VOL. XXXI. No.6 JUNE 1946

MECCANO MAGAZINE

NOTHING LIKE LEATHER!

6D.

Next Month: "THE L.N.E.R. CLYDE STEAMER FLEET." By W. A. C. Smith

MECCANO MAGAZINE

Editorial Office:
Binns Road
Liverpool 13
England

Vol XXXI
No. 6
June 1946

With the Editor

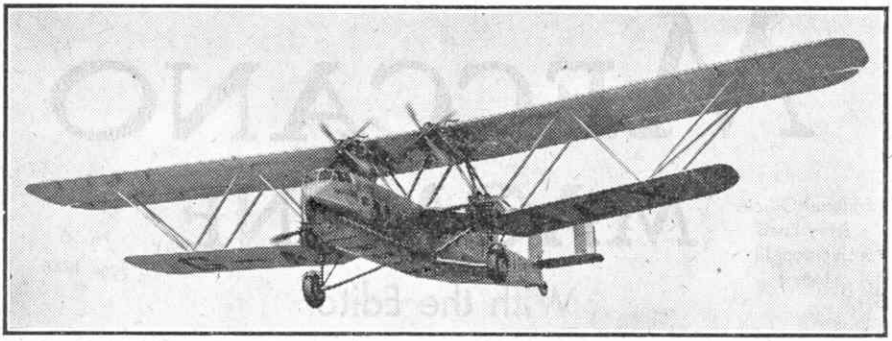
A Half Horse Power Insect

Insects are wonderful creatures. There are insect carpenters, masons, weavers and bridge builders, and others that are cunning enough to pretend to be sticks, leaves or even thorns, in order to hide themselves on the stems of plants. There is even one that pretends to be an orchid in order to lure unsuspecting butterflies to their doom. Books indeed have been written about the wonders of insect life, but I am afraid that one astonishing achievement related in last month's *"M.M."* is beyond the capacity of any one of them. This is flight at 800 m.p.h., attributed to the deer botfly, an American insect.

This story began about nine years ago with the report that the insect, apparently one resembling our own honey bee, could fly so fast that it would be capable of going round the Earth in little more than a day. This report was mentioned in the *"M.M."* at the time, with a suggestion that the insect's speed had been exaggerated. Naturally it aroused the greatest interest. Scientists calculated that the insect must be capable of exerting half a horse power, and the wind resistance it would meet in full flight was shown to be incredibly high, while experiments with models demonstrated that at speeds far less than 800 m.p.h. it would actually be invisible in flight. In view of this it is not surprising that a reader has taken me to task because the story was included in Mr. Carver's article *"Fifteen Thousand Miles a Second"* in last month's *"M.M."* The wonder is how to explain the measurements, said to have been made with the aid of a special camera, that gave rise to the story. Possibly there was a conspiracy between two of the insects, one of them hovering near the finishing line ready to dash across as the other started down the course!

This is not the first time that incredible speeds have been attributed to insects. At one time it was asserted that the warble fly could travel at 700 m.p.h., but its speed was later pulled back to the comparatively leisurely rate of 40 m.p.h. The record seems to be held by an Australian dragonfly that was timed at 55 m.p.h. The queen honey bee apparently is capable of 20 m.p.h., and the common working bee is only 5 m.p.h. slower. The wasp should be easier to escape from, for its speed apparently is only 12 m.p.h., but perhaps an angry wasp can improve upon this. It is interesting to find that the house fly can travel at the rate of 5 m.p.h. only.

This Month's Articles



Handley Page H.P.37 air liner "Hannibal," a type described by the author as "the world's most comfortable vehicle." Photograph by courtesy of "Flight."

Journeys by Air

By C. G. Grey

OUR much-respected Editor has suggested that I should do an article on "*A Journey by Air*," because so many readers have flown short distances that they want to know what a real journey is like. That is a tall order, because an air journey may mean anything between a trip from Speke (which is Liverpool) to the Isle of Man, and a journey from London to Australia, the longest air route in the world, and that may take three days or it may take three weeks, according to the type of aircraft and your "priority."

Still, as I have been in this flying game since 1908, which is 38 years, I may perhaps give some idea of what air journeys are like and have been like. And remember that, with half the world in a state of after-war chaos, air journeys to-day are nothing like what they ought to be. When that great affair called the Provisional International Civil Aviation Organisation, known as P.I.C.A.O., has done its provisional organising, and has become I.C.A.O., we may hope for law, order and decency in air journeys such as used to exist in travel by rail or steamship—which are both pretty beastly in these days.

Alec Henshaw, holder of the England to the Cape record, and one of the finest pilots in this, or any other country, said to me a short while ago: "Flying is the finest way in the world of getting about the country quickly if you're not in a hurry." And that is a stock joke among aviators, merely because they know how quickly one *could* get about if only Radar and a few other things were more fully developed and if the ground organisation worked properly—which it never has done quite.

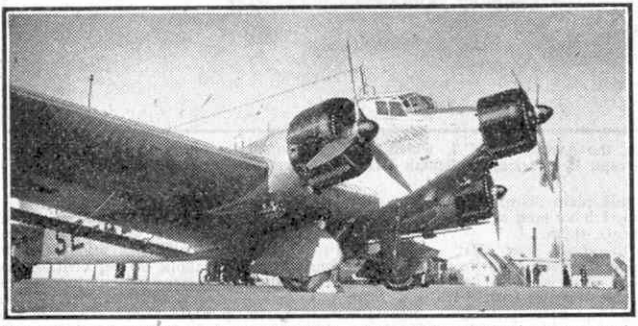
The best period in history for air journeys was from about 1936 to the outbreak of war in 1939. In those days you booked your ticket and reserved a seat at any good travel agency in any big European town or city, and you were sure of getting it. If all seats in the machine in which you wanted to travel were already booked, the office told you so, and you were booked for the next machine—or, if there happened to be a big demand for seats, the airline probably put on an extra machine, just as railways, even to-day, put on relief trains.

Then one went at a stated time to the place from which the aerodrome bus started and was driven to the aerodrome. That has always been one of the weak spots in air journeys. Everywhere, even in the United States, the terminal aerodromes are ten or fifteen miles from the centre of the town, and the time taken to get from the centre to the aerodrome is generally enough for the aeroplane to fly 100 miles or more.

I remember that on the London-Paris route, even with slow aircraft which took 3½ hours to fly from aerodrome to aerodrome, the time spent on the ground between the city terminus and the take-off of the aeroplane and between alighting at the aerodrome and arriving at the city terminus at the other end, what with passing Customs and all the rest of it,

was much more than the time spent in the air. But even so it was quicker than the best trains and boats.

Moreover, there were often days when the aircraft made their journey and the boats did not. Sometimes boats were held up by fog when the airports were clear, and the aircraft flew over the fog which only existed a few miles inland.



The 3-engined Junkers Ju 52/3m air liner. The machine shown here was used before the war by Swedish Air Lines.

I remember flying from London to Berlin in one of the dear old Junkers 52s, at more than 200 m.p.h., when that type only did 140 m.p.h. There was a shrieking westerly gale behind us, the North Sea was a solid white mass of foam, and all across Germany the sand of Brandenburg nearly blotted out the landscape. Not a boat put to sea, and friends of mine who had left the day before, and were crossing Germany by train while we were flying over it, told me that the railway carriages were thick with sand which was driven through the ventilators.

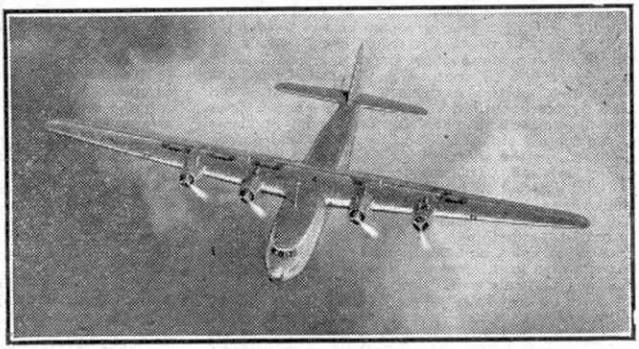
The wind was so strong that it was practically flat, without waves or gusts. But there was one funny incident. The sky was solid grey cloud, but near Hanover we saw a sheet of sunshine, penetrating between two layers of cloud, far ahead. As we flew into it the aeroplane dropped suddenly, as if hit on top by a big weight. And I still have a mental picture of a friend, who was on the other side of the gangway, sitting in the air just above the arm of his seat in exactly the same attitude in which he had been in the seat. I suppose I was the same. The machine had just dropped and left us in the air.

We sat down again on the seats in a second at most, without any particular bump, and my friend, a clever aircraft designer, leaned across and said: "I am so glad that the German designers take care to allow a special factor of safety in their wings for gusts."

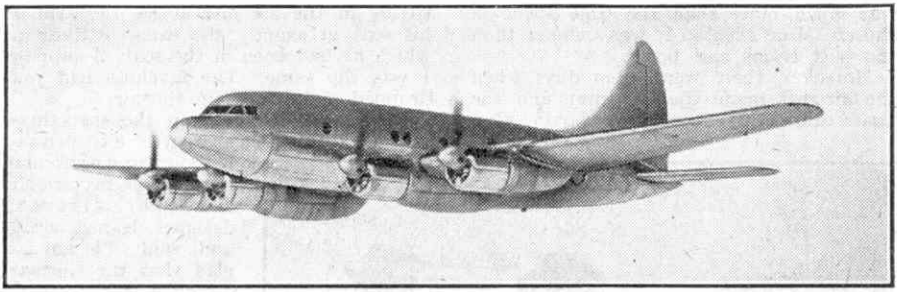
I may say that one of the best examples of German efficiency was the way in which they ran the ground services, such as Customs, passports, baggage transfers, tickets and so forth. If only our National-Socialist airlines run themselves as efficiently as the old Luft Hansa used to do, we shall have nothing at which to grumble.

For the matter of that our own Imperial Airways of that period were as good, and even though our Customs arrangements and passport examinations were run by the Government there was nothing about which to grumble, compared with the discomfort and delay at the seaports.

I have pleasant memories of flying from Paris to Croydon in one of the four-engined Handley-Page 37s, the old "Hannibal" type, on a bright sunny day with a southerly wind to help us. These H.P.s were the most perfectly upholstered vehicles in which I have travelled. Any



Armstrong Whitworth "Ensign." Photograph by courtesy of "The Aeroplane."



One of Britain's latest air liners, the Avro "Tudor" I, which is to go into service on the North Atlantic air route. Photograph by courtesy of British Overseas Airways Corporation.

Pullman car or motor car was just plain discomfort compared with them, and nothing I have seen of the most modern passenger craft beats them.

We had a first-class cold lunch on the way. My table-fellows were a young oil engineer and his wife straight from the Anglo-Persian oil-fields, and a well-to-do man who had, I saw later, a smart Bentley car and a chauffeur waiting for him. In a noisy, jolting, rolling, dusty railway carriage we should probably have munched in silence. Up there in the sunlight and fresh air we chatted about the Persian Gulf and the fun and games of Paris, and motor-cars and all sorts of things, like old friends. And the engines on those H.P.s were carried so well outboard that they did not interfere with conversation. They were slow, but they were the last word in luxury travel.

And those pilots knew their routes. I remember coming into Le Bourget, the Paris airport, in another H.P. with the famous O. P. Jones as pilot. There had been queer patches of fog all the way. When we got near Paris we could see the general lay of the country between fog-banks, and the Eiffel Tower sticking up, but the airport was fairly well under a blanket. It was the sort of fog which on a road would keep one's speed down to about 30 m.p.h. But O. P. kept straight on. Then he turned steadily but steeply to the left, and I saw the roofs of some tall blocks of flats under the wing-tip. A few seconds later we sat down without a bump, and taxied up to the Customs barrier.

I asked O. P. afterwards how he did it. He said that it was quite simple. If he could see the Eiffel Tower and some of the high ground he knew the direction of approach. And if, when he got nearer, he could see the roofs of the flats he knew when to put the machine down and "feel for the ground." He, and some others of the old Imperial pilots, were wizards at that game.

There is quite a modern story of O. P. which I must tell. Only a year or so ago he was bringing a load of passengers to Prestwick from Canada, in one of the big four-engined liners. In mid-Atlantic at night he left the controls to the second pilot and was sitting at the navigator's table working out some figures about arrival. The flight-engineer was squatting on the floor-plates chatting to him. Suddenly all the engines stopped. O. P. looked up and quietly remarked, in the silence: "Bit quiet, isn't it?"

That was all. The engineer spun round like a top, and scuttled on hands and knees into the pilots' compartment like a rabbit down a hole. The co-pilot had pulled the wrong plug, or pressed the wrong button, or something. The engineer put it back again in a second, and the engines picked up at once. But it was a grim moment. The only person awake who was perfectly calm was O. P. Jones.

I could go on all day telling stories of pilots I have known, or with whom I have flown. They all illustrate in one way or another the description of air journeys. But I must say something of modern air travel. Don't let it put you off flying. We shall get over all these official hindrances in time.

The other day a friend of mine wanted to fly to Paris. He booked two seats, a week in advance, with British Overseas Airways, and was lucky to get them, considering that about 80 per cent. of the seats are reserved for Government priority passengers, and mere business men who want to increase our exports have to queue up weeks ahead. The fare was £7/10/0 single, compared with £4/15/0 before the War.

Then he had to fill up two forms (for each passenger) to get passports renewed, and endorsed "for all countries in Europe including the Soviet Union." But nobody told him that he ought to have got a *visa* at the French Embassy for each. But for the fact that a French official friend met him on landing at Le Bourget he might have been sent back by the next machine. Incidentally the friend had been waiting an hour because French time is an hour in front of ours, and he had been given the English time of arrival. Also you may have to queue at the Embassy or Legation of the country you want to visit for days before you can get that *visa*.

Then you have to change good English pounds for foreign currency, and to get it you have to prove abnormal circumstances—"an ailing aunt, a putrefying property, an export order, an invalid cure, a separated family," as my friend said. Or else you need to have some "pull" behind the scenes. The tourist, friendly visitor or holiday-maker must still wait. Also you must not take more than £5 out of this country, or more than £5 into France without special permit. And £5 would hardly buy a decent Black Market meal in Paris to-day.

After you have got over all that you then have to leave home early enough to reach Airways Terminal in London at 06.30 Greenwich Mean Time, to leave Northolt, the present terminal aerodrome, at 08.00 hrs. That means before any trains, buses, or taxis are about. And all that for a flight of 1 hr. and 50 min. to Paris. As my friend says, one can travel the same distance in the opposite direction, to Manchester, in much less time without using an aeroplane at all.

So be content to wait till our international ground arrangements are better and fares are lower, and seats are easier to get. That will all come in time. And flying is such fun that it is worth the waiting.

That is always providing that you are going to fly in a reasonable aeroplane at a reasonable height on a fine day. Personally I like to potter along at a couple of hundred miles an hour, low enough to recognise the towns and rivers and railways, and to see the cars on the roads and the old ladies hanging out their washing.

These modern pressure-cabin air-conditioned, 400 to 500 m.p.h. stratosphere things, with fuselages like Mr. Churchill's cigars, are no sort of pleasure. Another friend of mine, in the United States, describes them as "over-heated under-ventilated flying corridors"—they are not cabins. (*Continued on page 260*)

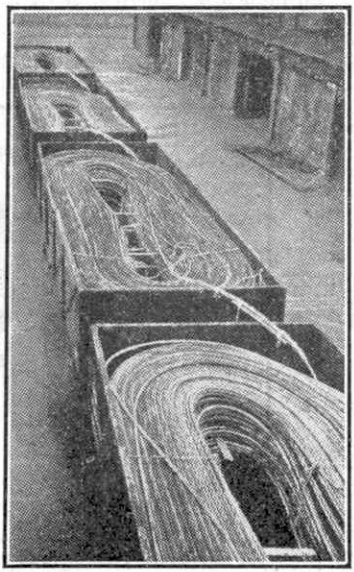
The Giant Skein

By L. A. Castleton

A CONTINUOUS length of submarine telegraph cable, 60 miles long and weighing 140 tons, was recently railed from Poplar to Plymouth, in eight specially selected 20-ton wagons.

Before the war, such cable, largely made at Greenwich by Submarine Cables Limited, for Cable and Wireless Limited, was either loaded direct into ships at the former's Thames-side wharf or taken by barge to the London docks for shipment.

In 1940, when France fell and the bombing of London began, fewer vessels reached the London docks. Cable had then to be shipped from provincial English, Scottish and Welsh ports. The great problem was to get it to these widely separate ports quickly and safely to catch the convoys. Sending cable by coastal freighter was deemed too risky and too slow. The alternative was the railway. Cable and Wireless Limited asked the main line companies to devise a way of conveying long lengths of cable, requiring several wagons, without breaking the length.



A continuous length of submarine telegraph cable loaded into four trucks, with a carry-over device from truck to truck. Photograph by courtesy of the "Great Western Railway Magazine."

Many types of wagon were inspected, and the choice fell on long, open wagons, such as "Tubes," which are 25 to 30 ft. long and can each carry up to 20 tons. The first consignment was railed in March 1942. Since then 23 others have passed, comprising 1,360 miles of cable; the greatest single consignment totalled 141½ nautical miles.

The cable is barged to one of the London docks, hauled out by winch and loaded into railway wagons. Up to eight nautical miles, the length varying with the thickness, are coiled into a wagon; a padded bight or loop of cable, protected by strips of wood and hessian, is then taken over to the next wagon and coiling is continued, looping over to each succeeding wagon until the whole length is loaded. Coiling was a hard, slow job at first, by hand; later a petrol engine saved much time and labour, enabling about 10 miles of cable to be loaded each day.

To prevent wagons from accidentally uncoupling in transit, or while shunting in goods yards in the blackout, special clips were bolted on to the coupling hooks. But for this precaution, fathoms upon fathoms of cable might have been uncoiled from the wagons and laid alongside the line, to the consternation of the railway staff!

When coupling clips are used, the wagons cannot be separated until shipment is completed; so before loading starts the length of the siding serving the ship's berth must be known; this determines the number of wagons which can be used, and may set a limit on the size of the shipment. All types of cables, from the deep water kind to the heavy shore-end type, have been successfully railed to the ports during the last four years.

Unloading from the wagon and loading into the ship is also a specialised job, as submarine cable has to be shipped wet. Boilermakers erect a tank in the hold of the vessel, and the cable is coiled into it. Each consignment is met at the port by a team of specialists sent by the makers; they have often had to work under difficult and dangerous conditions, including enemy air attack, to erect the tank and load the cable.

Consignments of cable have gone "Great Western" to Cardiff, Newport and Plymouth. The greatest single length shipped at Newport measured 73½ nautical miles, equal to nearly 85 land miles.

This article is reproduced by permission from the "Great Western Railway Magazine."

The Triumph of the Two-Stroke Engine

By Arthur Nettleton, F.R.G.S.

JUST 45 years ago, in a small workshop at Bradford, Yorkshire, a young inventor set out to produce something new in petrol engine design. His aim was to invent a type in which the number of explosions in the cylinder would be doubled, and at the same time to simplify the design.

How well he succeeded is plainly evident to-day. The autocycles, or self-propelled bicycles, that are familiar objects on our roads, romp along at speeds up to 30 m.p.h., yet they have engines of very simple pattern. For effortless cycling, economical running, easy maintenance and convenience, these machines are ideal, and their increasing popularity during the last few years is evidence of their value as run-abouts. It was the inventor at Bradford, a Scotsman named Alfred Scott, who first opened the gateway to this simplified form of motoring. He did this by producing the first two-stroke internal combustion engine, a type which because of its simplicity is now used as the power unit of all autocycles.

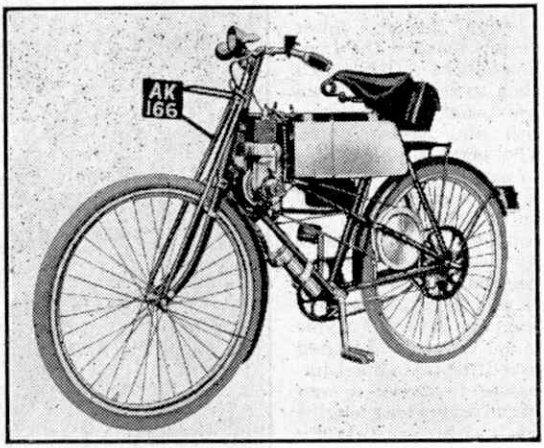
Many lightweight motor cycles are fitted with a similar but somewhat larger engine, and the miniature motor cycles dropped by parachute from aircraft for the use of Allied paratroops during the war had two-stroke engines. Other patterns of the same engine are used to propel motor boats. They are often employed also for stationary power purposes; they drive dynamos to generate electricity for lighting country houses; and they are used as auxiliary power units in hospitals and for driving machinery on farms and in workshops.

The development of the two-stroke engine, indeed, was an important milestone in engineering history. It made the internal combustion engine applicable to a wide variety of jobs for which, in its more complicated earlier form, it had not been suitable.

The two-stroke engine gets its name from the number of strokes, or up and down movements of the piston inside the cylinder. In it there are two such strokes, one up and one down, at each explosion of the petrol or oil vapour charge, and during those two strokes the four operations necessary to enable the engine to run take place.

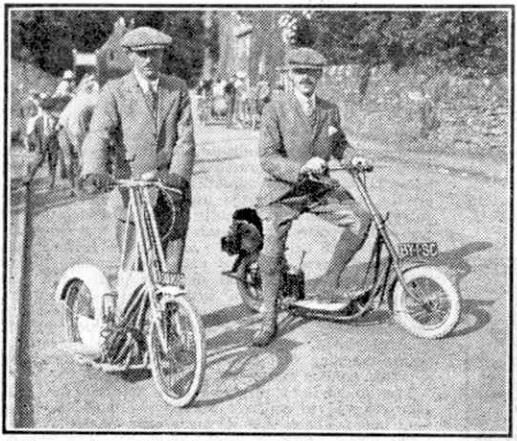
In order to operate successfully, an internal combustion engine must first draw in a charge of explosive vapour. Next it must compress that charge into the head of the cylinder, and then explode it, thus driving the piston to provide the motive power. Finally it must expel the exploded gases to make way for the next charge.

Before the two-stroke engine was invented, these four operations were always performed separately inside the cylinder. Valves, opening and closing in correct order, were an essential part of the mechanism, these operating at just the right instant to admit the new vapour or allow the expended gases to escape. Engines of the four-stroke type, as they are termed, are still widely used in motor cars and lorries.



The Scott motor cycle of 1902, in which a two-stroke engine was used for the first time.

The two-stroke, on the other hand, combines the four operations, so that it performs all four of them in two strokes of the piston. By an ingenious arrangement of the inlet and exhaust ports, and a specially shaped piston head, fresh explosive vapour is drawn in as the piston descends on the power stroke immediately after each explosion. As the piston comes



Motor scooters of 1921. Some of the machines of this type were fitted with two-stroke engines. Photograph by courtesy of "The Motor Cycle."

up again on the second stroke, it simultaneously compresses the new charge and expels the old one.

The most remarkable feature of this type of engine is that it requires no valves or valve mechanism; instead the piston itself controls the intake and expulsion of the gases. It is this simplicity of design that has made the two-stroke so eminently suitable as a lightweight power unit. It does not require cams, springs and the other mechanism necessary when valves have to be operated.

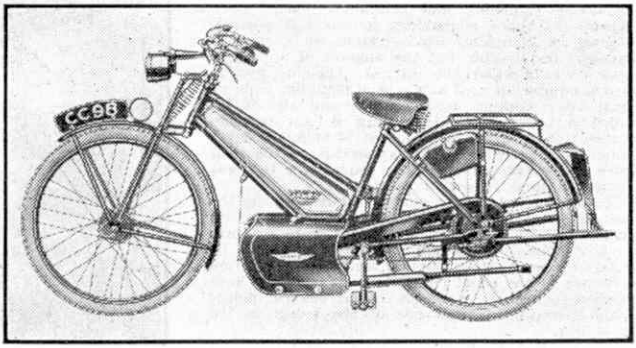
The first engine of the two-stroke type was fitted to an ordinary pedal cycle in 1902. Although the method of transmitting the power to the wheels was by means of a friction pulley in contact with the back tyre, the machine ran successfully. Indeed, when improved designs were produced, they proved to be so much an advancement that motor cycles fitted with Scott two-stroke engines began to win premier awards in sporting events. Twin-cylinder Scott engines were also built, and these were provided with water cooling, like cars. The dream of the young Scots engineer had given the motor world something not only novel, but highly efficient as well.

The Scott firm, though concentrating later on twin-cylinder high-powered two-stroke motor cycles, have nevertheless built autocycles in recent years. Other manufacturers, too, have manufactured two-stroke engines for power bicycles, and various improvements have been made during the last decade. One forward step, announced in 1939, was the introduction of a type that obviates the need for a specially shaped piston head. The intake and expulsion of the gases is controlled solely by the positioning and shape of the inlet and exhaust ports. As a result, greater power is obtained.

Thanks to such improvements, a present-day autocycle will run on little more than a mere whiff of petrol vapour, and up to 140 miles can be covered on a single gallon of fuel. Another benefit is that pedal assistance is required on only the steepest hills. A lightweight motor cycle with a two-stroke engine of only 125 c.c. cylinder capacity will climb any hill in Britain. Such a machine has climbed by its own power to the top of Snowdon!

The lightweight two-stroke engine proved its value during the war, when it was used for cross-country transport by the Army. Thousands of these small but serviceable engines were built and fitted to lightweight motor cycles for military use.

It may be wondered why larger editions of the two-stroke engine have not been produced for bigger vehicles, such as cars, lorries and buses. A few large types have been successfully employed, but the advantages over the (*Continued on page 260*)

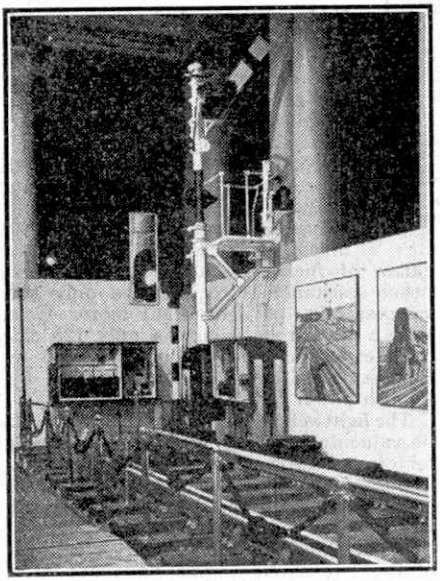


A modern auto-cycle that has a 98 c.c. two-stroke engine.

How Trains Are Safeguarded

An L.M.S. Signalling Demonstration

THE finest permanent way in the world and the most perfect locomotives and rolling stock would be of little use for dealing with traffic of modern speed and frequency without a signalling system to ensure the proper control of train movements.



Part of the equipment, including actual points and signals, seen at the recent signalling demonstration at Euston. Photographs by courtesy of the L.M.S.

Special interest therefore was attached to the L.M.S. signalling demonstration at Euston, in April this year. The exhibits in this were typical of the latest methods of railway signalling and communications.

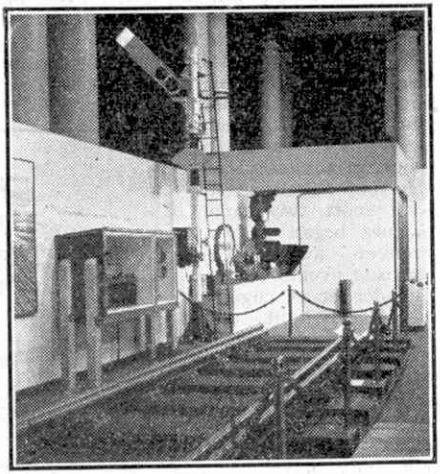
Owing to space restrictions it was not possible to stage a complete demonstration of a modern signalling installation, but the amount of apparatus on view was of remarkable interest. The chief feature was the equipment used at a typical main line country signal box, working actual points and signals installed on the site for the time being. A light structure representing a signal box housed a standard lever frame, and the whole of the apparatus on the shelf above the levers and under the floor of the box was exactly as used in actual practise.

The demonstration was made most realistic by the construction of a short section of permanent way, including sleepers, chairs and rails made up into a set of points. These points were imagined to be beyond the range of satisfactory mechanical operation by means of the usual point rodding, and they were therefore operated by means of an electric points machine controlled from one of the levers in the signal box.

The points were supposed to lead from the main running line into a loop, and three types of signals were provided in order to control this layout. First was a colour-light multi-unit distant signal. Then came a manually-operated upper-quadrant junction home signal, with a miniature semaphore bracketed off the main post in the usual manner, controlling entrance to the loop. Finally a standard electrically-operated upper-quadrant starting signal was supposed to control the exit from the loop at the further end. The points were provided with the standard facing point lock and electrical detector. An additional indicator in conjunction with these was fixed by the points themselves, in order to demonstrate to the onlookers exactly when the detection circuit was completed. There was also a separate electrical points machine that could be operated by means of a crank handle and its operation studied.

The colour-light distant signal of the multi-unit type referred to contains no moving parts, and the light beam is such that it can be seen clearly at least 1,000 yards away in bright daylight. The change in aspect from yellow to green or vice versa is made by means of a relay at the signal itself, remotely controlled from the signal box. A separate yellow light unit is provided, the lamp of which lights up automatically should there be any failure of the light in either of the main units. Any failure in the power supply to the signalling lights results in audible and visual indications being given in the signal-box. The electrically-operated starting signal also was controlled by means of a relay.

Other exhibits included many fascinating items, such as a collection of signal heads of various kinds, all of them electric; a searchlight type of signal having one lamp only, with moving coloured glasses working in front of it; and a special pattern of light signal indicating three possible routes over a junction, with a subsidiary signal for slow traffic and a route indicator for use with this signal. Relays, indicators and electric lamps were shown, and a working model of a track circuit. Rail joint insulation, points detection and single line token instruments also were the subject of exhibits.



Another view showing the upper-quadrant signal and, beyond, various types of signal heads.

Bananas!

By C. P. Hooson

OUTWARD bound from Liverpool a few years ago in the "*Loranian*" to load cotton at a port in the Gulf of Mexico, we received a message diverting us to Kingston, Jamaica, to load bananas for New Orleans. So we just turned the ship's old nose a little further to the South, and rolled on at a leisurely eight knots for Jamaica. There we made fast at the loading wharf and commenced to load.

As far as I remember, the actual carrying on board of the bunches of fruit was done by negro women, each of whom plodded up one gangway with a huge bunch of bananas on her head, was relieved of this, sometimes without even pausing, by two negroes at the open hatchway, and then trotted off down another gangway to the shore. Thus they formed a kind of endless chain. Then we noticed huge mounds like haystacks, tropical haystacks, of branches and leaves, mostly banana leaves, heaped up on the wharf. These haystacks, dozens of them, were hoisted on board and dumped on the deck. We also received about 30 wind shoots. These are really canvas ventilators, each a long tunnel of canvas some 20 ft. in length, with a diameter of about 20 in. kept open by means of light wooden hoops. They have bell-like tops to catch the wind.

In about 24 hours the work of loading was completed, and our 'tween decks were full of bunches of fruit, all standing on end, looking in the dim light like little pale green overfed Christmas trees.

It was midnight when the accommodation ladder was hoisted in, and the shore gangways lowered. We let go the mooring ropes and backed slowly away from the wharf. In a few minutes the engines were stopped; "Slow ahead" and "Half ahead" were signalled in turn, and we steamed quietly out of the beautiful harbour of Kingston. The sea was like a plain of polished jet, with thousands of stars reflected in it, and a phosphorescent bow wave went arrowing away from the stem of the ship, the little wavelets falling over each other in their hurry to get back to sleep. A few ragged palm trees on the hills to starboard were silhouetted against the maize yellow of a low West Indian moon.

Then the work started. Rakes and forks were produced, and the huge haystacks of leaves were spread out all over the decks from stem to stern, making a miniature jungle some 3 ft. deep. All the hatches were left uncovered and awnings were stretched everywhere from forward to aft, with four or five wind shoots triced up over each hatchway, their open ends leading down through the awnings into the holds. The idea of all this was to provide insulation from the heat of the Sun and so to keep the 'tween decks at a cool and even temperature. This wasn't all. The miniature jungle had to be kept damp, and was sprayed with hoses every few hours.

So we rolled along on our six day journey to New Orleans. Now all these unusual happenings were not passing without much comment and many remarks from our gallant crew. They didn't like trimming 20 or 30 wind shoots to catch every changing breath of wind, the continual messing about with wet hoses and the look of the ship, and they didn't care much for bananas anyway. Least of all did they like the damp soggy mess of leaves. Getting through it was like trying to walk through a shallow bog, and besides to a sailor's eye it didn't look right.

While loading we had been told that these trips were very popular with stowaways, and warned to keep a look out for them. Sure enough the first evening after leaving Kingston, just before dark, two young coloured youths stole up to the pump for water. They were promptly pounced on by the bo'sun and taken up to the "Old Man" for judgment. He decided they were to be locked up in a spare cabin and ordered a further search to be made.

So we dug out our torches and off we went scouting around the almost empty holds. The 'tween decks seemed the most likely place and so it proved to be. No. 2 hatch yielded two more poor fellows, huddled up in a corner fast asleep, but No. 4 hatch provided a touch of humour as well as pathos, for there in a little clearing, way back in the darkest part of the low 'tween deck, we discovered an entire family of five. Father, Mother, two small boys and a very small girl were squatted about a small square box containing a few handfuls of smouldering charcoal. We had interrupted their evening meal.

Stowaways among the bananas.

Just about this time, we began to hear strange tales concerning some of the passengers we had with us on this voyage. According to some accounts our jungle was inhabited by scorpions, tarantulas and boa constrictors, and when listening to some of the sailor's yarns one could almost imagine there were lions, tigers and even elephants in it. Seriously, we did have some queer little beasties on board. There were spiders of all shapes and sizes and snakes too, but no very big ones. I don't think I saw a snake more than 12 in. long, but when alone in the dark stillness of the night going aft to read the patent log at the end of each watch became quite an adventure.

In due course, while still far out at sea, we met the muddy discoloured waters of the Mississippi and later with pilot on board, breasted our way against that ever ebbing stream to New Orleans! No time was lost by the consignees in getting the fruit ashore, by the "Old Man" and the authorities in getting the stowaways ashore, by the mate in getting awnings and wind shoots ashore, and by the seamen in getting rid of the jungle and all its occupants.

Railway Notes

Express Running by "Pannier" Tank

The 0-6-0 pannier tank engines of the G.W.R. are not too commonly seen carrying express headlights, but one such turn which they frequently work is the 8 a.m. residential express from Porthcawl to Cardiff, booked non-stop from Bridgend to Cardiff, 20.3 miles, in 32 min. On a recent trip with this train No. 4643, having coupled wheels only 4 ft. 7½ in., with a load of 6 coaches, or 147 tons tare, completed the Bridgend-Cardiff stretch in 29¾ min. start-to-stop, despite a long and severe p.w. slack on the worst part of Llanharan bank, which brought the speed down from 48 to 18 m.p.h. Prior to this check No. 4643 had attained 54 m.p.h. on the level, and after getting away again speed was maintained at between 50 and 56 m.p.h. over the favourable gradients between Llanharan and the outskirts of Cardiff.

The fastest start-to-stop time noted over the same stretch by Mr. D. S. Barrie, who timed the foregoing unusual run, is 24½ min. by 4-6-0 "*Lode Star*," hauling a tare load of 340 tons.

L.N.E.R. Locomotive News

No. 2565 "*Merry Hampton*" is now an "A3" 4-6-2. The full initials "L.N.E.R." are now appearing on tenders or tank sides again. We are informed that the new "A2 Pacifics" now in hand will be painted green and numbered from 200 up.

More W.D. 2-8-0s are at work on return from military service, and construction of the 31xx L.M.S. type 2-8-0 locomotives continues at Darlington and Doncaster Works.

Further conversions from "04" to "01" 2-8-0 are Nos. 6216, 6324, 6371 and 6535. On a long list of withdrawn engines we notice "C1" G.N. "Atlantics" Nos. 3276, 3289, 4406, 4413, 4435 and 3284. The last named created a remarkable record 12 years ago by running the "*Queen of Scots*" Pullman express non-stop from Leeds to King's Cross, 185¼ miles, in 175 min., including two signal checks, several service slacks and many varying gradients. The train was 18 min. late leaving Leeds and punctual on arrival in London. The load was 295 tons and No. 3284 at the time was 29 years old. An average speed of 70 m.p.h. was sustained for well over 100 miles and at the time it was the fastest run ever made between the two cities.

"C7" 4-4-2 Nos. 737 and 2163 are being scrapped and by the withdrawal of Nos. 1242 and 1245 class "D21," comprising the largest N.E. 4-4-0s, becomes extinct. Class "D42" of the former Great North of Scotland, which dates back to 1888, also is extinct, No. 6817, the last representative, having gone. The following 4-4-0s are the first of their particular classes to be scrapped: No. 3051, G.N. "D1" superheated; No. 9287, "D34" "Glen" 6 ft. type built for the West Highland services; No. 9361, original "Scott" series of 1909 vintage with 6 ft. 6 in. driving wheels, class "D29," and lately carrying the same boiler as the "Glens," both being of North British design.

Another 4-4-0 withdrawn is "D2" No. 4338, one of the intermediate Ivatt type that lately had a "D1" superheater boiler and worked for many years from Grantham shed, sometimes assisting a "C1" to London or York, or in earlier years taking charge of such expresses alone. "D3" scrappings are Nos. 4073 and 4312, locomotives well remembered in the King's Cross-Hitchin district.

No. 4727 is reported to be the first "N2" class large 0-6-2T to be allocated to Colwick shed, Nottingham.

Former L.S.W.R. Shunting Tanks

All the 34 small "G6" 0-6-0 shunting tanks are still on the active list, although built between 1894 and 1900 at Nine Elms Works, London, to the original design of Mr. William Adams. Construction was continued by his successor, Mr. Drummond, who was also responsible for the "M7" 0-4-4T and numerous inside cylinder 4-4-0 classes familiar to-day.

Originally these engines were identical with the Adams "02" 0-4-4 passenger tanks as regards size of boiler, cylinders and wheels. They have always been employed in the freight or carriage shunting yards at principal centres of what is now the Western Section, S.R., and they epitomise former L.S.W.R. shunting tank practice. The photograph reproduced on this page shows a "G6" heading a train of light engines into the station at Salisbury, the locomotives being typical of the Western Section and including Drummond 4-4-0s.

On the opposite page we illustrate one of the two

Former L.S.W.R. "G6" 0-6-0T shunting locomotive hauling a train of locomotives from Salisbury shed. Photograph by G. O. P. Pearce.

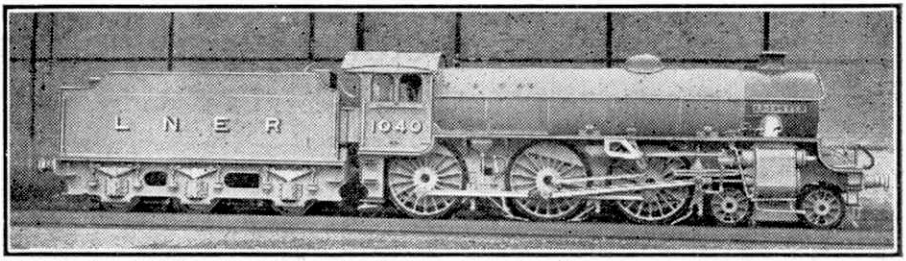
now remaining "C14" 0-4-0Ts of the diminutive Drummond class, long familiar on the quays at Southampton. This was built in 1907, and carries the number 3744 on the duplicate list. It has 3 ft. driving wheels and 14 in. cylinders, with a very short stroke. The trio of small ex-L.S.W. shunting tank classes is completed by the "B4" outside cylindered 0-4-0 variety employed in Southampton Docks, at Winchester, etc. There are 25 of these, larger and more powerful than the "C14," but able to negotiate short radius curves, and 14 of them are named after ports in France or the Channel Islands.

Great Western Tidings

Green paint is more and more in evidence on locomotives of all types, the less important classes being plain green with "G.W.R." lettering.

The newest "1000" class 4-6-0 noted on main line work is No. 1019 "*County of Merioneth.*" Engines of this type are all to be named after English and Welsh counties, so reviving the "County"-naming carried by outside-cylindered 4-4-0s 20 to 30 years ago, but now all scrapped. Modified "Hall" 4-6-0 No. 6967 carries the name "*Willesley Hall,*" and No. 6965 has the name "*Thirlestaine Hall.*" "Hall" names are being allocated to all such locomotives now in service from No. 6916 upward. New 0-6-0Ts of the 96xx pannier series are Nos. 9640-5. The experimental 8-wheeled tender was lately observed attached to "Hall" No. 6951.

"Saint" class 2-cyl. 4-6-0 express engines withdrawn earlier in the year were No. 2914 "*Saint Augustine*" from Weymouth shed; No. 2971 "*Albion*" from Swindon; and No. 2983 "*Red Gauntlet*" from



L.N.E.R. class "B1" No. 1040 "Roedeer." This is the first engine of the class to be built for the company by North British Locomotive Co. Ltd. Photograph by courtesy of the L.N.E.R.

Tyseley. Scrapped 0–6–0Ts were Nos. 2103 and 2729, and No. 819, the former Cambrian Railway No. 24.

Stretches of newly-laid flat bottom rail are reported from the Bristol-Taunton and Bristol-London main lines, so the G.W.R. is making similar experiments as regards maintenance and longevity of service to those in progress on the L.M.S. and L.N.E.R.

A fine run was recorded by Mr. W. J. Fill along the almost level old Taunton-Bristol main line by No. 6016 "*King Edward V*," with a 400-ton train that started from Taunton some 20 min. late. This was one of the numbered trains carrying a special headboard indicating that they are to be allowed a good run if possible. Apparently using full regulator and fairly long cut-off, the driver made a very fast start over the first 3¾ miles to Creech Troughs and then "notched-up," though continuing to maintain a fine turn of speed. Highbridge, 18 miles, was passed in 18 min. 40 sec., and Worle Junction, 28 miles, in 26¾ min., an average of 70½ m.p.h. having then been sustained for nearly 22 miles, with a maximum of 76. It seemed that the 44¾ miles into Bristol might be covered in 44–45 min., but unfortunately signal checks supervened to a considerable extent owing to special traffic, so that no more time could be recovered. It is hoped that such unforeseen delays which have been so prevalent under war conditions may now become less frequent.

L.M.S. News and Notes

The latest class "5" 4–6–0 mixed traffic locomotives in March last were Nos. 4928 and 4950, allocated to 24B shed, Rose Grove, Lancs.; Nos. 4929–30 and 4951, shedded at Blackpool; and No. 4952, allocated to Crewe North. Further class "4P" 2–6–4Ts built at Derby and sent to Plaistow depot were Nos. 2221–2.

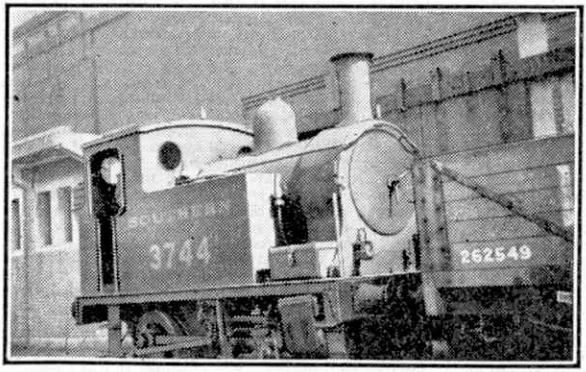
Engines condemned were 4–6–0 class "4P" No. 25804; No. 14633 of the Caledonian outside-cylinder type built by the L.M.S. in 1925; class "3P" No. 14692 "*Darnaway Castle*," ex-Highland Railway class "4F" No. 17957 of the 5 ft. 3 in. "Clan Goods" series; 4–4–0 class "2P" No. 14338 of the "Dunalastair 111" class; 0–8–0 ex-L. & Y. Nos. 12725, 12875 and 12964; 0–6–0 class "3F" 3834, of the former M.R.; Nos. 12087, 12101 and 12306, L. & Y.; and No. 17696, Caledonian. Of "2F" locomotives former Midland No. 22579, Kirtley double-frame type built in 1868, and No. 3704, as well as No. 28289, a Webb coal engine of the former L.N.W.R., also are condemned.

Class "6F" 0–8–0s numbered 8917, 9081, and 9350, have been reclassified "7F" on rebuilding.

Tank engines withdrawn include five more of the L. and Y. 2–4–2 passenger type numbered 10661, 10674, 10693, 10876 and 10888; 0–6–2T of former G.S.W. stock "3F" No. 16911; and Nos. 7761, 27604 and 27650 of the similar L.N.W. type, as well as that company's class "2P" No. 6869. Other withdrawals are No. 11508, one of the L. and Y. 0–6–0 saddle tanks of the shunting type familiar for nearly 70 years, and No. 7886, one of the big Bowen-Cooke 0–8–2T series, classed "6F" and built at Crewe in 1911.

A total of 135 new engines is to be built in accordance with a rolling stock building programme recently approved. Of these, 106 will be class "5" 4–6–0s and class "4" 2–6–4T. The plan also includes the building of five more unstreamlined "Coronation" type 4–6–2s, ten 2–6–0 light freight engines and ten 2–6–2 passenger tanks. All new and converted engines will have self-cleaning smoke-boxes, rocking grates and self-emptying ashpans to save labour and reduce preparing time in sheds. Locomotives so fitted have "SC!" painted on the smoke-box beneath the number plate.

Further rebuilt "Royal Scots" noted this year are Nos. 6101, "*Royal Scots Grey*," 6150, "*The Life Guardsman*" and 6159 "*The Royal Air Force*."



S.R. 0-4-0T No. 3744 shunting in Southampton Docks. This engine is of the Drummond "C14" class, familiarly known as "Potato Cans." Photograph by W. Hardin Osborne.

Passengers Again Have Preference

During the war the Southern handled nearly half as much freight traffic again as in 1939, much of it Government stores and ammunition. Preference frequently then had to be given to goods trains rather than to ordinary passenger trains. As part of the all-out drive to improve the running of passenger trains, now, however, especially during business hours, instructions have been given to traffic controllers and signalmen that except in certain specified cases preference on the running lines as well as through junctions must again be given to passenger trains as in normal times.

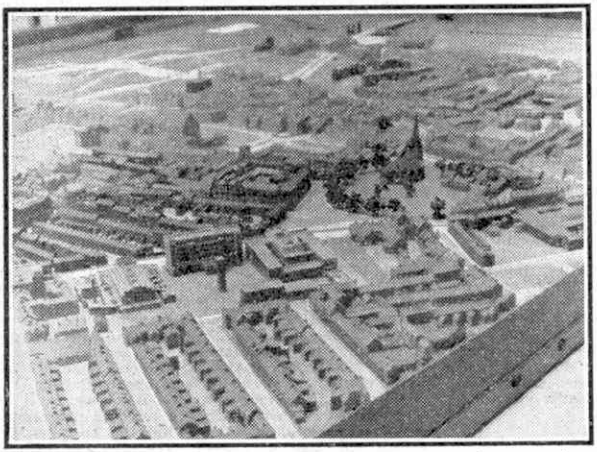
The Art of Architectural Modelling

From Drawing Board to Finished Glass Case Model

By W. J. Bassett-Lowke, M.Inst.Loco.E.

I HAVE often been asked by those who admire fine architectural models—new cities planned in miniature, individual buildings like public halls, baths, stations, blocks of residential flats, even houses and kitchen units—"How are these models made—from start to finish—and what are the materials used in their construction?"

This is a simple problem in some ways, but a difficult one in others. Briefly, a maker of architectural models requires a knowledge of drawing, the ability to read complicated plans, and skill as a draughtsman, and in setting out levels accurately. This last accomplishment is particularly necessary where contours are called for and in itself needs a working knowledge of surveying. With the actual model-making, he must be able to work in hard wood, Bristol board, metals and fabrics, must have a correct sense of proportion, and be adept in the art of fine painting.



A model of the town of Northampton in the course of construction, showing the buildings temporarily placed in position on the base.

Now as to procedure. The scales most frequently adopted for housing estate models are 1/250th and 1/288th actual size. The favourite scale of the "Town-Planner" is the latter, which works out at 24ft. to the in. This particular size has the advantage of showing the proposed buildings with a certain amount of detail, yet portraying the complete layout without taking up too much space. It is also possible in this scale to illuminate the model satisfactorily by under base lighting, to give day and night effect.

The scale of any model of course depends on the area to be covered; as this grows greater the scale must be reduced to, say, 50 ft. to 1 in. (1/600th actual size), or 100 ft. to the in. (1/1200th actual size). Some models are even made to the standard ordnance map size of 208.33 ft. to the in.

Let us assume we are going to build a model for a client. The first thing we must do is to obtain the architect's design, which of course is drawn to scale. Next we decide on the most suitable scale. Those I have mentioned so far are consistent with the architectural model in the generally accepted sense of the word—streets, buildings, fields, rows of houses—in short, a model of an "area"; but when a model of a particular house is required, the scale of 1 in. to the ft. or 1/12th full size is generally adopted, as this enables the detail to be properly shown of small fittings in a room. A scale of 1/6th full size is used when a model of one or two rooms only, where details like kitchen utensils, cups, saucers and plates, rolling pins, tap fittings, etc., need to be shown accurately and to scale.

Having determined the scale with the client, the first model-making job is to prepare the base. This is a wooden frame strengthened by bearers and covered and sheeted with plywood, upon which surface the ground levels are built up. Sometimes the model is very hilly and formers have to be built upon the base, covered with plywood and in some cases strong cardboard, fitted to reproduce the contours faithfully.

While this work is going on, other model makers are engaged in making the individual buildings. Here again they have to be set out on Bristol board exactly to scale, with windows and doors cut out if the model is to be illuminated. Streets and roads on the model are being built and the footpaths attached, while spaces and holes are left for the buildings. Any special features such as parks or open spaces are left with a rough surface, or prepared for laying out in pastureland with trees or as ornamental gardens with pavilions, sports grounds, tennis courts, bowls, etc., and perhaps a small boating lake or open air swimming pool.

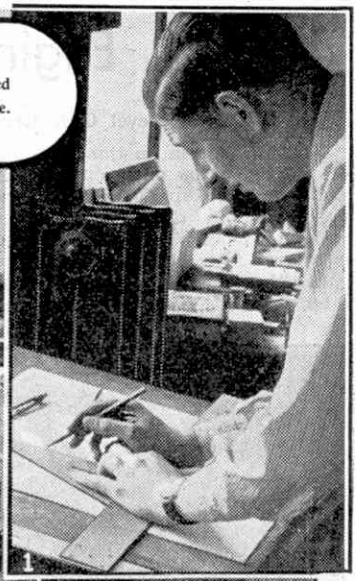
Making the trees is quite a skilled operation. The model maker uses a frame which represents the branches, and this is then built up with pieces of sponge, afterwards painted in correct colours.

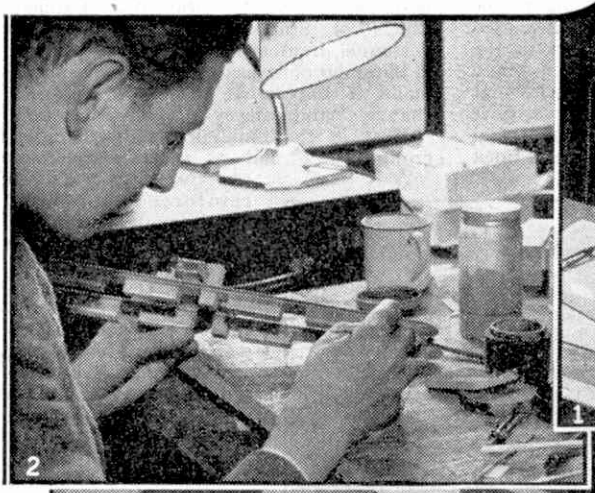
The various buildings, after assembly, are painted in correct colours, and then fixed each in its position on the prepared base. The roads and the pavements are also finished with either flat oil paint or poster colours, and such accessories as motor cars or other vehicles are added. These serve two quite important purposes. Firstly scale is given to the model by including vehicles of a well-known size, and secondly these little human touches make the model "live."

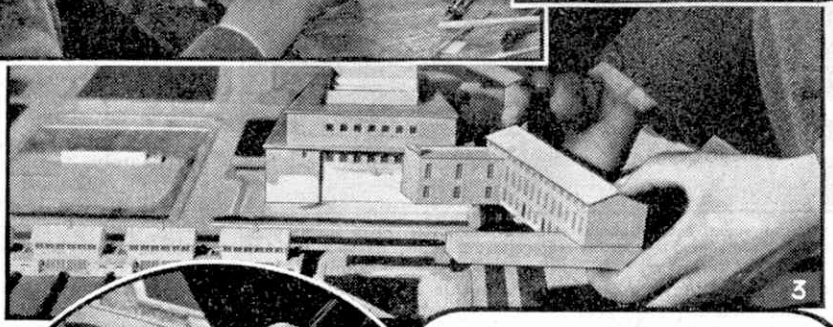
The artist looks at his model, touches a spot here and there until he is satisfied. The client sees and passes it, and then comes the important question of the best way to preserve it from dirt and dust and from the finger marks of those who always will touch everything. The best solution yet is to fit the model with a glass case, for it is a pity to spoil the work of craftsmen, and once a model gets soiled, it is practically impossible to recover its pristine glory without remaking.

What tools does the architectural model maker use? He works with knives, tweezers, razor blades, various drawing instruments for measuring, and of course all sizes of paint brush. In the case of professional model makers, most of the leading firms have their own methods, which are to some extent secret.

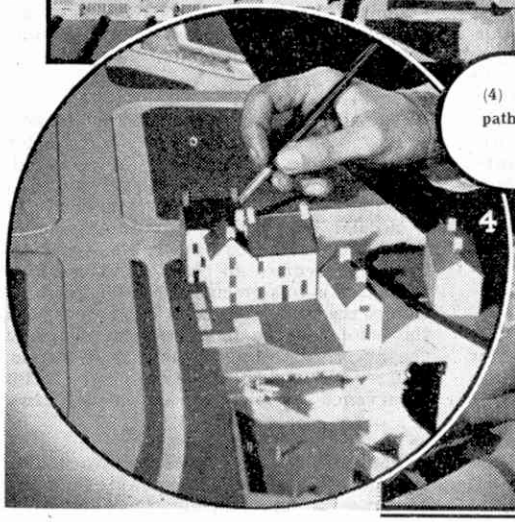
(1) Setting out—or drafting—buildings. (2) Painting a finished building. (3) Placing a building in position on the model base.

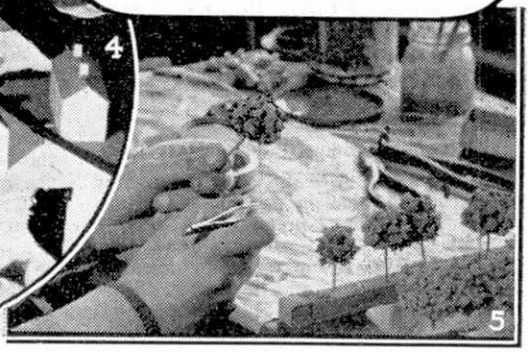






(4) Adding finishing touches to roads and pathways on a partly-completed model. (5) Tree making.

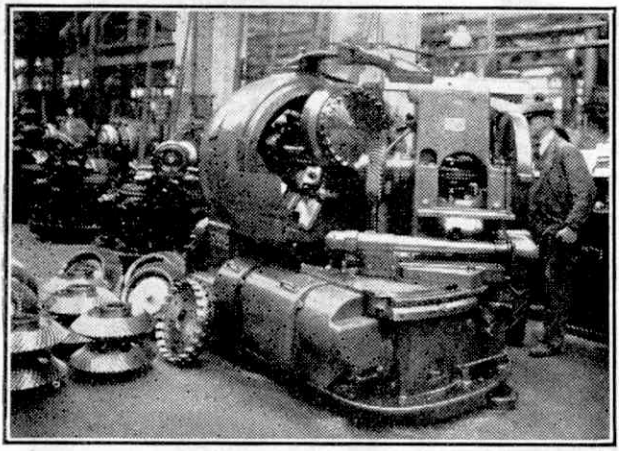




Engineering Notes

An Interesting Bevel Gear Generator

The illustration on this page shows one of the ingenious precision machines used for generating special bevel gears of the type used in the rear axles of many well-known cars and light vehicles. It is known as a Gleason spiral bevel gear generator, and the photograph is of special interest as it gives a good general idea of the arrangements and set-up for manufacturing this type of gear.



The Gleason spiral bevel gear generating machine referred to on this page. Photograph reproduced by courtesy of David Brown & Sons (Huddersfield) Ltd.

In addition to their uses in motor vehicles gears of the kind produced by this machine are used in large quantities for aircraft propeller feathering devices and for many other aircraft components. At the works of David Brown and Sons (Huddersfield) Ltd., gears of this type are made up to 5 ft. in diameter for such purposes as bore-hole pumps, for which application bevel gear units are particularly suitable.

Secret of a London Building Revealed

At the most critical stage of the war in 1940 three huge underground buildings were erected in London. The largest of these was built on what was once the site of a gasometer in Horseferry Road, Westminster, and it became known to Londoners as the Horseferry Road Citadel. During the war the purpose of the building was a closely-kept secret, but it has now been revealed that it was designed to shelter the War Cabinet, Chiefs of Staff, and their immediate personnel, numbering about 2,000 persons, in the event of invasion or if heavy bombing made it impossible to use the normal channels and offices of administration.

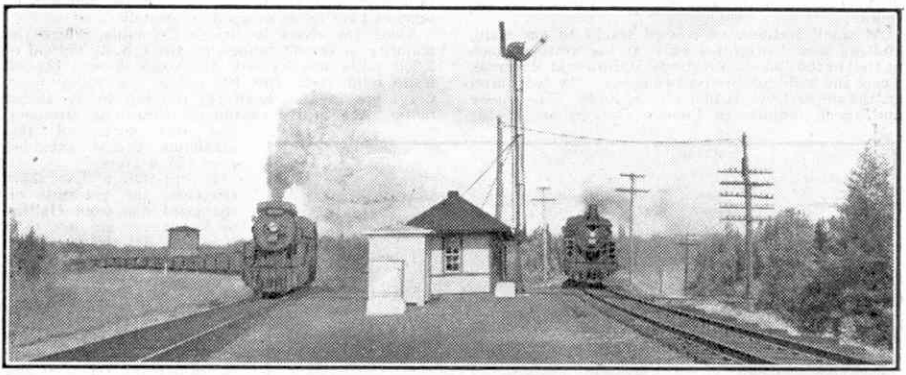
Most of the building was well underground and had a surface thickness of over 12 ft. of reinforced concrete, which made it unlikely that it would be seriously damaged by bombing. The design and construction of the building, which had its own power plant and self-contained fuel supplies, and the supplies of water and food provided were such that under the worst war conditions, including attack with poison gas, the entire personnel could have lived within it for at least three weeks. Fortunately, the course of the war did not necessitate the building being put to full use, but it has been employed recently to provide accommodation for some Government Departments.

A Novel Traffic Light System

An American inventor has developed a new type of traffic control light for which certain advantages are claimed. In his system the red light appears through a square-shaped spectacle, instead of a circular one as in the normal system. With the change to amber, the spectacle aperture becomes an oblong and the final transition is to a green circle. The inventor claims that this combined change of both the colour of the light and the shape of the aperture through which it is visible, brings a quicker reaction and better observance by drivers and pedestrians.

* * * *

The 1939–45 Star has been awarded to 214 men of the life-boat crews called out 25 times or more during the war.



An interesting scene on the C.N.R. at Pacific Junction, New Brunswick, showing Central Traffic Control equipment. The illustrations to this article are reproduced by courtesy of the Canadian National Railways.

By C.N.R. through Canada

By G. Paul Clifton and E. D. K. Coombe

WE landed at Halifax, Nova Scotia, and travelled continuously for five days on the Canadian National Railways to Vancouver, British Columbia, so that the trip from Montreal to Toronto in eight hours seemed a short journey. Locomotives and carriages were about twice British size; the overall length of locomotives ran up to 95 ft. and of carriages to 85 ft. Sometimes 20 men staffed 16 coaches, and the dining cars, sound-proofed and air-conditioned, served full-course meals for a dollar, or approximately five shillings. Vendors on the trains offered cans of tomato juice, peanuts, chocolates, magazines, souvenirs and fresh milk and sandwiches. Sometimes the tickets were "contract strips," 3 ft. long, with a section for every important stop, which enabled passengers to break their journeys at any point.

Canadian stations are level with the tracks and are usually wooden in country districts. Sometimes they comprise little more than a telegraph and stationmaster's office, with perhaps a water tower and a grain elevator. They are not always fenced, and sometimes the tracks are merged with streets. The buildings seem always clean and new, and those in medium sized towns have vestibules containing newsagents' shops and ice-cream bars. The latter are tiled and brighter than our refreshment rooms; they sell coffee and doughnuts and snacks.

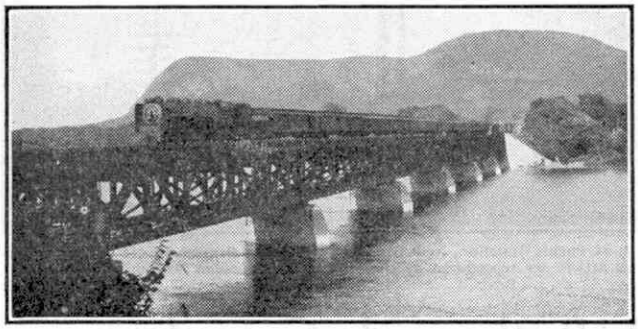
The arrival of a train is always an important event because daily services in most places average only four trains each way. Usually passengers are ready an hour before starting time, which varies because of great distances and unexpected halts; and considering this the usual arrival within minutes of schedule is very creditable. Changed arrival times are charted on blackboards. Men work on the trains at the terminal points, replenishing water and coal, refilling air-conditioning systems and drinking fountains with ice, loading mail and freight, and restocking dining cars. Halts at terminal points last 10 to 30 minutes.

On our trip both engine driver and conductor sometimes caught "train order" hoops when the train slowed down through stations, and the conductor threw off a running report and estimated arrival time. The progress of other trains not infrequently affected our times, and because only one train was cleared on single track, others had to wait until the line between sidings was free.

Canadians refer to journey lengths in miles, not in time, as we do. Distances between towns are far greater than in Britain, and we travelled two, three, four and even eight hours between stops, except for coaling, watering or other operating purposes. Canada might claim the world's longest continuous run, as in 1925 a special diesel-electric railcar travelled from Montreal to Vancouver, 2,937 miles, in 67 hours, and the car's

diesel engines never stopped once throughout the journey.

At small stations we crossed tracks to our train, and we saw footbridges only at big stations such as that of the Canadian National Railways at Montreal. There the buildings are on two levels. The concourse, on the upper level, is like a hotel lobby. The smoke and smell familiar in London stations are absent because the trains are below, and there we caught our train from the only raised platform we saw in Canada. There are no trolleys hooting among passengers, because luggage is loaded separately. Scurrying wagons and open brick arches comparable with those in London also are absent, and we passed through swing doors resembling those of a cinema entrance. An attendant called our taxi, which was streamlined and brightly coloured like most in Canada, and a service desk fixed our accommodation free.



"The Ocean Limited" crossing the Richelieu River, Quebec.

"Window-gazing" during the long journey was even more fascinating than at home, and vast areas such as Alberta's prairies seemed to us unexplored, with room for everyone. Towns are certainly farther apart, and in comparison with them our British towns now look old and drab to us. Houses are wider spaced, with big gardens that are rarely fenced. Most buildings are of wood, and the houses are green, red or cream, often splashed with blue or green roofs. Even telegraph insulators are of red or green glass. People waved as we passed, and boys took engine numbers.

The tracks were comparatively deserted, and we rarely passed gangers on their huts, or other trains. The countryside was unspoiled and beautiful, and constantly changed. Forests contrasted with prairies where wheat plains rolled to the horizon, and in the mountains woodlands alternated with bare slopes and snow-capped peaks. Often we travelled miles without seeing any signs of life apart from ranches, which had wooden porches and were scattered miles apart. A few rivers were wide and deep, but most were shallow and sandy, and many dried up in summer. Most bridges were of steel, and were often "caged" with trellis, but a few were of timber, piled high across river valleys. Near some hill slopes were metal or wooden fences that protected tracks from drifting sand and snow, and in places were supplemented with wooden snow sheds for protection against snow slides. Snow ploughs worked constantly in winter, when rails resembled pencil lines in solid ice, but C.N.R. services have never stopped completely.

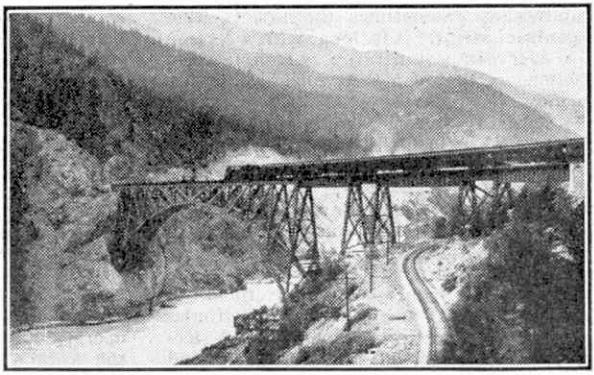
Along the rivers in British Columbia, where the majority of the 62 tunnels on the C.N.R. system of 2,300 miles are located, the roadbed was blasted from solid rock 200 ft. above the valley floor. Curvature in this territory, running to 11 chains radius, was nearly continuous over long stretches, and one curve of this maximum radius extended over 125 degrees.

Except for a few short stretches, the gradients on the main line from Halifax to Vancouver are less than 1 in 100 and the maximum gradient for short sections is about 1 in 50. Gradients on branch lines, however, are much heavier. On one stretch of main line, that between Halifax and Moncton, the elevation varies between sea level and 600 ft. higher, and rises more than 400 ft. in one 10-mile stretch. Grades here were 1 in 50, up which not more than 2,000 tons could be hauled with the most powerful engine.

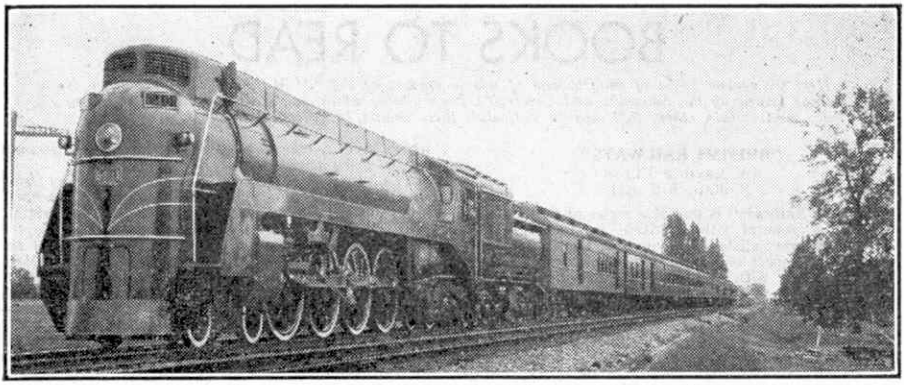
Arising from the adoption of air-conditioning, Canadian train windows are sealed tight on all transcontinental and other principal passenger trains.

The lack of tunnels except in the mountains of British Columbia was quite noticeable. We missed England's green fields very much and by contrast Canada's seemed yellow and brown. In some places there are timber mills, driven by water-power, near the tracks, and we saw logs floating downstream. Cuttings and embankments of appreciable depth are comparatively rare on the prairies. Curves are more frequent but not so well banked, which all reduced average speeds; and because distances are far greater than in Britain, track-levelling was not comparable with ours.

Except in cities such as Montreal, tracks rarely cross above or below roads or other tracks, and there are few, if any, railside advertisement hoardings. Most billboards are along main highways, and are streamlined and brightly coloured, carrying only one poster. Frequently road and rail run alongside each other, and black and white chequered poles



Cisco Bridge, British Columbia, with the C.N.R. "Continental Limited" passing over it. After crossing the bridge the track plunges directly into a rock tunnel.



C.N.R. No. 6401, the locomotive that hauled the Royal Train during the visit of the King and Queen to Canada in 1939, at the head of a train on typical Eastern Canada track. This streamlined engine has a tractive effort of 52,000 lb.

mark crossing gates which, in some locations, are lowered by electric power some minutes before a train's arrival. At other locations, protection is afforded by flashing red lights, the ringing of a bell, and the swinging of a warning *"Look! Listen!"* sign on a steel disc.

We noticed a conspicuous absence of signal gantries in most places. Where used in the more modern terminals the signals are generally of ground-light pattern, which type is also used for movements from sidings under Centralised Traffic Control. This system, which we saw at Moncton, has eliminated long waits in sidings, and has very materially increased the traffic where it is in operation.

Permanent-way sleepers are comparatively irregular and more widely-spaced than in Britain; the ballast is of crushed rock. Rails are flat-bottomed and are joined by angle bars, and as there are no "chairs," they are held in place by spikes. Rails rest upon shoulder tie plates, which reduce the tendency of the rail to cut into the tie and also give increased rigidity to the track structure. Standard rails weigh 100 and 130 lb. per yard. No British permanent-way material is used because track conditions are totally different, but some British mechanical appliances. such as mechanical feed lubricators and steel tyres, are used. In Canada an intermittent rumble replaces the rhythmic clicking during a rail journey in Britain. Most C.N.R. routes are single track. A notable exception is the stretch of 850 miles from Montreal to Chicago, and there are short stretches elsewhere of not more than 50 miles, where traffic is heavy and there are some fast passenger trains, with some very short stretches immediately outside other of the larger terminals.

There are neither class divisions nor compartments in Canadian trains, but Pullman-cars and Chair-coaches correspond to British 1st and 3rd class respectively. We paid 1½d. a mile by Chair-coach, in which a central gangway divides two rows of seats in pairs which are as comfortable as armchairs. Some of these swivel, so that everyone can face the engine, or alternatively four people can be grouped round a folding table. Most baggage is carried at each end of the carriages, where entrances open on each side. About four steps lead from track level to a platform that folds down for safety when the train is moving, and double doors shut out the cold.

Pullman travel costs about 2d. a mile, and to convert coaches for sleeping, a section of the side ceiling is pulled from above each seat, like a cupboard, containing mattresses, sheets and blankets. The open ledge is the upper bed, and the lower is made by joining two seats. These beds are very comfortable, and each is curtained off. From them passengers can watch the stars or use reading-lamps, and they can regulate the temperature. On long journeys washing and shaving is done in washrooms, which have plentiful hot water. When travelling in non-sleepers, we hired pillows for 25 cents., or about 1/3 a night, and slept upright in seats.

Footplate rides are far more breezy and easier to obtain than at home, and the cab accommodation is better. Mechanical stokers are practically universal to-day on all large locomotives. The stoker takes the coal from the tender by means of a screw conveyor working in a trough under the cab deck, which passes it through a crusher and delivers it to the distributor plate just inside the fire-box at the bottom of the fire-door opening. From the distributor plate the coal is blown into the fire-box by steam jets set at the required angles to give an even distribution of coal over the whole grate area. The use of the stoker permits a much thinner fire than was the case in the days of hand-firing, and as it is only necessary to open the fire-door at infrequent intervals, combustion conditions are better controlled, and damage to tube sheets, which was formerly prevalent due to the intermittent heavy rush of cold air through the fire-door, has been largely eliminated. The steam supply to auxiliaries is centralised in a turret ahead of the cab, the valves being controlled by extension handles which are marked air pump, steam heat, water pump, injector, stoker, lubricator, etc., and the throttle, reverse lever, air brake valve, whistle bell, sander and blow-off cock controls are within easy reach of the driver's seat on the right-hand side of the cab. The electric headlight can spot a man a mile down track.

Most Canadian steam locomotives are simple engines with outside cylinders. Compounding is not favoured, as past experience has shown that the extra maintenance required more than offsets any increase in efficiency, while the heavy reciprocating parts introduced counterbalancing difficulties which were hard to overcome. The valve motions include Stephenson's on some of the old engines, and Baker and Walschaerts on the modern types. All Canadian National Railways locomotives built in the past 15 years have single bar guides, and most of the engines built previously had alligator crossheads with double guide bars. The power reverse gear is operated by compressed air and, generally speaking, the valves, pistons and guides are provided with mechanical lubricators, and auxiliaries with hydrostatic lubricators. Boiler pressures on engines built in the last 20 years range from 210 to 275 lb. per sq. in., and the type "E" superheater which is used will deliver steam to the steam chests at 700 deg. F.

Compared with Britain's (*Continued on page 260*)

BOOKS TO READ

Here we review books of interest and of use to readers of the "M.M." With the exception of those issued by the Scientific and Children's Book Clubs, which are available only to members, and certain others that will be indicated, these should be ordered through a bookseller.

"BRITISH RAILWAYS"

By Arthur Elton
(Collins, 8/6 net)

"*British Railways*" is one of a series of publications under the general title "Britain in Pictures," all written by specialists and covering together practically every aspect of British life and interests. Most books dealing with railways, whether historical or otherwise, concentrate on technical aspects and developments. In this book, however, the author takes a different line. Technical advances and notable achievements are necessarily included, but the book deals in a more general sense with the development of British railways and the effect of quick, cheap and easy transport on social life and habits.

There are seven chapters, in the first of which the state of inland transport before the age of steam is described, together with the development of the railway from the crude timber tracks associated with early mining practice to the systems laid down chiefly for the transport of minerals from the pithead to the water side. In the second chapter the coming of the steam locomotive is described, from the experimental work of Murdock and Trevithick, to the part played by Murray and Blenkinsop with their Middleton Colliery locomotives and the achievements of Hedley, Hackworth and the Stephensons.

This brings us to the construction of the Stockton and Darlington Railway, the first public railway designed to employ locomotives as well as horse haulage, and of the Liverpool and Manchester Railway. The building and opening of the latter are described in some detail, as are the Rainhill trials, which finally established railways and the steam locomotive as part of our national life. The author shows clearly why such a development had indeed become necessary as industrialisation grew.

There is an interesting account in the next chapter of the construction of railways in their early days, when opposition and criticism still had to be faced by those who struggled to extend the network over the country. Then came the era of expansion, when railways sprang up in all parts of the country. The early struggles of different lines and the tremendous competition that developed between them are dealt with, and travelling conditions and the crude operating methods first employed are described. One short chapter deals with the venturesome tunnelling carried out by the Metropolitan Railway, the forerunner of the underground systems of to-day, and finally the story is told of railway progress during the present century, which has not only seen two great wars that affected our railways, but also has brought about the amalgamation of historic companies into the groups of the present day. The book ends on a fitting note with an appreciation of the great service rendered by our railways in the war emergency.

The illustrations call for a special note. They include coloured reproductions of interesting drawings, paintings and posters from various periods of railway history, with many black and white illustrations of the same kind in the text. Most of these are from the unique collection belonging to the author.

THE FIRST RAILWAY BETWEEN MANCHESTER AND SHEFFIELD

By George Dow, A.M.Inst.T.
(L.N.E.R., 3/6)

The centenary of the formal opening throughout of the railway between Manchester and Sheffield via Woodhead Tunnel occurred on 22nd December last. The line is now part of the L.N.E.R. and to mark the event the company have issued this booklet, which gives a comprehensive and interesting account of this fascinating road.

The story begins with a historical survey from the first suggestion for a Manchester and Sheffield line in 1830 to its opening 15 years later. The original proposal fell through, but the scheme was revived in 1838, when a new company was formed under the name of the Sheffield, Ashton-under-Lyne and Manchester Railway, and construction actually began. Progress was slow, but the line was opened from Manchester to Godley, 8¼ miles, in 1841 and extensions followed by degrees until only the completion of the final section through the projected Woodhead Tunnel remained. Driving this great bore, the longest in the country, was a formidable undertaking, especially with the means at the disposal of the contractors of a century ago. Its construction and the plans made for the operation of trains through it, are graphically described by Mr. Dow, who deals in equally sure and interesting fashion with the Mottram and Dinting Viaducts, the terminal stations in Manchester and Sheffield, and other notable features of the line, and with later developments, including the doubling of Woodhead Tunnel.

Next the author describes the locomotives, rolling stock and train services of the line in its earlier days. Although details are available of the Sheffield, Ashton-under-Lyne and Manchester locomotives, no illustrations of the earliest of these are known to exist. In spite of the arduous nature of the road many of the engines were single-drivers, though there were 0-4-2s for mixed traffic and a heavy design of long-boilered 0-6-0s that remained in service for many years.

The Sheffield, Ashton-under-Lyne and Manchester Railway eventually grew into the Manchester, Sheffield and Lincolnshire Railway by additions and amalgamations, and this in turn developed into the Great Central, which pushed southward to London in 1899. The future of the Sheffield-Manchester section, the nucleus of this great extension, promises to be no less interesting than its past, for its electrification is planned and was well in hand when war broke out.

The maps and illustrations in the book are well chosen and reproduced. An appendix gives numbers, dimensions and details of the original Manchester, Ashton-under-Lyne and Sheffield locomotives.

Copies of the book can be obtained from the Advertising Manager, L.N.E.R., Pancras Road, London N.W.1.

"THE MODEL MECHANIC"

The first issue of the "*Model Mechanic*," that for May, is an excellent production dealing with every branch of the subject from the construction of engineering gadgets to that of model aeroplanes, locomotives, race cars and ships. This new journal is published by the Drysdale Press Ltd., one of a group of companies directed by Mr. D. A. Russell, M.I. Mech.E., already known to readers of the "*M.M.*" through the "*Aeromodeller*" and other enterprises that provide excellent plans and information for the model maker.

The contents of this issue range from general topics, such as the sport of model yacht racing, to actual constructional work. Good examples of the latter are a Thornycroft air-sea rescue launch, a miniature blow lamp, a 3½ gauge "Pacific" locomotive, and a 45-in. span beginner's petrol aeroplane model. For all models good scale drawings are included.

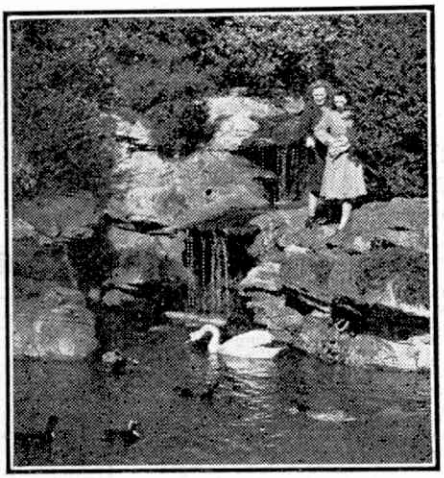
"*The Model Mechanic*" is published monthly, price 1/3, and the subscription rate, including a special double Christmas number, is 18/6 a year.

Photography

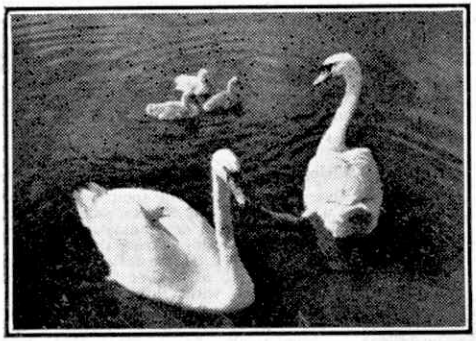
Water Subjects in June

By E. E. Steele

"FLAMING JUNE," as this month is sometimes called, is a good time for making pictures of rivers and waterways, and of their occupants. It is exceedingly pleasant to ramble along the course of a stream in search of pictures, and one may often come across those most graceful of water fowl, the swans. There is a beauty and dignity about this bird that makes it a delightful model for the camera. If you are lucky you may be fortunate enough to find the swans with their family of cygnets during this month, and if you have a few scraps to offer as bait you should make some interesting pictures. It is difficult to obtain a good rendering of the snow-white texture of the feathers, so give a good exposure but cut down development by a third to obtain a soft negative. A hazy sky is also more helpful than glaring sunshine.



Lunch hour in the Park.

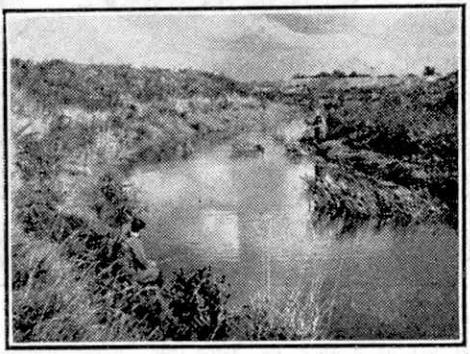


Proud parents.

Fishermen are to be found on quiet stretches of water, and can often be included in the scene as a means of adding interest. See that the exposure is made when they are intent upon their pastime and not turning to look at the photographer. It is advisable to use a lens hood to shade the lens from reflection from the water, which may give rise to flare, or spoil the crispness of the picture.

Many find an enjoyable hobby in the collection of pond-life and objects to put in the aquarium or to view through the microscope. A close-up of a "pond-hunter" examining his catch against the background of the stream adds variety to your pictures of water subjects.

Even the lake in the park in the busy city will offer many attractive pictures, such as visitors feeding the swans and ducks usually to be found on these ornamental waters, or children playing by the edge on their way to school. Care in concealing the camera until the actual moment of exposure is an advantage when human figures are included in these shots. This helps to avoid all suggestion of camera consciousness.



The fishermen.

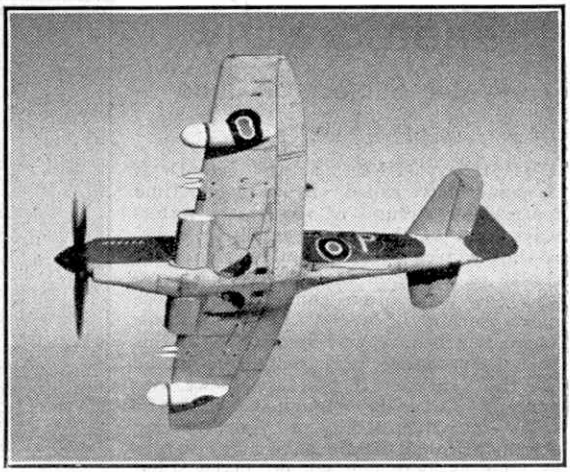
Air News

The "Firefly" Rejuvenated

The wartime achievements of the Fairey "Firefly" two-seat fleet fighter are well known. Now it has appeared in a new form as the "Firefly" IV, shown in the upper photograph on this page. It is still of the same basic design, but considerably cleaned up and with an exceptional performance.

The most noticeable change is in the position of the radiators, which are now mounted in the leading edge of the wings, like those of the "Mosquito" and "Hornet." The rather bulbous "chin" radiator has been replaced by a beautifully smooth cowling, a change that has greatly improved the aerodynamic cleanness of the "Firefly." The wing planform is also quite different as, in addition to the leading-edge radiators, the wing tips have been "clipped" to increase the already fine manœuvrability of the machine. The usual decrease in performance at height that results from such a reduction in wing area does not affect the "Firefly's" usefulness, as it is not intended for high altitude duties. Production machines are fitted with Rolls-Royce "Griffon" 74 engines, which develop over 2,300 h.p. at 14,000 ft.

On the early marks of "Firefly" the fuel is carried in a large main tank between the pilot's and observer's cockpits and in two wing leading-edge tanks. The latter had to be removed on the Mark IV to make way for the radiators. Consequently, to retain the long range so essential to a fleet fighter, a 90 gall. drop fuel tank is normally carried under the port wing. To balance this, special radar equipment is carried in a radome, of similar shape to the drop tank, under the starboard wing. Finally the fin area has been increased by the addition of a dorsal fairing to improve the directional stability.



The Fairey "Firefly" Mark IV, shown here in flight, is now in full production for the Royal Navy.

The result of these modifications is a two-seat single-engined fleet fighter second to none in the world. The "Firefly" IV has a top speed of 386 m.p.h. at 14,000 ft., and can cruise for up to 6½ hrs. at a speed of 220 m.p.h. In addition to its standard armament of four 20 mm. cannons, it can carry either sixteen 25 lb. or 60 lb. rockets, eight larger rockets, or two 1,000 lb. bombs; or combinations of any of them, such as eight 25 lb. rockets and two 500 lb. bombs. J.W.R.T.

"Solent" Flying Boats for British Overseas Airways

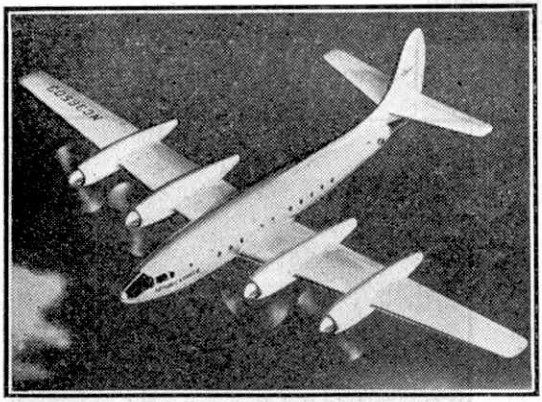
British Overseas Airways will soon be receiving the first of a new fleet of 12 Short "Solent" flying boats, capable of operation on transatlantic routes. The "Solent" has been developed from the "Seaford" military flying boat, and the prototype "Seaford" converted to a "Solent," is at present under test with B.O.A.C. The new fleet should prove worthy successors to the well-known Short "Empire" and "Sunderland" flying boats that have put in so many years of excellent service on Imperial Airways and B.O.A.C. routes.

The "Solent" has four 1,675 h.p. Bristol "Hercules" 130 radial engines, which give it a top speed of 236 m.p.h. at 7,000 ft., with an all-up weight of 75,000 lb. It has accommodation for 24 "sleeper" passengers or 36 day passengers in six cabins, four on the lower deck and two on the upper deck. When 24 passengers are carried the upper-deck cabins are used as a lounge and dining room. A crew of five is normally employed—two pilots, a navigator, radio officer and flight engineer—but two stewards can also be carried.

The "Solent" has a wing span of 112 ft. 9½ in., is 89 ft. 6½ in. long and 37 ft. high. J.W.R.T.

* * * *

British Overseas Airways last month introduced a fast air service to Cairo, using Avro "York" 12-seater machines. The outward flight, from Hurn aerodrome, takes 12 hr. 20 min., and the homeward trip is accomplished in 13 hr. 10 min.



A drawing of the Republic "Rainbow" 46-seater transport, several of which have been ordered by Pan American Airways. It has been developed from the company's XF-12 photo-reconnaissance aircraft, illustrated in the March 1946 "M.M." Photograph by courtesy of Republic Aviation Corporation, U.S.A.

The new Republic "Seabee" 4-seater amphibian. Photograph by courtesy of Republic Aviation Corporation, U.S.A.

American 4-Seater Amphibian

Last month the Republic Aviation Corporation, U.S.A., began an intensive production programme for their "Seabee" 4-seater amphibian "private owner" aircraft, and expect by the end of August next to be completing 40 of these machines a day. This rapid output has been made possible by extensive simplification of design and production methods, and will enable the company to sell the machine for about £950.

The "Seabee," shown in the upper photograph on this page, has a 215 h.p. Franklin air-cooled engine mounted behind and above the cabin and driving a pusher-type ground-adjustable 2-bladed propeller. The high wing, position of the engine, and the seven large window panels in the fuselage ensure a good unobstructed view for pilot and passengers, and wide doors on both sides of the fuselage give easy access to either front or back seats. Both main landing gear and tailwheel are retractable. The "Seabee" has a top speed of 120 m.p.h., a service ceiling of 12,000 ft., and can take off from water in 25 sec. At the end of its flight it requires a landing run of only 400 ft. on the ground or 700 ft. on water.

Improved Internal Air Services

The summer timetables of Railway Air Services and West Coast Air Services are now in operation. The daily direct service between London and Belfast has been increased from one to three services, leaving London at 9.30 a.m., 1.0 p.m. and 4.0 p.m., respectively, with corresponding return services Belfast-London departing at the same time. There are now two flights daily on the London-Liverpool-Belfast air route, the usual morning one at 9.45 a.m. and a new afternoon one at 3.0 p.m., with a corresponding return service in each case. The Liverpool-Belfast and Glasgow-Belfast services have been increased from two to three services daily.

Avro machines, which were tried out so successfully to Belfast and Dublin, are operating a daily service each way on the London-Glasgow route, leaving Glasgow (Renfrew Airport) at 9.15 a.m. and London at 4.45 p.m. The flying time has been reduced to 2¼ hr., a saving of 55 min.

There are four services daily between London and Dublin, two of them operated by West Coast Air Services and two by Aer Lingus Teoranta, the Irish airline. The departure times from London are 9.15 a.m., 11.30 a.m., 2.45 p.m. and 5.0 p.m., and from Dublin 9.0 a.m., 12.0 noon, 2.30 p.m. and 5.30 p.m.

Delivery of more and improved aircraft is expected to produce further improvement in services during the summer. At present operations are still restricted to weekdays.

"Austers" to the Rescue

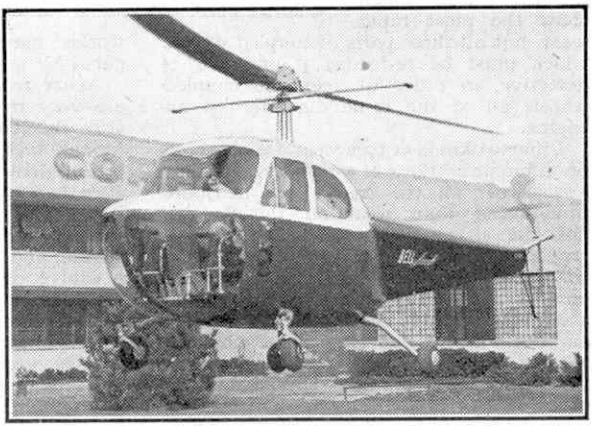
The story can now be told of a particularly daring rescue sortie carried out by "Auster" Ambulance aircraft just after the Arnhem operation.

Several wounded officers of the British airborne forces who had been captured were being treated in Dutch civilian hospitals, under German guard. Having been informed of the location of these hospitals, the "Auster" pilots set out at night, switched off their motors and glided in to land near the hospitals. The wounded men were then smuggled out to the 'planes by Dutch resistance workers and flown home to Britain. J.W.R.T.

First Post-War Helicopter for Commercial Use

The first commercial helicopter licence ever granted by the U.S. Civil Aeronautics Administration has been received by the Bell Aircraft Company in respect of their Model 47 two-seater helicopter, illustrated on this page. The issue of this licence followed extensive flight tests of the machine by C.A. representatives, during which it met all the C.A.A.'s airworthiness requirements and attained speeds in excess of 100 m.p.h.

The Bell 47 helicopter has a two-door enclosed cabin, dual control, all necessary instruments and radio, and 4-wheel landing gear. It has an overall length of 39 ft. 6 in., and the main rotor dia. is 33 ft. 6 in. This machine is the first of a series of models which the company will market under the trade name of "The Modern Magic Carpet."



Bell 47 two-seater helicopter hovering in front of the company's factory.

Wheels and Tyres

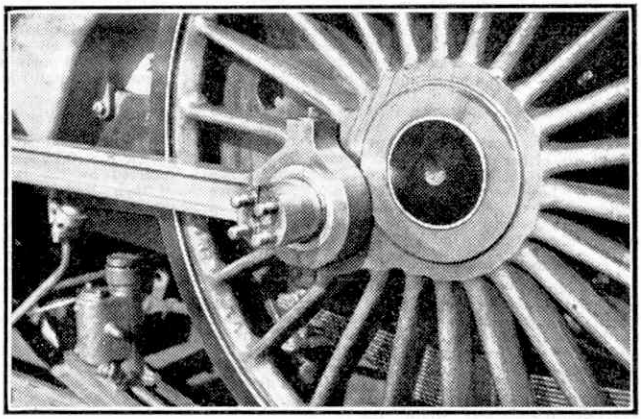
By "Shed Superintendent"

I WAS recently asked to settle an argument about the size of the driving wheels of a particular class of engine, whether the correct size was 6 ft. 7 in. or 6 ft. 5 in. My reply was to the effect that 6 ft. 7 in. was certainly the new size, shewn in the published dimensions of the engines, but that individual engines would vary according to the wear on the tyres. As a matter of fact, a 6 ft. 7 in. wheel will wear down to 6 ft. 4½ in. before requiring new tyres and, theoretically at any rate, the tractive effort will increase as the tyres become reduced in size by wear.

The actual loss of metal from the tyre is caused partly by direct wear and partly by the need for periodical re-turning of the tyre-profile in a lathe. Standard tyre profiles are used on British railways, and when the profiles on any pair of wheels become worn beyond certain limits the Shed Superintendent gives instructions for the tyres to be re-turned, or sends the engine to Works for new tyres. On a six-coupled passenger engine it is usually the leading coupled wheels which show the most rapid wear, but all three pairs of coupled wheels which must be re-turned if one pair is defective, in order to keep the coupled wheels all of the same diameter on an engine.

Different kinds of tyre wear are observed on different sections of a railway. In some areas wear on the treads will be more pronounced than wear on the flanges. On the other hand, engines working regularly on routes which abound in curves will shew more wear on the flanges than on the treads. This is well illustrated on a certain four-mile branch line which has curvature all of one hand, and which is worked by one tank engine on the "Push-and-Pull" system. This engine has to be turned periodically on a turntable, so that the wheels will wear evenly, otherwise the flanges wear sharp on one side of the engine only, causing premature withdrawal of the engine for attention to the tyres. Of recent years a great improvement in the wear of rails and tyres has been secured by the use of rail-oilers positioned at sharp curves.

Tyres do not, funnily enough, always wear round even though they start life round. On some engines the driving wheels tend to wear oval, and this is attributed to partial slip at certain positions of the cranks under certain unfavourable conditions, such as wet rails. This partial slipping can often be felt on the footplate when the engine is being worked hard at high speeds, and is easily cured by use of the sand-valve.



A driving wheel, with coupling rod in position and connecting rod removed.

Apart from these little troubles, tyres are very reliable. A monetary reward is still the custom for anyone finding a broken tyre, but it is rarely paid, and a jesting driver once boasted that he'd never even had a puncture! At one time, however, tyres were fixed to the wheels by means of studs or screws between the spokes, and the holes for these studs were a source of weakness, resulting in tyres breaking and flying off at speed. Now-a-days the tyre is shrunk on to the wheel-centre and retained by a hoop which springs into a recess at the back of the tyre. A tyre may therefore work loose but it cannot come off the wheel, unless it breaks in more than one place, which is a most unlikely occurrence.

Photograph by courtesy of the C.P.R.

The "*Beaverdell*"

New C.P.R. Turbo-Electric Cargo Ship

ONE of the most interesting vessels constructed since the end of the war is the Canadian Pacific Railway Company's "*Beaverdell*." This is the first of four new cargo liners of the most modern type to replace five lost during the war, and to be employed on the service between London and Montreal. The "*Beaverdell*" was built on the Clyde by Lithgows Ltd., Port Glasgow, to whom the work was sub-contracted by the Fairfield Shipbuilding and Engineering Co. Ltd., and recently completed her maiden round trip across the Atlantic and back again. Two further vessels are to be built by this company, and the fourth will be constructed in the Fairfield yards.

The overall length of the "*Beaverdell*" is 497 ft. and she has a maximum breadth of 64 ft. Her gross tonnage is 9,901 and her speed 16 knots. She is propelled by a turbo-electric system in which a Parsons marine turbine drives a 7,000-kW alternator that supplies energy for the propelling motor, which is of 9,000 shaft horse power.

As our illustration of this fine new vessel shows, there is no doubt of her class, for her most prominent features are six pairs of columns, or "Samson posts," connected by cross bars, which form the chief components of a series of derricks used for loading and unloading cargo. The vessel has seven holds of large capacity, covered by sliding hatches, and one of these can be used for either water ballast or cargo.

The boiler that provides steam for the turbine is of the Johnson type, in which there are two drums, one set vertically above the other. These are connected by curved tubes on the outsides, and in addition there is a vertical tube wall that divides the combustion space into two sections. The boiler is oil-fired, and is provided with a superheater, giving steam at a pressure of 850 lb. per sq. in. and with a temperature of 850 deg. F. The turbine to which it supplies steam is of the Parsons impulse-reaction type. The high pressure section has a two-row impulse wheel followed by reaction stages, and the low pressure section is of the reaction type throughout. The 7,000-kW alternator provides three-phase current at 3,000 V.

The propelling motor is in two sections, each of which can be run separately if this is necessary. Power for one section can be provided by an alternator driven by one of three 400-kW Diesel-engined auxiliary generators. This arrangement allows the use of half power in the event of a fault in one section of the motor or in the connecting cables, and the power provided is sufficient to keep the ship under way in estuaries, or to take it into harbour if any fault occurs in the main propelling system.

Special attention has been paid to the simplification of control, and a single wheel is employed for starting, synchronising and regulation of speed, along with five selector switches that decide the operating conditions. The wheel and switches are mounted on a control desk.

Full use is made of modern electric equipment. Altogether there are 110 electric motors to provide for services. These have a total of 1,786 h.p. and power for them is provided by the three 400-kW Diesel engine sets already referred to. They include motors for the refrigerating plant, a 53 h.p. warping winch and 20 cargo winches of 35 and 47 h.p. Other electric motors drive the ventilating fans and the auxiliary sets provide current also for lighting and other purposes.

The Story of Cement

Muddy Boots Lead to Creation of Great Industry

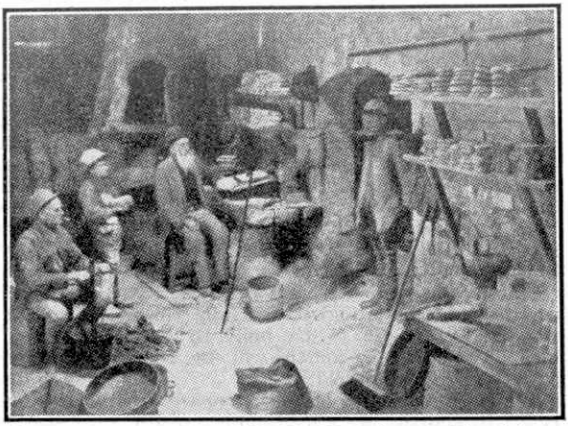
ONE hundred and twenty five years ago a Yorkshire bricklayer stumbled on a discovery that was to provide the world with a new building material and lead to the creation of an industry which gives, in Great Britain alone, direct or indirect employment to approximately 100,000 workers every year. The material was Portland cement, and its discoverer Joseph Aspdin of Leeds.

Aspdin had no qualifications as a research worker, but he lived in an age when the whole building industry was seeking a reliable hard setting mortar which would resist erosion when exposed to the sun, wind and rain. Lime mortars had been known and used with varying degrees of success since the days of the early Romans and Egyptians, but no exact formula existed for its manufacture to a standard quality.

Long and patient research had been devoted to the subject by John Smeaton, claimed to be the father of civil engineering in this country, in 1750. Smeaton was engaged at that time in the construction of the third Eddystone Lighthouse, and required a mortar, capable of setting under water, on which he could bed the huge stone blocks intended for use in the foundations of his marine tower. After many experiments with various types of lime and clay, Smeaton obtained what he wanted by mixing together lime, clay and a volcanic deposit, found near Naples, known as puzzolano. Although his lighthouse stood for 128 years Smeaton's mortar did not become a popular material—probably for the reason that it would have been too expensive to import the puzzolano all the way from Italy.

Smeaton's experiments were followed up during the next 70 years by Vicat, a French engineer and chemist, and another Englishman named James Frost, of Finchley. Vicat, although he made some progress, did not carry his research through to a successful conclusion, whereas Frost did succeed in producing a composition which he marketed for many years under the name of "British" cement.

It was in 1821 that Aspdin had his lucky accident. On arriving home one evening after a long day working in rain and mud, he placed his boots in front of the fire to dry. Returning to collect them some time later he found that they had been left too near the fire and the excessive heat had caused the leather to harden. To rectify this trouble Aspdin saturated the boots with water and then allowed them to dry naturally. He then tried to remove the dried "mud" in the normal way, but found to his surprise that it had set like stone.



Cement testing room about 1850. The illustrations to this article are by courtesy of the Cement and Concrete Association, London.

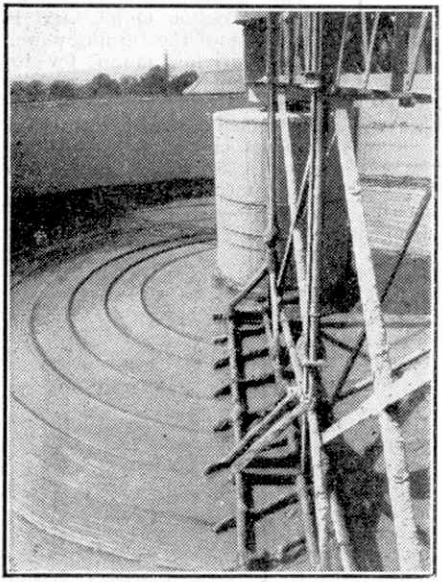
This aroused Aspdin's curiosity, and after reasoning out the sequence of events he correctly attributed the change in the "mud," which had originally been a mixture of lime and clay, to the fact that it had been burned in front of the fire and then wetted and allowed to set. Following these lines of approach he carried out experiments using varying quantities of lime and clay until, in 1824, he decided that he had found a cement superior to anything obtainable at the time.

Aspdin's first patent was taken out in 1824, and he named his product "Portland" cement owing to its resemblance, in the hardened state, to the famous natural stone.

The original Portland cement, however, was far from being the perfect and reliable material that we know to-day. Aspdin's methods, as revealed by his patent, were extremely crude, and he even suggested that the lime to be used in making cement should be obtained by sweeping roads in the neighbourhood of the lime kilns. Further, although the first batches of Portland cement produced by Aspdin in a works he started in Wakefield, Yorkshire, were superior to rival products such as Frost's "British" cement, they were not uniform in quality and therefore not completely reliable. Years of careful research and improvements in methods of manufacture have been necessary to bring the cement industry to modern standards from the days when varying quantities of lime and clay were burned under primitive conditions in bottle kilns.

The making of modern cement is an exact science. From the time the clay and lime, or chalk, are quarried, until the finely ground cement pours from the grinding mill in the last stage of manufacture, all ingredients are carefully analysed and checked for quality and correct proportions during each process of manufacture. Huge revolving cylinder kilns, the biggest pieces of moving machinery in any modern industry, have replaced the early bottle kilns for the calcination of the ingredients. These rotary kilns operate continuously day and night in more than 50 works throughout the United Kingdom, and in 1939 produced more than 9,000,000 tons of cement.

Row of original bottle kilns at Messrs. Robins and Aspdin's works at Northfleet, Kent.



Modern slurry mill showing harrows which continually agitate the mixture of clay, lime and water and maintain it at the correct consistency for pumping into the kiln.

The original slurry "backs," often covering several acres of ground, where clay, lime and water were mixed together and allowed to settle before the water was drawn off and the remaining sludge laboriously wheeled by hand to drying flats to be sun dried before going to the kiln, have been replaced by a system of up-to-date washmills, and slurry tanks with continuously revolving harrows from which the slurry is pumped in liquid state into the kilns. From the kilns the burned material, known at this stage as clinker, is first cooled, and then fed into cylindrical grinding mills which have replaced the slow and wasteful horizontal grindstones which were used in the early days of the industry.

Aspdin's original product was also difficult to place because it started to set immediately water was added to it, and therefore it was not advisable to make up a quantity greater than could be applied immediately. This tendency to what is known as "flash setting" is now overcome by adding a very small proportion of gypsum to the clinker when it goes into the grinding mill, with the result that the cement, when mixed with aggregates and water to produce either mortar or concrete, remains plastic for some time.

The extent to (Continued on page 260)

Among the Model-Builders

By "Spanner"

MOTOR CAR RADIATORS

Among suggestions received in the past for new Meccano parts the idea that a special automobile radiator should be manufactured has held a prominent position. From this it seems that many Meccano boys hold the opinion that an article of this type is essential to the completion of "perfect" model motor cars. The illustrations on this page, Figs. 1 and 2, however, show that this is not the case, and that with a little ingenuity a realistic radiator of either the private car or commercial lorry type can be quite easily built up from standard Meccano parts.

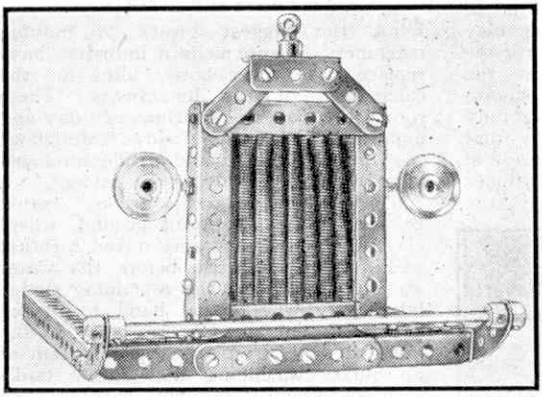


Fig. 1. A radiator of heavy type suitable for a commercial vehicle.

In Fig. 1 a heavy pattern of radiator is shown. In this case Springs have been used to form the "honeycomb" portion and I think it will be generally agreed that they look quite realistic. The Springs are held on two Axle Rods, the ends of which are journalled in Cranks bolted to the upright Angle Girders. A bumper bar also is fitted.

Fig. 2 shows a radiator of the private car type, and it will be seen that it is fitted with louvres or shutters in place of the springs used in the model illustrated in Fig. 1. This gives the radiator a most distinctive appearance, as louvres usually are only fitted to an expensive car. The $2\frac{1}{2}$" Double Angle Strips forming the louvres should be bolted on the slant to give the required effect.

Mr. G. P. Alcock, Hartford, Northwich, a First Prize Winner.

SERVO FRICTION CLUTCH

In response to several enquiries I have received I am illustrating in Fig. 3 a novel form of clutch mechanism that is specially suitable for use in model cranes. Its special feature is that it facilitates the lowering of loads under gravity. When the power unit is stopped the load remains stationary, but as soon as the friction brake included in the device is released the load begins to fall, the descent being under constant control.

The mechanism is known as a servo friction clutch, and it makes use of the turning power of the driving motor for its application. Fig. 3 shows the mechanism as it would be constructed for incorporation in a model crane. A Rod 2, on which a 3" Pulley is free to rotate, forms the crane winding drum. The Pulley is driven from Rod 1 and carries a 1" Rod on which a Collar 4 and a 50-teeth Gear 6 are fixed. The Collar is fitted with a bolt to which a length of Cord is attached. The latter passes around the rim of a $1\frac{1}{2}$"

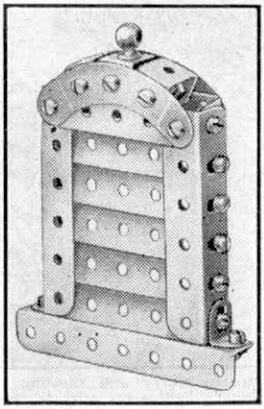


Fig. 2 A built-up radiator of distinctive appearance.

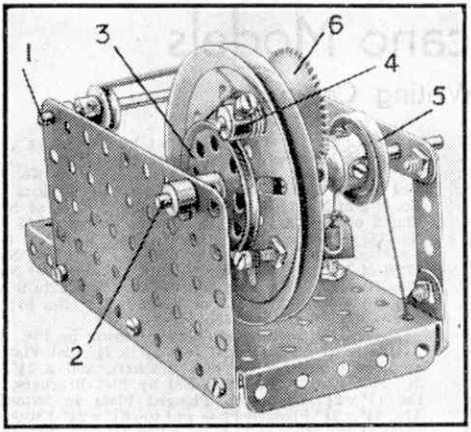


Fig. 3. A servo friction clutch mechanism.

Pulley 3 fixed to Rod 2, and is tied to a $\frac{1}{2}$" Bolt lock-nutted to the 3" Pulley.

The 50-teeth Gear meshes with a $\frac{3}{4}$" Pinion that is connected to a 1" Pulley 5 by a Socket Coupling. This assembly rotates freely on Rod 2, but its rotation can be retarded by a band brake, which is made by anchoring a length of Cord to the baseplate, passing it round the 1" Pulley, and then tying it to an Angle Bracket. The Bracket can be moved up and down the shank of a $\frac{3}{4}$" Bolt by means of a Threaded Boss. When the band brake on Pulley 5 is slack, the 3" Pulley and Pulley 5 rotate as one unit and no drive is transmitted to Rod 2. If the rotation of Pulley 3 is retarded, however, the 50-teeth Gear rotates around the $\frac{3}{4}$" Pinion and tightens the band brake round the $1\frac{1}{2}$" Pulley. As this is fixed to Rod 2, it transmits the rotation of the 3" Pulley to this Rod.

When the friction brake is released on Pulley 5, the band brake on the $1\frac{1}{2}$" Pulley 3 is released and the load commences to fall. To control the descent of the load therefore it is only necessary to operate a hand or foot lever conveniently placed and actuating the band brake around Pulley 5.

READERS' SUGGESTIONS

Many Meccano models, such as roundabouts, bridges and motor cars, are improved in appearance and interest by fitting them with electric lights supplied with current from a dry battery. In view of this Arthur Brackley, Birmingham, suggests that the addition of a special 4-volt dry battery to the Meccano system might prove useful and welcome to many model-builders. He suggests that the battery should be supplied enclosed in a special container fitted with drilled lugs by means of which it could be bolted in position in the model, and connection terminals. The idea is interesting, but as it is not possible to supply anything of this kind at present, I am filing the idea for reference when the position becomes more normal.

Another novel suggestion has been submitted by I. Elland, West Thurrock, Essex, who is a member of the Meccano Guild and the H.R.C. He thinks that a semi-spherical part, like the half of a hollow ball, would be useful in many models.

Such a part could form the nose of an aeroplane or the dome of a large model locomotive, and uses in connection with the streamlining of model vehicles could be found for it.

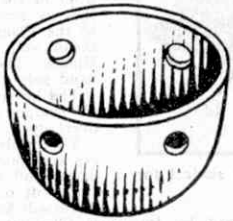


Fig. 4. This suggested Meccano hemi-sphere would have many uses. It is mentioned on this page.

A SIMPLE STEERING GEAR

In Fig. 5 we show a simple form of steering gear, suitable for a small lorry, devised by Flying Officer T. Lloyd, Babbacombe. A feature of the construction is the very few parts required.

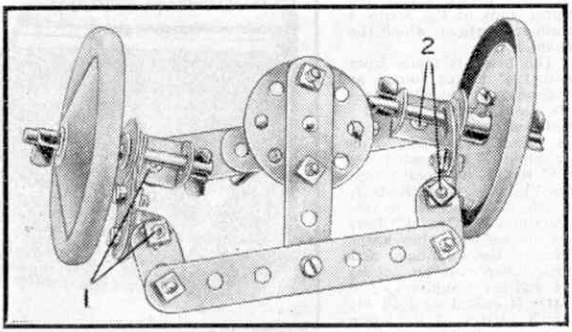


Fig. 5. A simple steering gear suitable for a lorry. In this arrangement the steering column is vertical.

New Meccano Models

Balance—Writing Cabinet

OUR two new models this month are of a less usual type and both of them are quite easy to build. The first is a useful balance, shown in Fig. 1, and the second is a combined writing cabinet and calendar, which is seen in Fig. 2.

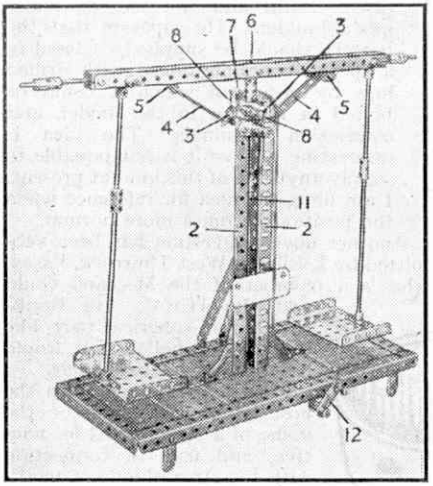


Fig. 1. This fine balance is an excellent subject for model-builders.

The column for the balance is formed by two 9½" Angle Girders, fastened to the base by Flanged Brackets and joined at their upper ends by a 1½" Strip. The Bolts fixing the 1½" Strip also carry two Reversed Angle Brackets 3, to each of which a 3" Strip is attached by an Obtuse Angle Bracket. Two 1½" Strips 5 bolted across the upper ends of the Strips 4 form supports on which the beam rests.

The beam is made from two 12½" Strips joined at their ends by Double Brackets, a Coupling 4 being fastened between the Strips at their centres. This Coupling is connected by a 1" Rod to a second Coupling pivoting on Rod 7, which is supported in two Couplings 8. Two 1½" Rods are locked in the lower ends of the Couplings and their inner ends are joined by another Coupling. The latter is locked on Rod 11, which carries at its lower end a 1" Pulley. A Flat Bracket fixed by a Collar to the Rod of Crank 12, bears against the Pulley, so that by depressing Crank the beam is lifted off its supports.

Parts required to build the Balance: 2 of No. 1; 2 of No. 2; 2 of No. 4; 6 of No. 6a; 2 of No. 8; 2 of No. 9; 2 of No. 10; 5 of No. 11; 2 of No. 12; 1 of No. 12a; 2 of No. 12c; 1 of No. 13a; 2 of No. 14; 1 of No. 15; 2 of No. 15b; 2 of No. 16a; 2 of No. 17; 1 of No. 18a; 2 of No. 18b; 1 of No. 22; 7 of No. 37; 6 of No. 37a; 3 of No. 38; 2 of No. 53; 4 of No. 53a; 10 of No. 59; 1 of No. 62; 2 of No. 62b; 9 of No. 63; 4 of No. 63c; 2 of No. 70; 3 of No. 81; 4 of No. 126; 1 of No. 147b.

The useful writing cabinet is shown in Fig. 2. At the front of the model two 5½" × 2½" Flat Plates are joined together by Flat Brackets, and a 2½" × 2½" Flat Plate is also attached by Flat Brackets to the 11" × 2½" compound Flanged Plate so formed. This 3½" × 2½" Flanged Plate and the 5½" × 2½" Flanged Plate at the other end are joined to 3½" × 2½" Flanged Plates and 9½" Angle Girders 1 at each side. Each side is then filled in with 5½" × 2½" Flat Plates and 12½" and 9½" Strips that are bolted to the Angle Girders 1. The upper ends of these Strips are secured to 1½", 2½" and 3½" Strips.

The inkwells are held in a framework consisting of 2½" Strips bolted to the Flanged Plates at the front of the model, and to a 15" compound Strip 8 that is secured, together with two similar Strips, to the Flanged Plates at each side. The covers for the inkwells are 3" × 1½" Flat Plates fitted with Meccano Hinges. The pens are placed in the slot at the left-hand side of the inkwells.

The lower front part of the model is filled in with 15" compound Strips consisting of 12½" and 3½" Strips overlapped.

The leaflets denoting the day, month and date are contained in pockets consisting of 1½" and 2½" Strips and 2½" × ½" Double Angle Strips attached to the front of the model by Double Brackets and ½" Reversed Angle Brackets. The back of the cabinet is filled in with 12½" Strip Plates. 5½" × 3½" and 5½" × 2½" Flat Plates are secured to Angle Brackets bolted to the 5" compound strips and the Strip Plates at the back. The slots in which the writing paper is placed are divided off by compound flat plates.

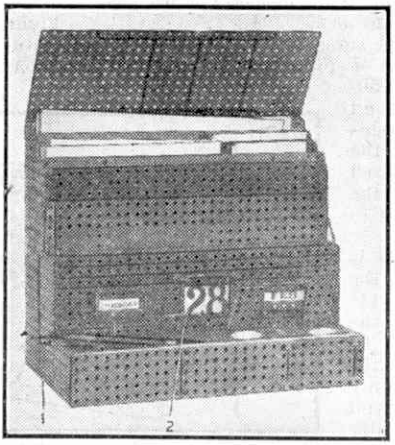


Fig. 2. A combined writing cabinet, letter rack and calendar.

The upper portion of the front consists of two 5½" × 2½" and a 3½" × 2½" Flanged Plate and a 2½" × ½" Double Angle Strip fixed to the sides. The remaining space is filled in by 15" compound strips of various lengths suitably overlapped.

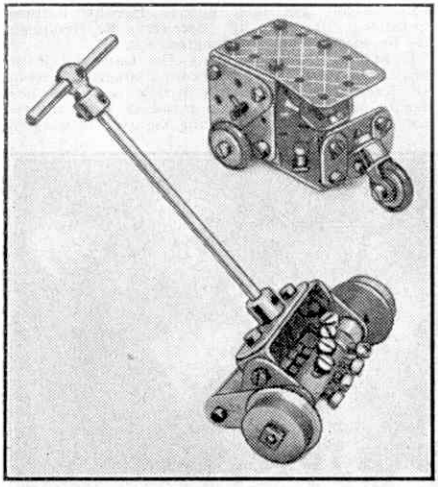
Parts required to build the Writing Cabinet: 18 of No. 1; 16 of No. 1a; 7 of No. 2; 17 of No. 3; 21 of No. 5; 6 of No. 6a; 2 of No. 8; 2 of No. 8a; 4 of No. 10; 8 of No. 11; 44 of No. 12; 2 of No. 12a; 360 of No. 37; 12 of No. 38; 4 of No. 48a; 5 of No. 52; 10 of No. 52a; 4 of No. 53; 6 of No. 53a; 7 of No. 70; 3 of No. 73; 2 of No. 108; 7 of No. 114; 4 of No. 125; 1 of No. 192; 6 of No. 197.

Model-Building Competitions

By "Spanner"

"Simplicity" Model-Building Contest

In this contest owners of even the smallest Meccano Outfits can compete on level terms with the more

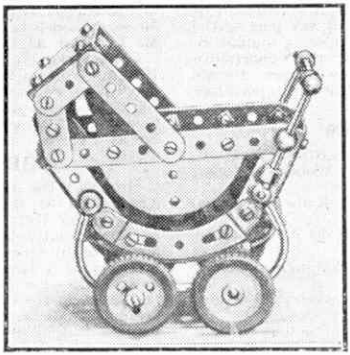


These "Simplicity" models won a prize in a previous Contest. They were built by A. Short, Birmingham 17.

fortunate possessors of the more ambitious sets, and we hope that every Meccano boy that reads this announcement will decide to send in an entry. Prizes will be awarded to Meccano model-builders who succeed in constructing the most ingenious and realistic models from the smallest number of parts. Competitors may choose any subject they like for their models, and the more unusual and interesting these are the better their chances of winning prizes.

When the model is completed the competitor should obtain either a photograph or a good sketch of it. He should then write his age, name and address on the back of the illustration and send it to "*Simplicity Model-Building Contest, Meccano Ltd., Binns Rd., Liverpool 13.*" The actual model must not be sent.

The competition will be divided into two Sections. A, for readers of all ages living in the British Isles; B, for readers of all ages living Overseas. The prizes to be awarded in each section are: First, Cheque for £2/2/–; Second, Cheque for £1/1/–; Third, P.O. for 10/6. There will be also Consolation Awards. The closing date for Section A is 31st July, and for Section B 30th November.



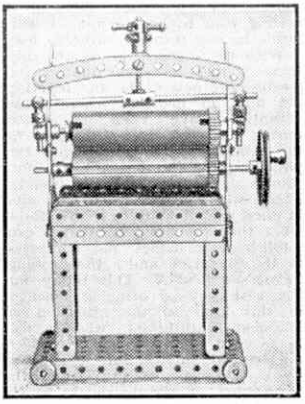
Another realistic model by J. Matthews.

Home Gadgets Model-Building Contest (Home Section)

The list of prize-winners in the Home Section of the "Home Gadgets" Competition is as follows:

1st Prize, Cheque for £2/2/–: R. A. Fisher, Woodford Green; 2nd, Cheque for £1/1/–: K. V. Ketteridge, Cambridge; 3rd, P.O. for 10/6: R. B. Batly, Buxton.

Consolation Prizes of 5/–: J. Bullock, London S.W.6; J. Matthews, Fillongley; D. Harding, Fetcham; R. F. Jackson, Didcot; E. Hardy, Thetford.



A simple but realistic model wringing machine built by J. Matthews, Fillongley.

An outstanding feature of this Contest is the fact that the First Prize was won by a boy under 10 years of age, competing against model-builders much older than himself. He is Roger Anthony Fisher, Woodford Green, and he won his success by designing and building a really useful music stand of the kind used by violinists. This is a really sturdy and practical piece of equipment that would be creditable to a much older boy.

K. V. Ketteridge, Cambridge, evidently is an optimist! His entry consisted of one of those ingenious gadgets used for whisking eggs in the days when real fresh eggs were plentiful and few of us had even heard of the dried variety! Ketteridge apparently thinks it worth while being prepared for the return of the real thing, even though the prospect seems rather remote at present!

Another interesting and unusual entry was a revolving stand of the kind used by confectioners when decorating cakes with icing. The model is really very simple, and consists of a table formed by two Hub Discs face to face, which revolves on a vertical shaft supported in a sturdily constructed and decorative base. On account of its simplicity coupled with usefulness and sturdy construction the model was awarded Third Prize. It is the work of R. B. Batly, Buxton.

I hope to illustrate some of the successful models in future issues of the "*M.M.*"

Club and Branch News

WITH THE SECRETARY

THE GUILD GOES AHEAD

The reappearance of Meccano Outfits has led to a great revival of enthusiasm for the Guild. Thousands of new members have already been enrolled, and those who during the war have been unable to continue with Guild activity have now been able to pick up again the threads of their former interests. Recruiting activities on the part of members also are intense, and the enrolment of new members should continue at a fine pace. Keep up the good work by getting your friends to join. I will send application forms to any member eager to find recruits.

With the increase in membership there should be opportunities for establishing new Clubs and reviving old ones in districts where these activities have been suspended during the war. Every member of the Guild should think over the possibility of forming a Club, and should discuss it with his friends. Those who set out with this aim in mind should write to let me know what they are doing so that I can publish their names and addresses in the Magazine under the heading "*Proposed Clubs.*" This is by far the best way of bringing schemes of this kind to the attention of Meccano enthusiasts who would make good members, and it enables me to give advice and assistance, by such means as providing lists of members in the district in which a Club is planned.

GUILD AND H.R.C. CORRESPONDENCE CLUBS

The Correspondence Clubs of the Guild and H.R.C. are sharing in this revival of interest. Membership of these Clubs is open to all who have joined the Guild or H.R.C., and I am looking for more members in order to satisfy the needs of those who are at present awaiting correspondents. New members are required particularly in Australia, Canada and the United States, and indeed I can promise a correspondent very soon for any member in almost any part of the World outside Great Britain, as I have a number of members in this country awaiting the opportunity of exchanging news and views with pen friends overseas. Write now for details of the Correspondence Clubs, and for entry forms.

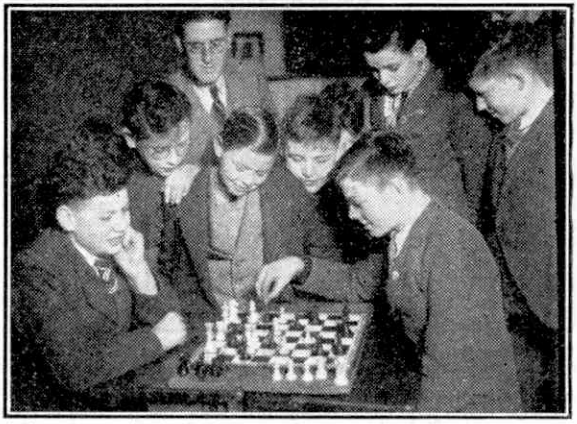
PROPOSED CLUBS

ROMFORD—Mrs. Hathaway, 33, High Street, Romford.
SHROPSHIRE—Mr. P. G. Harries, Woodard House, Ellesmere Coll, Shropshire.
CRESWELL—Mr. J. A. S. Noble, 13, Railway Avenue, Creswell, Nr. Worksop, Notts.
STAPLEFORD—P. R. Williams, 57, Halls Road, Stapleford, Nottingham.
CHORLEY—Mr. K. Bowling, 7, Wellington Street, Chorley, Lancs.
BEESTON—Mr. D. Spicer, 5, Firs Avenue, Beeston, Notts.
FOLKESTONE—A. McKelvey, 1, Stoddart Road, Folkestone, Kent.
DUBLIN—W. Coakley, 216, Phibsboro Road, Dublin.

Club Notes

HILL-CORNER (LEAMINGTON SPA) M.C.—Steady progress is being made with Model-building, and a variety of Games is enjoyed at meetings. It is hoped soon to secure a larger Club Room, and in the meantime a sound foundation is being laid for good Club work, which will then include Hornby Railway operation. Club roll: 16. *Secretary:* R. Hemming, 53, Prospect Road, Leamington Spa.

HENLEAZE (BRISTOL) M.C.—The Club roll is increasing and it is hoped to secure a larger Club room. An Exhibition of Meccano Models is to be held shortly, and in preparation members have enjoyed many interesting Model-building Nights. The question of "*Nationalisation*" has been debated. Model-building Competitions continue, and a visitor has demonstrated Meccano models to the Club. Club roll: 17. *Secretary:* M. E. Frost, 32, Oakwood Road, Henleaze, Bristol.



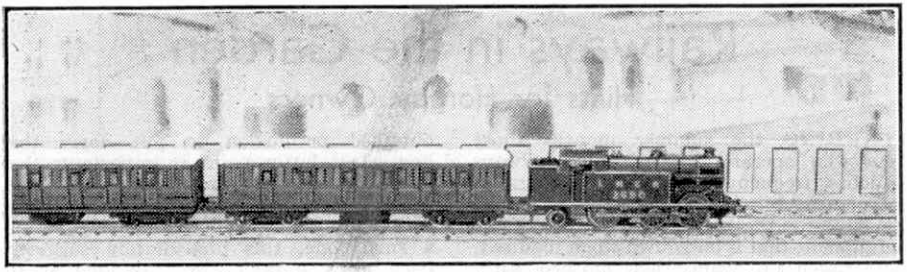
A keen game in the club room of the Tynecastle School (Edinburgh) M.C. The contestants are W. Jeffrey, Secretary, on the left, and S. Dean, Treasurer, on the right. Mr. J. Stirling, one of the Leaders of the Club, is looking on from the rear. This Club was affiliated in February 1929, and under the Leadership of Mr. W. C. Stephen it carries out an excellent programme of Meccano Model-building, model aeroplane construction and other activities.

CAER URFA (SOUTH SHIELDS) M.C.—Meccano and Hornby Train nights alternate with Games Meetings and others devoted to Stamps. An excellent "Quiz Night" provided splendid entertainment. Club roll: 30. *Secretary:* G. Burrows, 113, Quarry Lane, Cleadon, South Shields.

BRANCH NEWS

HORLEY—The usual track meetings have continued. The layout at these is varied and timetables are arranged for them. On one occasion 80 trains were operated, and a derailment gave splendid practice in arranging diversions to avoid dislocating the service. *Secretary:* D. J. Hunt, 61, Castle Drive, Horley, Surrey.

URMSTON—For the outdoor season a track is to be laid down in the open and Branch outings are being arranged. A Branch Library is in operation. The members are making models of galleons, modern ships and aeroplanes. *Secretary:* J. A. Denton, 6, Southgate, Urmston, Manchester.



A Dublo Tank Locomotive busy with a stopping passenger train. This engine is equally suitable for passenger or goods traffic working.

Dublo Tank Engine Topics

TANK engines are handy and can be used for a great variety of operations. They can be run equally well forward or backward, and so do not require to be turned at the end of each journey, a feature that simplifies the track layout requirements considerably. They carry coal and water supplies on their own frames instead of in a tender, so that they are easily manœuvred, which makes them particularly useful in miniature railway operating. Another good point is that they occupy relatively little space, which is an advantage when the Engineer of the line has had to keep the length of his sidings and loop lines to the minimum.

The Hornby-Dublo 0-6-2 Tank Locomotive has all the merits of the type. Its six-coupled wheels of moderate diameter make it a splendid "general purpose" engine, and it is equally at home when hauling goods or passenger trains. It can indeed be used to good effect in passenger train operation of almost every kind, except on the fastest and heaviest long-distance services. In real practice a great deal of heavy local passenger work as well as goods train operation is carried out by tank locomotives of the 0-6-2 wheel arrangement represented by the Dublo Tank. A good example is the vast suburban traffic of the L.N.E.R. in and out of King's Cross and Liverpool Street Stations in London.

We can therefore find plenty of work for a Dublo Tank locomotive. Probably its first run in any given spell of operations will be from the engine shed to the siding where the passenger coaches are stored, and from the siding the train is worked "empty" to the station near by, ready for its first journey. On very simple layouts in restricted space, however, it may be necessary for coaches to be accommodated at the station platform when they are not in use.

On the usual oval circuit the first trip can consist of a series of runs of one lap each, a stop being made at the station each time round in order to represent an early morning stopping train service. If we have a terminal station, so much the better, for the train can finish its trip by running in there. Shortly after arrival the locomotive will have to get round its train in order to be ready for the return journey. On some layouts this running round may be possible within the platform limits; on others it may be necessary for the train to be shunted out into a loop line before the engine can make its way to the opposite end and couple up for the down run. Details of this kind depend entirely on the layout arrangements.

If we have no terminal station we must run the train alongside the same station platform that we have been using throughout the run. If there is no loop line available for running round purposes, the engine will have to be transferred from one end of the train to the other by working it right round the oval track. This is a sort of "secret operation" that is frequently necessary in miniature railway working, owing to the restrictions of space and equipment.

The down journey can be similar to the up trip or possibly stops on alternate circuits only may be made. Then after similar running round operations and probably a visit by the locomotive to the water crane or tank, if we have one, another up journey can be started. This time the train represents a tightly-timed business service without any intermediate stop, unless we particularly wish to include one for "ticket collecting" purposes. After this run the engine will probably shunt its train to the sidings for the time being, and it will then itself move off to the engine shed. Here it may be supposed to refuel and stand for some time until its next trip.

For variety in working its next job may involve the collection of a goods brake van from the yard nearby and then a supposed journey down the line in order to pick up wagons here and there until a complete train is formed. These vehicles can then be worked to the shunting yard, where some reforming of the train can be carried out in order to make it ready for a through run. It is in operations of this kind that the handiness of the tank engine and the perfect control afforded by the Dublo Controller are seen to great advantage.

If the tank locomotive is the only one available it can well be used for the through main line run. This is not unrealistic, as journeys of considerable length are frequently made by tank engines on this type of work. The run can be broken by stops for examination of the train at different points, and the engine can take advantage of these to replenish its "water supply." A run of this kind would in actual practice take quite some time, and the engine would not immediately be worked back to its home station. It would have to put into the distant depot for servicing and attention before the run home.

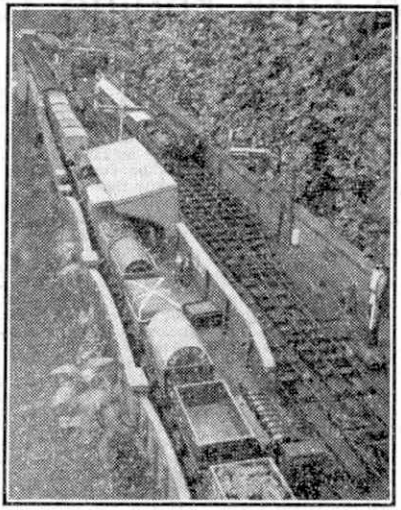
Where the tank locomotive does not make the main line through run with its freight train, it can be employed round about its own depot before going out again to help deal with the rush of evening passenger traffic. A few wagons may have to be moved in the goods depot, there may be some empty coaches to be worked along to the station where they will form a main line express and many similar jobs can be arranged. Finally a stopping train trip out and home and then perhaps a fast run down in a similar manner to the up run of the morning, and another stopping journey, will be made before the engine parts with its empty coaches and returns to its shed after a busy working day.

Operations on these lines can be varied considerably according to the layout and stock at the disposal of the Hornby-Dublo owner. Where several engines are in use and there are more operators involved the fun is even more exciting.

Railways in the Garden

Hints for Hornby Owners

DURING the summer months those who operate their Hornby railways indoors frequently envy the owners of permanent outdoor systems. It is indeed possible for the owner of Hornby railway equipment that is laid down when required, and taken up again when finished with, to conduct operations in the open, by the simple, if somewhat laborious process of carrying his railway material outside, and laying down the system there. Naturally it is wise to do this only on a fine warm day, and when operations are over the whole of the equipment should be carefully boxed up and taken to its usual storage place indoors.



Mixed freight on the outdoor system of Mr. C. B. Smith, Lincoln. Two goods trains are standing "head to tail" on the loop line.

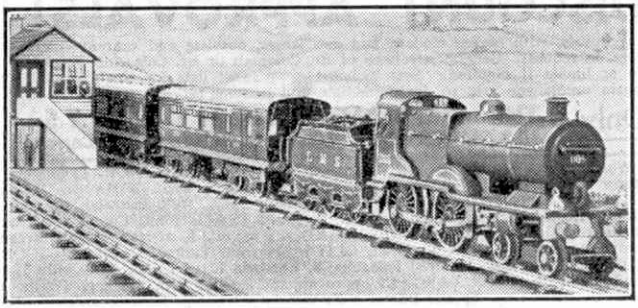
It must be pointed out straight away that Hornby railway material is designed essentially for indoor use, and the track and accessories particularly are not suitable for permanent service outside. The effects of the weather would soon cause rusting and deterioration. Quite satisfactory results, however, can be obtained by the method described previously, and if various precautions are taken, no difficulty should arise.

A dry, level site for the layout is essential. Another point is that in order to counteract any effect of damp and consequent rusting, it is important to wipe over each piece of track and each accessory with a slightly oily rag when the railway is being put away. Should it happen that a sudden shower overtakes the operator in the middle of his train working, then drying with a plain rag followed by an "oily wipe" should help to avoid any trouble.

The question of where to lay the railway outside depends largely on the garden where we will assume we have obtained permission to put down the line. This latter point is important; the "railway company" must always have the consent of the "landowner" just as in actual practice. If there is a lawn, even a small one, this immediately suggests itself as a suitable site. As long as it is level it will do, but it is important that the grass must be cut very short; otherwise it is certain to hinder the running of the trains. One big advantage of a lawn is that it provides the effect of "green fields" surrounding the layout without any trouble on the part of the railway maker.

Such alternatives as a concrete pathway or a tiled walk also make good firm bases for the track, and it is not difficult on either of these surfaces to build up any of the usual accessories that many of the Hornby railway owners like to have at the lineside. Another advantage is that roads and station yards are readily provided and a good running surface is afforded for the road vehicles frequently operated in conjunction with the railway.

Each of the schemes so far described involve "on the floor" operations. Where it is considered necessary for the railway to be raised for convenient handling it may be possible to arrange a wooden structure for this purpose, the nature of this depending to a certain extent on conditions on the spot, and the material available. Little difficulty is encountered where the railway is arranged indoors, possibly in sections, on a wooden base. These can be installed out of doors as they are, and suitable supports to raise the railway to convenient height can usually be arranged by means of boxes, trestles or even chairs.



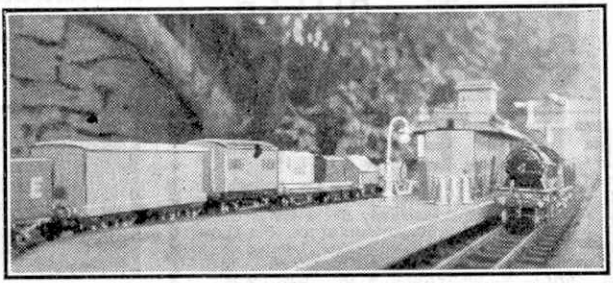
Northward Bound! "The Yorkshireman", complete with train nameboards, is hauled by a Standard Compound Hornby L.M.S. E220 Special Locomotive.

Sometimes the miniature railway owner is fortunate enough to have a small plot of ground entirely at his disposal, on which he can arrange his railway. This gives a splendid opportunity for obtaining realistic natural effects. Actual earthworks may be necessary in order to obtain a level track, but in any case cuttings, embankments and sometimes even tunnels can always be arranged by a bit of "navvying." These will remain a permanent feature, although the actual track will be removed when operations are over. In these circumstances a prepared path for the line will be necessary, which will have to be arranged according to the materials most readily available.

Apart from such engineering features there are various advantages in outdoor operation from the working point of view. There is more space as a rule and this means that longer stretches of track are possible than when the railway is laid down indoors. Longer main lines, sidings and loops give a greater sense of distance. An interesting result of this is shown in the illustration on the previous page of part of the now well-known Bincliff, Lakeside and Shedley railway of Mr. C. B. Smith of Lincoln. In this lengthy trains are seen, and the capacity of the running loop in the foreground is such that two trains are shown standing "head to tail" in it. This helps to keep main line traffic on the move satisfactorily and each goods train is ready to travel on its way immediately there is a "path" for it.

This Bincliff railway is a permanent line that has been in operation since 1937. It is arranged on the "there and back" principle so that trains departing from Bincliff station ultimately arrive back there, after a run of some 150 ft. Although the track is laid on a raised structure, attractive natural effects are evident in different places, particularly near *"Westwood Tunnel,"* by means of which the line turns practically at a right angle when approaching "Lakeside" station. Hornby clockwork locomotives are used extensively on this system and with careful usage and maintenance several of them have given good service for a considerable number of years. There is still plenty of mileage left in them.

Another outdoor system, arranged on the end-to-end plan, is shown in the lower illustration on this page. This is the "Central Lines" owned and operated by our reader *"Rosco."* Hornby clockwork locomotives again provide the motive power, and Hornby rolling stock is freely used. A variety of interesting operations is undertaken and a typical scene is that at "Midby" station shown in the illustration referred to. This station, as its name implies, is an intermediate point between the two terminals. At one time its train service was not very frequent owing to the attraction of non-stop runs from end to end of the line. Now, however, things have changed, and "Midby" is a station of importance. It is situated in attractive surroundings, as the illustration shows, and this is a good instance of the realistic effects that can be obtained by the use of a little imagination and skill.



Another outdoor layout; traffic is shown at "Midby" on the central lines owned by our reader "Rosco."

For other Stamp Advertisements see also pages 256 and vii.

Stamp Collecting

The Stamps of Western Samoa

By F. Riley, B.Sc.

BEFORE leaving the islands of the South Seas in our Empire tour we must call at Western Samoa, a group of islands with an interesting history, that have been associated with Robert Louis Stevenson, the author of "*Treasure Island*" and other fine stories in which readers must have revelled.

The Samoan Islands are divided into two parts, one under British rule and the other under that of the United States. It is the western division that is British, under the guardianship of New Zealand, and this consists of the two main islands, on one of which is Apia, the capital. The islands have not always been divided this way. Last century Germany and the United States, as well as Britain, became interested in them, and eventually Western Samoa became German and the rest American, Great Britain receiving compensation elsewhere. This settlement was effected in 1900, and it only lasted until the Great War, for in 1914 a New Zealand force landed on the German islands of Western Samoa and these have remained under New Zealand guidance ever since.

The varying fortunes of Western Samoa have been reflected in the stamps of the country. The earliest of these were issued in 1877, when there were native kings ruling the country. They were printed in Sydney, Australia, for King Malietoa, and most of my readers will be familiar with them, for they were the well-known Samoan "Express" stamps. They could not be described as attractive in appearance, but those who possess genuine specimens of the original issues of all values should be pleased with themselves, as they are fairly high priced. Unfortunately there have been many reprints and remainders that are worthless, and those who possess Samoa "Express" stamps should not jump to the conclusion that their examples are of any special value or importance.

These "Samoa Expresses" lasted 10 years, and then three further designs were introduced, one showing palm trees, another bearing a portrait of the King, and the third a white cross with the words "*Samoa Post.*" These stamps are more common than genuine "Express" stamps, but there is nothing particularly important or interesting about them. Various changes followed, in colour and in perforations, but the settlement of 1900 put an end to the issue of British stamps in the islands. The stamps of the following years were of the usual German colonial design, the chief feature of which was the ex-Kaiser's yacht "*Hohenzollern.*" This design is mentioned here because when Western Samoa again came under British rule, and on its occupation by the New Zealand Expeditionary Force in 1914, the sale of stamps was immediately stopped until they could be overprinted with the letters "G.R.I." and values in shillings and pence instead of in marks and pfennigs. These overprints are not very plentiful, and some of them are rare.

Next came stamps of New Zealand overprinted with the name of the country, including a Victory series in 1920; and in December 1921 a long set of stamps specially printed for Samoa appeared. These had on them a picture of a native hut, and they continued in use for 14 years. The highest value in the set was 1/–, and higher values were provided for by overprinting the stamps of New Zealand.

The modern history of the stamps of Western Samoa began in 1935 with an entirely new pictorial set, a very handsome one that followed the modern practice of illustrating some of the chief features of the country and of the people who live in it. The 1d. value shows the capital, Apia, and others feature falls and lakes, rivers and native houses. A chief and his wife are depicted on one value, and a Samoan girl is shown on the lowest.

The Samoans are regarded as the most handsome of Pacific races. Life has always been easy for them, for ample supplies of food of all kinds are provided by nature, and houses giving the little shelter needed in the beautiful climate of the islands are easily built.

It was into this Earthly paradise that Robert Louis Stevenson came in 1889, when he was cruising among the Pacific Islands. He reached Samoa at Christmas in that year and bought an estate, near Apia, to which he gave the name "Vailima." He championed the rights of the Samoan natives in various troubles that then beset them, and they came to revere and honour "Tusitala," the teller of tales, as they called him. When he died the natives cut a road through the jungle to the summit of Mount Vaca, and bore his body there to be buried in the tomb that is pictured on the 1/– stamp of the 1935 issue. This stamp and the 6d. value, which shows the famous author's home "Vailima," are reproduced on this page.

The Silver Jubilee of King George V was celebrated in 1935 by the issue of the native hut design previously used, with an overprint to mark the occasion, and in the same year there was a further issue of New Zealand stamps, also overprinted, to provide for high values up to £5. Then in August 1939, almost on the outbreak of the recent war, there came another pictorial set to celebrate the 25th anniversary of New Zealand administration of the islands. In this there were four designs, all well chosen. The 1d. stamp in olive green and scarlet showed a coastal scene, with palms waving in the air; the 1½d. stamp, in light blue and red-brown, provided an excellent map of Western Samoa; a Samoan dancing party was shown on the 2½d. value, red-brown and blue, and "Tusitala" on the 7d. value.

For other Stamp Advertisements see also pages 254 and vii.

Stamp Gossip

and Notes on New Issues

By F. E. Metcalfe

ALTHOUGH it is some time since the news was given out that Great Britain was to issue two "Victory" stamps, collectors are still discussing them and wondering just what they will be like. Soon after these words appear we shall know, but if the stamps run true to form they will fall far short of the really magnificent set that has been provided by New Zealand. Why does that sister country of ours do everything so perfectly? Space is very short, and there are lots of other stamps we should like to illustrate, but we simply cannot resist showing two of New Zealand's set of 12 values. To avoid queries it can be mentioned here that this particular set will not be overprinted for official use, as happened when the last commemorative set was issued. No doubt the most popular will be the 9d. value, showing the Southern Alps as seen through the chapel window at Waiho Gorge, for it is really a most beautiful stamp; but the ½d. value seen below, showing Lake Matheson and the Southern Alps, will take a lot of beating. Well done, New Zealand!

Last month we mentioned a fine set that had been issued by the Vatican to commemorate the 4th centenary of the Council of Trent, and we are illustrating one of this set of 14 bi-coloured stamps, which are well worth study. The lowest value shows the church where the historic Council gathered, and the rest of the set is devoted to kings, popes and cardinals. The colouring and designs make really beautiful stamps, and as the set can be bought for a few shillings, dealers report that it has been almost a best seller.

The fourth stamp to be illustrated this month is the 3c. U.S.A. issued in honour of that country's mercantile marine. That service is fully worthy of the honour, and it ill becomes our authorities to maintain silence regarding our own.

It has been mentioned several times what substantial pickings the United States Post Office gathers from the sale of special stamps. As readers know, four commemorative stamps were issued in honour of the late President Roosevelt. "*Meekel's Weekly*," the popular American philatelic journal, gives some figures regarding first-day sales of these stamps that are worth repeating, if only to show what our own Post Office is missing.

The 1c. stamp sold to the tune of 390,219 copies on the day of issue by way of first-day covers, and 1,625,000 stamps also were sold, of which probably not 10 per cent. will ever be used for postage. The 2c. showed 426,142 covers and 1,133,189 stamp sales; the 3c. 391,650 covers and 3,103,853 stamps; and the 5c. 466,766 covers and 2,092,226 stamps.

Altogether collectors spent over £50,000. Of course our Post Office doesn't need the money as the U.S.A. Post Office does!

Naturally Commonwealth collectors are all agog over the forthcoming issues of "Victory" stamps for most of the colonies. At the time this is being written no date of issue has been given, but there are pointers that this will be about 8th June, and the stamps will remain on sale until the end of this year, or until they are sold out. Collectors should be sure to mark the latter point, for it is likely that some of the stamps will sell out before the year's end, and then they will be a lot more costly to buy than when current. Most collectors will get their sets while the stamps are current, but these will certainly advance in price once they are obsolete. Our tip for the month must be these Crown Colony "Victory" stamps, if only to induce collectors to buy their sets as soon as the stamps are available, just in case some go off sale shortly after their emission, as they may well do.

Although it is some time since the stamps of Sarawak and British North Borneo were overprinted "B.M.A.," very few to date have come through and it now looks as though both sets are going to prove fairly good property. Some of the prices asked seem rather stiff, yet who is to say that they are too high? Who is, as a matter of fact, to say that any stamp prices are too high? Over a year ago, when the Colonial commemorative sets, such as Falklands, Sierra Leone, etc., bounded up in price, all the pundits, not entirely disinterestedly, told us that these sets were riding for a big fall, as, to be quite candid, the writer of this would have said had his opinion been asked. What has actually happened is that these stamps have gone higher still, and there is no sign that they will fall.

It had been our intention this month to illustrate the Newfoundland 2c. on 30c. provisional, which was issued unexpectedly, but lack of space prevents this. As the stamp is being offered at about 2/- a copy, it might be as well for interested collectors to buy now. The stamp will never be a rarity, but Newfoundland, is a very popular country and British dealers had their orders cut 90 per cent., so none can have been able to put many away.

Another stamp that looks like being a good thing in the long run is the 6d. Falkland stamp which was dropped without notice at the end of March. The writer happens to know that more than one wholesaler was left with practically no stock.

And now as a final word, don't forget to buy your set of Crown Colony "Victory" stamps as soon as they are available, but don't buy more than you need for your own collection. Remember the "Coronation" stamps fiasco.

From Our Readers

This page is reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

A FAMOUS WELSH CASTLE

Pembroke Castle in South Wales stands on a rocky promontory about four acres in extent, which juts out in a north-westerly direction between two arms of Milford Haven. Its curtain wall follows the edge of the rocks, and the south side, towards the town of Pembroke, that is across the neck of the promontory, was defended by a dry ditch.

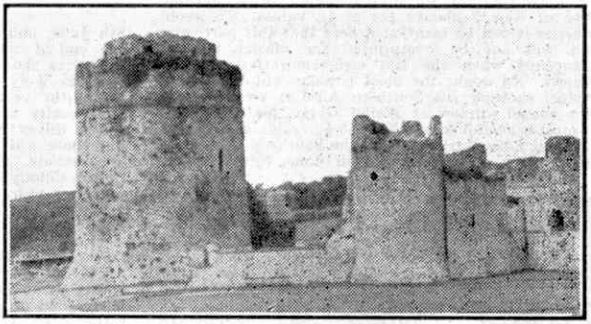
The castle consists of two wards. The inner one contains the most conspicuous feature of the whole castle, the great circular donjon or keep 75 ft. high, to which it is said no parallel can be found. The keep originally consisted of a basement and three storeys reached by a winding stair in the thickness of the wall, which is 17 ft. thick at the bottom and 14 ft. at the top. As the walls rise they incline inward, the diameter at the base being 58 ft. and at the top 48 ft. A stone dome covers the top.

The keep was probably built in the 12th or 13th century, when the round tower was taking the place of the square keep characteristic of earlier castles in France and England. Many authorities regard the keep of Pembroke Castle as the finest of the circular type; it is certainly very striking and in a splendid situation. Its height was sufficient to allow the garrison to see the approach of an enemy from a distance, and missiles could be discharged from the battlements with great effect.

There is an excellent harbour by the castle, and one secret of its strength was that supplies could be obtained readily by sea. A passage cut in the rock led from the castle down to the Hogan or Wogan cave below, which opened out to the water.

The castle withstood attacks from the Welsh, but the great event in its history was the siege by Cromwell in 1648. The besieged held out gallantly and only surrendered when heavy guns reached Cromwell and he was able to destroy the water supply.

C. A. READER (London S.W.18).



Pembroke Castle, the ruins of which are being restored with care and understanding. Photograph by C. A. Reader, London S.W.18.

A GREAT MALTESE DOME

The third largest dome in the world is that of Musta Church in Malta, G.C., which exceeds that of St. Paul's, London, by 16 ft. The extreme height of the church is 202 ft. and it is estimated that a congregation of about 10,000 persons can be accommodated in it. The foundation stone was laid on 30th May 1833, and the church, one half of which was built by voluntary labour, was finally completed in 1863. This huge temple was built over a much smaller church which had been too small to hold the increasing population of the village, and the older structure was levelled soon after the new church was finished.

Musta Church was built to the designs of a Maltese architect and engineer, Giorgio Grognet de Vasse, and under its vast dome stands a marble bust of Grognet with a tablet beneath it, a tribute of gratitude from his countrymen.

Bombs threatened the church many times during the war, and finally, one afternoon in 1942, a big one pierced the dome and crashed down on the marble floor when there were several hundred people present. Nobody was hurt, however, and the bomb failed to explode, while the damage to the dome was not too great.

J. P. O'SHEA (Valetta).

The London Birdman. Photograph by R. D. Barrett-Lennard, Braintree.

THE LONDON BIRDMAN

It is very interesting to watch Mr. R. Hedges Bates, the London birdman, feeding the sparrows in Hyde Park. He calls each bird by name at feeding time and they come and feed from his hands. One of them he calls "*Twink*" is so tame that it will even feed from his mouth.

As is seen in the accompanying photograph, sometimes a wood pigeon will feed from the birdman's mouth too, but this is not usually encouraged as the bird has such an enormous appetite. The tameness of the London wood pigeons is curious when one considers that they are the direct descendants of their country cousins, which are so wary and wild.

Mr. Bates is a very well known figure in Hyde Park,

R. D. BARRETT-LENNARD (Braintree).

Competitions! Open To All Readers

What Stations Are These?

There are many interesting and curious names among those of stations on the British main line railways. When some of the letters in these are taken out, it is often puzzling, but at the same time interesting and amusing, to try to find out what the full names are. The panel on this page contains the remains of 20 British main line station names that have been treated in this way. The missing letters may be either vowels or consonants, and the idea is to replace them and so to reveal the original names.

As an example we may deal with the first name on the list. This has two words in it, and the second one looks as if it should be "Road." The end of the first name suggests "Pool" and this leads to the recognition of the name as Pontypool Road, a South Wales station on the G.W.R.

A list should be made of the complete names in the order in which they appear in the panel, adding in each case the name of the company on whose line it is. After adding his name and address, the competitor should then forward his entry to *"June Station Names Contest, Meccano Magazine, Binns Road, Liverpool 13."*

There are two sections in this contest,

P-NT-P--L R--D	A---Y W--D
B--D--D ON A--N	P--B---E D--K
V-R--N-A W-T-R	W--T---A-E
K-R-K-Y S--P--N	W--T A--E---N
P--BL-S	N-W H--L-ND
F-T-N J--C-T-N	B---H---T H--L
G--D-N G-O-E	S--P--N M-L--T
B--N--M ON S--	K--N--N M--D-V---E
L--G---N B---A-D	P--N-Y A-D C---T-N
M--D-N N--T-N	S-F---N W--D-N

for Home and Overseas readers respectively, and in each there will be three prizes, of values £1/1/–, 15/– and 10/6. Other deserving efforts will be awarded Consolation Prizes. In the event of a tie for any prize the judges will take neatness and novelty into consideration.

Closing dates: Home Section, 31st July; Overseas Section, 31st January, 1947.

An Easy Cipher Puzzle

Every reader of the *"M.M."* would be interested at once, but perhaps a little surprised, if he were asked to read the following passage: Hkujgtogp ctg vq dg hqwpf qp swkgv uvtgvejgu qh ycvgt, cpf ecp qhvgp dg kpenwfgf kp vjg uegpg cu c ogcpu qh cffkpi kpvgtguv. Ugg vjcv vjg gzrquwtg ku ocfg yjgp vjga ctg kpvgpv wrqp vjgkt rcuvkog.

This is clearly written in cipher, and we are sure that our readers will be eager to find exactly what the queer looking assembly really means. This should not prove difficult if they bear in mind a few simple facts. For example, the letters that are most often used in ordinary English are E,T,A,O and N in that order, while K,X,Q,J and Z are the least often employed. Another good plan is to examine carefully letters of two or three words and see if a code can be found that will change these readily into such common words as "in," "to" and "of," or "and," "the" and "are." It is also a help to remember that the letters E, O, L and F are those most commonly doubled.

The passage reproduced above is actually a simple code rendering of one that appears in the present issue of the Magazine. When it has been deciphered it should be written out, signed by the competitor, who must remember to add his address, and then sent to *"June Code Puzzle, Meccano Magazine Binns Road, Liverpool 13."*

There are two sections of the contest, as usual, one for Home readers and the other for Overseas entrants. In each of these sections there will be three prizes, of values £1/1/–, 15/– and 10/6, for the best entries in order of merit, and other deserving efforts will be awarded Consolation Prizes. In the event of a tie for any prize the judges will take neatness and novelty into consideration.

Closing dates: Home Section, 31st July; Overseas Section, 31st January, 1947.

June Photographic Contest

This month's photographic contest is the sixth of our 1946 series, and in it, as usual, prizes are offered for the best photographs of any kind submitted. There are two conditions: 1, that the photograph must have been taken by the competitor, and 2, that on the back of the print must be stated exactly what the photograph represents. A fancy title may be added if desired.

Entries will be divided into two sections. A, for readers aged 16 and over, and B for those under it. They should be addressed: *"June Photographic Contest, Meccano Magazine, Binns Road, Liverpool 13."* There will be separate sections for Overseas readers, and in each section prizes of 15/– and 7/6 will be awarded. Closing dates: Home Section, 29th June; Overseas Section, 31st December.

Journeys by Air—(*Continued from page 224*)

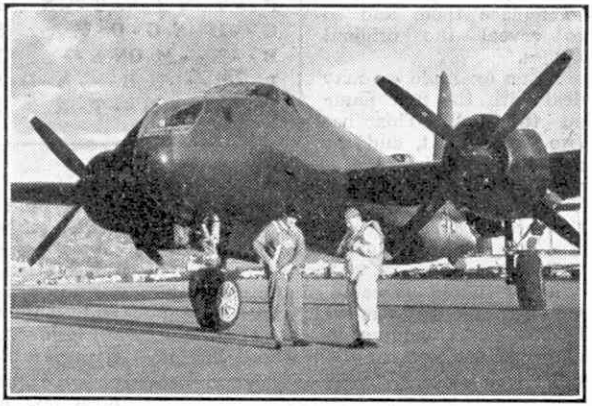
There is nothing to see, except when you are starting or landing, because you are away over the tops of the clouds, and even on a fine day the normal mist over land or sea prevents you from seeing either. If you are in a hurry and all goes well that is fine. But it is not the most enjoyable sort of air journey. Give me low flying at a reasonable speed for pleasure in the air.

The Triumph of the Two-Stroke Engine—

(*Continued from page 227*)

four-stroke decrease as the size increases. For instance, small two-strokes up to about 250 cc. in cylinder capacity can have "petroil" lubrication, that is the oil needed to lubricate the cylinder while the engine is running, and without which the works would "seize up," can be mixed with the petrol in the tank. It is then drawn into the cylinder with the petrol vapour. Larger editions, developing greater power, require a somewhat more efficient oiling system. They need a separate arrangement, consisting of an oil pump and its mechanism. Simplicity, one of the chief benefits of the two-stroke, is then destroyed.

It may be asked whether size for size a two-stroke engine does not develop twice as much power as a four-stroke one. Since the former engine causes the petrol vapour to explode each time the piston rises, and the four-stroke engine does so only every other time, it does seem that a two-stroke should develop greater power and higher speeds. But the amount of petrol vapour that can be taken in during the very short time available is limited. In a two-stroke working at 5,000 r.p.m. the charge has to enter the cylinder in one three-hundredth part of a second! This reduces the efficiency, because at such a high speed the opportunity for the engine to clear away the old charge and accept the new one is too short. Consequently there is always some expended gas remaining, and this mixes with the new gas, reducing the force of the explosion. To help to overcome this drawback a supercharging device can be fitted to force the fresh gas into the cylinder, but here again simplicity is sacrificed.



Lockheed P2V Patrol Bomber, in front of which a Lockheed experimental flight test engineer and a test pilot are adjusting their parachutes in preparation for a routine test flight in the machine. Over 100 P2Vs are in production for the U.S. Navy. Photograph by courtesy of Lockheed Aircraft Corporation, U.S.A.

The Story of Cement—(*Continued from page 245*)

which Aspdin's discovery has affected our daily lives is not generally realised. With the advent of a reliable cement it became possible to bind sand and gravel or coarse aggregate together to produce concrete, a material which exhaustive road tests have revealed to wear away at the rate of only one inch in 200 years. To-day concrete fills a multitude of uses—roads, pavements, bridges, buildings of every size and type, wharves, quays, dry docks, main drainage schemes, power and water supply plants, and so on through many hundreds of similar examples down to street lighting standards, roofing tiles, and even ash trays.

By C.N.R. Across Canada—(*Cont. from page 237*)

22½ tons per axle, the maximum axle loading on the Canadian National is about 25½ tons, and spring rigging is equalised on a three point suspension system. The percentage capacity of the locomotive, which is painted on the side of the cab, indicates the maximum tractive effort, one per cent. being equivalent to 1,000 lb., a 57 per cent. type engine therefore, having a maximum tractive effort of 57,000 lb. The maximum tractive effort on the C.N.R. is 90,000 lb. for a 4100 class "Sante Fe," or 2–10–2, which includes 10,000 lb. for the booster. Boosters are used generally for starting the load and add about 10,000 lb. to the starting tractive effort.

A typical modern locomotive is the 4–8–4 "Northern," which is a mixed traffic engine capable of handling both fast passenger traffic and high speed heavy manifest freight. Generally speaking, "Santa Fe," "Mikado" or 2–8–2 and "Consolidation" or 2–8–0 types are freight locomotives, and "Mountain" 4–8–2, "Hudson" 2–6–4, and "Pacific" 4–6–2 types are passenger locomotives, with the "Northern" type handling passenger or freight. The latest "Northern" type will handle either a 20 car fast passenger train or a 100 car freight train, both at high speeds. The fastest passenger engines on the Canadian National are the 5700 class "Hudson" type, the 6400 class "Northern" type and the 6060 class "Mountain" type. The 6400 class locomotive No. 6401 that hauled the Royal Train during the visit of the King and Queen to Canada in 1939 is illustrated on page 237. The Vanderbilt tenders used on these modern engines have a capacity of 11,700 gall. of water and 18 tons of coal.

Most freight wagons are covered "box cars" of all-steel construction, weighing when loaded approximately 70 tons. Box cars are now being built experimentally with aluminium sheeting to reduce weight. All-steel refrigerator cars are used to transport fish and fruit from British Columbia to the Eastern markets over distances of more than 3,500 miles. Flat cars also are used, with gondolas, hoppers and ballast cars for construction and repair work. Cabooses correspond to our guard's van, but are totally different in appearance. They carry a raised glass cupola on top, and have beds and cooking equipment for the use of the crew.

OUR APRIL LOCOMOTIVE PUZZLE

The Locomotive Cross-number Puzzle in our April issue was attributed in error to R. H. Cropper, Dewsbury. It was actually the work of another "*M.M.*" reader, B. E. Timmins, Stourbridge.

Fireside Fun

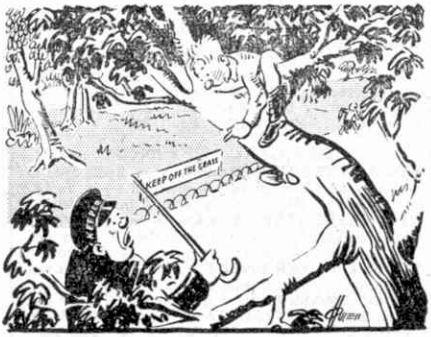
Headmaster: "Now, Smith, what are the two sources of sugar."

Smith: "Please sir, I've forgotten."

Headmaster: "Disgraceful. Just bend over that chair."

Smith: "Oh, I've just remembered, sir. Cane and beet."

* * * *



"Hi! What are yo doing up there?"

"Just obeying the notice."

* * * *

"How is your birthday party going, Billy?"

"Oh, fine. I've asked all the boys and they are coming. All I have to do now is to ask mother if I can have it."

* * * *

"Did you hear about Jim's new job? He was given the sack the instant he started work."

"What a shame! Where was that?"

"At the Post Office. He's a postman now."

* * * *

"Last week a grain of sand got into my wife's eye, and she had to see a doctor. It cost me two guineas."

"That's nothing. A fur coat got into my wife's eye and it cost me two hundred guineas."

* * * *

"What's the use of giving anybody a pair of sugar tongs for a present nowadays?"

"Oh, we can use them for the coal, can't we?"

* * * *

"I want a new dial."

"Yes Madame. Beauty parlour on the next floor."

BRAIN TEASERS

CAN YOU RING HIM UP?

When asked for his telephone number Smith said that this had three figures in it and that the first two were alike. When pressed for further information he said that the three together added up to 20 and that when multiplied together they gave the number of square inches in a certain number of square feet. What was the number?

* * * *

A WEIGHTY PROBLEM

In a certain school 10 boys were found to weigh the same as 12 girls. If three boys and two girls weighed 42 stone, what was the weight of four boys and one girl? B.I.N.

* * * *

CONFUSED GEOGRAPHY

Here are the names of six countries disguised by putting letters in the wrong places.

ALBICOOM	TRASMUA	IGRAINE
AGRINENTE	KREDMAN	ABIRESI

Can you find what countries they are?

* * * *

"Good-bye, Helen. You danced like a brick."

* * * *

SOLUTIONS TO LAST MONTH'S PUZZLES

A start is obtained to the solution of our figure puzzle, the first of last month's set, on noting that the last figure of the top line must be 7 in order to give 9 as the last figure in the result of multiplication. The problem can then be worked out step by step. The two numbers to be multiplied together are 74637 and 21567, and the product is 1609696179.

The solution of our second puzzle is as follows:

92836
12836

105672

Readers who remembered the former puzzle on weighing without weights would find our third teaser last month easy. The first thing to do is to divide the medallions into sets of 9, and weigh one set against another. If the weights are equal, then the counterfeit is in the set not weighed, while if one set is lighter than the other it must contain the counterfeit itself. Then repeat the process, first with the set so picked out, dividing it into three batches of three each, and then with the set of three marked down as containing the counterfeit, weighing two of these against each other.

* * * *

THIS MONTH'S HOWLER

Hydrophobia is a mania for staying at watering places.

STAMP ADVERTISEMENTS

(See also pages 254 and 256)

FINE STAMPS—FAIR PRICES

CANADA, WAR EFFORT COMPLETE, 24 v., M. 35/–. U. 9/6 set.

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Ascension ..	2/–	3/–	Montserrat ..	1/10	2/11
Barbados ..	2/3	3/3	N. Rhodesia ..	2/–	3/–
Basutoland ..	2/–	3/–	Palestine ..	2/6	3/6
Bechuanaland	2/–	3/–	Pitcairn Is. ..	1/7	2/8
Bermuda ..	1/10	3/8	St. Helena ..	2/–	3/10
Br. Guiana ..	1/7	2/8	St. Lucia ..	1/10	2/11
Br. Honduras	1/8	2/5	Seychelles ..	2/1	3/7
Br. Sol. Is. ..	1/6	2/4	Swaziland ..	2/–	3/–
Cayman Is. ..	1/11	3/–	Transjordan	1/8	2/8
Ceylon ..	2/4	3/–	Trinidad ..	2/3	3/3
Cyprus ..	1/11	3/8	Turks Is. ..	1/11	3/–
Dominica ..	1/11	3/–	Virgin Is. ..	1/10	2/11
Fiji	2/2	3/1	Zanzibar ..	2/8	3/7
Gibraltar ..	1/7	2/8	S.A. Victory Set ..		1/6
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READERS' SALES AND WANTS

SALES

One Small Clockwork Hornby Loco. (Reversing); Seven Carriages; Five Wagons, including Brake Van and Crane; 40 ft. Track; Two Points; Two Stations; Two Tunnels; Signals (One Junction, One Home, One Distant); No. 2 Signal Cabin; Buffers; Viaduct. The lot for £6/10/-.—John Rees, Esclusham Vicarage, Wrexham.

As New: Eight "A.T.C. Gazettes"; Eight "Aeroplanes"; Six "Flights"; Eight Large "Meccano Magazines," 16 Small; 29 "Aero-modellers." Offers.—Pollock, 88, Dollis Hill Avenue, London N.W.2.

"Meccano Magazines," 1925–31 inclusive; 1935–39 inclusive; 1941; 1943–45 inclusive; all in good condition. What offers?—FitzPatrick, Hanick Terrace, Forfar.

Chemicals and Chemical Apparatus (cheap and good quality). Apply—M. Griffin, Halford Vicarage, Craven Arms, Shropshire.

"Meccano Magazines," 1924 to 1933 (59 copies), early copies soiled; lot or separate. Offers.—Matthews, 29, Hillhouse Road, Downend, Bristol.

Meccano No. 9; good condition; many Extra Parts, £3/10/-. Apply—J. Sims, Wood Cottage, Hadopen House, Castle Cary, Somerset.

10 "Railways"; Seven "M.R.N.s," and 46 "Model Engineers," 25/-.—Magnus Deo Cottage, Lingfield.

"Meccano Magazines," good condition, 1939, 1940, 1941, 1942, 1943, 1944 and 1945; September 1940 missing.—Brian Carter, "Vailima," Llangunnor, Carmarthen.

"Railway Magazines," Jan. 1939 to Aug. 1939, June 1940 to Dec. 1940, Jan. 1941 to Dec. 1941 (May 1941 missing), Jan. 1942 to Dec. 1945; complete, 42/-; all in good condition.—Croft, 29, Cromer Road, Branksome, Dorset.

Volumes 1, 3, 4, 5, 6: "Aircraft of the Fighting Powers." Excellent condition, £5/5/-, or will sell separately.—T. Moody, 25, Byron Street, Bristol.

"Meccano Magazines," 1931 and 1932 (June and Dec. 1931 missing, Nov. and Dec. 1932 missing); Gibbons, (Whole World) "Stamp Catalogue," 1937, good condition.—W. Snelson, 16, Edilom Road, Hr. Crumpsall, Manchester 8.

Stamps: many British Colonial and Foreign Sets and single items; all far below catalogued price; details and a selection on application.—M. G. Faraday, Coniston, Cedar Road, Berkhamsted, Herts.

Collection of Birds' Eggs, 140 all different, including Golden Eagle, Griffon Vulture, Peregrine Falcon; offers £10 or over.—Butler, Manor House Farm, Poulshot, Devizes, Wilts.

Set of Chessmen, good condition, 15/- or nearest.—Thomas, 8, Woodland Avenue, Stoke-on-Trent.

"Britain's Wonderful Air Force," Odhams Press, good condition: "M.M's." Jan.—Dec. 1945; "Model Railway News," Jan.—Dec. 1945; "Model Railway Constructor," Feb. 1944—Dec. 1945. All as new, what offers?—D. Brown, 7, Warren Road, Conisborough, Doncaster.

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Registered at G.P.O., London, for transmission by Canadian Magazine Post.

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Display. Quotations for space bookings, and latest net sale figures, will be sent on request.

WANTS

Urgently for Binding, "M.M." Jan. 1941; details to—Clark, 28, Stoke Road, Gosport Hants.

"Meccano Magazines," July and November 1944 required to complete set; must be in good condition.—K. Carlisle, 1, Sherrard Road, Leicester.

Urgently; good condition; 1945 "Meccano Magazines"; state price wanted.—N. Butler, The Cottage, Gambles Lane, Woodmancote, Nr Cheltenham, Glos.

Harmonica; also Two Mouthorgans; in good condition; state own price.—Victor Dillon, "Aland," Barham Ride, Nr. Wokingham, Berks.

Gauge 0 Curved Rails (Wooden Sleepers); also Hornby Clockwork Gauge 0 Engine and Station; good condition essential.—Williams, "Compton," Parkstone Avenue, Southsea, Hants.

"Meccano Magazines"; months: September, November and December 1945.—Setchell, 13, Conquest Road, Bedford, Beds.

Good Pair of Ice Skates.—West, 48, Rhoose Road, Rhoose, Nr. Barry, Glam.

"Meccano Magazine," September 1944, urgently required to complete Set.—W. Snelson, 16, Edilom Road, Hr. Crumpsall, Manchester 8.

Hornby-Dublo Electric Straight Lines and Points. State price and condition.—R. A. Roberts, 54, Lovelace Road, Cressington, Liverpool, 19.

Super Model Instruction Leaflets. State model and price.—Woolnough, 30, Rushmere Road, Northampton.

Two Copies each "Meccano Magazine," June–Dec. 1944.—D. Brown, 7, Warren Road, Conisborough, Doncaster.

Gauge 0 Clockwork Locomotive and Tender, with more than Four Wheels. Please state price and condition.—Thomas, 8, Woodland Avenue, Burslem, Stoke-on-Trent.

Dublo Accessories Required: Electric Loco. and Tender; Two Carriages; Seven Curved Rails and One Curved Terminal; Eight Straight Rails; Two Isolating Rails; Electric Points; Transformer and Controller.—J. Badenoch, Farnley, Willington Quay, Northumberland.

Books by Sax Rohmer, Arthur Conan-Doyle, G. E. Rochester, "Sapper," Freeman Wills Crofts, Gerald Verner, Dennis Wheatley, Carter Dickson, Edgar Wallace and W. E. Johns. Send particulars (Titles, Condition and Price Required) to—Box "M.M.7."

Hornby Metropolitan Electric Locomotive (20-volt). State condition and price.—Harvey, 267, Nithsdale Road, Glasgow, S.1.

"Meccano Magazines," 1940–1945, Six Volumes in good condition. State price of each volume to—Kishor Sutaria, Patker's Blocks, Bandra, Bombay 20, India.

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