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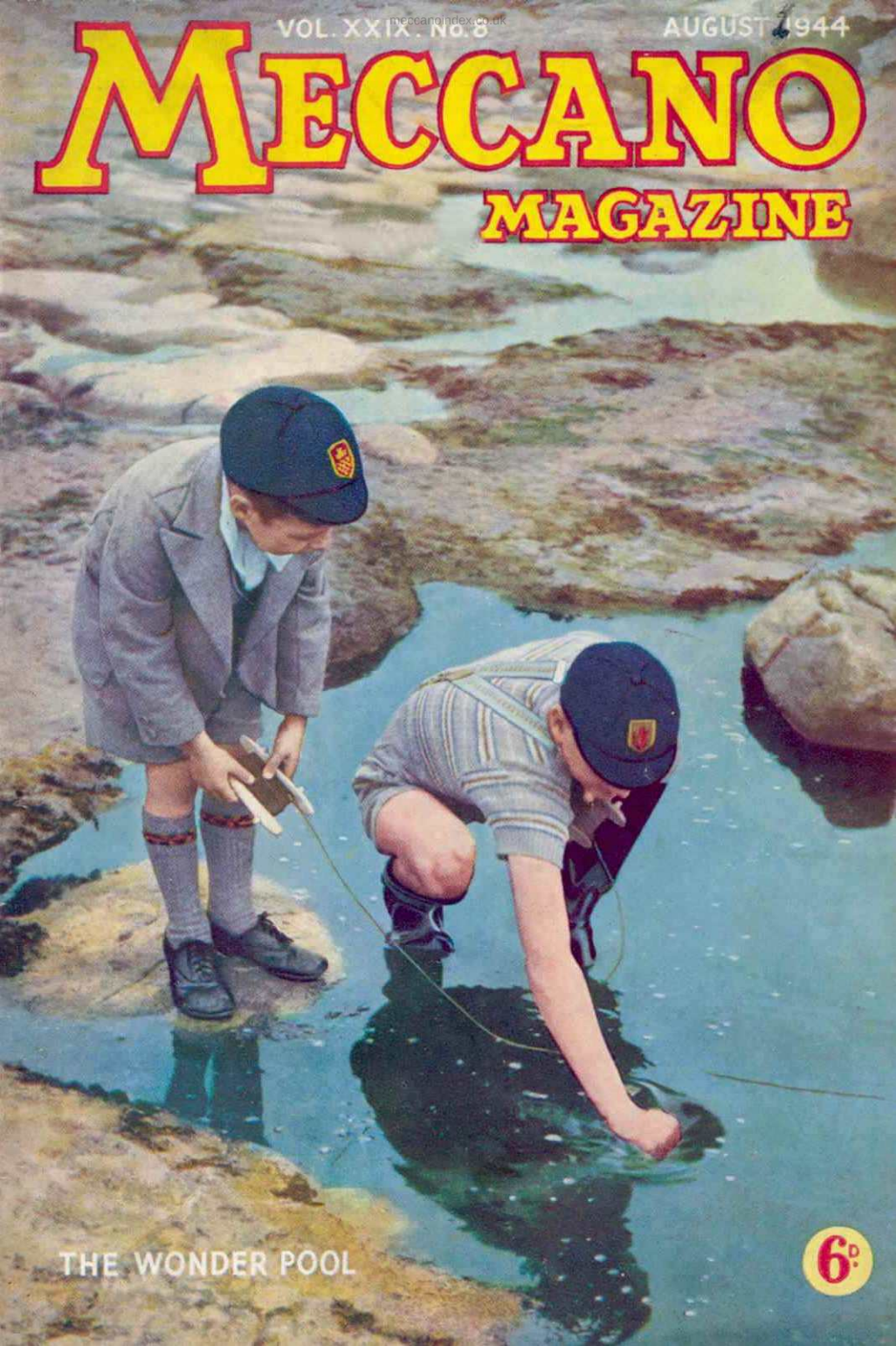

THE WONDER POOL

6D.

Next Month: "PEACEFUL AIR TRANSPORT." By C. G. Grey

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With the Editor

Readers' Suggestions

In December last I invited readers to tell me the features they specially like in the "*M.M.*," those they don't like, and what changes they suggest. Large numbers of readers have accepted my invitation and the flow of letters still continues.

The "Pocket" Size

I have been specially interested to find that the great majority of writers—over 90 per cent.—want the present size of page to continue after the war. They say that the small "*M.M.*" is easier to handle and to find room for when bound, and much handier to carry about. Of course they all want many times the present number of pages as soon as the paper restrictions are relaxed. Those who ask for the old size of page back again do so mainly because they want bigger illustrations than are possible on the small page. This is a very important question, and I will return to it in a later issue.

As regards the contents, most of the regular features find favour. Some writers think there is too much space given to aviation, but they are in a small minority. There is almost general approval of Mr. C. G. Grey's articles and those of Mr. J. W. R. Taylor.

Ships and Railways

The demand for articles on the Navy and on ships in general I have met by the introduction of articles by Captain Acworth, D.S.O., and Mr. Denis Rebbeck, M.A., M.I.N.A., and these will be continued.

The articles on William Hedley and Timothy Hackworth have led to requests for information about other railway engineers, and I have in preparation a series of articles on the famous locomotive engineers of the great railways. The first of these, on John Ramsbottom, appears this month, and will be followed by one on F. W. Webb. I intend to continue this series up to the locomotive engineers of the present day. Another feature I hope to introduce shortly is a series of descriptions of the different types of engines now in use on the main lines of the British Isles and of other countries. There will also be articles on railway working, a subject in much demand.

There seems to be a violent difference of opinion about Nature articles, and therefore I do not propose to give much space to these. The "brain teasers" seem generally popular, and so too does the "Have You Ever Thought About This?" page.

A Correspondence Column

Among the suggestions is one for a correspondence column. This seems to be a good idea, and I invite letters suitable for such a column.

Many other features have been asked for and I will do my best to include them. But my great trouble at present is: *No Room!*

This Month's Special Articles

A Battlefleet Action

By Capt. Bernard Acworth, D.S.O., R.N. (Retd.)

H.M.S. "Rodney" shows her teeth.

IN a previous article I examined the naval and military position in the Far East in our war against the great maritime power Japan. I tried to show that up to the present the operations in the outlying Pacific Islands, and in Burma, were in the nature of skirmishes with the object of wearing down the resources, and particularly the maritime resources, of all the belligerents. I also showed that the main Japanese Fleet would almost certainly endeavour to preserve itself intact, or in other words to play the part of what is known as "A Fleet in Being" until such time as it was, by some Allied mistake, given the chance of engaging a weaker Anglo-American Fleet, or until a stronger Anglo-American Fleet threatened to sever Japan's absolutely vital communications in the China Seas. In the latter circumstances Japan's weaker Fleet would be compelled to engage the stronger Anglo-American Fleet or to confess herself beaten and sue for peace. This we have no reason to suppose the Japanese will do, and we are therefore justified in expecting, sooner or later, a great modern *"Trafalgar,"* with modern ships and great engines of war substituted for the old wooden sailing ships of Nelson.

I also emphasised that it would be necessary for the Allies to recover the use of some great Naval base, preferably Singapore, nearer to the Japanese sea-communications through the China Seas, before a real and compelling challenge to the Japanese Fleet could be brought about. It was, it will be remembered, such a preliminary operation as this which is likely to make a great and hazardous invasion of Malaya or Burma necessary.

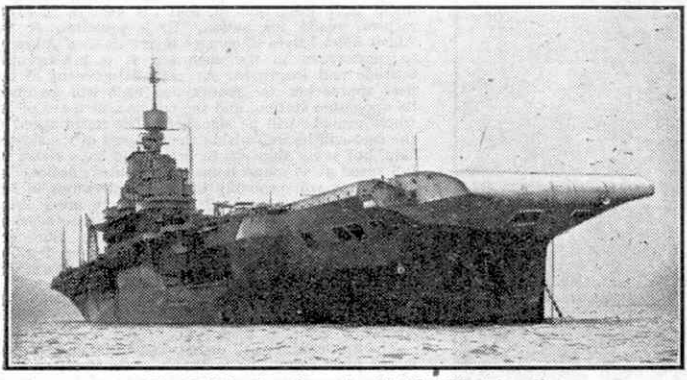
So much for a brief retrospect of the strategical position we have to create before a Far Eastern *"Trafalgar"* is likely to be joined. We will now assume that the great preliminaries have been successfully achieved, and that Singapore is once again available as a secure base for the final naval "show down" between the main Japanese Fleet and the materially superior Anglo-American Fleet.

We will first assume that there is now assembled at Singapore a great fleet of Allied battleships with all the attendant warships needed to fight a successful fleet action—cruisers, aircraft carriers, destroyers, and, to a less degree, submarines. I have no means of knowing what is likely to be the strength in all classes of ships of such a fleet, nor yet the strength of the Japanese Fleet which, for the past ten years, has been shrouded in secrecy. What, however, it is safe to assume is that the Allied Fleet will be *numerically* the stronger. Ship for ship we shall be on the safe side in assuming that the antagonists are equally matched materially and in fighting skill and spirit. We are thus anticipating a battle which will go down in history as at least the equal in grimness and fatefulness of Nelson's *"Trafalgar."*

Before bringing the armadas into action, it may be well to explain briefly the function of the various types of ships.

Battleships. These may be regarded as the floating citadels of sea-power, armed with very heavy long-range guns against which no other class of surface warship can fight with any hope of success, unless they can do so in greatly superior numbers. An example of this latter case was the sinking of the small German battleship *"Graf Spee,"* armed with six heavy 11 in.

guns, by three small cruisers armed with light 6 in. guns. In such a case the battleship can only engage one small ship at a time, while the others, themselves



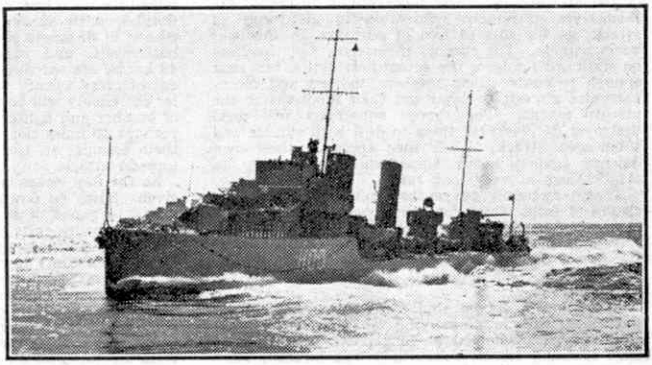
The British aircraft carrier H.M.S. "Illustrious."

unattacked, can close in and plaster the battleship with small shells. Against submarines the battleship has little, if any, means of self-defence. She has therefore to rely upon screens of small ships, generally asdic-fitted destroyers, for her protection.

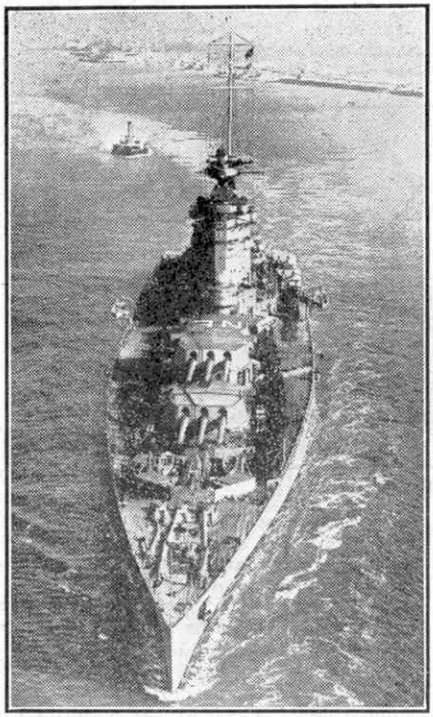
I have referred to the very heavy guns of modern battleships. Some idea of the power of these guns can be obtained from the performance of the 16 in. guns of the *"Nelson"* and *"Rodney,"* each of which mounts nine arranged in three triple turrets. These 16 in. guns can hurl projectiles of about one ton accurately for a distance of about 45,000 yards; that is to say about 22 sea-miles, or about 26 shore-miles. At this extreme range the projectiles reach a height that would clear the top of Mount Everest. But at such extreme ranges the chance of hitting a ship is remote because the descent of the shell is at a very steep angle, and therefore what is called the "danger-space" of the target is very small. Needless to say, battleships are covered with thick armour, which may be as much as 18 in. over vitals.

Cruisers. This class of warship has many functions, but in a fleet action cruisers share with reconnaissance aircraft the function of "eyes" of the battlefleets. The Admiral in each opposing battlefleet needs to know the composition, course and speed of the enemy battleships, while preventing the enemy from knowing his. The Admiral with this pre-knowledge has the immense tactical advantage of being able to place his fleet advantageously for action, an important point being the obtaining of a position in which the smoke of his own guns will not obscure the enemy. In a fleet action, therefore, each battlefleet will have ahead of it a far-flung cruiser line, commonly known as an "A-K line." Thus a cruiser action is likely to be joined before the battlefleets sight one another.

Destroyers. Some destroyer flotillas will be used to screen the battlefleet against submarine attacks, but the majority will be used as a torpedo striking force against either the enemy's cruisers or his battleships. From a position on the bows of the opposing battlefleets, a position which it is hoped their high speed of 35 knots will enable them to reach, they steam in to close quarters and release a shoal of torpedoes. For their own defence against the battleship they depend upon speed



A destroyer races on.



A striking view of H.M.S. "Nelson."

and numbers, and against enemy destroyers upon their light guns.

Submarines. There is no need to enlarge upon the functions of these craft, but it should be said that in a fleet action their slow submerged speed makes it likely that they will never get into firing range. The best chance of bringing them into action is for the Admiral in Command to spread them in advance and to endeavour, in the course of the action, to lead or drive the enemy across the area in which he has stationed them.

Aircraft-Carriers. These huge mobile "garages" are themselves extremely vulnerable to all forms of attack, as the loss of five of our own in this war bears witness. The carriers themselves will therefore be stationed far from the actual fleet action but near enough to enable their bombers, fighters and reconnaissance aircraft to carry out their functions to the utmost extent. The carrier squadrons will need destroyer flotillas with them to deal with surface and submerged attack. Their own speed is their own defence against heavy ships which might try to attack them at very long range.

That, very briefly, covers the functions of the various classes of ships which may be expected to take part in a great fleet action. Remember, the opposing battleships are the citadels of sea-power, and it will be the object of each Admiral in Command to get at, and to destroy his opponents citadel, whose flag-ship is the keystone.

Let us now suppose that a great Anglo-American battlefleet, with accompanying warships of the types described, is assembled at Singapore, and that our light scouting forces, submarines and aircraft, have reported the main Japanese Fleet at Saigon, in French Indo-China. We will also suppose that the Commander-in-Chief of the Allied Fleet knows that through the intolerable strain on the Japanese communications the Japanese Fleet can no longer postpone the final arbitrament of a great sea action.

On the appointed day, every ship in the fleet is complete with stores, fuel and ammunition; any lame ducks have been refitted, and the fleet is, in every respect, ready for action. Each squadron of the Allied Fleet leaves Singapore under its own Admiral, to rendezvous in the open sea at a pre-arranged latitude and longitude. As each detachment of the fleet approaches the rendezvous, each will be given its appointed station; and the course and speed of the whole armada will be signalled. The mean speed of the fleet will be well within the compass of the slowest ship, but every ship will be ordered to have steam for full speed at so many hours', or minutes', notice. The battleships will probably be in two divisions in line ahead, disposed abeam. Thirty or forty miles ahead of the battlefleet will be spread the Cruisers, covering visually a distance of, perhaps, 100 miles. Stationed on the battlefleet's bows will be the destroyer flotillas, and at a considerable distance on the quarter the aircraft-carriers.

So, majestically, will the great fleet advance to meet the enemy's fleet which, we will assume, is somewhat similarly disposed.

The first contact will be between the cruiser screens whose function will be to obtain accurate information of the disposition, course and speed of the enemy. This will lead to individual cruiser actions which may develop into a general cruiser action before the battlefleets sight one another.

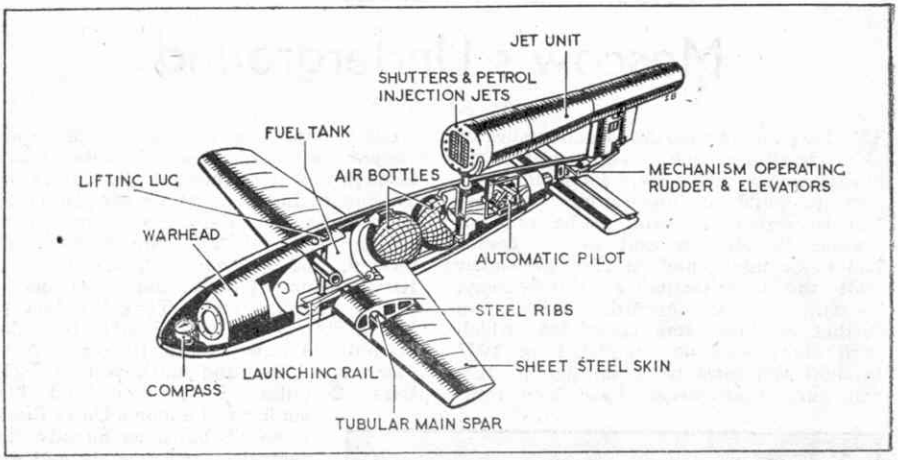
Let us now assume that the British cruisers have succeeded in getting the anxiously awaited information of the enemy's battle-array, and that, armed with this knowledge, the British C. in C. has deployed his fleet in such a way as to have the tactical advantage of wind and light, and of placing his fleet between the enemy and his base.

The opposing battlefleets, in single line ahead, and abeam of one another are now within sight of one another, and therefore within range. With a roar like thunder our first ranging salvo leaves the muzzles of our guns. Almost simultaneously the flash of the enemy's guns is sighted, perhaps nearly a minute before the splash of the shell is seen, and last the sound of the discharge is heard. The first splashes of the shells of each fleet are datum points from which the sights are adjusted, and thereafter the great battle is joined. One ton shells begin raining over and short of each battleship, only a small percentage finding their mark. But those that do, leave havoc behind them. The dark red glow of fire in the midst of thick smoke soon appears. Some battleships are seen to drop out of the line with a list; in others the rate of fire diminishes.

But at this stage, if not before, the cruisers have joined the main fray with their lighter guns. Destroyer flotillas, with spray flying from their bows, have rushed at 35 knots towards the head of the opposing battlefleets, and some hundreds of torpedoes, at 45 knots, are speeding unseen at the foe. If only one out of every twenty finds its mark, the consequences for the enemy will be grim. At the same time, flights of bomber and fighter aircraft from invisible carriers, perhaps 40 miles clear of the main action, are joining their assaults to the pandemonium of gunfire and torpedo attack.

So the day wears on. No quarter is asked, none is given. Ships go down with their colours flying, and a vast expanse of sea is covered with burning oil, and with boats, rafts and floats to which thousands of men cling. As the sun sets, what is left of the Japanese Fleet seeks safety in retreat, and the depleted Allied fleet reforms, while destroyers turn from destroying to the humane function of life-boats for the rescue of brave enemies adrift on spars, or swimming.

A Far Eastern "*Trafalgar*" has been won, but at a far greater cost in life than in Nelson's "*Trafalgar*." With the Japanese sea-power in the China Sea broken, there can be no option (*Continued on page 286*)



Internal arrangements of the "Doodlebug."

The Hun's "Flying Bomb"

By John W. R. Taylor

HITLER'S secret weapons have never been taken very seriously by the British people. Nevertheless, his latest—the "flying bomb" or pilotless aircraft—might have had a most serious effect on public morale but for two facts. The first is that Air Marshal Sir Roderic Hill and his colleagues of the Air Defence of Great Britain were expecting the attack by these robot planes and were well prepared for it; the second is the irrepressible spirit of the British public.

The "*Doodlebug*"—as the "flying bomb" has been christened by our airmen—is well illustrated in the picture on this page. Made almost entirely of steel, it would be quite a nicely streamlined little monoplane but for the jet-propulsion unit stuck up on top of its fuselage. It has a wing-span of 16 ft., a length of 25 ft. 4½ in., and a speed of about 350 m.p.h.

To reduce production time and cost, the jet unit is not fitted with a compressor and is thus relatively inefficient. Instead it has an intake at the front in which there is a multiple flap valve. Behind the valve are the fuel jets and, further back, a venturi with a sparking plug mounted at its narrowest point. The fuel is fed to the jets under pressure by compressed air; meanwhile the forward speed of the aircraft forces air past the flap valve into the "engine," where it is mixed with fuel from the jets. The mixture is compressed in the venturi and ignited by the plug. The consequent explosion closes the flap valve and all the gases are forced out of the rear end of the jet unit, so propelling the aircraft forward. As the pressure falls, the airflow again opens the valve and the whole operation is repeated. This series of explosions causes the raucous "two-stroke motorcycle" noise of the "*Doodlebug*."

The 130 gallons of petrol that give the "flying bomb" a range of about 150 miles are carried in a tank in the fuselage between the wings, and the 2,000 lb. explosive charge is carried in the nose just behind a compass. The latter is set approximately in the direction of the objective before take-off, and operates the rudder when the aircraft is in the air. No other means of controlling the bomb are provided and it is thus quite an inaccurate and indiscriminate weapon.

The "*Doodlebug*" is launched from a platform and is assisted into the air by catapult rockets, or other method, as the jet unit does not function efficiently until the machine is airborne. It then flies on until its fuel is exhausted, when it goes into a dive and crashes to explode on the ground. This is an expensive way of delivering 2,000 lb. of explosive because, unlike a bomber plane, the "*Doodlebug*" naturally cannot return for another load of bombs. But the decision to use them was forced on the Hun, as the shortage of trained crews for the Luftwaffe is very serious after four years of losing struggle against air forces always superior in equipment and training, and now vastly superior in numbers.

Reprisal weapon V1, as Dr. Goebbels calls the "*Doodlebug*," was first launched against Southern England on the night of 13th June, but this was only a small-scale "try-out," and the first full-scale operation was on the night of 16th June. Naturally some damage has been caused by these "flying bombs," but every day has seen a goodly percentage of them destroyed before they have had a chance to reach their objectives. By day and night their platforms are bombed with devastating effect by the Allied air forces, and the "*Doodlebug*" is the answer to the anti-aircraft gunners' prayer.

Pilots of the Air Defence of Great Britain Force and our Tactical Air Forces regard Doodlebug-hunting rather as a hotted-up form of clay-pigeon shooting, and "Thunderbolts," "Typhoons," "Spitfires," and "Mustangs" have all been used with good effect. But the Hawker "Tempest" has proved the star anti-Doodlebug weapon, and a large number of flying bombs destroyed have fallen to the cannons of this new British fighter, whose great speed has made it admirably suited for the task. Ace "Doodlebuster" is Wing-Commander Roland Beamont, D.S.O., D.F.C. He says: "Sometimes when the bombs are hit by cannon-fire there is an eruption in black, some red smoke, some red flash, and a quick feeling that 'This is it, lad.' But you come out all right."

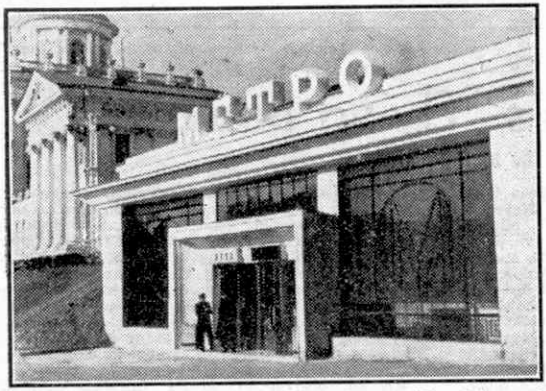
The Hun expected big things of the "*Doodlebug*." His communiques mentioned crowds of people streaming out of a blazing and smoke covered London. The amount of wishful-thinking behind these boasts does not need explaining. The "*Doodlebug*" was conceived by the enemy to try and terrify the British civil population into

(*Continued on page 286*)

Moscow's Underground

By H. F. Howson

WITH all its countless square miles of territory, one would think that Russia would hardly have found it necessary to build an underground railway. Yet so serious did the traffic problem become in Moscow that such a course had to be taken, and on 17th November 1934 the first section of the railway, 7½ miles long, was opened. In 1938 two further sections were completed, which with short sections completed in 1937 brought the total route mileage to 16½. Still further extensions have been completed since, and Moscow can now claim to be well served in this direction. She has need to be, for of her four million inhabitants almost all appear to be fond of travelling, whether for business or pleasure. It has been computed that the average Moscow citizen makes 500 journeys a year, a good many more than does a New York citizen!



The modern style in stations. Entrance to one of the stations of the Moscow underground railway.

Compared with similar projects in London, New York, Berlin and other large cities, Moscow's underground railway is young. It is said that the idea was first mooted in 1900, but objections were raised by the then Archbishop and others, who were afraid that their churches would be undermined and would topple earthward. The Moscow engineers of 33 years later thought otherwise, and in spite of appalling difficulties drove tunnels that have in no wise endangered existing buildings above them.

A glance at a map of London's Underground helps one to envisage Moscow's system, for the river Moskwa winds through the city somewhat similarly to the Thames in London. At present Moscow's tubes radiate from the city's centre, connecting some of the main surface line termini, and extending in the west to Kiev Station, 2½ miles, and in the north-west to Sokol, 6 miles. They run east to Kursk Station and now possibly to Stalin Stadium, 6 miles, south to Stalin Auto Factory, 4 miles, and south-west to Gorki Park, 2 miles. Later a circular line similar to London's Outer Circle is to be built, as already the central interchange stations are becoming congested, and a circular line will do much to relieve such congestion.

The railway was constructed by Russian engineers with the help of expert advisers from the London Passenger Transport Board and the New York, Paris and Berlin Underground Railways, so it can be said that many of the early mistakes made on other railways should have been, and mostly were, obviated. There were several stiff problems for which there was no precedent, however. For instance, when shafts were sunk through quicksand, compressed air had to be blown into the surrounding soil to dry and solidify it, and in similar situations later it was found necessary to hold back the shaft sides by freezing the soil to a depth of one metre to enable the shaft rings to be assembled.

In central Moscow the tunnels were driven from 100 to 130 ft. below the surface, according to the nature of the subsoil, and in this work, although excavation was partly assisted by the use of English-made shields, most of the soil was dug out with ordinary picks, together with a few pneumatic drills, and then removed in wheelbarrows by thousands of labourers. These primitive methods could not be said to be unduly costly, as Russian labourers worked for just a fraction of a Londoner's pay, but progress was slow. In dangerous places the advance per day was sometimes only two yards, which explains why the long period of nearly

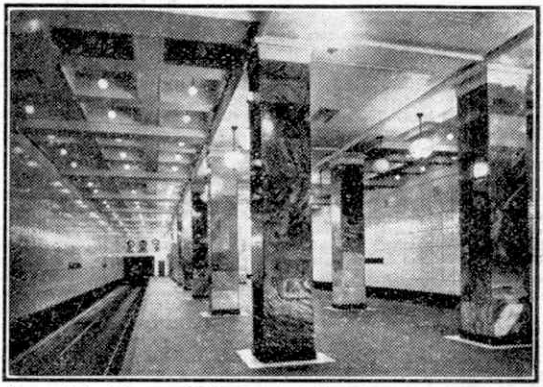
three years was taken to build the first section.

In the suburbs, where more space was available, construction was carried on by the cut and cover method, and the depth here is from 30 to 40 ft. A unique method of construction was employed at times. Space for the walls was first excavated, and these were completed in concrete, each section 13 to 16 ft. in length. The roof was then built over the section and the core of soil finally removed. During extreme cold the workmen were protected, and the earth made workable, by erecting temporary roofing and lighting fires beneath. Where possible the railway is allowed to run in open cuttings.

The tunnels in general are larger than the London tubes, thus allowing roomier coaches. Longitudinal seats of polished oak are fitted in the coaches, giving plenty of floor space. Doors are operated pneumatically from the driver's cabin, and the guard seems to have very little to do with giving the rightaway. The latest information available is that the drivers—there are two men in each driving cabin—look to the stationmaster to exhibit a disc when the train is ready to move.

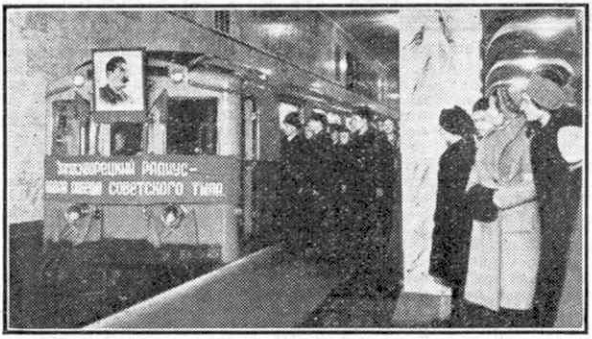
The trains themselves are composed of pairs of motor units and trailers, to the maximum of four pairs. Each coach has seats for 55 persons, and standing room for 170 normally and 250 during rush hours, so that a full train load can number as many as 2,400.

Direct current at 750 v. is supplied to the motors through an underrunning rail. Each motor unit has four 205 h.p. motors, and acceleration is automatic. Auto-colour light signalling permits trains to run at 2½ min. intervals on some sections, and on others there are headways of 4 min. and 6 min. respectively. The latest figure for passengers carried is reported to be approaching a million a day, so that as near as can be calculated the railway is carrying 15 per cent. of the entire railway, bus and tram traffic of Moscow.



Some of the Moscow Underground stations have very broad platforms, with pillars faced with rose and other coloured marbles.

The layout, architecture and colour schemes of the railway are striking, to put it very mildly. The stations, of which there are now possibly 40, are of different designs, the trend in all being towards bold modern styles, some having representations in bas-relief of the peoples of the U.S.S.R. Platforms in general are extremely broad, and some are reached by escalators placed at each end. If the designers had it in mind to obviate platform congestion as much as possible, they would appear to have succeeded, for instead of there being two separate station tunnels, as on older underground railways, some stations have been excavated as a whole, and passengers may move freely across a broad, tiled space between the platforms. There the roof is upheld by pillars faced with rose and other coloured marbles, and a fine lighting effect is obtained from lamps mounted on ornate pedestals or roof fittings giving indirect lighting.



The first train on the Moscow Underground at Stalin Plant Station.

The Story of Steel

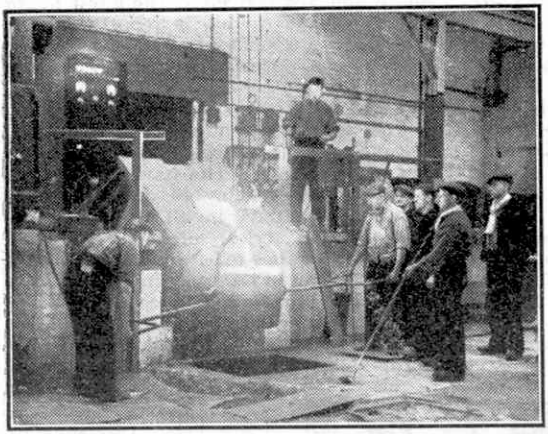
III—Shear Steel and the High Frequency Crucible Process

By Eric N. Simons

IN the last article, we left our piece of "blister" steel waiting to be turned into an even better kind of steel, known as 'shear" steel. Many years ago—about 1750, perhaps even earlier—there was a number of cloth cutters men who cut cloth to pattern, in the Leeds area. They found that only one type of steel gave them really good cutting shears, and they would have no other That is how shear steel came by its name, which is still used to-day.

The way this shear steel was, and is still, made was to break up the blister steel bars into pieces about 18 or 20 inches in length, heat these to an orange colour, and hammer them under a power-hammer, originally a water-driven hammer, but to-day, of course, a steam or electric hammer. The reason for this hammering was to flatten the unsightly blisters: but it was not the only reason.

It is a curious thing that the more you knock steel about, in certain ways and circumstances, the better it gets, just as people say it does a boy good to "get knocked about a bit!" The more you "work" steel, that is, hammer it or roll it, the tougher and stronger it becomes, because the large, coarse crystals are broken down into a smaller and finer structure. The hammering, then, toughens the blister steel. About five or up to seven of the short pieces are piled on top of one another and clipped together in a metal clip with a long handle. A wedge is driven between the steel and the clip to ensure that the pieces do not work loose. This is known as "piling together." As the steel is very hot when hammered, and not so far from the melting point, the hammering welds the pieces together into a solid mass, which is called *single shear* steel.



Modern High Frequency Electric Crucible Furnace.

This is good stuff; but for some purposes such, for example, as the finest carving knives, it is not quite good enough. So the steel maker takes this solid mass of welded steel, doubles it over on itself by nicking the middle and bending it back under the hammer, and hammers it all over again until it is back to its original size. Thus the piece is precisely the same in form, dimensions and weight, but has had *twice as much work put into it*, and is therefore more even in structure and of higher quality. This is genuine *double shear* steel.

Nothing like the same amount of shear steel is made to-day as formerly, because new processes and steels have replaced it, but there is still one firm, Edgar Allen and Co. Ltd., of Sheffield, making the real double-shear steel to-day, and many people regard it as the finest steel in the world for cutlery.

It was not until 1740 that a certain clockmaker of Doncaster, named Benjamin Huntsman who, like everyone else, had to use shear steel for his clock springs, became so dissatisfied with this steel that he set to work to invent a better steel-making process. Shear steel was good enough for cutlery, but because of the hammer and weld marks in it, it was no good for clock springs. The remarkable thing is that Huntsman, who was not a steelmaker at all, succeeded in beating the steel men at their own game, and brought out the famous *crucible* process of making tool steel that reigned unchallenged until 1927, as we shall see.

Huntsman took the pieces of blister steel, broke them up small, and put them into a closed clay pot or crucible, which he then heated up in a coke fire built round the pot. The steel, when melted, was poured into a mould, and when solidified, was taken out and formed an "ingot," about 3 in. square in section. This ingot was then broken up and re-melted in the same way. In this manner was produced a perfectly good spring steel, and with modifications that the genius of later metallurgists were to devise, the process proved capable of turning out the finest cutting steels—steels that gave Sheffield an unrivalled reputation all over the world.

The pouring out of the pot was always a fearsome business. In later days the pots were heated in gas furnaces, which were pits in a floor heated by town's gas. When the steel was ready, the workman took a pair of steel tongs, and standing astride the melting hole, removed the cover, endured the terrific heat of the furnace, with sweat pouring down him, and by sheer strength and skill pulled the glowing pot out of the hole, and poured its contents into the waiting ingot mould. That process is still to be seen in many works to-day, but it is gradually passing away before cleaner and less exacting modern methods.

Not only this, but the preparation of the pots was in itself a dreadful strain. Men had to tread out with their naked feet the cold clay mixture from which the pots were made, so as to force out all the air bubbles, and detect any small pieces of foreign matter. If these had been left in, a cavity might have resulted which could let the hot steel through, and possibly kill or injure a melter. Only the naked feet could do the work properly, and in cold weather, as you will imagine the job was trying in the extreme. Feet used to swell, and the cold alone was agonizing.

The pots were moulded to shape in a machine, dried in a "crucible house" for 10 to 14 days, and then annealed in a grate.

This is the best place at which to tell the story of the process that was to replace the centuries-old Huntsman crucible process, because if it had not been invented, men would still be sweating over

the furnaces and treading out the clay with no prospect of a change.

In 1926 an old gentleman, still living, who controlled as Chairman a large Sheffield steel works, and who had in his younger days himself been a competent and experienced metallurgist, saw a little experimental electrical furnace designed for the laboratory melting of non-ferrous metals, that is, metals that do not contain iron or steel. These metals are much easier to melt than steel, and the temperatures do not have to be nearly so high. This little furnace was so ingenious, however, that the elderly gentleman was enchanted with it, and his brain put to him the question: if this furnace will melt brass and other metals so nicely, why can't it be used for melting fine steels?

Now the principle of this furnace was something like that of wireless, in the sense that the metal was melted without any actual contact with fuel, so that nothing could get into the metal except what was already in it. A current of high-frequency electricity was generated by means of a dynamo, and this current set up "eddy currents" in the metal, and the resistance of the metal to these currents generated a heat great enough to melt it.

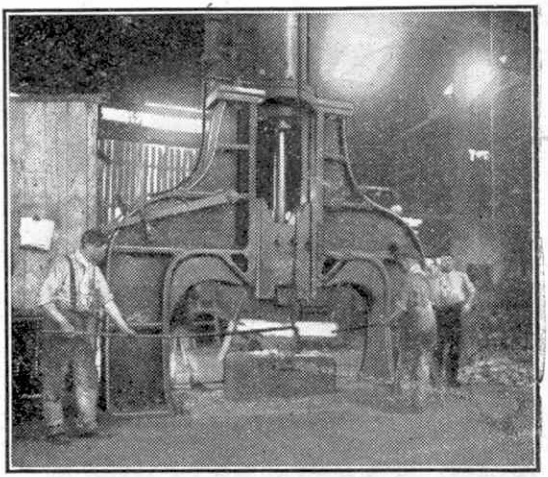
To cut a long story short, the elderly gentleman inspired so much enthusiasm in a number of clever people that eventually a furnace was designed that would actually melt steel in this way, and in November 1927 nearly a hundred editors of newspapers, technical journals, and magazines, including the "*Meccano Magazine*," witnessed the first tool steel ingot in the world being made by the new "high frequency electric crucible process," to give it its full name.

Many difficult problems had to be solved before this result could be achieved, because so much higher a temperature had to be developed by the eddy currents to melt steel that the electric generating machine had to be vastly more powerful than had ever been built before on these lines. There was a lot to learn, too, about how the steel would behave, and what were the best pots to melt it in, and so on.

In the end, the pot was made of a special composition, and packed in a special, heat-resisting sand; a copper tube was wrapped around it, filled with water to cool the tube and prevent it from melting. The whole assembly was packed into a *wooden* box, and after the demonstration, many of the newspapers came out with two startling headlines: "Steel made in a wooden box," and "Steel made by wireless." By the time the news reached Japan it had grown into a story that, by pressing a button two miles away, steel could be melted by wireless, which shows that not all one reads in newspapers is true!

To-day, most of the larger firms are making their tool and stainless steels by this new process, which has been much improved. The advantage is that whereas eight or ten men were required to produce a heat of steel in four hours, the same amount of steel can be produced by this process in one hour with four men, and the conditions under which these men work are far more cleanly and comfortable. For example, whereas even in the bitterest winter the old crucible pot workers sweated pints, to-day they need their overcoats.

This is not all. The steel itself is much purer, because there are no elements from outside to work their way in. Gas from either gas or coke furnaces used to get through the clay pots to some extent, and carry impurities into the steel. That no longer happens. Also, the electrical currents produce an up-and-down motion in the molten metal that prevents heavy alloy ingredients from sinking to the bottom of the pot. This means that they are distributed, as they should be, throughout the molten mass,



"Cogging" an Ingot.

and so produce a uniform ingot, instead of one with rich alloys in one part and next to none in the other.

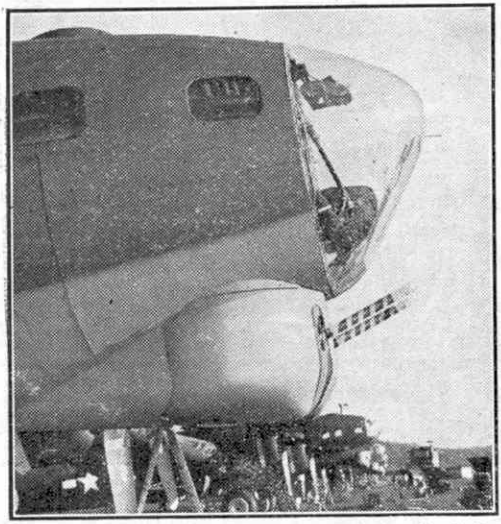
I have taken a long time to tell you about this process because it really is the most important advance in tool and fine steel making for many years, and perhaps there will not be in our time another so revolutionary a development. I should have liked to tell you more about the electrical principles involved, but they are so very complicated that far more space would be needed to explain them than I am sure the Editor can afford.

Whether the steel ingot is made by the old Huntsman process or by the new high-frequency process, it is only a rather bulky lump of steel, and not at all in the form in which it can be used for steel tools. Consequently, it has to undergo a number of processes designed to turn it into steel bars. The first of these is termed "cogging." This is hammering down of the ingot under a powerful hammer or press (or in a rolling mill) to reduce the hot ingot to a "billet" about 6 in. square. This billet is then hammered or forged with special tools, or rolled (a process pretty much the same as mangling, only the rolls are of steel and vastly bigger) into round bars or rods up to 2 in. diameter, square bars, or flat sections of similar area.

The bars are "reeled" to give them a better finish. This is a process of rolling them from side to side instead of from end to end. They may also be straightened, if they have become bent, by placing them in a machine that grips and straightens them. The bars are then annealed. Many writers of historical and other novels seem to think that to anneal steel is to make it hard; in fact it is just the reverse. Annealing makes the steel softer, and takes away any strains set up in it by the forging, rolling, or pressing. The object of annealing is also to put the steel in such a condition that it can be machined in the lathe or other machine tool into the form the user requires, after which it can be hardened properly. Finally, the ends of the bars are knocked off and the fractured surface inspected for flaws. The steel is branded, varnished, painted with distinguishing colours to show the kind of steel, and labelled. Then it is put into the warehouse until a customer orders it. He makes it into the tools he needs.

In the next article I shall leave the subject of steel for tools, and turn to the processes designed to make steel for aeroplanes, locomotives, bridges, guns, automobiles, cranes, girders, rails and the like.

Air News



A striking view of the power-operated "chin turret" of the latest Boeing "Flying Fortress" heavy bomber.

The "Fortress'" Chin Turret

Many of the latest version of the famous Boeing B-17 "Flying Fortress" heavy bomber are now in service. This version, called the B-17G, differs from earlier ones mainly in having a power-operated "chin turret" under the nose, in which are two .5 calibre machine-guns with an effective range of 1,000 yds. This turret and its sinister armament are well shown in the top illustration on this page.

More About Rocket Projectiles

Since the official announcement that several types of British aircraft have been fitted to carry rocket projectiles under their wings, as mentioned in last month's "*Air News*," U.S. Army Air Force H.Q. has stated that American machines also are using R.P. Rails for projectiles have been fitted to "Airacobras," "Dauntless" bombers, "Thunderbolts," "Lightnings," and "Mustangs."

Rocket-firing "Typhoons" did particularly fine work during the initial stages of the invasion of Normandy, and "shot up" tanks, transport and troop columns, bridges, and E-boats. Their finest achievement was the destruction of dozens of enemy radiolocation stations before D-day, a fact that helped us to effect a tactical surprise in the initial landings.

J.W.R.T.

Douglas Air Liner Notes

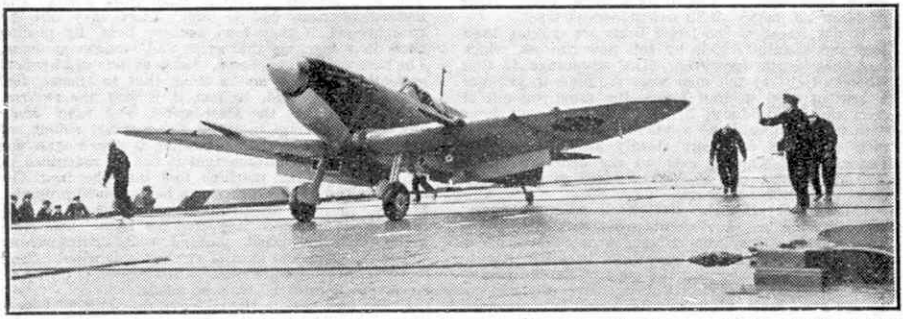
Before the war Douglas air liners were in service on commercial air routes in all parts of the world, and in spite of the suspension of civil flying in many countries owing to the war they are still in extensive use. For instance, Royal Dutch Air Lines (K.L.M.) are operating their Lisbon service with Douglas DC-3 machines.

A much bigger and more recent type of Douglas air liner is the DC-4, and the Government of Canada has ordered a fleet of 50 of these machines from Canadian Vickers Ltd., for the Government-owned Trans-Canada Airlines. The DC-4 is a 4-engined machine, and as produced before the war was notable for the great luxury of its passenger equipment. It seats 40 passengers by day and has sleeping accommodation for 28 at night. Its powerful engines give it a speed of about 265 m.p.h.

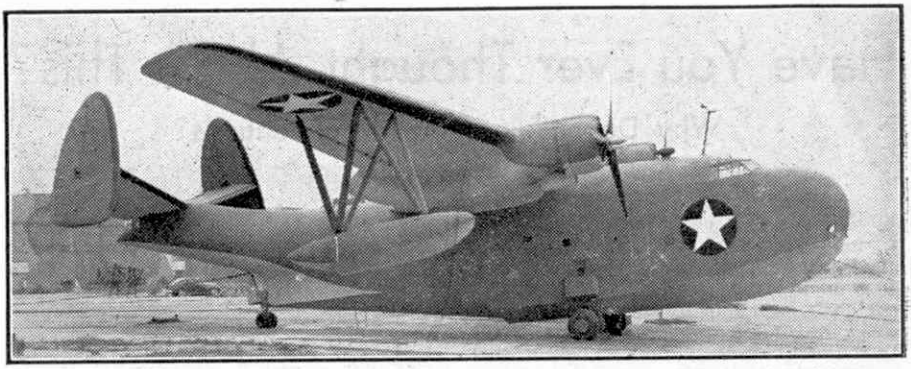
The Douglas Aircraft Company, in common with other leading aircraft producers in the United States and elsewhere, are already planning new and better air liners for production after the war, and they have just given some details of their first completed design under this head, the DC-7. This machine will be large enough to carry 86 passengers by day and will have provision for 76 at night. It has a wing span of 173 ft. 3 in., and is 123 ft. 4 in. long, and it is calculated that its four 3,000 h.p. engines will enable it to fly at speeds up to about 400 m.p.h. The first DC-7 is under construction and may be ready for test-flying before the end of this year.

An International Affair!

Passengers who left Asmara on a British Overseas Airways service recently included an Englishman, a Greek, a Palestinian, a Lebanese, an Egyptian, a Sudanese, and two Ethiopians. The Customs examination was carried out by a Roumanian, the traffic list was typed by a Polish traffic clerk, and the aircraft was loaded by Eritrean porters under the supervision of British traffic clerks!



Vickers-Supermarine "Seafire" landing on the deck of an aircraft carrier. The "Seafire" is the Fleet Air Arm version of the "Spitfire."



Martin "Mariner" transport of the U.S. Naval Air Transport Service. These big twin-engined flying boats carry cargoes averaging 4 to 4½ tons on transocean flights of 1,200 miles and more.

The "Black Widow" Night Fighter

Some details have been released about the U.S. Northrop "Black Widow" night fighter, of which brief mention was made in the February "*Air News*." This machine is the heaviest and most powerful twin-engined fighter used by the Allied Nations. It was designed to a U.S. Army specification, and the prototype machine first flew on 26th May 1942. After modifications had been made to the design, the type was put into production at the Northrop company's Californian factory, and several squadrons of the U.S.A.A.F. now have these formidable fighters.

The "Black Widow" is fitted with two 2,000 h.p. Pratt and Whitney Double Wasp" engines, and the engine nacelles extend beyond the trailing edges of the wings in long tapering booms that support the wide tail unit. Details of armament are not known beyond the fact that the machine has both forward and rearward firing guns.

Another Fast Transatlantic Flight

On 1st July last one of the Vought Sikorsky 44A flying boats of American Export Airlines, Inc., operating the company's transatlantic air service, flew from Foynes, Eire, to New York in 21 hrs. 26 min. It carried 19 passengers and 2,686 lb. of air mail. A stop of 3 hrs. 10 min. was made at Botwood, in Newfoundland, so that the actual flying time was 18 hrs. 16 min.; this is claimed as a record for an East to West commercial flight between Foynes and New York.

The record time for a West to East Atlantic crossing by these 4-engined flying boats is 15 hrs. 20 min., achieved by a non-stop New York-Foynes flight on 17th April last.

Great New Boeing Bomber

The latest Boeing aircraft, the huge B-29 "Superfortress," has been in full production since early this year, and machines of this type in service with 20th Bomber Command, U.S.A.A.F., went into action for the first time on 15th June last when, operating from bases in Suichang province, China, they attacked an important steelworks on the most southerly island of Japan proper. They were thus the first landplanes of the Allied Nations to bomb targets in Japan. On the previous occasion when the Japanese mainland was attacked—on 18th April 1942—the raid was made by North American "Mitchells" operating from carriers. The "Superfortresses" made their second attack on Japan on 6th July last.

The "Superfortress" is the largest 4-engined aircraft in service in the world. It has a wing span of 141 ft. 3 in. and is 99 ft. long, as compared with the "Flying Fortress'" wing span of 103 ft. 9 in. and length of 73 ft. 9 in. The four 2,200 h.p. "Double Cyclone" engines drive 16 ft. 6 in. dia. airscrews, the biggest ever fitted to an aeroplane, and, it is claimed, give the machine a top speed of over 300 m.p.h. It cruises at about 250 m.p.h.

Exact details of bomb load and armament are still secret, but this new air giant is reported to be armed with 20 mm. cannon and to have power-operated turrets equipped with .5 in. machine-guns. It is the first heavy bomber to have a pressure cabin for high altitude flying.

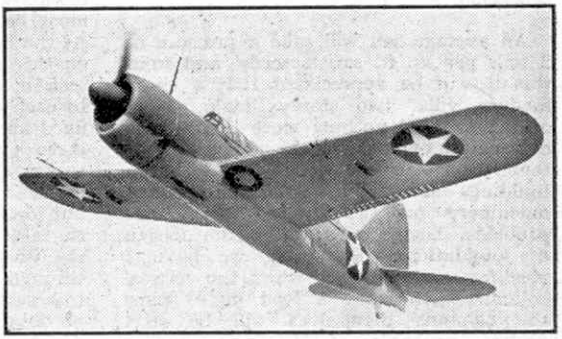
Production of the "Superfortress" is being carried out at three Boeing factories, the Bell Aircraft Corporation's new factory at Marietta, in Georgia, and at the Glenn Martin factory at Omaha, Nebraska.

* * * *

Seas Shipping Company, Inc., U.S.A., have applied to the Civil Aeronautics Board for authority to operate a weekly air service between New York and Capetown or Johannesburg. The service is intended to supplement the company's Robin Line ocean service between the United States and Capetown.

* * * *

The U.S. Navy Department announced recently that the Navy of that country has 100 aircraft carriers operating in the Pacific.



Brewster "Buccaneer" dive-bomber, a type in service with the U.S. Navy, and as the "Bermuda" with the Fleet Air Arm. Photograph by courtesy of the Brewster Aeronautical Corporation, U.S.A.

Have You Ever Thought About This?

Why Do Buildings Need Foundations?

By O. S. Nock, B.Sc., A.M.I.Mech.E.

IF one sits in a chair on a lawn, unless the ground is baked hard after a long dry spell the legs of the chair will sink a little into the ground. Yet if each of the chair legs were resting on a plank of wood, no sinking at all would be noticed. In the first case the weight is concentrated in four places; in the second it is distributed throughout the length of the planks. When any article is resting on the ground, pressure is brought to bear on the earth underneath, just as when iron, steel or concrete is under compression. The great difference is that the capacity of earth to resist compression is an extremely variable quantity.

Clay when baked dry after a long spell of fine weather, can be almost rock-hard, but when saturated with moisture it is soft. Gravel, chalk and other soils all have their different characteristics, which the engineer designing a foundation must take into account. With any ground, however, the weight of the structure to be supported must first be considered. Let us take further domestic examples. No matter how soft the soil, there would be no need for any foundation at all underneath a dustbin, which is quite light. It is another matter with the garden roller; if this is left on soft ground it will sink in considerably, and a fine job it will be to pull it out the next time it is needed.

An average soil will take a pressure of 2 tons per sq. ft. satisfactorily, and from this it will be appreciated that a small modern villa, two storeys high, would ordinarily need nothing more than a row of concrete or stone blocks a foot wide as foundation for the walls. It is when buildings are taller, or include heavy machinery on the upper floors, that problems begin to arise in the design of foundations. Supposing we have a steel-framed building in which the vertical columns each carry a load of 10 tons: the columns themselves will be steel girders, probably of H-section, and a plate just covering the "H" would have an area of about one quarter of a square foot. If this alone were used, the pressure on the ground underneath would be 40 tons per sq. foot, which would be much too great, even if the foundation were solid rock.

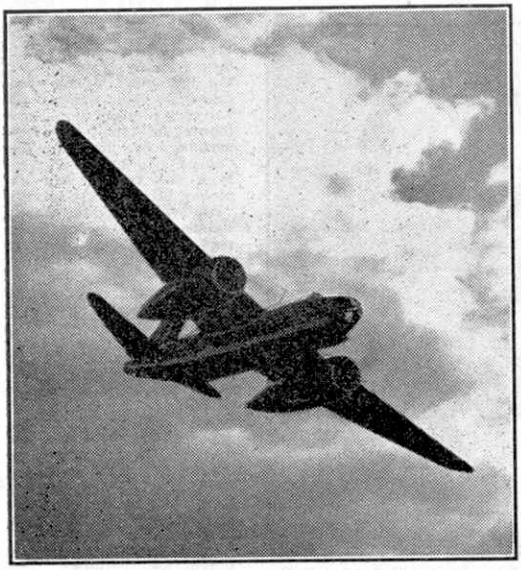
In order that the pressure on the earth may not exceed 2 tons per sq. ft. the area of the base of the column must be 5 sq. ft. The column itself would be fitted on to a steel base about 1 ft. square, and this in turn would rest upon a reinforced concrete or stone slab about 2 ft. 6 in. square.

But 10 tons is a comparatively light load for a modern building, in which the columns may carry 100 tons or more. The foundations for such columns must not only be adequate to distribute pressure on to the earth, but also must be of sufficient depth to give stability. But then it is not always desirable to undertake deep excavations in order to instal heavy masonry foundations. A very useful alternative, which provides great strength with only shallow depth, is the grillage type of foundation. This arrangement can best be described by taking an actual example, a column carrying a load of 100 tons on ground that will take a pressure of 2 tons per sq. ft. The base of this column is made 2 ft. square, while since the area of the foundation needs to be 50 sq. ft., it must be made a little over 7 ft. square. At the bottom there is a layer of concrete; on this are placed nine steel girders of H section, each 7 ft. long, and lying parallel to each other. On top of these girders is fixed another layer, this time having only three girders, and lying at right-angles to the girders of the bottom layer. The upper tier would again be 7 ft. long but only 2 ft. wide, just wide enough to take the base of the column. Thus the weight on the column is distributed through this grillage system, and with this particular design a robust foundation is obtained in the remarkably shallow depth of 2 ft. 6 in., this including 1 ft. of concrete below the bottom tier of girders.

"Our Intruders Were Out . . ."

By John W. R. Taylor

MAJOR KURT MOLNER smiled as he raced low over Chievres airfield. How easy were these tip-and-run raids on the English coast. You just shut off your motor as you came in, opened it up with a roar as you dropped your bomb, and then, back home at top speed. It was all over in a matter of minutes. Yes, it was easy. Now he was back over his base, and soon would be in the mess drinking the inevitable champagne provided by the French as part of the cost of German "protection." Up to 1,000 feet, throttle back, hood open, switch on landing and identification lamps, undercarriage and wing flaps down. Ah, there's the visual Lorenz—a stream of golden lights, hundreds of yards long, with arrows and crosses to guide him to a safe landing. A steady glide now at about 100 m.p.h. and then . . . . .



The Douglas "Havoc," an American twin-engined type used with great success as an intruder fighter.

But Kurt Molner was not alone in the sky over Chievres that night. Suddenly there was a roar of powerful motors behind him, he flashed his head round, his feet kicked over the rudder-bar, but it was too late. Even as he turned, a shattering burst of fire from four 20 mm. cannons blasted both Focke-Wulf and pilot to eternity.

That story is repeated night after night in the skies of France, Belgium, Holland and Germany, wherever the Luftwaffe is to be found, for Fighter Command has developed its "intruder" tactics to a fine art, carrying the war to the Hun over his own airfields. The effect on the morale of enemy pilots can be well imagined: for a plane coming in to land with all its lights on, and flying slowly, is the sort of target that every fighter pilot dreams about. Raids on England have been scotched before they have even begun, as in the recent case when two "Mosquito" pilots found a German aerodrome covered with Dornier Do 217s ready to take off on a bombing raid. Two Do 217s were shot down on to the runway, another 21 were wrecked on the ground with bombs and cannon fire.

How did these intruder operations start? The answer is to be found during the last war. In September 1918 pilots of night-flying Sopwith "Camel" squadrons, based in France, were presented with so few targets on their own side of the lines that they used to patrol enemy aerodromes, looking for trouble. Twice during that month no less than three enemy aircraft were brought down in one night in this way—a lot in those days—and, in the five months during which it operated as a night fighter squadron, No. 151 (Camel) Squadron achieved 20 confirmed victories and six "probables," mostly large bombers, without loss to itself.

So, more recently, when the blitz on this country was at its height, some R.A.F. night fighter pilots decided that it would be much easier to shoot down the Hun over France where 'plane and aerodrome would be lit up, than to search for it in the inky blackness over England. Their "Hurricanes" were given a coat of black paint, and each night when the Luftwaffe raided Britain they ranged over the Continent, shooting enemy 'planes out of the sky and smashing them on the ground. If no Luftwaffe targets were found they shot up railway engines, gas holders, searchlight and flak posts, barracks, in fact anything and everything that enabled the Hun to wage war.

The pilots of these intruder aircraft receive little publicity, although a few names like Flt. Lieut. Kuttelwascher, the Czech ace, and our own Sq. Ldr. MacLachlan stand out as a result of extremely gallant and sustained offensive action. Each of these pilots has shot down nearly a score of enemy aircraft in night actions.

Special training was necessary, for the tactics are entirely different to those of home defence night fighting. Apart from being a good pilot and navigator, his eyesight and powers of quick thinking must be of the highest order, for it is by no means unusual for a Heinkel or Dornier to switch on its lights and fly past a mere 40 or 50 yards away. The intruder pilot gets no second chance. If his first burst of fire is ineffective all lights both on the ground and in the air disappear like magic, and the Hun is on his guard. Anti-aircraft fire can be very intense over the airfields and surprise is essential. The fighters often go in to attack at "nought feet," below the level of the guns on the flak-towers. Then the pilot has the added worry of dodging trees, hangars, wireless masts and other obstructions, often returning to base minus a wing-tip or even with bent propeller blades through flying too low. In spite of all the hazards, however, losses among intruder squadrons are very low.

Since the early days intruder fighters have increased both in numbers and fire-power. "Havocs," "Beaufighters," and now "Mosquitoes," all have been used in the attack with great success. The first attacks are invariably followed up with bombs on dispersed aircraft or hangars, and before the defences can get into action the fighters are well clear.

As final victory draws near there will be fewer Luftwaffe targets for Fighter Command, but the intruders will still fly out at night, deep into enemy territory, striking the Hun when and where he least expects it.

Famous Locomotive Engineers

I—John Ramsbottom, 1814-1897

THE fact that John Ramsbottom governed such a celebrated engine-building establishment as Crewe would be sufficient indication of his importance in the locomotive world of his time; but in addition he introduced such a number of features in locomotive building and running practice that his work played a notable part in the development of the locomotive. He was in fact termed "*the Father of the Modern Locomotive*" in a lecture delivered by F. C. Hambleton, from which various items in this article are quoted.

Ramsbottom was born in 1814, and as he lived until 1897 his lifetime covered a notable period in the development of steam locomotion, and saw the expansion of rail transport from the early colliery lines to the practically completed British railway system of the late nineties. The once celebrated firm of Sharp, Roberts and Co. of Manchester was the scene of his first labours in connection with locomotive engineering. His ability must have been marked, for we find him at the age of 28 being appointed Locomotive Superintendent at the Longsight works of the then Manchester and Birmingham Railway, in 1842. At that time Crewe Works did not exist, but even after their establishment, and the amalgamation in 1846 of the Manchester and Birmingham with other lines to form the London and North Western Railway, Longsight still remained a locomotive centre of importance. Ramsbottom stayed there as the District Superintendent of what was known as the North Eastern Division of the L.N.W.R. until, in 1857, he was appointed Locomotive Superintendent at Crewe. As such he was in control of locomotive matters of what was then the Northern Division, with which his previous charge the North Eastern Division was now combined. The Southern Division was a separate locomotive "kingdom" with headquarters at Wolverton, where James McConnell presided. Practice in the two Divisions was quite distinct, and even the colours used for their respective locomotives also differed. Wolverton favoured brick red, Crewe dark green.

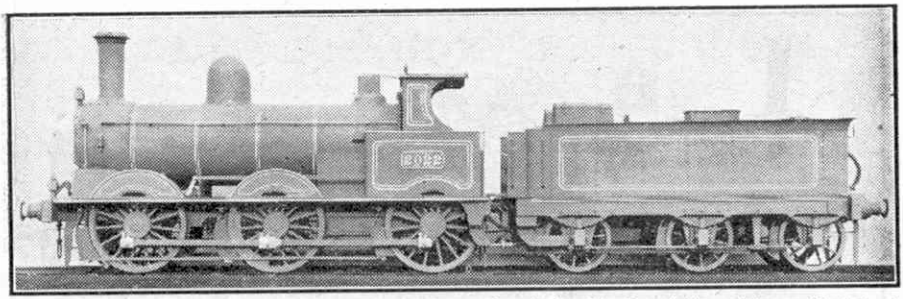
John Ramsbottom. From a photograph in the Science Museum, South Kensington, London.

Prior to his Crewe appointment Ramsbottom had begun to make his mark in locomotive practice. His balanced or "double-beat" regulator valve was introduced about 1850. This he took with him to Crewe, and it remained a standard feature until the building of engines of L.N.W.R. design ceased. Pistons next claimed his attention, and in 1852 he devised a lighter type of piston than that hitherto standard. It was fitted with three piston rings to maintain steam-tightness. These showed a considerable economy, and in his statement to the Institute of Mechanical Engineers, which body he had assisted in founding, that they could be of brass, iron or steel, we get an indication of his interest in steel production. This developed further when later on he installed steel-making plant at Crewe.

So far his inventions concerned internal details of the locomotive, but in 1856 came the introduction of something familiar to all railway or locomotive observers, the Ramsbottom safety valves. This type, with its twin columns bridged by the easing lever and with the central tension spring, is shown on the model Ramsbottom locomotive illustrated on page 268. These safety valves have been and still are in use on many locomotives all over the world, and only comparatively recently has the "Pop" type of safety valve tended to oust the older pattern. The Ramsbottom type is very sensitive, and probably most readers have noticed the humming sound produced by vibration of the valves as pressure approaches blowing-off point on locomotives so fitted. This "music" is quite different from the sudden and explosive lifting of the modern "Pop" valves, and the equally sudden "plop" with which they close down. On the line of its origin the Ramsbottom safety valve remained standard until in the early 1920s "Pop" valves began to appear; and even now, we believe, it has not entirely disappeared from ex-L.N.E.R. engines.

The first new engines to be built during Ramsbottom's superintendency at Crewe appeared in 1858. These were the first four of the numerous and long-lived 0-6-0 goods tender engines known all over the L.N.W.R. as "DX" class. They represented the fruits of Ramsbottom's experience in locomotive building and running, and they also incorporated various ideas from previous Crewe practice, some of which were to become traditional on the line. The square base to the chimney, for instance, and the rectangular side panels over the trailing wheels, are still to be seen to-day. The "DX" class had screw reversing gear, another of Ramsbottom's innovations, permitting easier and finer adjustment of the valve gear than was possible with the lever arrangement.

Engines of this class were built over several years, and 793 were put into service in Ramsbottom's time at Crewe alone. They provided probably the first instance of the mass-production of standard engines, Ramsbottom applying here no doubt some of his experience with the Sharp, Roberts concern, and following his flair for organisation and orderly works practice. A further 150 of the class were built after Ramsbottom's retirement, of which, remarkable though it may seem now, 80 were for the Lancashire and Yorkshire Railway. This adventure of the L.N.W.R. into the engine-building business was, however, stopped at the instigation of the outside building firms. In later years quite a few of the "DX" class were sold out of the service of the L.N.W.R. to other smaller lines, one if not more of



L.N.W.R. 0-6-0 No. 2022, one of the "DX" class, the first engines designed by Ramsbottom at Crewe. Photograph by courtesy of the L.M.S.

them even finding its way to Belgium. Many of them, on their own line, having been fitted for working trains with automatic brakes, were used for passenger work. These became known as the "Special DX" series, and No. 2022 illustrated was one of them. Some survived until L.M.S. days, and the class was not finally extinct until about 1931.

Better known even than the "DX" class, perhaps because they all carried names and were express passenger engines, were the "Problem" class single-drivers. These were 2-2-2 engines with 7 ft. 6 in. driving wheels, and their general appearance, after cabs had been added to the original design, is seen in the illustration of the model of "*Lady of the Lake*" No. 531. This was one of the best known of the class. It was built in 1862 and shown at the London International Exhibition of that year, where it was awarded a Gold Medal, a reproduction of which it proudly carried on its cab side until withdrawn from service in 1906. Such a long life may seem surprising for such a small, light locomotive, but the "Problems" were great favourites as pilot engines on express trains, so much so that most of them were rebuilt during the 90s. Their withdrawal did not begin in earnest until after the close of the Webb regime and the building of sufficient bigger engines that were able to work the trains without pilot assistance.

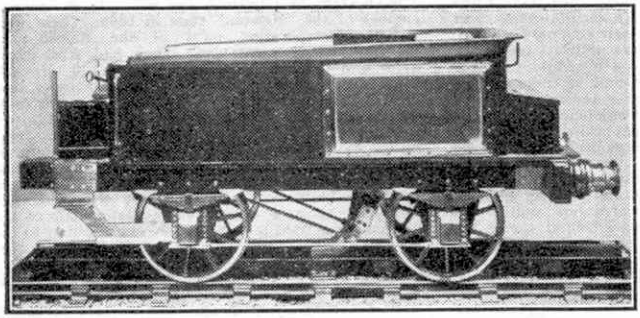
One of this class was the first locomotive to be fitted with an injector for boiler feeding purposes, an item of interest since these appliances are invariably fitted to steam locomotives nowadays in place of the feed pumps that once were universal.

The "Problem" class is invariably associated with Ramsbottom's most spectacular and probably best known invention, the track water trough, and the tender water scoop of "dip" by means of which the water supply can be replenished while the engine is running. It was in connection with an acceleration of the "*Irish Mail*" trains, even then non-stop between Chester and Holyhead and worked for many years by the "Problems," that the water pick-up apparatus came to be devised. The trough was cast iron in 6 ft. lengths, jointed with india-rubber cord and laid in the centre of the track. On the tender a rectuangular pipe passed downward from the bottom of the tank to within 18 in. of the trough. It finished in the form of a curved scoop of similar section to the pipe, and was arranged to hinge or pivot so that its mouth, which faced forward, could be lowered into the trough so as to "cut off," as it were, the top layer of water, which by the forward motion of the engine was forced up the pipe and into the tender tank. So simple, so effective, and still so puzzling to many!

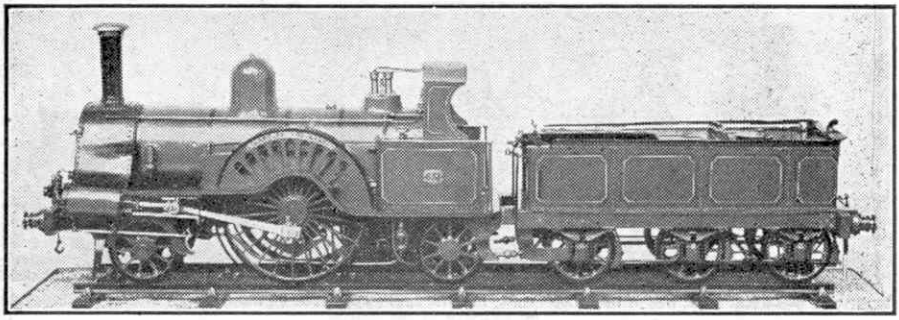
The model tender in one of our illustrations shows the principle of the apparatus, and is of special interest in that it was lent by the inventor himself to the Science Museum authorities in 1893. The glass panel specially fitted to the side of the model allows the internal arrangements of the tender to be seen. Although the model shows the delivery pipe entering the tender floor and closed there by means of a flap valve, the usual arrangement in practice is for the pipe to pass upward to the top of the tank, and then turn downward, so that while the water can get in, it cannot get out by the same passage.

The device was patented by Ramsbottom in 1860, and after the first experimental installation of troughs others were laid down at different points on the L.N.W.R. main line. Picking up water at speed remained for many years a special L.N.W.R. "stunt" of which the company were very proud, but the idea was adopted on other lines as longer non-stop runs were called for. The principles of the apparatus in use to-day remain the same, though the details have been improved. The letting down of the scoop and its subsequent raising was managed by a long rod in the original apparatus, to which considerable force had to be applied by the engine crew, especially when lifting the scoop clear. This method was used on all L.N.W.R. tenders until 1903 or so, when a hand wheel and screw were substituted.

The frequency of the placing of the troughs had the effect of keeping the tenders small throughout the Ramsbottom and Webb periods, and it was only on the adoption of more modern tenders with steel frames in 1904 that the capacity was appreciably



A model built by Ramsbottom himself, showing the principles of his water pick-up apparatus, trough details, and so on. From a model in the Science Museum, South Kensington, London. Crown Copyright.



A splendid working model of one of the most famous of Ramsbottom's "Problem" class, No. 531 "Lady of the Lake." From a model in the Science Museum, South Kensington, London.

increased. Even so the amount of water carried never exceeded 3,000 gallons right up to the building of the last L.N.W.R. engines. The timber-framed tender was a Crewe tradition that Ramsbottom continued, his contention being that in the event of a collision or other serious mishap the tender would break up first and so lessen the likelihood of the coaches becoming telescoped.

In connection with the experiments carried out by Ramsbottom with his water troughs, he devised a "velocimeter" or speedometer, by which speeds could be readily recorded, and the amounts of water picked up at different rates of travel ascertained. This consisted of a vertical closed glass tube half filled with oil, rotated bodily by a band driven from the trailing axle of the locomotive. As speed increased, so did the rate of rotation of the tube, and the effect was to depress the centre of the surface of the oil. Speed was read off on a scale placed at the side of the tube. Like many similar instruments this particular one was not adopted elsewhere, but it was only devised for a particular purpose and was not standard on the line of its origin.

In 1862, on the retirement of James McConnell from the chief position at Wolverton Works, it was decided to concentrate at Crewe locomotive building for the whole line. To this end the works there were reorganised by Ramsbottom, and this was the beginning of the developments that made the establishment so self-supporting. It used to be said at one time that the only parts of the L.N.W.R. engines that were not of Crewe manufacture were the copper fire-box plates and brass and copper tubes or rods. At all events, as part of his plan Ramsbottom introduced a plant for making steel on the Bessemer process; and this, together with his 30-ton horizontal steam hammer, formed for a long time one of the "show pieces" of the works. To facilitate transport of parts about the large area now covered he introduced the narrow gauge works railway on which low wagons hauled by tiny 0–4–0 saddle tanks of special design were used. The first of these engines was named "*Tiny*" There were seven in all, and one of them, "*Pet*," is still in existence though not at work, for the narrow gauge railway was done away with in the great reorganisation of Crewe effected by the L.M.S.

The 30-ton steam hammer consisted of two 30-ton steel blocks mounted on wheels and running on rails. These blocks were moved towards one another by means of steam cylinders placed behind them, the mass to be forged being held between them. Equally valuable though less spectacular was the system of high-speed rope cranes installed in various of the shops. An important introduction at this time was that of steel rails in place of the iron ones previously used, and the rolling mills that he installed for this purpose formed another of the "specialities" of the L.N.W.R., even long after Ramsbottom's time.

Thus equipped, Crewe was well able to turn out large numbers of engines, and the year 1866 saw the completion of the 1000th locomotive to be built there. The second, third and fourth thousand were reached during the chieftaincy of F. W. Webb, and the fifth thousand was achieved in 1911. The sixth thousand was not attained until the L.M.S. period.

To return to the Ramsbottom locomotives, between 1863 and 1866 a series of 50 rather small 2–4–0s were built in batches of ten—note the mass-production idea as a result of the organisation of the plant generally—which were known as the "Samson" class. In a sense they formed the basis of the army of 2–4–0s that subsequently were placed in service in the L.N.W.R. In their external appearance too they set a standard that was adhered to practically throughout the remainder of the company's history. A contemporary introduction was that of some 0–4–0 saddle tanks, but the building of these was more spread out; there were 36 of them and the last was not completed until 1870. They were built in batches, but there was an interval in their building from 1865 to 1870 when the last lot appeared.

A novelty in detail in the construction of the latter engines was the provision of plain bushes to the coupling rods, and the adoption of the circular form to the ends of the rods themselves. Previously, adjustable rectangular bushes had been used, with correspondingly shaped rod ends. With these it was possible for incorrect adjustments to be made, to the detriment of the running and the service obtained from the parts themselves. The circular bush set in a circular hole in the rod prevented any possibility of incorrect gauging and so on, and the securing details of course were much simpler than the cotters, wedges, etc., required by the older pattern.

Increased power for passenger train haulage caused Ramsbottom to introduce the 6 ft. 7½ in. express engines of the "Newton" class in 1866. These were 2–4–0s, incorporating most of the Ramsbottom features already mentioned. They had steel crank axles and tyres, a scheme for the forging of these from solid ingots having been devised by Ramsbottom in collaboration with Webb, who by now was Works Manager. This no doubt was a direct result of having their own steel-making plant right on the spot at Crewe. The "Newtons" were handsome engines, though still without cabs, and they formed the basis of the later "Precedent" design developed by Webb. In due course the "Newtons" were nominally rebuilt to the new design, but actually little of the originals was used in this process. In addition to the 76 "Newtons" turned out by Ramsbottom, another 30 were built by Webb, and one of these was appropriately named "*John Ramsbottom*." As renewed it lasted into the L.M.S. period.

Ramsbottom's last design was a class of saddle tanks of the 0–6–0 type, of which the first appeared in 1870. Only 20 were completed before his retirement, but the class was subsequently multiplied considerably, and the "Humpies," (*Continued on page 286*)

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. We can supply copies to readers who are unable to place orders in this manner. Order from Book Department, Meccano Ltd., Binns Road, Liverpool 13, adding 6d. for postage.

"THE WRIGHT BROTHERS"

By F. C. KELLY (Harrap. 10/6 net)

It is a good thing to have the story of the invention of the first successful aeroplane told fully and reliably, as it is in this book. Probably no great invention ever came into the world so little noticed. The Wrights made no secret of their aims, and it is on record that they extended a general invitation to all in the neighbourhood of Kitty Hawk to come along and see their first attempt at flight. They were equally open when they continued their experiments in a field near their home in Dayton, Ohio, often flying in full view of passengers in trains on a railway running alongside. Yet for more than three years very little notice was taken of their efforts; newspapers scoffed at the stories that reached them and even refused to print them.

The two men who gave the world this remarkable invention were quiet and retiring, but in their earliest days showed their mettle in many different ways. The author tells us the full story of their boyhood activities, and of their entry into the bicycle business, of which they made a great success. They always found time for experiments on all manner of subjects, and from boyhood they took special interest in anything they could discover about attempts at flight. They were particularly impressed by the gliding trials of Lilienthal, and from reading about him they came to thinking for themselves about the control of gliders in the air. This was the beginning of their great work, in which they combined actual gliding with measurements and calculations. They made their own engines, and even built a wind tunnel in which to test models.

This long series of experiments and trials is now history, and in Mr. Kelly's book we can read every detail. We get a clear account of the steady advance that led eventually to successful flights, and at the same time we have pictures of the two men themselves, modest but confident, persevering and ingenious in overcoming difficulties of all kinds. Slowly their success brought them fame, not only in America, but throughout the world, in spite of the fact that people everywhere were slow to believe that the miracle of human flight had been accomplished. They were less at home in the business ventures that necessarily followed, but they went their own quiet ways through these, and it is clear from Mr. Kelly's story of the way in which they won recognition that success did not spoil them.

This authentic story of the Wrights has been read and authorised by Orville Wright. It is illustrated by 18 excellent photographs.

Owing to wartime difficulties, it is impossible to guarantee prompt delivery of books ordered as described at the head of this page, but every effort will be made to ensure speedy despatch.

"THE FIRST RAILWAY IN NORFOLK"

(The L.N.E.R. Price 1/- net)

It is a matter for congratulation that, in spite of the war, the L.N.E.R. have been able to produce this booklet of 24 pages in connection with the centenary of the opening of the Yarmouth and Norwich Railway, which took place on 1st May 1844. We are running into a period of interesting railway centenaries, and it would have been a pity if the story of the first railway in Norfolk had gone unrecorded. This became the Norfolk Railway, and was absorbed by the Eastern Counties, later to form part of the Great Eastern, which finally became the East Anglian constituent of the L.N.E.R. we know to-day.

The various stages in the development of railway communication between Norwich and Yarmouth with London are described in an interesting manner, and are easily followed on the excellent map included as a frontispiece. There are details of the train services, and a very clear table gives particulars of the running between Norwich and Yarmouth in 1845, 1867, 1939, and to-day, for comparison. Stations old and new are illustrated, and rolling stock and locomotives have their due share of attention. The illustrations include line drawings representative of six of the types that made up the total of the 40 locomotives taken on by the Eastern Countries system from the Norfolk Railway, and the dimensions of these also are given. Finally those with a leaning to railway heraldry will welcome the reproductions of the coats of arms of the Eastern Counties, the Great Eastern and the L.N.E.R., and the seal of the Yarmouth and Norwich Railway that appear on the front cover.

The book is splendid value, at 1/-, and those who wish to obtain a copy should do so at once as the supply is limited. It is on sale at railway bookstalls.

"DIRECTION FINDING BY THE STARS"

By J. B. SIDGWICK

(Faber and Faber. 5/- net)

Mr. Sidgwick's book is a fascinating little volume. It is fine to be able to recognise the chief stars and constellations of the heavens, and with his aid this can readily be done. It is still better to find that with this knowledge we can make our way about the Earth and even tell the time. All that is required for this is admirably and clearly explained, and 30 drawings ensure that the picture is complete.

The foundation is laid by the explanation of the cardinal points, and of G.M.T., D.S.T. and other times in use. Then we follow the Sun in its course, seeing how this gives us our bearings, after which we turn to the night sky, beginning with the Plough. We see how the constellations are placed with regard to each other, and learn their positions in Spring, Summer, Autumn and Winter, so that we have many alternative guides to direction at any time throughout the year. The practical value of the book is increased by easily-read tables and graphs.

"JUNCTION X"

By CECIL MCGIVERN

Many readers must have heard the graphic account broadcast a few weeks ago of a day at a vital railway junction. In this listeners heard something of the many tasks that have fallen to our railways during the war, from the handling of men and material arriving by convoy to the movement of vast stores of munitions, with flashes back to the railways' share in such dramatic events as Dunkirk and the air raids. Now we have the full text of the broadcast, and reading it confirms the impression gained of its truth and value. The book includes splendid pictures covering every phase of wartime railway activity. It is obtainable at bookstalls, price 1/- net.

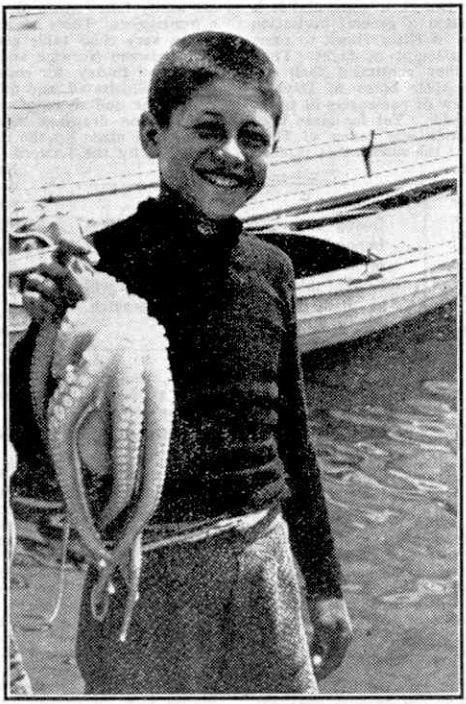
Of General Interest

Squids

Most of us are familiar with the squids that are abundant on our coasts. These appear to be strangely attracted by the Moon, swimming towards the light in great shoals when this is at full. Often on these night excursions, when they cannot see where they are going, they run ashore and die in hundreds.

Squids take many strange forms and vary greatly in size. Some of them have broad fins that make them look like butterflies in the sea, and others have arms connected for part of their length by membranes that have earned for them the name of umbrella squids. They are all capable of squirting out a black or purple liquid or "ink" to hide their movements, but perhaps their most remarkable feature is the parrot-like horny beak, a powerful weapon with which they tear the flesh of their victims.

The squids of our coasts are small and harmless. In the Mediterranean and elsewhere much larger squids are to be found, as our illustration shows, and in northern waters there are immense squids 20 ft. in length, with tentacles stretching out to a length of 50 ft. These giants are so large and powerful that they are capable of desperate battles with sperm whales, for which they provide a favourite food.



A Greek boy displays a fine specimen of a squid. Photograph by T. H. Elwell.

Fish Swimming Champions

The champion swimmer of the fish world appears to be the tunny, which is capable of 44 m.p.h. It is closely followed by the dolphin, with a speed of 37 m.p.h. and the next fastest fish is the blue shark, at about 26 m.p.h. The salmon seems to be able to swim at speeds up to as much as 25 m.p.h., and the trout is only a little slower. Pike can move through the water at about 20 m.p.h., and the roach and the perch are about half as fast.

It is not surprising to find that the shrimp brings up the rear in the fish swimming class. It takes about four hours to cover a mile! A little more unexpected is the revelation that the octopus is a very slow swimmer. It is indeed little faster than a capable human swimmer, and its best speed is slightly less than that of the holder of the world record over a mile.

Incidentally can anyone understand why mackerel always swim in schools? If one mackerel is kept alone for a time and another one is then introduced the two immediately form up, swimming together in line. Others brought along also team up in the same way and even keeping a fish isolated for several weeks does not prevent it from immediately joining up in a school with other mackerel when it has the opportunity.

A Well-Armed Fighting Bird

One of the most curious birds in the world is the trumpeter, a central American native, related to the crane family, that is about the size of a hen. In its natural haunts it is retiring, but when captured it is easily tamed and is a remarkably efficient guardian of a flock of poultry. When introduced to these it immediately takes charge, giving battle to any pugnacious members who challenge its mastery. Then it shepherds the flock generally, calling them up to feed on dainty morsels it has discovered, hustling them into their sleeping quarters and, above all, defending them from all foes. It is not specially armed in any way, and it owes its success as a fighter to its agility. Heavier angry birds rushing at it are dodged neatly and then viciously attacked by pecking.

The trumpeter has a rival as a fighter in a bird known as the screamer, a well armed warrior that has a strong beak, like that of a hawk, and formidable curved claws. Its most surprising feature, however, is a pair of sharp spurs on the bend, or "elbow" of each wing. It is strong and active and with its claws and spurs it tears its opponents to pieces. It is too much even for the stout-hearted trumpeter, but it is said that the two birds never fight each other, each apparently respecting the prowess of the other. The screamer too is a good guardian for poultry, but if the two are herded together with a flock it leaves the trumpeter to do the actual shepherding. This plan appears to work quite well, for if an alarm is raised the trumpeter hurries the poultry into safety while the screamer gives battle.

A Famous Dundee Whaler

A famous old ship has been lost at sea after a splendid career of nearly 60 years. This is the "*Terra Nova*," a barque built at Dundee in 1884 and employed for 20 years or so as a whaler and sealer in Northern waters. She was the last but one of the Newfoundland sealing fleet and while engaged in this work brought in more than 800,000 pelts. In her later days she was fitted with an auxiliary steam engine, and she reached the height of her fame when her sealing days were over, for she was the ship in which the Scott Expedition of 1910-12 sailed to the Antarctic.

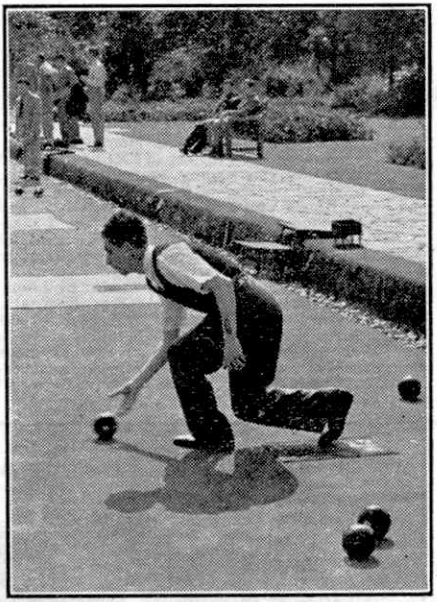
Photography

Holidays at Home

THIS year most "*M.M.*" readers will be spending their holidays at home or not far away, and the photographers may, to use a popular phrase, "take a dim view" of the prospects of interesting pictures. It is true that the range of subjects will be limited, but any camera-owner who looks around him will find many more subjects than he can get films to take!

For instance, most towns are arranging special "holidays at home" attractions in the local parks and elsewhere, and these will provide ample material for pictures, many of them probably of a kind that have not come our way previously. One cannot walk far among a crowd of folks enjoying outdoor entertainment without coming across amusing scenes that will make splendid snaps and raise many a smile among our friends when we show our snaps round. Here the important point is to have the camera ready for instant use, for these little episodes are soon over, and the chance does not come again.

Where no special attractions are provided there are almost always good pictures to be made of outdoor games. The accompanying scene on a public bowling green is a good example of an attractive picture that is easy to find and to take. Many other incidents on a bowling green are worth trying, particularly for those whose cameras have only slow-speed shutters. At the same time it must not be forgotten that even such fast-moving games as lawn tennis provide many interesting moments when there is little rapid motion.



Bowling green scenes make good subjects. This one is by W. Taylor, Southall.

The Air Training Corps! Photograph by G. Gemmill, Burnley.

Apart from organised games, there is plenty to be done among the improvised amusements of the local youngsters. Our other picture shows a simple little scene of the kind to be found almost anywhere without stirring far from home.

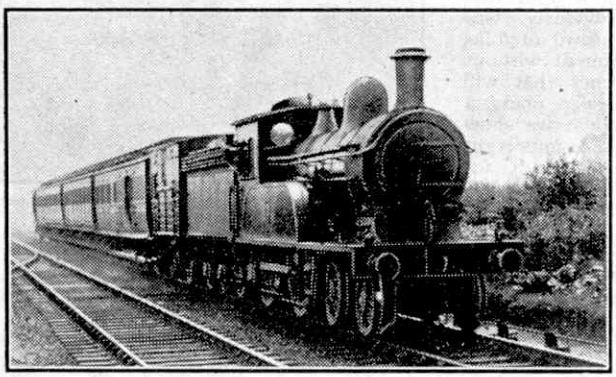
Then there is the unfailing supply of subjects to be found in the garden. Portraits or groups of the family and friends, perhaps including the household pets, are always worth taking, and it should be remembered that such pictures will give enormous pleasure if sent to the absent ones overseas who are fighting for us. Indeed it would be well worth while to consider devoting all our films to pictures taken for this special purpose.

Railway News

L.N.E.R. Running Notes

Along the severely graded West Riding lines in Yorkshire on the G.N. section, an interesting feature for many years has been the use of "N1" Ivatt 0–6–2 tank engines, carrying express passenger headlights, on the Bradford portions of the principal services to and from King's Cross, as between Wakefield and Bradford. Standard "J39" 0–6–0s also take a share in such duties, which used often to be worked by G.N. "J1" 0–6–0 mixed traffic locomotives, recently illustrated and described in the "*M.M.*"

On account of heavy loads lately carried by Leeds-London expresses, pilot assistance was frequently given by tank engines as far as Wakefield, as the road includes a steep initial climb, followed by a 1 in 100 rise up to Ardsley. Locomotive combinations under such circumstances have included a superheated "N1" 0–6–2T and a "K3" 2–6–0; G.C. "C14" 4–4–2T with a "V2" 2–6–2 and "N1" No. 4579 piloting "C1" 4–4–2 No. 4433. In each case the load was 12 corridors, to which the Bradford portion of four or five coaches would be added at Wakefield. Exceptional instances have been reported also of G.C. 4–4–2Ts assisting "Pacifics" out of Leeds Central.



Leeds-Darlington express headed by 4-4-0 No. 1874 of Class "D17/2." Photograph by courtesy of the L.N.E.R.

The new unnamed 4–6–2 of class "A2/1," No. 3696, was being run in on slow trains from Darlington at the end of May.

Engines withdrawn for scrapping in the N.E. area recently include "C6" 2-cyl. "Atlantics" Nos. 295, 1776; "C7" 3-cyl. 4–4–2s Nos. 710, 717, 719 and 721; and another "D17/2" 4–4–0, No. 1871, of the once famous N.E.R. "Q" class, with 7 ft. 1 in. driving wheels, the upper sections of which are covered by one long splasher, as will be noted from our illustration. No. 922, a "B16" N.E. 5 ft. 8 in. 4–6–0, has been rebuilt, with new cylinders and Walschaerts gear. No. 2560 "*Pretty Polly*" is an additional rebuild from "A1" to "A3/3" with the latest style boiler of the class.

The celebrated "A1" No. 4472 "*Flying Scotsman*," which was exhibited at Wembley in 1924–5 and later took a leading share in the operation of the summer King's Cross-Edinburgh non-stop runs, was recently transferred from Doncaster to Peterborough shed, where some "super-Pacifics" also are now stationed. The second "01" 2–8–0 No. 6244, rebuilt from G.C. "04" type, has been tried on fast coal and other freight trains on the G.N. section, where similar tests have also been taking place with an L.N.E.R.-built "8F" 2–8–0 of L.M.S. design, No. 8513. Trials also took place between these two classes over the steeply graded Manchester-Sheffield main line, which is scheduled for electrification.

In Scotland No. 2001 2–8–2 "*Cock o' the North*," "B1" 4–6–0 No. 8303 "*Impala*," stationed at Perth, and "Pacifics" and "Green Arrows" have been seen on Edinburgh-Perth passenger services. They are turned on the L.M.S. turntable at Perth. "Green Arrows" appear a good deal on the Waverley route between Edinburgh and Carlisle, a route presenting fearsome climbs.

Great Western Tidings

In Devonshire, on the West of England main line between Newton Abbot and Totnes, where there are precipitous gradients, and on towards Plymouth, banking engines observed last spring assisting passenger and goods trains included the following in addition to mixed traffic 4–6–0s and 2–6–0s; 2–8–2Ts Nos. 7208 and 7222; 2–6–2Ts of the "41xx," "51xx" and "61xx" classes; and new 2–8–0 W.D. locomotives of the U.S.A. and L.M.S. types, on loan to the G.W.R. "Bulldog" 4–4–0s are still seen sometimes, as so often of yore, piloting "Castles" or "Kings" through from Newton Abbot to Plymouth, where single-engined express and other loads have to be restricted on account of the severity of the route.

A reader writes of regular journeys by the 6.25 p.m. semi-fast Paddington to Oxford, which runs over the G.W.-G.C. joint line to Princes Risborough and thence along the single track via Thame. On 32 evenings round about March last, the engines on this duty comprised in the 4–6–0 range "Castles," "Stars," one "Saint" and "Halls" of all three series, as well as a 2–6–0 from Taunton and a modern 2–6–2T. Other sheds represented included such far away places as Plymouth (Laira), Cardiff, Bristol and Birmingham. Then by contrast, for nearly two months No. 6960, one of the new "modified Halls," almost monopolised the working, being kept in very smart condition and returning as far as West Ealing with a milk train via Didcot and the main line.

Diesel cars Nos. 6 and 19 on loan to the L.N.E.R. have been operating between Newcastle and North Wylam, in an area of Northumberland historically associated with George Stephenson's early activities and the beginnings of colliery railways.

The new "Modified Hall" Class, G.W.R.

As many readers will be aware, the latest of the long series of "Hall" class 2-cyl. 4–6–0 mixed traffic engines now coming into service, numbered from 6959 up, are of a modified type. By courtesy of the Stephenson Locomotive Society, we are enabled to detail the modifications that their "*Journal*" reports. The main frames are rolled in one solid length, so doing away with the extension piece bolted to the front of the older engines; this gives the new "Halls" a more built-up appearance at the front end, rather like some of the L.M.S. Stanier designs. There is a new design of bogie, with each wheel independently sprung by means of laminated springs placed above the wheels; previously there was only one inverted spring on each side, placed between the wheels. The new arrangement is much simpler from the fitter's point of view as regards access in the event of breakage of a spring, and drivers say that the smoothness of running is improved, also that the "6959" class

are very economical performers. The next paragraph probably explains why.

Contrary to the practice developed recently by the other three British railways, Swindon superheaters have always been of a modest character, sufficient to overcome condensation in the cylinders; it was not considered worth while sacrificing ordinary tubal heating surface in order to obtain high degree superheat, which other authorities claim induces drier, gaseous steam that can be used more expansively, so enabling the engines to be worked more economically. It is a tribute to the Swindon design of valves and steam ports, as well as to their early introduced policy of high boiler pressures, that their locomotives do so well with low degree superheat, as the 14-element superheaters hitherto standard on most of the 4-6-0 classes up to "Castles" provide only 262 sq. ft. superheater area. On the latest "Halls" a 21-element superheater is provided, however, and this development will be watched with interest; the units are of the Superheater Company's type and the header inside the smoke-box incorporates the regulator valve. Finally, there appears to have been some change in the lubrication system, which may indicate the adoption of other fitments standard on other lines, such as external mechanical lubricators.

G.W.R. 2-6-0 No. 8337 piloting No. 6016 "King Edward V" on Dainton bank. Photograph by R. Brookman.

The Railways and the Invasion

From 26th March, first day fixed for the movement of personnel, to the completion of the initial "D" Day moves two months later, British railways ran 24,459 special troop, ammunition and stores trains. Not all these trains were connected with "D" Day itself, but of the great number that were 1,000 carried 230,000 soldiers across Britain, together with 12,000 tons of baggage.

Stores and heavy equipment for "D" Day absorbed another 800 special trains, or more than 30,000 goods wagons. These trains carried amongst other vital war traffics some 7,000 vehicles, including tanks, and more than 6,000 wagon-loads of supplies and equipment were also sent by ordinary freight trains.

These big railway movements, designed to cause the least possible interference to ordinary traffic, passed almost unnoticed by the public. It was in fact a "tarpaulin armada" of innocent looking trucks in their thousands, covered with tarpaulin sheets, that carried the devastating instruments of war and the multitude of supplies needed by a modern army.

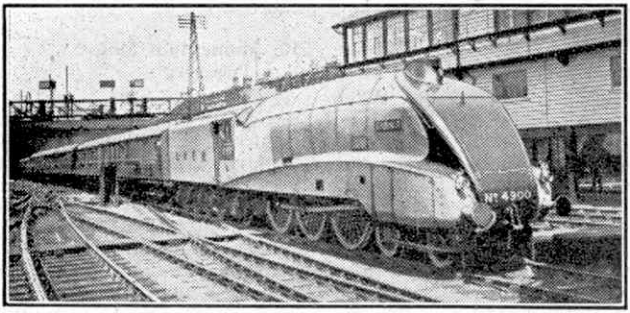
During the three weeks prior to "D" Day the movement of special trains reached a climax. In one week all wartime records were surpassed by the running of 3,636 special trains, the total for the three weeks being 9,679.

Centenary of Historic Railway Run

Just over 100 years ago, on 18th June 1844, a historic train left Euston in London, then known as Euston Square station, at 5.3 a.m. Its destination was the Tyne. The entire journey from Thames to Tyne had never before been accomplished by rail and this through communication had been made possible by the completion, a few days previously, of a 21¼ miles stretch of line known as the Newcastle and Darlington Junction Railway, which closed the last gap between north and south.

The route from Thames to Tyne traversed the lines of no less than seven different railway companies. These were the London and Birmingham as far as Rugby, thence the Midland to Normanton, the York and North Midland to York, the Great North of England to Darlington, the Newcastle and Darlington Junction to Washington, the Pontop and South Shields to Brockley Whins, and lastly the Brandling Junction to Gateshead, all of them important ancestors of the L.M.S. and L.N.E.R. systems of to-day!

The train steamed into Gateshead at 2.24 p.m., 9 hrs. 21 min. after leaving London. The actual travelling time for the 303 miles had been 8 hrs. 11 min., giving an average speed of 37 m.p.h. Immediately prior to the war the streamlined *"Silver Jubilee"* of the L.N.E.R., with a route 35 miles shorter, linked London and Newcastle in 4 hrs., but the real measure of the achievement of 1844 can only be seen when it is realised that if the same journey had been made by stage coach, until then the speediest means available for the general public, it would have taken no less than six days!



Up Leeds express entering King's Cross, hauled by "A4" No. 4900 "Gannet" when freshly painted blue. Photograph by W. B. Greenfield.

Suggestions Section

By "Spanner"

(648) Compact Reversing Gear
("Spanner")

The simple device shown in Fig. 648 is a neat reversing gear in which the ratio between the driving and driven shafts is 1:1, so that these rotate at equal speeds in both the forward and reverse positions.

The driving shaft 1 and the driven shaft 2 are journalled in a Channel Bearing fixed to a base plate, and each of them carries a ¾" Sprocket and a ¾" Contrate. A Washer is placed between each Contrate and the Channel Bearing for spacing purposes. Two 1"×1" Angle Brackets form bearings for a 3" Rod carrying a ½" Pinion 3 and a ½"×½" Pinion 4. This Rod is slidable, but its movement is limited by the Pinion 3 and a Collar fixed on the opposite end of the Rod. The 2½" Strip 5 is pivotally connected to an Angle Bracket attached to the base, and carries in its second hole a Bolt, the shank of which fits into the space between the boss of the Pinion 3 and a Collar on the same Rod.

When the Pinion 4 meshes with both Contrates, as in Fig. 648, the shaft 2 is rotated in the opposite direction to the driving shaft. When the lever 5 is moved so that the Pinion 4 continues to mesh with the Contrate on the Rod 1, but slides out of engagement with the other Contrate and the Pinion 3 engages this Wheel, both shafts 1 and 2 rotate in the same direction.

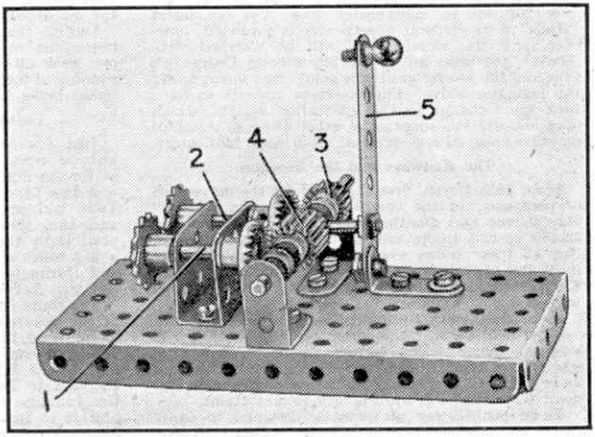


Fig. 648.

(649) The Smallest Meccano Free Wheel
(D. W. Insall, Bristol)

Fig. 649 shows a very small free-wheel mechanism that can be used in special models where space is limited. Although it is probably the most compact mechanism of this kind that has so far come to my notice, it works efficiently and smoothly, and is worth constructing if only for the purpose of ascertaining its features for oneself.

It consists of a ⅜" Bolt screwed into a Collar that is fixed by its Grub Screw to a Rod. On the ⅜" Bolt is a Spring Clip, and a Bolt fixed in a second Collar is adjusted so that it is in contact with one wing of the Spring Clip and prevents the latter from moving around its Bolt. The other wing of the Spring Clip is in contact with the teeth of a ¾" Contrate Wheel, which is mounted freely on the Rod and is spaced from the Collar by four Washers as shown.

The Socket Coupling is fixed to the boss of the Contrate Wheel at one end and carries at its other end a Gear Wheel, by means of which the drive is transmitted.

It will be seen that the Spring Clip allows the Contrate to rotate in one direction, but prevents it from rotating in the other owing to the wing of the Clip catching in its teeth and locking.

(650) Momentum Motor
("Spanner")

When it is not practicable to drive a model by means of either a Clockwork or an Electric Motor, and this is very often the case nowadays, when Meccano Motors are difficult to obtain, it is occasionally possible to drive a model by utilising the energy stored up in a heavy revolving flywheel. Power obtained from this source is only available for comparatively short periods, but if it is properly applied to the right kinds of models it can often be made to operate for periods almost as long as a small Clockwork Motor. The

flywheel must be very heavy and well balanced, and its bearings must be as free from friction as it is possible to make them.

A good example of the application of a momentum motor to driving a simple model is shown in Fig. 650. In this case the model is a tractor. The Flywheel is mounted on a short Rod, the front end of which carries a ½" Pinion that can be brought into mesh through a high step-up gearing with the starting handle. When this handle is pushed inward the gear train is brought into operation automatically and the Flywheel can then be set in motion with a very high speed of rotation.

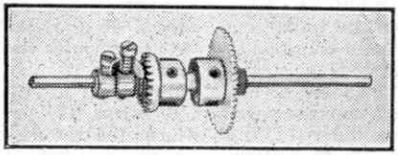


Fig. 649.

At the opposite end of the Flywheel Rod is fitted a second ½" Pinion. This can be brought into engagement with a 1½" Contrate 6, which is secured on a sliding Rod controlled by a short lever. A Compression Spring normally keeps the Contrate in gear with the Flywheel, but when the latter is set in motion the lever is moved over to one side. No movement is then imparted to the road wheels while the Flywheel is being started, and they are brought into gear when required by the return movement of the lever.

(651) Ladders for Use in Meccano Models

(M. A. Reed, Woodford Green)

M. A. Reed, Woodford Green, suggests a novel method for constructing realistic ladders for use in various kinds of Meccano models. For the runners he uses Strips of any suitable length. Each rung consists of a 1⅛" Bolt pushed through one of the runners and then fitted with a Rod Connector. The free end of the Bolt is then pushed through the other runner, and the whole is held in place by a Nut.

It is usually found best to place the rungs in alternate holes in the runners, but the scale can be changed as required, for example by making use of 1" Rods as rungs.

(652) A Novel Use for Meccano Gears

("Spanner")

An interesting range of sprocket wheels, which can be used in conjunction with Meccano Sprocket Chain when the actual Sprocket Wheels are not available, may be obtained by substituting the 50, 57, 95 and 133 teeth Gears for the proper Sprockets. The pitch of the teeth of the Gears is approximately half that of the Sprocket Wheels, so that each link of chain takes up two teeth of the Gears. An arrangement of this kind is only suitable for light drivers, and care must be taken to ensure that the Chain is joined up neatly, as slight distortion of the links will result in the Chain leaving the gears when in motion.

(653) Driving Small Models

("Spanner")

The most simple form of driving gear for small and light models is the cord and pulley system. This is very easy to arrange, and by taking care to select the right sizes of Pulleys it is possible to provide a very wide range of either "step up" or "reduction" ratios. For example, by using a 3" Pulley and a ½" Pulley a ratio of 6:1 is obtainable, while a 6" Pulley and a 2" Pulley give a ratio of 3:1. Other useful combinations can be arranged.

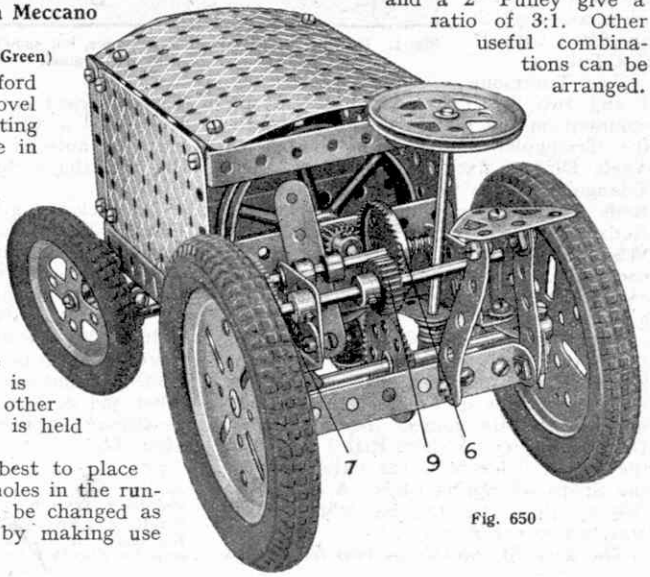


Fig. 650

New Meccano Models

Steam-Driven Excavator—Treadle Grindstone

THIS month we describe two models that differ considerably in type, although both are simple to build and neither requires a very large number or variety of parts. The first is a steam-driven excavator, which includes several interesting movements, and illustrates well the chief features of machines of this kind. The second, a treadle grindstone, is a smaller model that should be particularly attractive to younger model builders, who will enjoy the realistic effect produced when the grinding wheel is set in motion.

The steam driven excavator that is the first of the models described this month is shown in Fig. 1. The base of this model is a 5½" × 2½" Flanged Plate, to each side of which is bolted a 9½ Strip. In their end holes these Strips carry the wheel axles, which are fitted with 1" fast Pulleys.

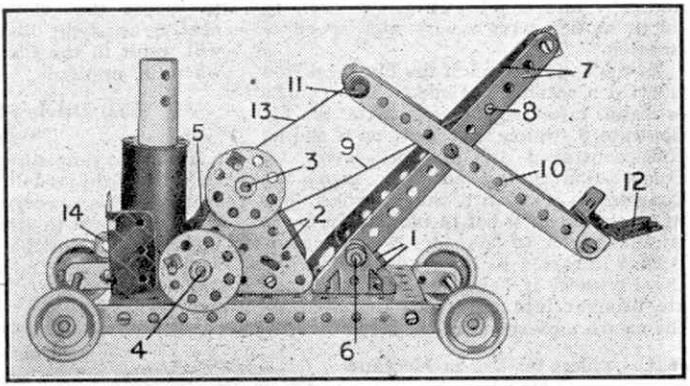


Fig. 1. This fine model excavator is simple, but shows well the various movements of the original.

Two Trunnions 1 and two 2½" Triangular Plates 2 are mounted on the Flanged Plate as shown, the Triangular Plates being bolted to Angle Girders fixed to the Plate. The Triangular Plates form bearings for two Rods 3 and 4 to which the operating cords are fixed, and which carry Bush Wheels fitted with Threaded Pins at one end and Collars at the other. The Rod 4 carries also a ½" fast Pulley 5 that forms a brake drum.

Pivoted on a Rod 6 held in the Trunnions 1 are two 5½" Strips 7, which form the boom. These are spaced apart on the Rod by Spring Clips or Collars, and at their upper ends are joined together by a Double Bracket. A short Rod 8 is held in the fourth holes from the outer ends of the Strips by Spring Clips. A Cord 9 is tied to this Rod and its other end is attached to the Rod 4.

The arm 10 consists of two 5½" Strips pivoted on Bolts locknutted in the Strips 7 as shown, and bridged at their inner ends by a Rod 11 held in place by Collars. At their outer ends these Strips are joined by a 1½" Double Angle Strip, to which are bolted a 1½" Angle Girder and three 2" Strips 12, bent slightly as shown to form the shovel teeth. A second piece of Cord 13 is tied at one end to the Rod 11 and at its other end to the Rod 3.

The boiler is represented by a Cylinder fixed by Angle Brackets to the base plate. This is closed at its top end with a 1½" Disc and a Chimney Adaptor held in place by nuts on a Threaded Rod passed through the Cylinder and the Flanged Plate.

The back of the driver's cab is a 2½" × 1½" Flexible Plate bent ½" from one end and fixed to the base by Angle Brackets.

A brake is provided to check the movement of the boom, and this consists of a 2½" Strip 14 pivoted on a lock-nutted Bolt to the near side Triangular Plate. A piece of Cord is tied to the Strip, then passed around the ½" fast Pulley 5 and its other end is then made fast to the Strip. The brake is applied by pressing downward Strip 14.

Parts required to build model Steam-driven Excavator: 2 of No. 1b; 4 of No. 2; 2 of No. 6; 3 of No. 6a; 3 of No. 9f; 1 of No. 11; 1 of No. 12; 2 of No. 16; 2 of No. 16a; 1 of No. 16b; 1 of No. 17; 1 of No. 18a; 4 of No. 22; 2 of No. 23a; 2 of No. 24; 40 of No. 37a; 35 of No. 37b; 1 of No. 52; 7 of No. 59;

2 of No. 76; 1 of No. 80c; 2 of No. 115; 1 of No. 117a; 2 of No. 126; 1 of No. 163; 1 of No. 164; 1 of No. 188; 1 of No. 216.

The model treadle grindstone is illustration in Fig. 2. Its base is a 5½" × 2½" Flanged Plate, and to this are bolted four 5½" Strips, which provide supports for the grinding stone axle and the other parts of the mechanism. A 2½" × ½" Double Angle Strip is bolted across the front pair of Strips to make them rigid. Journalled in the holes at the upper ends of the Strips is a 3" Rod, which carries a 1" Fast Pulley and two Wheel Flanges fixed to the Rod by means of Bush Wheels bolted to them. The Rod is held in place in its bearings by means of Collars.

A second 3½" Rod is pushed through holes in the rear pair of 5½" Strips and this one carries a Flywheel, a 3" Pulley and a Bush Wheel. A Driving Band connects the 3" Pulley with the 1" Pulley on the first Rod.

The treadle driving gear consists of a 3" Strip pivoted as shown on a 3½" Rod, the Rod being held in the front pair of 5½" Strips by Collars. Pivoted by means of lock-nuts in the rear end hole of the 3" Strip is a 2½" Strip, which in turn is pivoted in its upper end hole to the Bush Wheel. To make this connection a ⅜" Bolt is used, and this is fitted with lock-nuts.

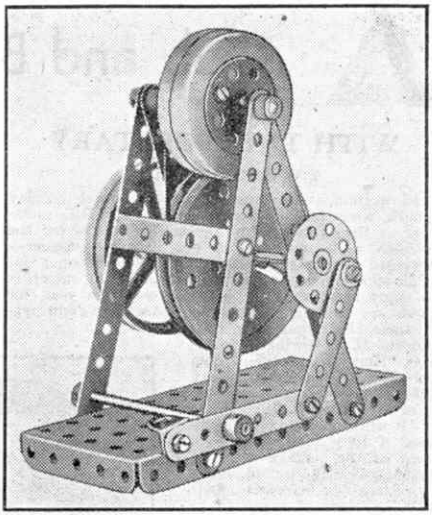


Fig. 2. An easy working model of a grindstone with a treadle action.

Parts required to build model Treadle Grindstone: 4 of No. 2; 1 of No. 4; 1 of No. 5; 1 of No. 12; 2 of No. 16; 1 of No. 16b; 1 of No. 19b; 1 of No. 22; 3 of No. 24; 16 of No. 37a; 14 of No. 37b; 2 of No. 38; 1 of No. 48a; 1 of No. 52; 7 of No. 59; 1 of No. 111c; 1 of No. 132; 2 of No. 137.

Summer Model-Building Competition

Transport—Past and Present

There have been many rapid and surprising changes in methods of transport within the last 100 years. If it were possible for a boy of say 1844 to see a modern motor car or bus, a giant passenger liner of to-day, perhaps driven by oil, or a giant streamlined locomotive, he would find it difficult to realise that these have grown out of the comparatively crude pioneer road vehicles, small ships and locomotives with which he was familiar. To us to-day it is equally interesting to look back over the years and to compare say a modern motor car such as a Rolls Royce with one of the clumsy, noisy and lumbering vehicles that were known to our grandparents in their younger days. An equally startling comparison is a giant modern air liner with the Wright biplane that was the forerunner of modern aviation, although the first successful aeroplane was built only 41 years ago.

It occurs to us that a good model-building competition can be based on this theme, and this month therefore we announce details of such a contest in which every model-builder may compete. In it fine prizes are offered for the most interesting and best-built Meccano models representing some method of transport, either in its obsolete or its present-day form. For example, an entry may consist of a simple model of "*Puffing Billy*" or "*Rocket*," or of a more elaborate modern locomotive such as "*Silver Jubilee*" or "*Princess Elizabeth*." Models of obsolete ox-wagons, bullock carts, bicycles, aircraft or ships also would be suitable, while those model-builders who have large Outfits and are able to build more elaborate structures may prefer to choose modern subjects such as a "Flying Fortress" or a "Hurricane," or a battleship such as "*King George V*."

Competitors should have no difficulty in finding illustrations of suitable subjects on which to base their models, and a search through past issues of the "*M.M.*" or a visit to the local library will prove helpful in this respect. There is no restriction on the type or quantity of parts that may be used in building models for entry in this contest, but it should be borne in mind that simplicity of construction will often produce better and more pleasing results than a mass of detail work clumsily and carelessly put together.

To enter this contest it is only necessary to send in either a photograph or a good drawing of a model. The actual model is not required. Also models need not be specially built for this contest. Any suitable model already constructed may be entered, provided that it has not previously been awarded a prize in any "Meccano Magazine" Competition.

Entries will be divided into two Sections, A, for competitors under 14 years of age, B, for competitors over 14 years of age. Entries should be addressed to "*Summer Model-Building Competition, Meccano Limited, Binns Road, Liverpool 13*," and should be posted in time to reach this office on or before 30th September next.

The following prizes will be awarded in each Section: First Prize, P.Os. for £2/2/–; Second Prize, P.O. for £1/1/–; Third Prize, P.O. for 10/6. In addition there will be Consolation Prizes of 5/– for meritorious entries that just miss being winners of the principal awards. Closing date: 31st October.

Club and Branch News

WITH THE SECRETARY

A WARTIME HOLIDAY

In normal times August was the great holiday month, when I could picture Guild and H.R.C. members at the seaside or in the country, enjoying the warmth and sunshine of our British summer—provided of course that this unreliable performer put in an appearance. It may not be possible for members to enjoy themselves in the same way this year, for there are too many wartime distractions and restrictions, but that need not prevent them having a profitable time near their own homes, and I hope that every Club or Branch member will have a good holiday.

All will find it exceptionally good if they combine it with some of the outdoor work so urgently called for in order to ensure our harvests. Last year members of many Clubs gave a hand in the fields, with profit to themselves and benefit to the country as a whole, and I hope that a good number will carry on the good work this year.

KEEP THE JUNIOR MEMBERS IN MIND

One esson that the war has taught us is that we cannot do too much to encourage junior members. This of course is not really a discovery, for on countless occasions in the past I have urged Leaders to recruit younger boys to join the Club, and to keep them carefully in mind in arranging programmes. I did this because I know that it is from the ranks of junior members that the future officials of a Club are to be found. It is easy to see that member who have gained experience in Club ways by joining as juniors and working their way up will make the best of all secretaries, assistant Leaders or even Leaders, for they combine experience with enterprise, a combination that is to be desired for every Club.

It is doubly important to look after the juniors to-day, when the Services and other wartime activities are claiming older members, and I have been very greatly interested to find on checking up that most of the Clubs and Branches that have made the best showing in wartime have always had junior sections, or at least have given a special welcome to junior members. So here is a rule for the coming winter sessions—give the younger members every encouragement!

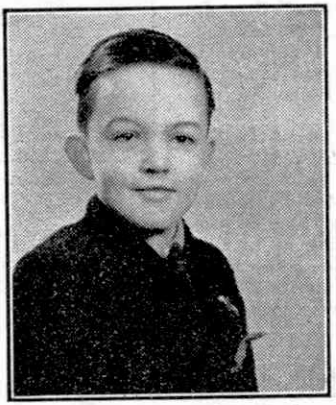
PROPOSED CLUBS

GRANTHAM—Mr. D. E. Gammage, 27, North Parade, Grantham, Lincs.

HELSTON—Mr. A. Gaffin, 18, Church Street, Helston, Cornwall.

JOHANNESBURG—Mr. P. Goldstein, 14, Doris Street, Berea, Johannesburg, S. Africa.

PETERBOROUGH—Mr. G. Taylor, 97, Fane Road, Paston, Peterborough, Northants.



D. Hopkins is Secretary of the Banbury Branch, No. 461; Leader, Mr. J. H. Hopkins. This Branch was incorporated in April last. It possesses a well planned layout, with Meccano bridges, and excellent track meetings are being held. Chemical experiments provide another Branch activity, and frequent lineside visits keep members in touch with railway practice.

CLUB NOTES

EXETER M.C.—The Club has settled down to intensive model-building and the large store of parts is in great demand. Jeeps and bulldozers, railway trolleys and ships, and a "skyscraper" building of 16 storeys have been constructed. Club roll: 260. *Secretary:* I. L. Coates, 103, Monks Road, Exeter.

BARKERS' BUTTS BOYS SCHOOL (COVENTRY) M.C.—This recently affiliated Club has made a splendid start. Each week a model-building contest is held, and is the most exciting feature of Club work. Large Club models also are being constructed, those so far attempted including a giant lorry, a floating crane and a fairground traction engine. Club roll: 23. *Secretary:* D. Jones, 170, Lavender Avenue, Cousdon, Coventry.

PLYMOUTH M.C.—Excellent work continues, with membership steadily increasing. The Printing Section is producing a Club Magazine and the Dramatic Circle is rehearsing a play. A Club Holiday Ramble was very greatly enjoyed. The Hornby Railway Section is making signals for the layout. Club roll: 97. *Secretary:* S. R. Finnemore, 5, Mutley Plain, Plymouth Devon.

AUSTRALIA

MELBOURNE (AUSTRALIA) M.C.—Members visited the Models Exhibition in the Town Hall, which attracted an attendance of 58,000. At ordinary meetings the Meccanograph has been built and designs made by members, and the aerial bombing game model also has provided much fun. A Visit has been paid to an airfield and to points of vantage along the railways. Club roll: 12. *Secretary:* L. Ison, 8, Hayes Street, Northcote, N.16., Victoria Australia.

BRANCH NEWS

CANFORD MAGNA—Special meetings were devoted to the repair and testing of locomotives, and these were followed by enjoyable running operations. Then the track was lifted and overhauled, and relaid out of doors, with imposing cuttings and embankments to give realism. Interesting Visits have been paid to stations. *Secretary:* R. M. Jelfs, 1, Broadway Court, Broadstone, Dorset.

HILLSBOROUGH—Repair work on the layout has now been completed and operations are in progress. A member with artistic ability has drawn excellent scenic backgrounds. *Secretary:* F. Skelton, 12, Bickerton Road, Hillsborough, Sheffield 6.

LOCKWOOD (HUDDERSFIELD)—This Branch is now incorporated and membership is growing. Operations on the Branch layout are carried out at each meeting. A good Library has been assembled. Debates on railway topics are arranged and aircraft identification has been taken up. *Secretary:* G. S. Moss, 35, Holly Road, Thornton Lodge, Huddersfield.

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 MOUNTAIN SPECTRE

While on holiday with a friend near Capel Curig, North Wales, we climbed Tryfan, 3,010 ft. high, whose triple crested peak is a well-known feature to those who travel along the Holyhead Road through the Nant Francon pass. As we descended the mountain by its south-eastern face we could see the silhouette of the summit ridge projected by the setting sun as a shadow on the valley below.

The shadow of the Welsh mountain Tryfan on the valley below it. Photograph by A. W. Bull, Beeston, Notts.

This interesting sight, which I was able to record with my camera, reminded me of the phenomenon known as "The Spectre of the Brocken," which is sometimes seen in mountainous country. The "spectre" is actually a greatly magnified shadow of the climber projected by a low sun on a bank of cloud or fog below the observer. The image naturally follows the movement of the climber, and this in early times was one of the reasons why mountains were regarded as the home of giants and evil spirits.

I have had the good fortune to see the Brocken effect in this country. The occasion was when two of us were on a winter-time tramp in Derbyshire. We were standing on top of the rocks known as Robin Hood's Stride, near Birchover. The valley below was filled with fog, which reached to the foot of the rocks, the tops of which however were in sunlight. We could see our own shadows, greatly magnified, projected on the fog below. The strangest thing was that each could see only his own shadow

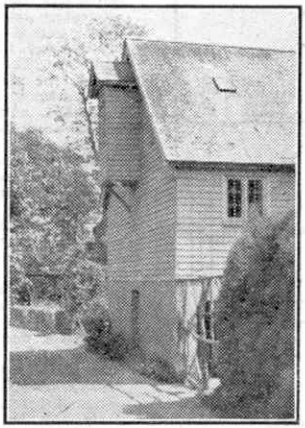
A. W. Bull (Beeston).

A RELIC OF THE WEALDEN IRON INDUSTRY

Down a rough lane off the London-Eastbourne road near Felbridge, Surrey, north of East Grinstead, stands the Wire Mill. This mill, behind which is Felbridge Water, the lake which provided the power to turn its water-wheel, was once one of the flourishing ironworks of this district. The Weald of Surrey, Sussex and Kent was and still is rich in iron ore, which was extensively worked in the 17th, 18th and early 19th centuries. When the iron industry moved to the North of England in the late 18th and early 19th centuries, the mill was one of the last works to keep going, and tradition says that it supplied nails for the building of St. Paul's Cathedral.

The mill itself has been much altered, and probably bears very little resemblance to its former self. The lowest of its three storeys is of brick, while the upper parts are constructed of whitewashed weather-boarding. New windows and doors have been made, but the mill, now the Wire Mill Hotel and Fishing Club, with a turbo-generator installed for giving current, is still a picturesque old building, and is interesting as being one of the few visible remains of the Wealden iron industry.

P. Milne (Whyteleafe).



The Wire Mill, Felbridge; a relic of the Wealden iron industry. Photograph by P. Milne, Whyteleafe.

SHIPS BY RAIL

During a stay at Sackville, New Brunswick, I visited a museum in which were many items of interest. Those that aroused my curiosity most were an old railway map or plan, and a special cradle designed to carry ships over land. I gathered that these were relics of what was known as the Chignecto Ship Railway, the purpose of which was to carry ships overland from the St. Lawrence to Cumberland Bay, at the head of the Bay of Fundy. The line had only reached a short distance from Amherst, on Cumberland Bay, when money ran short and the scheme had to be abandoned. The part that had been built was left to decay, and now on the road from Amherst to Aulac there is a board to state the end of this attempted railway.

The ship cradle was meant to be hauled by four locomotives, two pushing and two pulling. The cradle itself had two four-wheeled bogies, and at each end were two uprights. When a vessel was to be fitted on it, the cradle was run to the water's edge and the rear uprights were lowered to form skids and slipped under the keel. Winding gear then hauled the boat up ready for transportation.

H. Hunt (Debert).

Hornby Railway Operation Out of Doors

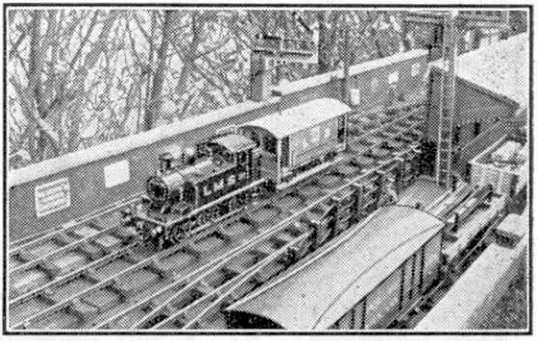
The "Saddlecombe Joint Railway"

IN August, the holiday month, one's thoughts invariably turn to the operation of miniature railway layouts in the open air. In effect we transfer our system from inside the house to outside on a fine dry day; when we have finished with it we dismantle it and return the various components to their usual storage place inside. Hornby Railway material must not be used for permanent outdoor layouts.

The layout shown in the diagram on this page shows the usual outdoor formation of the *"Saddlecombe Joint Railway,"* a Hornby system owned by M. and J. Kaser of Richmond, Surrey. Occasionally it is added to when friends arrive to combine their equipment with that of the Saddlecombe concern.

The country served by the line is supposed to be a typical area in Southern England including a seaport, market towns, villages and hamlets. There is a range of hills and a stretch of moorland and heath. A novel point is that a map of this "country" is included in the timetable prepared for the line. This is altered yearly; services are modified and improved though the general scheme of the layout usually remains unchanged.

Referring to the diagram, the left-hand side of this is supposed to be bounded by the English Channel. The principal places served by the line on this seaboard are *"Kirkwall"* a busy port, *"Terminbury,"* a popular seaside resort and *"Blatchington,"* a noted beauty spot. All the other places on the railway are inland towns and villages of which the chief is *"Saddlecombe,"* terminus of the line and from which the railway takes its name. Another important place is *"Matchington,"*



A scene on the outdoor layout of Mr. C. B. Smith, Lincoln, showing very natural effects.

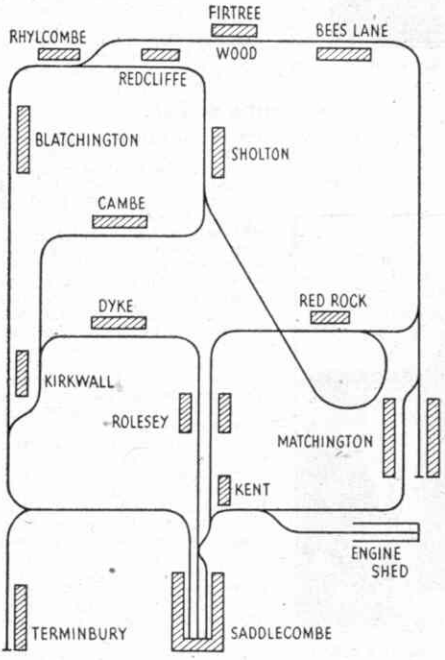


Diagram of the "Saddlecombe Joint Railway" described on this page.

a market town, and between the two an industrial area.

A pleasing variety of names designates the wayside stations where agricultural traffic forms the chief freight item for despatch, while fish and other perishables from the seacoast towns are received. Industrial freights from the *"Saddlecombe-Matchington"* belt are considerable and passenger traffic also is heavy. The trains and their composition will be referred to later. Working is carried out strictly according to the programme laid down for each outdoor operating, and the passenger timetables claim to "provide a comprehensive service to all stations."

In general the layout provides for running of the "out and home" kind, but the numerous loops and connecting lines afford a variety of routes full of interesting operating possibilities. Readers will no doubt find it entertaining to trace the number of possible ways that a train can take from *"Saddlecombe"* and back! The station at *"Saddlecombe"* boasts three tracks, the platforms and buildings being made at home of wood. Offices and waiting rooms are provided, timetables notices and posters decorate the walls and a novel feature of the street frontage is the inclusion of a number of shops. For the remaining stations Hornby Accessories and "M" type items for the smaller "halts" are employed, in some cases with extended platforms according to the length of the trains that use them.

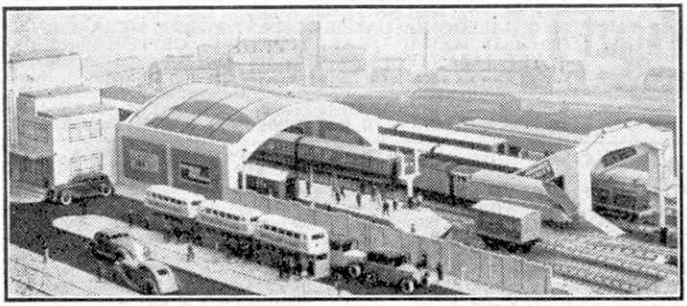
Various natural features aid the realism of the system as a result of the outdoor site. Thus the rockery which represents *"Blatchington Cliffs"* is traversed by a tunnel and where the tracks divide just by *"Rhylcombe"* a change of levels takes place. The upper line skirting a hill passes from *"Firtree Wood"* to *"Bees Lane"* on a lengthy viaduct then threads a deep cutting through hilly country to emerge finally on to level plainland. A novelty is the cable railway that reaches from *"Redcliffe"* to the *"Blatchington Cliffs,"* this being a Swiss made model obtained before the war. A lift made of Meccano parts provides access to this elevated system at *"Redcliffe"* and the trains make connections with the cable car services.

At *"Kirkwall"* both Ocean Liner and Cross-Channel traffic is dealt with and the (Continued on page 286)

Station Working in Hornby-Dublo

ONE great point about a miniature railway, and particularly a Dublo system, is the variety it can afford. Different layouts, varied operating schemes, station arrangements and so on are all features in which we can take special interest and the fun is greatly increased as a result. In this article we deal specially with station working.

Sometimes, as a change from operations on a complete continuous layout, Dublo owners try the plan of arranging just a particular section of a railway. Thus, instead of managing the working of a complete line, we may concentrate our resources in reproducing a particular station that we know and its immediate surroundings.



A busy town station made up from Hornby-Dublo components. Evidently "rush hour" traffic is in full swing!

Consider for a moment the station shown in the upper illustration on this page. This is assembled from the components of the City Station Outfit that was so popular before present conditions caused its temporary disappearance from our dealer's windows. The main platform in the centre of the picture is an island, and both it and the other platform are spanned by the arched roof. In addition to this main line portion of the station, there is what we may call the "Suburban Side," which includes a standard Island Platform with awning, that is seen beyond the footbridge. This separation of long-distance and suburban traffic is quite realistic, and the different trains may be supposed to afford connections in an interesting manner.

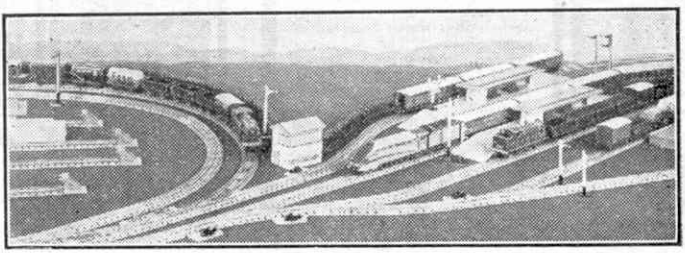
A further touch that suggests real practice is the presence of the track that is terminated by buffer stops at the foot of the ramp of the main island platform. This is the very place to stand an odd coach, if we have one that may be used for strengthening purposes when traffic is heavy. Alternatively, as in the illustration, a Horse-box or Van that is waiting to be taken forward by a main line train can be left there for the time being. This is an instance where the van would be attached to the tail of a train travelling from right to left in the illustration, and the use of a "station pilot" or shunting engine would be required to move the vehicle on to the train, or to remove it.

The outside arrangements to the station generally make a great deal of difference to the realism of the scene. The background can be painted or done with coloured chalks on plain light blue wallpaper. Another method sometimes used is to draw and colour the prominent buildings separately and then stick them on their various positions. This "paste up" scheme is quite successful if carefully done, and gives the features in the foreground a definition that is most effective. Such printed "brick papers" as are still obtainable can be used here, and if not used too freely will give good variety to the scene.

Station approach and road effects help to do away with the impression that a layout is not "all railway." The use of miniature road vehicles, especially if we still have a few veteran Dinky Toys, adds interest. We can move them about and vary their positions according to the needs of the moment. Connecting bus services are a good scheme if we have two or three Dinky Toy buses available.

In contrast to the activities just described is the scene shown in our other illustration. This represents a country junction, the station itself consisting of two Island Platforms. This is a good arrangement for a four-road station as the "fast" traffic can be kept to the centre roads, loop lines being arranged to carry the "slow" traffic to the outer faces of the platforms. The branch line is evidently for goods traffic, as it does not connect directly with the station; but the freight activities of the place are considerable for there are yards on both sides of the main line. This gives plenty of opportunities for the movement of wagons from one part of the layout to the other, trains being made up for the branch line and remarshalled in the yards on arrival from the branch.

It would be possible for a branch line passenger train to be operated, but this would need to be reversed into the station on arrival, and it would have to depart in the same way in order to keep the engine at the head of the train when making its branch line run.



The country junction referred to on this page. A branch line "goods" waits for the express to leave.

Stamp Collecting

British East Africa

By F. Riley, B.Sc.

FROM Aden and British Somaliland it is natural to go south to Kenya, Uganda, and Tanganyika, formerly a German colony but now under British rule, three countries that are to-day grouped together to form the East African Postal Union. Our progress carries us from the dry regions around the Gulf of Aden to lands that are favoured by rain and warmth, and are remarkable for their fertility and for the immense variety of plant and animal life in them. They are favourite resorts of the big game hunter. The East Africa lion is famous for its size and strength, and elephants, giraffes, buffalo and other large wild creatures abound, together with deer of many different and interesting kinds. Bird variety is equally remarkable.

The great lakes of this region are evidence of its natural resources. It forms in fact one of the two great lake regions of the world, rivalling the St. Lawrence basin in North America in this respect. Victoria Nyanza, the largest of these lakes, is larger than Ireland, and the Caspian Sea and Lake Superior are the only inland waters in the world that exceed it in size. To the south of it is Lake Tanganyika, a little less than half its size, but probably containing a larger volume of water, as it is considerably deeper. Farthur south again, on the border of Tanganyika, is Lake Nyasa, almost equal in extent to Lake Tanganyika, and there are many other smaller lakes, some of which indeed would be regarded as great in other countries.

These lakes are undoubtedly the most remarkable feature of East Africa. They have been formed in gigantic chasms and hollows that form a sort of break in the African Continent. This break runs roughly north and south, and it seems as if nature had tried to tear off a strip of the Continent, in the same way as the island of Madagascar may have been split off. There are romantic mountains as well as wonderful lakes in the three countries. In Kenya there is the extinct volcano, 17,000 ft. in height, after which the country is named; and just over the southern border, in Tanganyika, is Kilimanjaro, also an extinct volcano, and the highest point in West Africa, almost 20,000 ft. above sea level. Uganda too has its famous heights in the Mountains of the Moon, the Ruwenzori range, a region of snow-clad peaks and glaciers almost on the Equator.

I have no space in which to speak of the many splendid races that inhabit this vast area, or of the great explorers who first penetrated to Africa's lake region, chiefly in search of the source of the Nile, one of the greatest mysteries of the past. The mystery has now been solved, and the origin of the great river, so well known throughout the ages in its lower reaches, but completely unknown in its upper course, is taken to be Ripon Falls, over which the waters of Victoria Nyanza plunge to form its beginnings.

Originally Kenya was the East African Protectorate, and its stamps bore the words "*British East African Protectorate*" until the postal union with Uganda in 1903. Remembering the stamps of Aden and British Somaliland, collectors will not be surprised to find that these early stamps were issued in rupee and anna values. From 1903 onward they formed a series of the same general type as those issued at the same time in British Somaliland. Each bore the head of the reigning monarch, Edward VII to begin with and George V later, with the usual crown and other ornaments, and there were two sizes, the larger one for the rupee values. A break in the series came shortly after the first Great War with a new design of more modern type, also carrying a portrait of George V flanked by palm trees, banana plants and other tropical vegetation.

In the meantime Tanganyika as well as Uganda had come within the fold. Uganda had begun with its own stamps, typewritten by a missionary, in 1896, and it is interesting to find that the values were in cowries. Most of these early stamps are highly priced for young collectors, but the first de la Rue stamps, with Queen Victoria's portrait on them, are more easily obtainable. Tanganyika was German until conquered in 1916 by the British, led by General Smuts, and after its occupation the need for stamps for postal services was met by issuing the stamps of Kenya and Uganda, overprinted "G.E.A." It was not until 1922 that Tanganyika got its own stamps, a series showing the head of a giraffe. Here again there were two sizes of different designs, the smaller size being used for cent values and the larger one for 1/- values.

It is interesting to find that 1/- values were now making their appearance not only among Tanganyika stamps, but those of Kenya and Uganda also. The change dates from 1922, the year in which the new design of portrait stamps appeared in Kenya and Uganda, and these stamps in Tanganyika. The rupees were replaced by shillings, which were taken locally to have the same value, and the number of cents in the 1/- was fixed at 100. This gave the cent half its former value, so that a 10 c. stamp of the older type was equivalent to a 20 c. stamp of the newer one.

The final step in the many changes that have distinguished the stamps of this portion of East Africa came in 1935 with the formation of the East African Postal Union, covering all three countries, and the issue of a series of pictorials, the first on a large scale to appear in these countries. These have one special feature in the shape of a variety that I know from correspondence has been looked into (*Cont. on page 286*)

Stamp Gossip

and Notes on New Issues

By F. E. Metcalfe

SEVERAL new issues are available this month for illustration, and not the least interesting of these is the new 1/3 value for Sierra Leone, which has been issued to cover the half ounce air-mail rate on letters from the colony to Great Britain. The colour is yellow and the design similar to several other values. In view of the reason for its issue air-mail stamp collectors will be justified in adding a copy to their collections, which is quite a change as far as colonial stamps are concerned. This is rather surprising really when one considers the far-flung nature of the British Empire and the obvious need there is for an air mail service. Maybe after the war there will be a change.

A writer in an American paper recently stated that "*Uncle Sam*" was the only one who refused to tap collectors' pockets by the issue of special stamps, or words to that effect, whereas the same old gentleman, if the truth must be told, probably makes more out of collectors than anyone else on this planet, and good luck to him. Pity our own Post Office doesn't exhibit similar enterprise, for then British taxpayers might expect some of the hundreds of thousands of dollars made yearly from the sale of special stamps by the United States Post Office to come their way. We could do with them, and British collectors would also be gainers.

Within the last few weeks the U.S. Post Office has emitted three very attractive "commemoratives." One was to mark the centenary of the telegraph in America. The design of this stamp is particularly clever—just try to make an artistic job of a telegraph pole! The second celebrates the 125th anniversary of the first steamship crossing of the Atlantic, and the third is in commemoration of the first transcontinental railroad. Readers should mark well the reason for the issue of this last stamp. Our own authorities, who should perhaps never be forgiven for the omission, didn't even take the trouble to produce a stamp to commemorate the centenary of the first railroad in the whole world.

All of the three new U.S. stamps are in various shades of purple and of 3 c. face value. We are illustrating the "railway" stamp as the one most likely to interest "*M.M.*" readers. Unfortunately there is not enough room to show the other two. In a used state all should be fairly easy to secure, and all are well worth a place in our albums.

Quite an interesting set has been issued in London by the Free Polish Government to celebrate the Polish victory at Monte Cassino. Four values of the first Free Polish set, now obsolete, have been overprinted and surcharged in the manner shown by the stamp we are able to reproduce. A set of these stamps can be purchased at the moment for about 3/-, but the price is likely to rise considerably.

This set is a striking example of the value of special stamps for all kinds of publicity. No doubt most of us carefully read the war news, yet how many remember the special part Polish troops played at Monte Cassino? Precious few, I'll warrant, but now messages in the form of postage stamps will be speeding over a large part of the world, proclaiming that Poland is not down and out, but is still alive and taking an active part in the fight for freedom of others as well as herself. When will our authorities wake up to the fact that they alone are ignoring one of the greatest of publicity weapons?

Yet another free Government set of stamps has been issued in London. This is one of nine values, and is for use on Dutch ships and also in Holland when the Nazis have been expelled. There is only room to illustrate the 5 c. value, which by the way depicts the deck of H.R.M.S. "*De Ruyter*." Other values show a Dutch infantryman, a liner, and an air pilot in a cockpit, and a portrait of Queen Wilhelmina herself appears on the 5 top values. The set will be easily obtainable at about 3/-. Holland has in recent years produced some quite handsome stamps, so fortunately this British-prepared set is also attractive; very different from the ill-conceived sets that have been inflicted recently on the various Free French Colonies.

A number of collectors appear to be still short of the latest edition of the colonial section of Gibbons catalogue, but they might obtain a copy by writing at once, enclosing a P.O. for 11/1, to the publishers, at 391, Strand, London W.C.2.

Alas, in these days, the catalogue editor's job must be anything but easy. Just now there appears to be a certain amount of discussion as to what shall, and what shall not—the latter doesn't seem to worry collectors much—be included in the all-important "Big Gibbons." "Perfs" and "Shades" are the troubles, and some collectors of modern colonial stamps claim that their favourites are not receiving all the recognition they deserve. Maybe there have been occasions when I have felt the same way, but on the whole one has got to admit that the present editor of the only British stamp-catalogue which really matters has done a pretty tidy job. In the past far too many unworthy stamps have been listed, and it is not to be wondered at if the pendulum has swung a little too much in the opposite direction. No doubt it will settle dead middle in time.

There is news that the 1/- to £1 values of Australia will be changed later in the year.

Famous Locomotive Engineers—

(*Continued from page 268*)

so called from their saddle tanks, were seen all over the system.

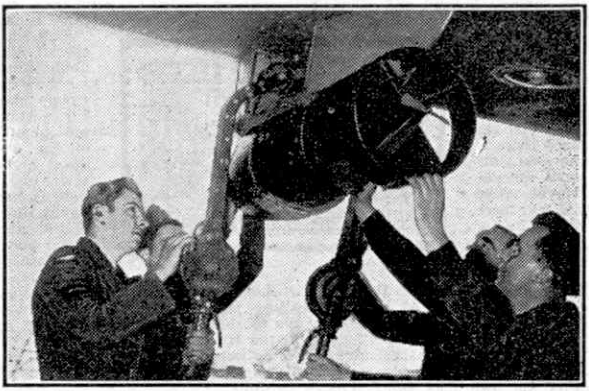
Ramsbottom retired from Crewe in 1871, but he became a director of the Lancashire and Yorkshire railway, and as such was greatly occupied later with the layout of their new works at Horwich. Needless to say the orderly planning and systematic arrangements that made that establishment for long a "model" works were characteristic of Ramsbottom. Horwich, too, had its narrow-gauge works railway! He was also connected with the well-known firm of Beyer-Peacock and Co., and was a governor of Owen's College, Manchester. In 1870 and 1871 he was President of the Institute of Mechanical Engineers, and in 1890 was awarded the honorary degree of Master of Engineering at Dublin University. Apart from these distinctions he must have felt well satisfied with his work, as so many of his ideas remained standard on the L.N.W.R. He died in 1897.

The Hun's "Flying Bomb"—

(*Continued from page 257*)

submission, when all the time he knows that, for him, the end is but a matter of time. It will be defeated by our airmen and gunners and by the people of London and Southern England who refuse to let the Hun's latest exhibition of "frightfulness" make them relax their will to carry on to victory. That is what the Germans are up against, and why they can never win this war.

A nation that can face up to death and destruction with quiet, cheerful courage is unconquerable.



Fitting a 500 lb. bomb to the wing of a "Mosquito." Photograph by courtesy of de Havilland Aircraft Co. Ltd.

A Battlefleet Action—(*Continued from page 256*)

for the enemy but to accept our terms. Thus, and thus only, as I see it, can Britain and America recover their lost possessions in the East, and bring about the setting of the "*Rising Sun*" of Japan.

There is another school of thought which believes that the main Japanese Fleet can be coerced into a Fleet action by subjecting Japan to intense air and sea bombardment. The view is held that the Japanese people would insist on their Navy's intervention. Personally I doubt it. After all, bombing can have few terrors for a people inured to earthquakes and tidal waves.

Stamp Collecting—(*Continued from page 283*)

by some of my readers and will be of interest to others. One of the seven pictorials of 1935, the 5 c. value, shows a dhow, another example of the famous East African vessel already met with at Aden. This time the dhow is sailing on Victoria Nyanza, and the variety concerns the stern rope reaching to the highest point of the sail. In the original stamp this rope was not actually joined to the sail, but in a later issue the defect was rectified, the stern rope this time makng contact with the sail, so that it could do its work. Examples of both stamps can be bought at reasonable prices, but a further variety with the rope joined and with perf. 13½ × 11½ instead of the standard 14 is really rare. The example illustrated on page 283 shows the rope joined, but is not the scarce variety!

Of the remaining stamps in this pictorial series, two designs in five values show cranes in the Gulf of Kavirondo, an arm of Victoria Nyanza, and an East African lion. These are representative of the animal and bird life of the countries. Their mountains are typified on three others, two of them showing Kilimanjaro and one Mt. Kenya. Two values picture Lake Naivasha, in Kenya, and the remaining stamps illustrate engineering progress in the region, for they show the fine bridge that has been erected over the infant Nile just below Ripon Falls.

Hornby Railway Operation Out of Doors—

(*Continued from page 280*)

trains run for this purpose consist of Hornby bogie Pullman and Saloon Coaches, the engine being invariably of the No. 3 "*Royal Scot*" type. This equipment also serves for the "*Sea Coast Express*," one of the best trains on the line. The "*Blatchington Flyer*" and the "*Pullman Limited*" recall former L.B.S.C. practice, not only in the name of the latter but also from the fact that the "*Flyer*" is usually worked by a 4–4–2 Tank engine. Four No. 1 Locomotives are the "general purpose" engines and divide the time between goods and local passenger traffic. A No. 1 Special Tank is stationed at "*Matchington*" to assist trains up the incline to "*Bees Lane.*" All the engines are clockwork and except two small ones all are of the Hornby Series.

Goods stock varies according to the traffic; Banana and Refrigerator Vans hurry the transatlantic cargoes from "*Kirkwall*" inland, local traffic calls for Milk and Fish Vans, High-Capacity vehicles, Coal Wagons and special-purpose stock such as Well Wagons deal with the heavy industrial traffic of the "*Saddlecombe*" area.

COMPETITION RESULTS

HOME

February "Queer Station Names" Contest.—Judging by the entries competitors enjoyed tracking down the station names to which clues were given in this contest. The names were as follows: SALE, STONE, SILVERDALE, PITTS HILL, MARSH BROOK, FORD BRIDGE, NINE MILE POINT, HAY, SIX BELLS, HALT, GOLDEN GROVE, FLINT, STAR CROSSING, HOPE, SANDHILLS, HIGHTOWN, HORNBY, PILL, KNOTT END and HOLLY BUSH.

1st Prize: F. Lintin, Mirfield; 2nd Prize: C. E. Wrayford, Bovey Tracey; 3rd Prize: J. W. Gardner, Lancaster. Consolation Prizes: P. Platt, Baillieston; E. G. Smith, Chorlton-cum-Hardy.

April Photographic Contest.—1st Prizes, Section A: W. Silvester, Bromley; Section B: D. Kibble, Staton-Under-Bardon. 2nd Prizes, Section A: A. R. Priestley, Silcoates School; Section B: J. A. Dale, Paignton. Consolation Prizes: T. R. K. Davey, Newton St. Loe; F. N. Lyon, Plymouth; R. H. Holland, Solihull.

Competitions! Open To All Readers

What Would Give You Your Greatest Thrill?

To-day we can scarcely pick up a newspaper without reading of many thrilling exploits. There were other, more peaceful thrills before the war, and the enormous developments that have taken place in certain directions since the outbreak of the conflict have stepped some of these up to higher levels as well as producing new ones. It occurs to us that readers will be interested in a competition based on these, and in the panel on this page we have listed eight exciting experiences. None of these is of the freakish variety. Some of them in fact have been accomplished, in some instances not once but many times. There is plenty of variety in them, and we are sure that every reader will be able to pick out from the list at least one thrill that he would enjoy above all others. Most readers indeed will find difficulty in making a selection.

1. **A "Mosquito" full speed flight.**
2. **A Submarine trip to the Near East.**
3. **A balloon ascent to a height of 10 miles.**
4. **A Footplate trip on "Flying Scotsman."**
5. **Climbing Mount Everest.**
6. **Motoring at 370 m.p.h.**
7. **A sustained glider flight.**
8. **Motor-boating at 142 m.p.h.**

There are two parts in this contest. To begin with competitors are asked to say which of the eight thrills they would most like to experience. Then they are required to arrange the eight in the order in which they think the popular vote will place them. Each of the thrills is numbered, so that only the numbers need be given by competitors.

The contest is in the usual two sections, for Home and Overseas readers. In each there will be prizes of 21/–, 15/– and 10/6 for the three best entries, in order of merit, and other good efforts will be awarded consolation prizes.

Entries must be addressed *"August Thrills Contest, Meccano Magazine, Binns Road, Liverpool 13."* The Closing dates are 30th September in the Home Section, and 31st March 1945 in the Overseas Section.

Find These Locomotive Names

Below is a rather fanciful story that at first glance has no railway interest. Those who know anything of locomotive names however will soon realise that there is more in the story than this. In fact it has concealed within it the names of 25 well-known locomotives, representing all four British railways. Some of the names are single words, but others have up to four words in them. What readers are asked to do in this competition is to hunt out the names, and to make a list of them, adding after each name the initials of the owning company and the number of the locomotive.

Here is the story: **The coronation celebrations attracted wonderful crowds, people flocking to the capital from the city of Manchester, the city of Liverpool, the city of Birmingham and other places, including the city of Glasgow. They were hardy folk, content with a sandwich or two, or a bit of Cheshire cheese and bread, during the long wait. The route of the procession from Westminster was lined with troops, with the British Legion and the boy scout and the girl guide formations represented as well as the Navy and the Royal Air Force. The Prime Ministers of the Dominion of Canada, the Commonwealth of Australia and other dominions were present, and the enthusiasm was irresistible. The King's own tenants from Sandringham were among the privileged spectators. There was a hurricane of cheers all along the route as the Royal coach bearing the British monarch passed by, and this was sustained as illustrious contingents of the Forces from all quarters of the Empire, including outposts in the orient, all renowned for their valour, followed on. This was no pioneer effort; it was a pageant, proud and almost defiant, of the whole Empire.**

When the entry is complete it should be forwarded to *"August Locomotive Names Contest, Meccano Magazine, Binns Road, Liverpool 13,"* and competitors must remember to write their names and addresses on each sheet. There will be two sections in the contest, for Home and Overseas readers, and in each prizes of 21/–, 10/6 and 5/– will be awarded to the senders of the best entries in order of merit. Other good efforts deserving of recognition will be awarded consolation prizes. Closing dates: Home Section, 30th September; Overseas Section, 31st March 1945.

August Photographic Contest

This month's contest is the 8th in our 1944 series, and in it, as usual, prizes are offered for the best photographs of any kind submitted. There are two conditions: 1, that the photographs must have been taken by the competitor; and 2, that on the back of each 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 16, and all entries must be clearly marked with the section letter. They should be addressed: *"August Photographic Contest, Meccano Magazine, Binns Road, Liverpool 13."* There will be separate sections for Overseas readers, and in each prizes of 15/– and 7/6 will be awarded. Closing dates: Home Section, 31st August; Overseas Section, 28th February, 1945.

Fireside Fun

Major: "What is the best thing to produce chest expansion?"
Lieutenant: "Plenty of medals, sir."

* * * *

"Are you looking for shells, sonny?"
"No. I'm looking for father. I forget where I buried him."

* * * *

"Do please play something, Professor."
"But it's getting late, and the piano will disturb the neighbours, won't it?"
"It doesn't matter about them. They poisoned our cat last week."

* * * *

"Hi, you poked your umbrella in my eye."
"Pardon me. I did not. That umbrella belongs to a colleague of mine at the office."

* * * *

BRAIN TEASERS

HOT OR COLD?

Every schoolboy knows the difference between the Fahrenheit and Centigrade scales of the thermometer. There is one temperature at which these give the same reading. What is it?

* * * *

"What's your new brother's name?"
"I don't know. We can't understand a word he says."

CURIOUS TRAIN TIMING

A man was travelling up to London by the 11.4 a.m. express from Cambridge. After a time he asked a fellow traveller at what time the train was due in. The curious answer he received was that there was still half an hour to go, and the remaining distance was five elevenths of that already covered. He soon worked out the arrival time. Can you do this, assuming that the train travelled at the same speed throughout?

* * * *

BUT AREN'T THEY THE SAME?

Which is the heavier, an ounce of gold or an ounce of feathers?

* * * *

IN THE NEWS

Here are a number of places that have been in the news lately, all disguised, but not beyond the powers of "*M.M.*" readers: IGRA; EXBAYU; ACONNA; RHELGON; ALNVI, TEAS SPURASI; GOURBRECH; PANISA; SKUBOBRI; ANSAKU.

* * * *

"So you were a tailor in Civvy Street! That's fine. You can get the jackets off that lot."

* * * *

SOLUTIONS TO LAST MONTH'S PUZZLES

How many readers could give the answers immediately in our first brain teaser last month? Here they are. A cricket pitch is 22 yds. long. The full size of an Association football ground is 120 yds. by 80 yds. This is larger than a full size Rugby football ground, which measures 110 yds. by 75 yds. A badminton net must be 5 ft. high at the centre, and its depth is 2 ft. 6 in.

In the solutions to the previous month's puzzles in the July "*M.M.*" the letter P was left out of the word "apples" on its third appearance in the second paragraph.

Farmer Giles' little puzzle is easy. All that we have to do is to note that he grew 6 acres of barley for every 9 of wheat. Since he also grew 5 of oats for every 9 of wheat, all that is necessary is to divide 200 acres in the proportion of 9, 6 and 5. These add up to 20, so that 9/20ths, or 90 acres, were wheat; 6/20ths, or 60 acres, were barley; and 5/20ths, or 50 acres, were oats.

The following is the solution to the word square puzzle:

E S C A P E
S T O V E S
C O V E R T
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THIS MONTH'S HOWLER

Compliment is when you say something to somebody that both of you know isn't true.

MECCANO MAGAZINE

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Readers' Sales and Wants. Private advertisements (i.e., not trade) are charged 1d. per word, minimum 1/-. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Readers' advertisements are published as soon as possible; inclusion in the first issue after receiving them cannot be guaranteed.

Small Advertisements. 1/8 per line (average seven words to the line), or 20/- per inch (average 12 lines to the inch). Cash with order.

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

READERS' SALES AND WANTS

SALES

Over 1,000 British Colonial and Foreign Stamps, catalogued over £15, mounted in S.G. Viceroy Album; also S.G. Simplified 1943 Stamp Catalogue. Offers. Write—Hammond, Station House, Barnham, Thetford, Norfolk.

"Meccano Magazines" for sale; March 1934 to February 1944; some copies missing; all in good condition. Send stamp addressed envelope for list.—Hodson, "Langbar," Tunstead Avenue, Simonstone, Nr. Burnley, Lancs.

Meccano. Very large Outfit for sale, worth £30; will sell either as whole or separate parts. Write—T. Stubbs, 26, Atherley Road, Southampton. Aeroplane Constructor Outfit No. 2 for Sale.

Hornby Dublo Electric Goods Sets; extra Rails, Points; S.A.E. for particulars.—Brooke, Torre Cottage, Liversedge, Yorkshire.

Cigarette Cards; Railway Books and other books; George VI Stamp Catalogue; "Meccano Magazines," 1941-1942, all good condition; stamped envelope for lists.—Pitman, "La-Chaumière," Sand Bay, Kewstoke, Wester-Super-Mare.

"Meccano Magazines" Jan. 1930–Aug. 1935; 30/- lot.—Holt, 138, Alexandra Road, London S.W.19.

Racer III Motor Boat; Dinky Toys; "War Illustraded's" Vos. 1–2.—Stockton, 80, Brook Lane, Chester.

WANTS

"Meccano Magazines" No. 1 to Dec. 1925; Super-Model Leaflets Nos. 2, 14, 15, 16, 17, 18, 22, 26, 27, 28, 33, 37; please state Nos., condition and price.—Faulkner, 76, Ock Street, Abingdon, Berks.

Dinky Toys Ambulance, Despatch Rider, Police and Civilian on motor bikes.—Lowe, 597, Gorton Road, Reddish, Stockport, Cheshire.

Urgently. Four each of 20a, 19b, 142a, 142b, 142c, 58a, 30; Two each of 140, 147 and 148, 43, 58; One each of 94, 211a and 211b, 30a, 30c; also Nuts and Bolts.—Apply—R. Pennels, 2, Council Houses, Figheldean, Salisbury, Wilts.

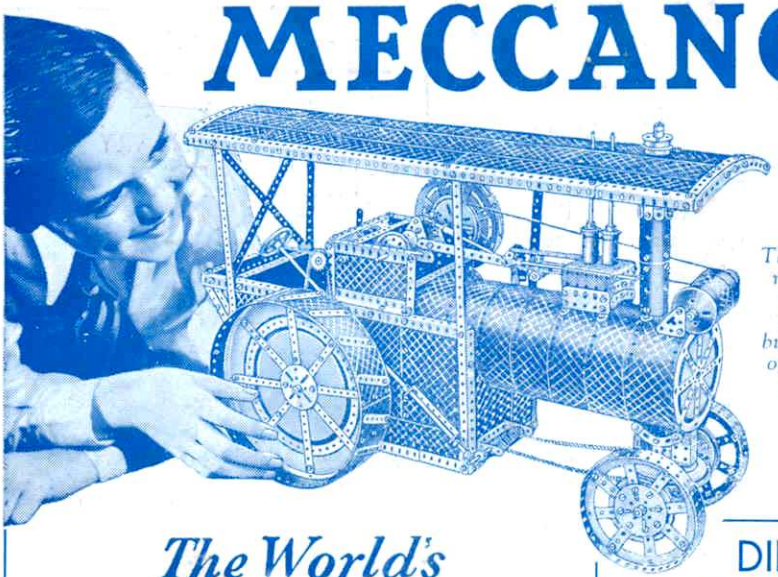
Railway Magazines, Jan.–Aug. 1943; good condition.—Stockton, 80, Brook Lane, Chester.

"M.M.'s" Jan. 1937–Jan. 1940; state price.—Wood, Knockandoch, By Whitehouse, Aberdeenshire.

Meccano No. 3 extras, £1. Wanted parts 7, 7a, 25a, 26, 26a, 27b, 30a, 30c, 31, 34b, 64, 62a, 62b, 89a, 89b, 143, 144, 145, 146, 199, 212.—Lee-Booker, White Walls, Perranporth.

Will Exchange Hornby Train worth £5 for large Cinematograph complete with 1 inch wide Films.—R. Dunstan, 8, Green Lane, Redruth, Cornwall.

MECCANO

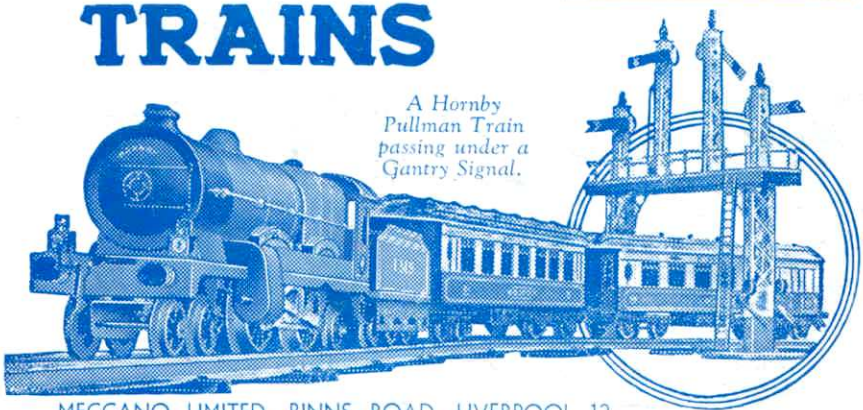


This splendid model of a Traction Engine is built entirely of standard Meccano parts.

The World's Greatest Toys

We are sorry that we cannot supply these famous toys to-day, but they will be ready for you again after the war. Look out for the good times coming!

HORNBY TRAINS



A Hornby Pullman Train passing under a Gantry Signal.

DINKY TOYS

De Havilland "Flamingo." Used by R.A.F. for transport and communication work.

Buick "Viceroy" Saloon Car.

MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

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