustrating at once the very slight margin of safety that is often considered sufficient in scaffold construction, and the danger of dropping heavy objects on a scaffold, is reported from Sheffield. At an inquest held on the body of John Ogden, builder's labourer, it was shown that deceased met his death through the breaking of a cross-bar supporting one end of the scaffold on which he was at work. The foreman in charge at the time of the accident, attributed the breaking of the bar to the way in which deceased emptied the bricks out of his hod. He dropped them when some distance from the ground, instead of lowering them. He had often been spoken to about this practice, but he had said in reply that he was too tall to bend down. Other witnesses also attributed the accident to the dropping of the bricks, and the jury decided that death was due to an accident which could not have been foreseen.

The Flat Roof.

Flat-roofed houses are commonly regarded as quite unsuited for wet climates and the steep pitched roofs, which are thought to be demanded as a protection against the weather, are often made features of great interest and value from an aesthetic point of view. An architect who chooses a flat-roofed construction would seem to be throwing away a chance of obtaining picturesque effect, even if he is not adopting a form of structure of doubtful

FIRST

Cover Design Competition.

A Prize of Two Guineas is offered for the best design in black and white · either line or wash drawing—suitable for a full page cover design for a Special Industrial Number of this Journal.

The wording to be as follows:

Progress. New Zealand Industrial Exhibition Souvenir Number. June, 1911. 1/-

The words

"Progress Exhibition Souvenir Number"

to be accentuated.

Designs to be drawn about half as large again as they are to be reproduced, and to be sent in not later than March 20th, and clearly marked

"Cover Design Competition."

The design will be submitted to a competent judge, whose decision shall be final. A coupon taken from the current issue (see page 596) must be sent with each design.

SECOND

Cover Design Competition.

Another Prize of One Guinea will be offered for the best full page design in black and white—either line or wash drawing—suitable for a Special Motor Number of this Journal.

The wording to be as follows:

Progress—Special Motor Number.
(Leave Space for Month Here.), 1911.

And to contain something on the subject of Motors, significant of speed.

Designs to be drawn about half as large again as it is intended they should be reproduced, and sent in not later than April 20th, marked clearly

"Cover Design Competition."

with name and full address on separate piece of paper.

The designs will be submitted to a competent judge whose decision shall be final. This competition is limited to subscribers of this Journal.

serviceableness. Such is the general view, but it is not that of Mr. Edgar Wood, whose interesting flat-roofed house of "Upmeads," Stafford, is illustrated and described in *Country Life*. The writer of the article, who no doubt expresses the architect's views on the subject, tells us of the advantages of flat roofs. With such roofs, he points out, the plan can have any sort of projection or recess, without the creation of difficulties higher up. Access to a pitched roof for the repair of slate or tile or for the change of a chimney-pot is often troublesome, and not seldom involves the use of scaffolding. A flat roof can be made absolutely weather-proof. It allows a reduction in the number of down pipes necessary to carry off rain water, and gives immunity from the vagaries of wind and driven rain and snow, which are apt to try slate or tile beyond their endurance. From the point of view of habitability must be mentioned the avoidance of sloping ceilings in attic bedrooms, though they are no great harm, and the provision of an additional outdoor living-room in summer. From such an elevation there may, perhaps, be enjoyed fine distant views, invisible from the garden by reason of encircling trees, and in any case the garden itself lies open beneath one's eyes like an unrolled map. Probably most people would agree that the appearance of "Upmeads" is somewhat forbidding. But it is a bold departure from the conventional which might win more approval if it were less unfamiliar.

Architects and Drawing.

("Illustrated Carpenter and Builder.")

The relation between draughtsmanship and architecture was the subject discussed at the recent meeting of the Architectural Association. Mr. Gerald C. Horsley introduced the subject in a paper, which boldly proclaimed its main contention: "That fine draughtsmanship conduces to fine architecture." It is interesting to find an eminent architect putting in a plea for fine drawing in this uncompromising way, because the trend of discussion on this subject lately has been rather in the direction of belittling drawing as a handmaid of architecture. The misleading character of some perspectives and the difference in effect produced by the drawing and by the actual building have been commented upon, and it has sometimes been suggested that architects have sought to conceal the poverty of their architecture behind the excellence of their drawings. There is no doubt constant need to remind the architectural student that an excellent drawing is not architecture. Nevertheless, it may be a symbol of fine architecture, and Mr. Horsley maintains that it generally aids its achievement. The philosophical basis of his plea for good draughtsmanship is interesting. Mr. Hosley's idea is that skill in drawing, once it is really attained, becomes a living mental force to the artist, an added force to his mental equipment. A fine draughtsman, he thinks, appreciates the qualities of objects better than a poor draughtsman can. Designing being a mental process, the importance of added mental force to the artist must result in more powerful work. Excellence in drawing has an educative influence which the architect who would be a capable artist cannot afford to neglect. Mr. Horsley holds that working drawings should not only give directions to the workmen; they should convey to their minds the very spirit and heart of the design. In the same way, sketches made for clients should not be mere diagrams; they should be drawn with intelligence and care, to create an interest in the architect's purpose and an understanding of his aim. In the interesting discussion which followed Mr. Horsley's insistence on the importance of drawing found general agreement, though some speakers dissented from his views as to the logical connection between drawing and architecture. Mr. C. F. A. Voysey, for instance, argued that drawing, like other forms of art, simply expressed qualities already present in the artist.

Answers to Queries.

Tank Pipes.—With the delivery pipe entering at the top of receiving tank, the duty of the pump would be constant, because the water has always to be lifted to the same level, whereas if the pipe is connected to the bottom of the tank the duty of the pump will vary according to the height of water in the receiving tank. On the average, therefore, the duty will be less than in the case where the water is delivered into the top of the tank. This is accounted for by the fact that the pressure of water varies directly with the head, i.e., depth or height. The quantity of water stored does not affect the head.—E. W. Hursthouse.

As a general rule, the care of 20 h.p. is now recognised as the limit to which say four out of five—if not more—motorists commit themselves. The cost of maintenance has depopularised (the word may not be in the Dictionary, but it will serve) the higher-powered car, and most garage proprietors who come in direct contact with the men who use their cars will tell inquirer that the vehicles now in use are mainly in the 12 h.p.-20-h.p. category.

Patents.

The following list of applications for Patents, filed in New Zealand during the month ending February 15th, 1911, has been specially prepared for PROGRESS.

28883—Moore, R. F., Auckland: Reinforced concrete structure.
28884—Sanderson, C. J., Auckland: Window sash lowering, &c.
28885—Howcroft, J., Caulfield, Vic.: Axle cap.
28886—Wallace, A. C. J., Marton: Sock and stocking.
28887—Wallace, A. C. J., Marton: Swingletree.
28888—Elder, D., Onehunga: Wire wrapping machine.
28889—Imperial Cash Register Company, Ltd., Wellington: Cash register.
28890—Lomas, G., Sydenham: Truck hauling.
28891—Hercus, J., Graham, E. P., and Morton, W., all of Dunedin: Water level observer, etc.
28892—August, H., Invercargill: Commode.
28893—Kidd, T., Invercargill: Milking apparatus.
28894—Symes, J., Fryerstown, Vic.: Excavator.
28895—Drew, H. V., Timaru: Dust-laying method.
28896—Herrold, A. B., Auckland: Fanlight opening and closing.
28897—Bressey, E. F., Auckland: Marine engine racing preventor.
28898—Huber, A., Kaponga: Milk can.
28899—Ingram, J., Richmond: Milk separator.
28900—Alexander, L. W., and Hall, J. W., both of Auckland: Non-refillable bottle.
28901—Johnston, G., Glasgow, Scot.: Filtering apparatus.
28902—Johnston, G., Glasgow, Scot.: Quartz, &c., crusher.
28903—Preston, J. E., Stockport, Eng.: Galvanic battery.
28904—Davis, H. T., Adelaide, S. Aust.: Time table, etc.
28905—Haulker, W., Nelson: Cask manufacture.
28906—Riley, A. H., Ponsonby: Billy, milk, etc., can.
28907—Tootell, C., Melbourne, Vic.: Fly screen.
28908—Penny, G. W., Gore: Fencing dropper.
28909—McNicoll, R. W., Dunedin: Brooch fastener.
28910—Young, A. E., Christchurch, and Holmes, G. G., jun., Pigeon Bay: Lawn mower attachment.
28911—Andrews, F., Mercer: Hair pin.
28912—Morton, W., Dunedin: Hat pin point protector.
28913—Aston, W. L., and Aston, E. A. V., both of Upper Riccarton: Bicycle saddle cushion.
28914—Henderson, M., Onehunga: Life saving boat.
28915—Boyce, W. L., Eulabil, N.S.W.: Cattle enclosure.
28916—Hudson, F., Malvern, Vic.: Table top connection.
28917—Lumiere, L., Lyons, France: Acoustical instrument.
28918—McKellar, C. G. M., Christchurch: Tennis racquet.
28919—Gilmour, J., Gisborne: Main water pipe leak repairing.
28920—Morton, W., Dunedin: Franking machine.
28921—Joy, W., Corringham, H. A., both of Auckland: Hat pin.
28922—Currie, F., Hamilton: Self-indexing account book.
28923—Holden, A., Christchurch: Oil separator.
28924—Holden, A., Christchurch: Telephone message receiving device.
28925—Broomby, J. J., Launceston, and Petersen, W., Westbury, Tasmania: Treshing machine.
28926—Currie, S. D., Te Aroha: Internal combustion engine power transmission.
28927—Currie, S. D., Te Aroha: Teat-cup.
28928—Good Inventions Company, Brooklyn, U.S.A.: Combing machine.
28929—Benson, R. S., Middleton, St. George, and Head, Wrightson and Co., Limited, Thornaby-on-Tees, Eng.: Coal-washing machine.
28930—United Shoe Machinery Company, Paterson, U.S.A.: Uppers conforming to last.
28931—Hodsdon, H., Brisbane, Q.: Enumerating machine.
28932—Voorhees, G. T., New York, U.S.A.: Gas compressor.
28933—Dixon, F. and T., Mataura: Gear wheel for traction engine.
28934—Thaeter, E., Paddington, N.S.W.: Wash board.
28935—Sorenson, A., Panmure: Telescopic ladder.
28936—Nesbitt, C. L., Toronto, Can.: Piano, etc., keyboard note guide.
28937—Unsworth, E., Napier: Concrete wall construction.
28938—Trimming, E., and Basley, G. W., both of Auckland: Milking apparatus.
28939—Phillips, L. J., Kaitoke: Milking machine can gauge, etc.
28940—Lumiere, L., Lyons, France: Acoustical instrument.
28941—Doudney, R. P., Farringdon, Eng.: Carburetter.
28942—Lee, H. W., and Weedman, G. H., both of Mount Morgan, Q.: Mine alarm.
28943—Whitney, A. N., Melbourne, Vic.: Rifle range, etc.
28944—United Shoe Machinery Company, Paterson, U.S.A.: Heeling machine.
28945—United Shoe Machinery Company, Paterson, U.S.A.: Heel attaching machine.
28946—United Shoe Machinery Company, Paterson, U.S.A.: Eyeletting machine.
28947—United Shoe Machinery Company, Paterson, U.S.A.: Heeling machine.
28948—United Shoe Machinery Company, Paterson, U.S.A.: Heel trimming machine.
28949—Muir, R. L., New York, U.S.A.: Saw.
28950—Fear, F. J. W., Wellington: Scissors, shears, etc.
28951—Andrews, W., and Beaven, A. W., Christchurch: Oil engine and vacuum pump.
28952—Robinson, G. H., and Beldam, C. A., both of London, Eng.: Piston rod, etc., packing.
28953—Sorensen, A., Panmure: Level.
28954—Cavill, G. T., Sydney, N.S.W.: Change-speed spur.
28955—Hicks, J. W., Melbourne, Vic.: Metal clothes peg, etc.
28956—Mjolkningsmaskin Aktiebolaget, Hornsberg, Sweden: Milking machine air supply tubing coupling device.
28957—Mjolkningsmaskin Aktiebolaget, Hornsberg, Sweden: Milking machine.
28958—Beadle, J., Dunedin: Metal, etc., preserving compound.
28959—McCrae, D., Wellington: Bedding.
28960—Jenkins, H. R., Eltham: Milk sampler.
28961—Player, C. E., Birkenhead: Mat-slipping prevention.
28962—Lutz, E. F., Christchurch: Directory.
28963—Sandiford, T. M., Masterton: Gas-lamp lighter, etc.
28964—Tate, W. T., Glebe, N.S.W.: Chimney-cleaning device.
28965—Hamilton, W. L., Glasgow, Scot.: Aerial railway.
28966—Bourcourd, A. E., London, Eng.: Iron manufacture.
28967—Dalziel, W., Blenheim: Potato digger.
28968—Neugeschwender, J. J., Timaru: Go-cart strap.
28969—Connell, R., Christchurch: Tire inflator.
28970—McKellar, C. G., Christchurch: Closet basin.
28971—Holden, F., Frankton Junction: Hat pin.
28972—Middleton, D. M., Greymouth, and Dewhirst, J. A., Kotuku: Saw bench feed.
28973—Seifert, A., Masterton: Flax-gripper and conveyor.
28974—Seifert, A., Masterton: Flax-blade sorting.
28975—James, A. J., Christchurch: Cycle pump connection.
28976—Flood, W., Enmore, N.S.W.: Door stop and lock.
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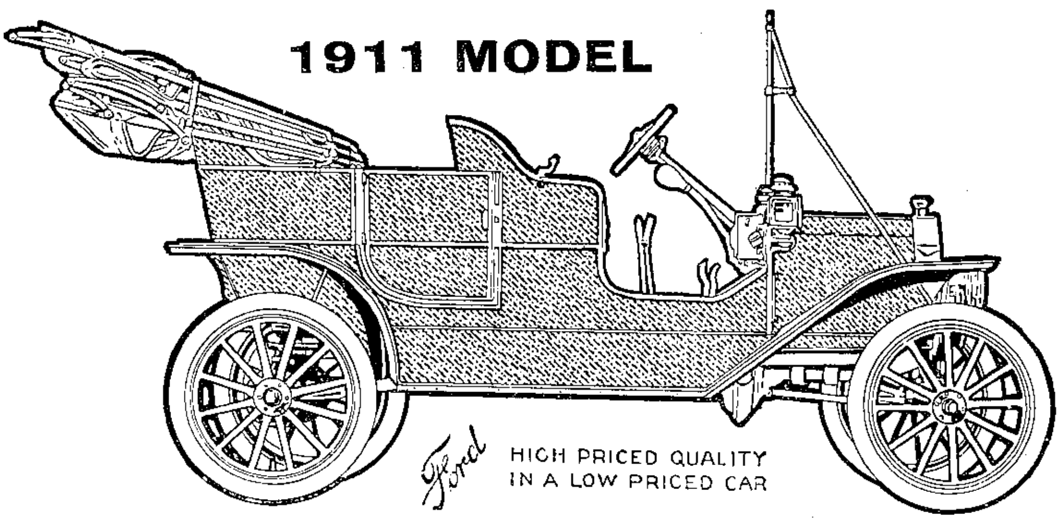

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