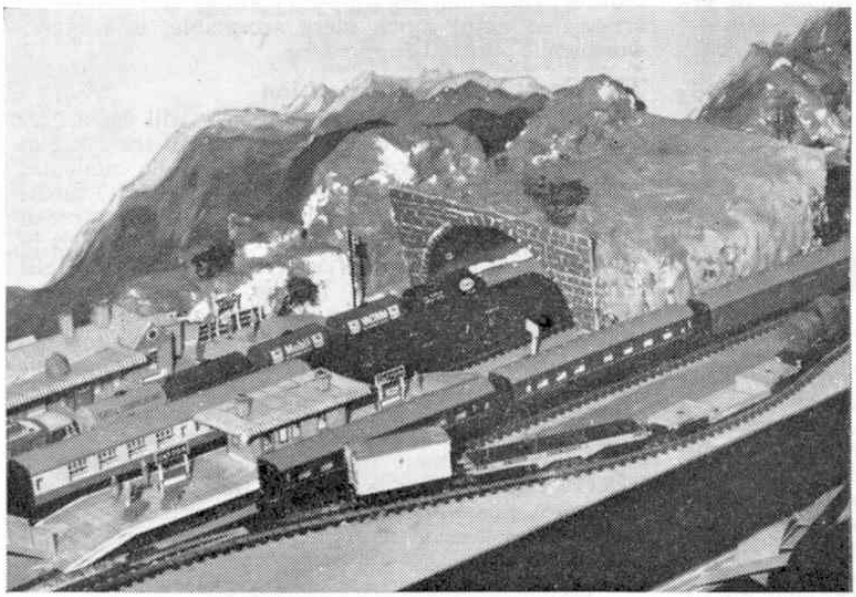


At left: The layout of Gatton station is very realistic, but still simple to construct. Note the tunnel mouth brickwork effect and the painted background to give a depth effect on the wall.

At right: Locomotive E 3001 approaching a bridge after passing through the local station. Note the simple structure that supports the layout, the model people really add realism to this type of layout.

Below right: Locomotive 7032 " Denbigh Castle " with passenger stock passing through Oakham signal box with a 30027 M7 tank locomotive on the quarry branch line.

BUILDING A REALISTIC OO GAUGE LAYOUT ON A TIGHT BUDGET

by D. S. Thomas

THE LAYOUT described here was built as cheaply as possible, a good thing these days when pocket money seems to vanish overnight! The final result looks most realistic and always impresses visitors.

It doesn't take long for the proud owner of a new train set to realise that the carpet is no place for a layout, what with fluff getting into the works and requests to dismantle the track to tidy the room! Not to mention the dangers of treading on the rolling-stock. So the author decided to make a layout that could remain in place. If you are lucky enough to have a spare room, or space in your bedroom, then the location is fixed. Our layout occupies a spare bedroom and we decided that the tracks should be run around the room with space left in the centre for the controller and privileged visitors.

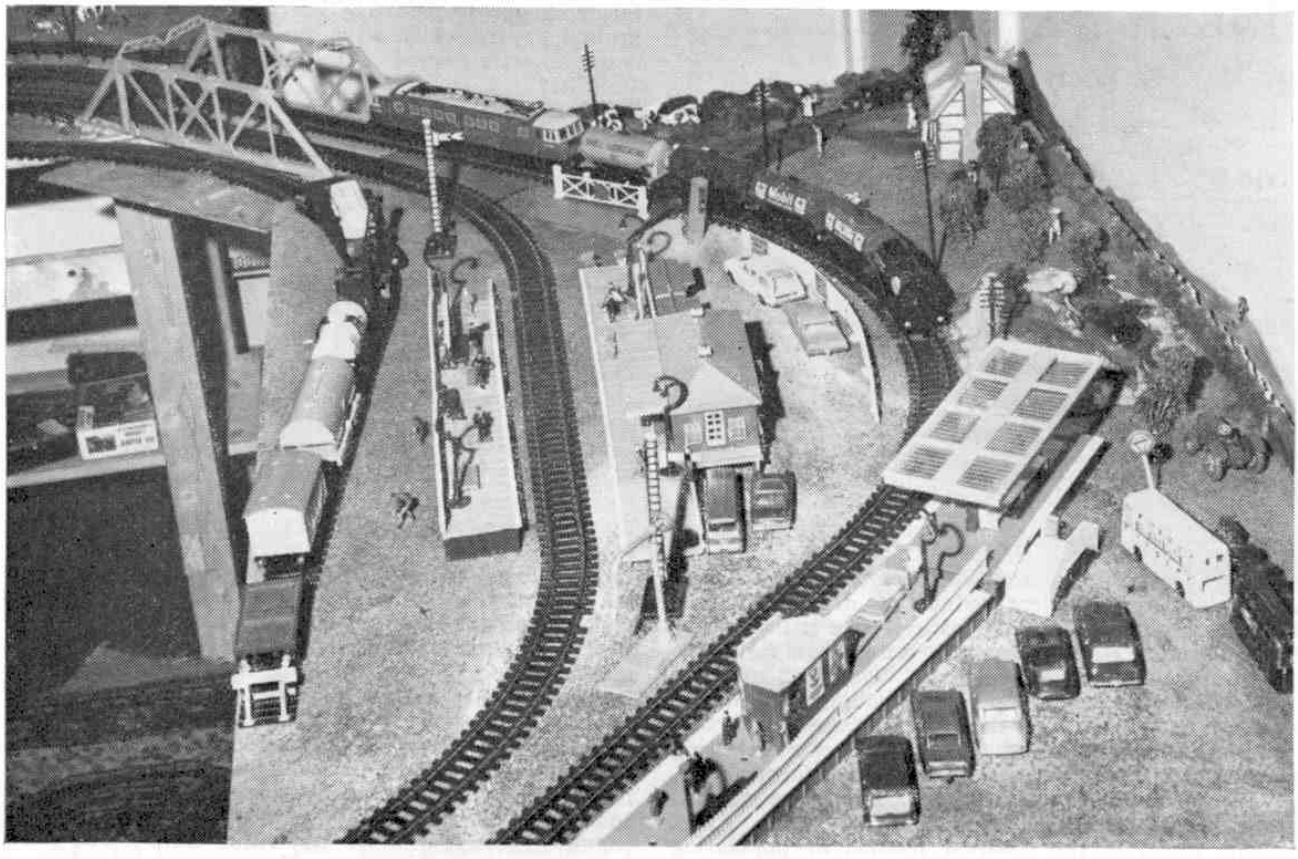
The track must be laid on a baseboard, and for this we made benches along each of the walls. The bench tops are preferably made from insulation board with wooden battens for strengthening purposes, as we can push track pins etc. easily into this material. We pressed into use some chipboard which originally formed darkroom benches, and an old double wardrobe unscrewed to form two halves which, when placed on their sides, formed ready-made benches. The width of the benches should not be more than about 3 feet, to allow access to any part of the layout. The height of the benches is about 2 feet, which allows the controller to sit in comfort and supervise operations.

We then planned the track routes, and from this moment it became more and more interesting. Planning, modelling and making scenery can be even more interesting than operating trains. *See the last seven months of " Trackside Competition " in Meccano Magazine for some simple stations, signal boxes, loco-sheds etc. Back numbers available price 2/6d. each plus 4d. post from the Editorial Office.* Let us have a branch line to a quarry, for example, and a tunnel or two and cuttings. It adds interest if the train disappears from view for a short time during its journey. It is best to plan ahead at this stage, even if we will have to wait for some time for more track, points, etc., so that you won't have to remove a mountain or two to make room for later additions.

We laid the track on the baseboard and altered it here and there until we thought we had the basis of an interesting layout. One bench was occupied by engine sheds, turntable and sidings, one was allocated for a tunnel and station, the third for the quarry branch line and the fourth for another station, a farm and surrounding scenery. We also decided to have mountains along the back of the second and third benches.

The track itself makes two independent loops, with a crossover near the engine sheds. The gap between the benches near the door was bridged over a section of ' river '. This means that access to the room is by crawling under the ' river ' or stepping carefully over the bridge! After pencilling-in the positions of the tracks, they were removed and the scenery construction started.

The mountains and cuttings were made from blocks of expanded polystyrene, which is used for packaging many things these days. Egg-boxes are a good substitute. Pieces were broken-off the blocks, leaving a mountainous contour and the blocks then glued to the baseboard, using UHU glue, or similar. When the glue had set, the mountains and cuttings were coated with a runny mixture of Polyfilla, using a palette knife to produce the final contours. The tunnel was made from thin card bent into a half-cylinder between two hardboard tunnel portals, and supported by dowel pins glued and nailed between the portals. The Polyfilla mixture was then applied over the card and allowed to dry.



We then started painting the scenery. A flat-finish paint such as Poster Paint or plastic emulsion paint is suitable. Greens, browns and greys are required, but it is cheaper to buy yellow and blue to make green, and white and black to make grey, as we get six colours that way. The scenery is improved if we use the scatter powders that are available in landscape tints, or we can use sawdust and paint over it. We tried two ways of using the scatter powders—one by using the paint liberally and scattering the powder on to the wet paint, and the other by brushing glue over the dried paint and scattering the powders on the glue. We painted the track route and engine shed area in very dark grey scattered with black powder. Roads were made a lighter grey.

To improve the bareness of the landscape, we made trees and bushes from lichen, stuck to twigs found in the garden. The trees were "planted" in Plasticine; another method would be to drill holes in the baseboard and glue the twigs in place, although this makes re-arrangement of the landscape rather more difficult. Hedges were made from foam rubber strips, tearing the tops here and there for a more natural appearance, and stuck to the baseboard, then painted.

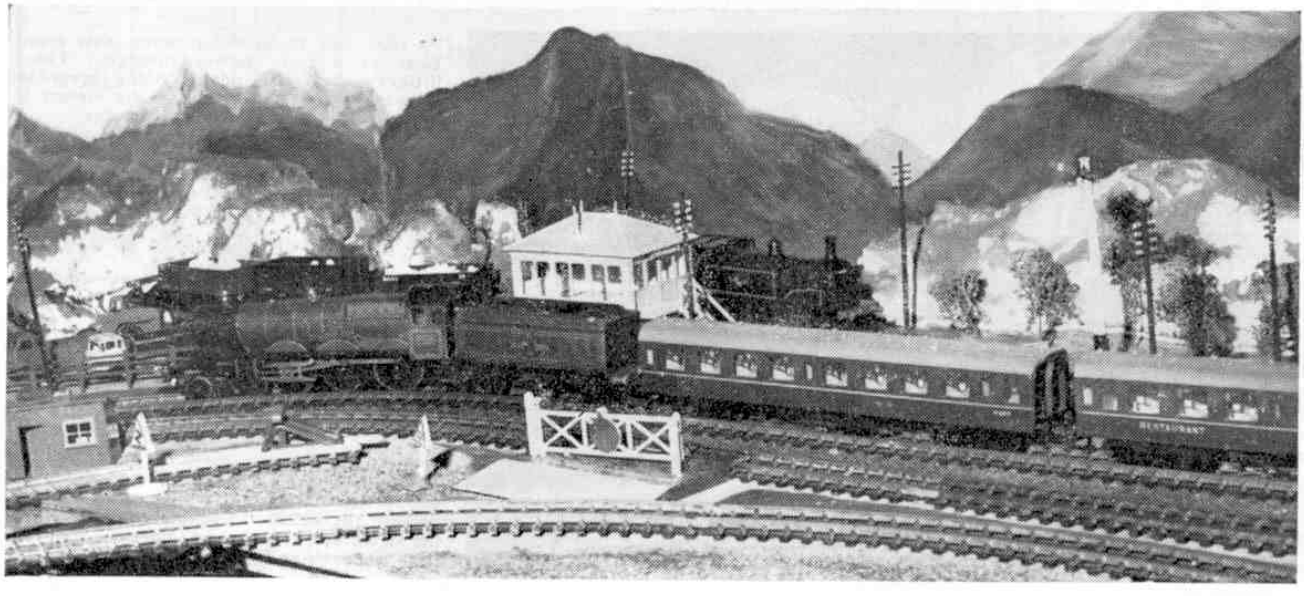


FIG 1

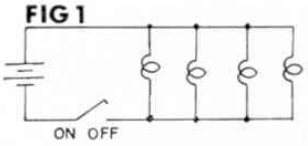


FIG 2

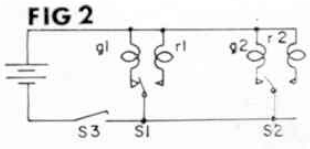
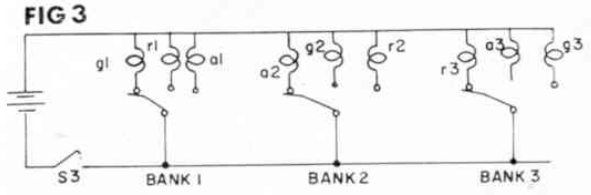


FIG 3



We then laid the track, checking that we had adequate clearance between the two tracks at bends, by running two coaches or locos which have an overhang. When satisfied, the track was pinned at intervals to the baseboard.

We are now ready to add stations, bridges, signal boxes etc. It is much cheaper to assemble these from kits such as Airfix, or to make them from card. The Airfix kits are excellent value for money and the finished result looks most realistic if care is taken over the painting. Humbrol paints were used for these models, using the matt colours. We found that the Airfix kit of telegraph poles, although one of the simplest, added greatly to the realism of the layout.

The next stage is to add life to the scene by having passengers on the platform, and animals, farmers, etc. on the surrounding countryside. There are various proprietary figures on the market, but again Airfix provide probably the cheapest method of populating our layout. These must be painted, but Merit make very life-like figures which are already painted. We used the Triang-Hornby figures for engine crews and sitting passengers in the coaches. An assortment of Matchbox cars, tractors etc. parked near the stations and farms add to the life of the scene.

Although the layout now looks very realistic, a vast improvement is made if we provide a background. We actually painted a landscape scene on the walls. This method has one advantage at least—if you feel like a change of scenery, you just paint over the old one! If you will be photographing your layout, don't forget to paint the sky area sufficiently high to exceed the camera field of view. If you don't feel artistic or confident enough to paint the walls, you can obtain background papers which have various landscapes, village and industrial scenes. Bilteezi and Peco are two suppliers.

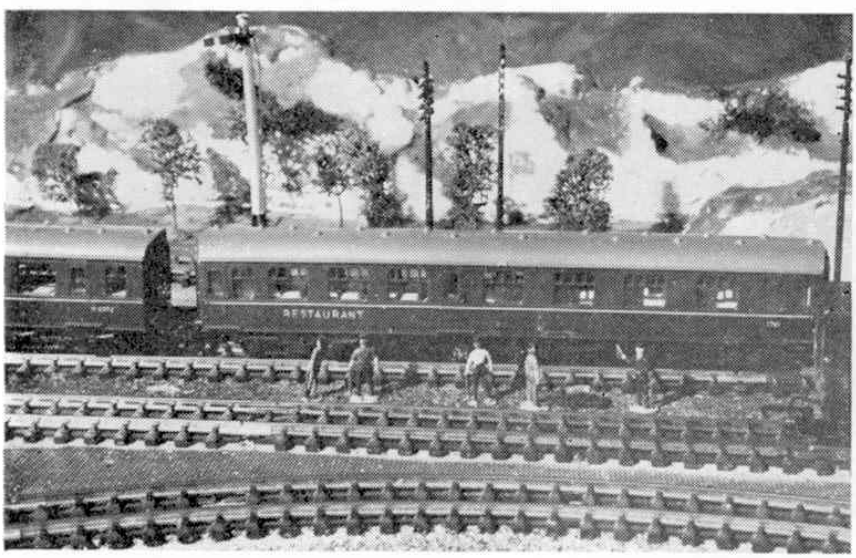
We now have a very lifelike layout, but we can add refinements that will not only lift it out of the ordinary, but will increase our enjoyment in operating the trains. These refinements are lights for the buildings, floodlights for the outside of some of the buildings and colour light signals. Now these are expensive to buy, but if we make them ourselves, it can be economical.

Firstly the lights. For those we used 'grain of wheat' bulbs, so-called because of their shape and small size. These bulbs, in green, amber, red and clear, cost about a shilling each and do not require bulb-holders, as they have their leadout wires extended to about 4 inches. When the bulb has been placed in position in the booking-hall for example, the lead-out wires are secured in position with a couple of spots of glue. The bulbs work from 12 volts, but it is better to run them from 9 or 10 volts, as this will prolong their lives. This means a separate voltage supply from that supplying the track. We use two 4.5 volt batteries connected in series, that is + of one battery to — of the other. You could also use a bell transformer, giving 8 or 10 volts output. Don't forget to take care when using mains electricity, *it can kill*. The bulbs are connected in parallel across the battery or transformer output via an on-off switch, as shown in *figure 1*.

Up to 10 bulbs can be connected in this manner. The wires are run underneath the baseboard, drilling holes for them to come up inside the buildings. To enable us to start night operations, we should add colour light signals. We can either have a red-green system, or red-amber-green. For the red-green system, we need a single-pole double-throw toggle switch for each signal. These switches are obtainable from radio spares shops. *Figure 2* shows how these are connected to operate two signals, g 1 and r 1 being the green and red lamps for the first signal and g 2 and r 2 for the second, s 1 and s 2 being the toggle switches and s 3 the on-off switch.

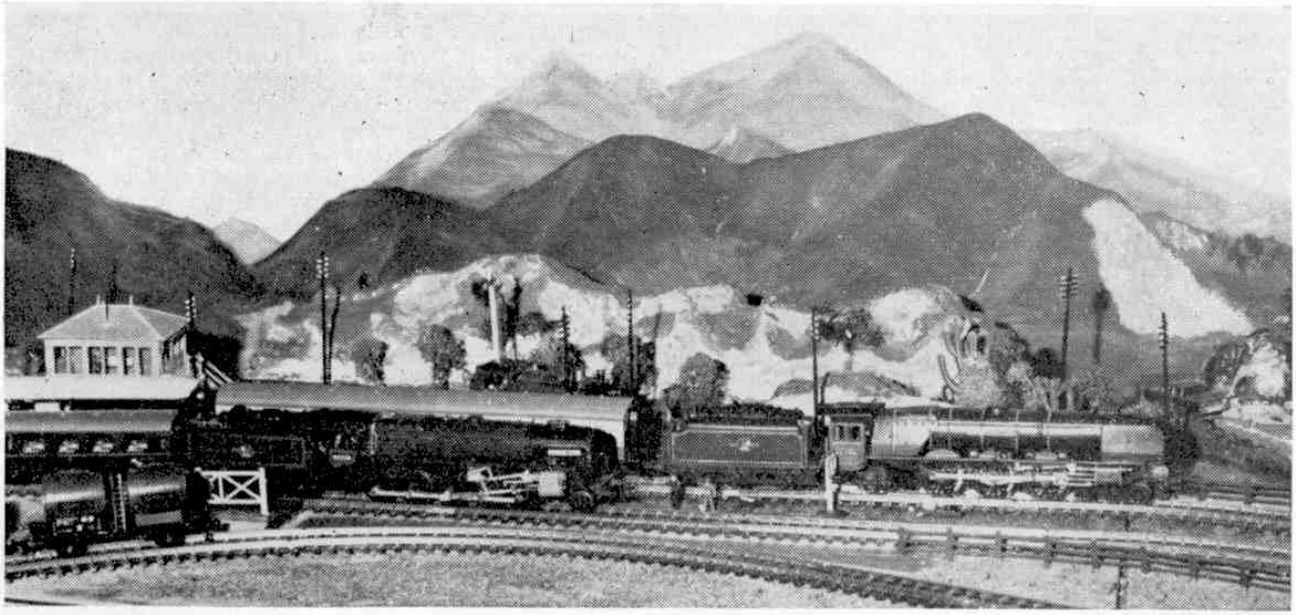
For a red-amber-green system, we must use a wafer rotary switch, again obtainable from radio spare shops. For three signals we shall need a 3 bank 3-position switch. *Figure 3* shows the connections.

With this circuit, signals 1, 2 and 3 will show green, amber and red respectively with the wafer switch in



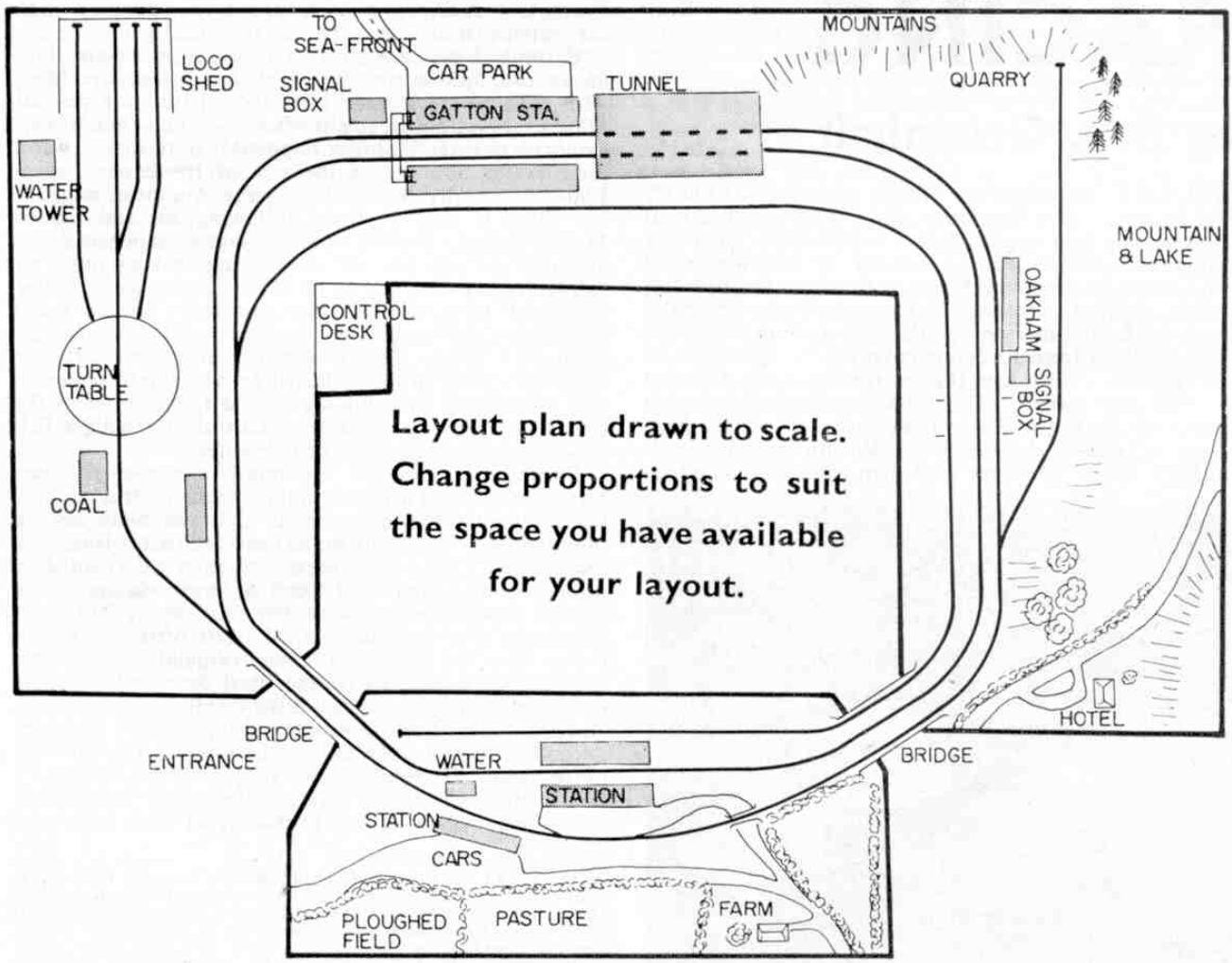
At left: The track maintenance crew stand clear as a train passes through. These little touches with people doing everyday railway jobs on the layout, really elevate it from 'toy' to 'model' status.

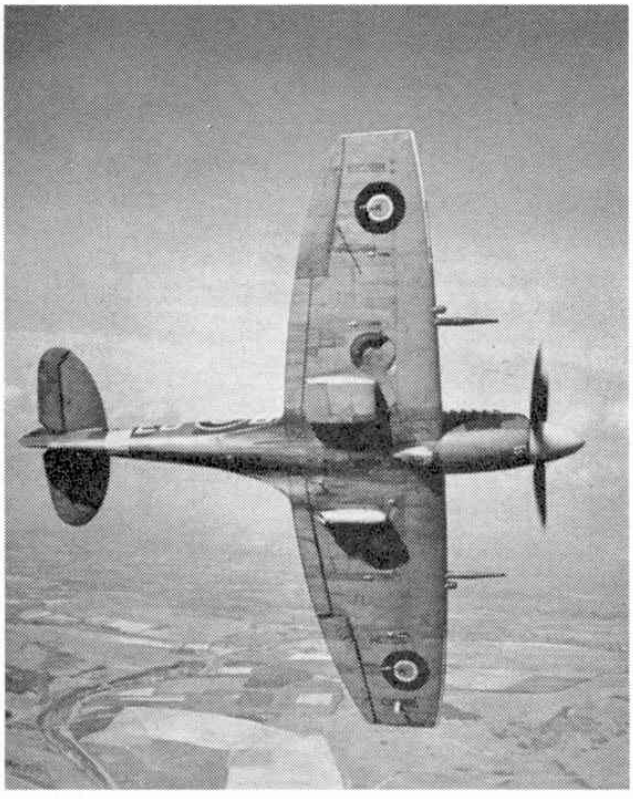
At right, above: The 46225 "Duchess of Gloucester" with the 11 a.m. down express passing the 92220 "Evening Star". Note the telegraph poles and lineside fixtures such as fences and gates.



position 1 as shown. As the train passes signal 1, we turn the switch one position and now signal 2 will be green; 3 and 1 being amber and red respectively. Similarly another operation of the switch makes signals 3, 1, 2, turn green, amber and red respectively. Thus a continuous clearway for the train can be signalled or the train may be stopped at any signal.

The final touch for realistic night operations is to have a blue bulb in the room light and we now have a layout that we can be proud of.





THE BRITISH TOY THAT BEAT THE LUFTWAFFE

John W. R. Taylor describes the historical events that led up to the design and development of the most famed fighter aircraft of all time—the Supermarine Spitfire.

At left: The first of the Griffon-engined Spitfires, the Mk XII had clipped wings to increase its speed at low altitudes. Below: The Schneider Trophy. Lessons learned in winning this helped to make the Spitfire an outstanding fighter. The Supermarine S.6B, winner of the Schneider Trophy, first aircraft to set up an over 400 m.p.h. speed record, and ancestor of the Spitfire.

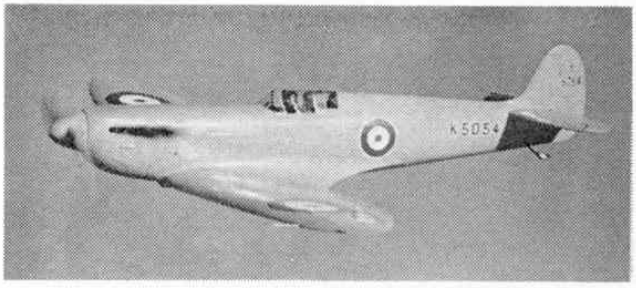
THE AIR Attaché from the German Embassy in London was not impressed when he saw a Spitfire for the first time, at an air display in June 1936. Accustomed to the more angular, aggressive lines of *Luftwaffe* warplanes, he refused to believe that anything so small and dainty as the Spitfire could be a hard-hitting fighter, and referred to it as a toy.

Major Alexander de Seversky, the famous American designer, was a little more enthusiastic. After flying both a Spitfire and a Messerschmitt Bf 109 in the summer of 1939, he wrote that the British fighter seemed the better of the two, but was more difficult to maintain and not so fast as the Bf 109.

The R.A.F. knew, and the *Luftwaffe* was soon to discover to its cost, that the Spitfire was really faster than the Bf 109, and no toy. But there were moments when even the most enthusiastic pilots found their "Spits" rather a handful. At least four experienced pilots, brought up on biplanes with a fixed undercarrige, forgot to lower their wheels when landing and ended up feeling rather foolish, surrounded by a bent aeroplane.

One sergeant-pilot at Duxford did this in front of a huge crowd at the 1939 Empire Air Day display. Intent on winning a spot-landing competition, he touched down bang (literally !) on the spot marked on the airfield, with his wheels still retracted. Right up to the last moment, the public thought it was a prearranged stunt and that the airmen who dashed on to the airfield, waving their arms in a desperate but vain atempt to attract the pilot's attention, were all part of the act. Instead of winning the prize, the unfortunate sergeant was fined £5 for negligence.

For the R.A.F. such accidents were serious. War with Germany seemed more and more likely, and Fighter Command needed every aircraft it could get. But the Spitfire's high performance stemmed from the fact that it was a highly-advanced design, with a complicated wing structure and an all-metal semi-monocoque rear fuselage, and deliveries were at the rate of only one aircraft a week, at first. By comparison, the Hawker Hurricane was much easier to build, as its



K5054, the Spitfire prototype, which flew for the first time on March 5th, 1936. Note the very much changed lines of the Mk 5 and Mk 9 on the cover.

construction differed little from that of the biplane fighters it replaced; but it was slower than either the Spitfire or the Bf 109.

Looking back, after nearly thirty years, we realise that it was these differences between the British fighters, rather than their many similarities, that enabled the R.A.F. to win the war in the air.

Sufficient Hurricanes had been delivered by the start of the Battle of Britain to equip 29 squadrons, compared with 19 Spitfire squadrons. Had there been only 19 squadrons of each, the outcome of the battle might have been very different. In the years that followed, the Hurricane was switched to specialised duties such as ground attack and anti-tank operations, armed with bombs, rockets and even a pair of 40-mm. cannon as big as Bofors anti-aircraft guns. In this way, it was able to play a major role in defeating Rommel's armour at Alamein and the Japanese in India and Burma, without having to match itself too often against later, much improved enemy fighters.

The Spitfire, on the other hand, became a better and better fighting aircraft as the war progressed. It ended up with an engine more than twice as powerful as that with which it started, a top speed nearly 100 m.p.h. higher and a tremendously increased fire-power, enabling it to hold its own against the best enemy piston-engined machines.

It is wrong for anyone to suggest that the Spitfire was better than the Hurricane, or vice versa. The R.A.F. had the right numbers of each type, in the right place at the right time, often doing different jobs, and together they made the greatest fighter team of World War II.

To learn the secret of the Spitfire's long life and high performance, we have to go right back to 1922. On 12th August that year, a British Supermarine Sea Lion flying-boat won the sixth contest for the coveted Schneider Trophy. Had it not done so, the Italians would have gained a third consecutive victory and the Trophy would have been theirs for keeps; in which event their might never have been a Spitfire.

Supermarine's brilliant young chief designer, Reginald Mitchell, knew that the clumsy-looking Sea Lion would not be good enough to win again. It put a good show in 1923, but the contest was won by an American Curtiss seaplane. The engine installation and floats of the winning machine were so neat and well-streamlined that the whole aircraft had a very small frontal area. Mitchell learned a lot by studying these features of the Curtiss, but already knew how to produce something far better.

Like the Sea Lion, the Curtiss was a biplane. The racer he wanted to build would be a small, incredibly " clean " cantilever monoplane—the smallest seaplane, in fact, that could be designed around a 700 h.p. Napier Lion engine, with no wing struts, bracing wires or unnecessary bumps to reduce its speed.

The Supermarine directors had such faith in Mitchell's ability that they gave him a free hand to develop his revolutionary aircraft. There was no contest in 1924. By March 1925, Mitchell and his design team had completed the drawings of the racer, known as the Supermarine S.4. It was built in only five months and flew in August. On 13th September, it set up a world seaplane record of 226 m.p.h., proving itself the fastest aircraft built in Britain up to the time.

Before it could compete in the 1925 Schneider contest, the S.4 developed wing flutter and crashed; but nobody doubted any longer that Mitchell's ideas could produce a world-beater. Up to that time, Supermarine and Napier had borne the whole cost of building and flying the aircraft they entered in the Schneider Trophy contests, despite the fact that most of the foreign entries were heavily subsidised. Victory in the contest had assumed such importance that the prestige of entire national aircraft industries hung in the balance at each race. The British government could no longer stand aloof and ordered seven specially-built high-speed seaplanes, of which three were to be improved versions of the S.4.

It is hardly necessary to recall what followed. A Supermarine S.5 won the 1927 contest at a speed of 281.6 m.p.h. Two years later the S.6 not only repeated the success but set up a new World Speed Record of 357.7 m.p.h. There were no contests in 1928 and 1930, so when an S.6B won the 1931 event Britain gained the Trophy outright. Shortly afterwards, another S.6B raised the World Speed Record to 407.5 m.p.h., becoming the first aircraft ever to exceed 400 m.p.h.

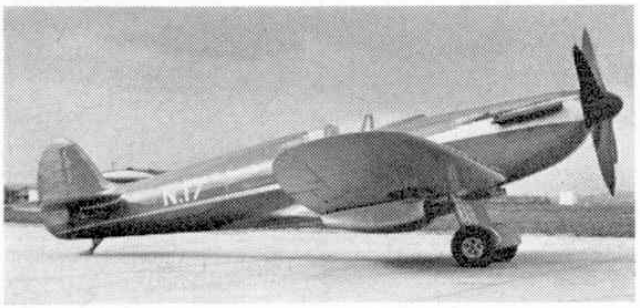
The S.6B was a remarkable aircraft, powered by a Rolls-Royce engine giving no less than 2,300 h.p. Although its racing days were over and its job done, it had pioneered many new ideas in the design and construction of airframes and earo-engines, and Mitchell wasted no time in making use of the experience gained.

When the Air Ministry issued Specification F7/30, outlining the kind of fighter they needed to re-equip the R.A.F., he produced a design based as closely as possible on that of the S.6B. Unfortunately, the Specification recommended use of the 660 h.p. Rolls-Royce Goshawk, which proved to be one of the few disappointing products of the world's greatest aero-engine company. Mitchell's F7/30 had a top speed of only 230 m.p.h. and none of its competitors, produced by other firms, showed any greater promise; so the Air Ministry decided to abandon them all and ordered instead the Gladiator, a conventional radial-engined biplane based on the well-proven Gloster Gauntlet.

However, Specification F7/30 was not a complete failure. It inspired British designers to be more adventurous and led to a doubling of the fire-power of R.A.F. fighters which, until then, had continued to carry the same two Vickers machine-guns as their predecessors of World War I.

Having discovered the shortcomings of official specifications, Mitchell and his counterpart at Hawkers, Sydney Camm, decided to design the sort of fighters they thought the R.A.F. should have. The results, in due course, were the Spitfire and Hurricane, evolved in very similar ways.

Mitchell began by replacing the big-span " inverted gull " wing of the F7/30 with a more conventional wing. He added an enclosed cockpit for the pilot and drew a retractable undercarriage in place of the " trousered " main wheels of the F7/30. By this time, there had been two important developments. The Air



The Speed Spitfire built in 1939 for an attempt on the World Speed Record.

Ministry had issued Specification F5/34, calling for a fighter very like Mitchell's new machine, with an armament of six or eight machine-guns, a reflector gun-sight, retractable undercarriage, wheel-brakes, enclosed cockpit, an oxygen system for the pilot, and a performance which included a ceiling of 33,000 feet and speed of 275 m.p.h. at 15,000 feet. Rolls-Royce had under test an engine that would make such a performance possible; known as the PV-12, it gave promise of 1,000 h.p. and was to become, in due course, the Merlin.

Mitchell refined his design, found room for eight guns inside its thin, elliptical wings, replaced the original Goshawk with the PV-12, and submitted the design to the Air Ministry. They were so impressed by it that they issued a new Specification, F37/34, based on the Supermarine fighter, and ordered a prototype, with the serial number K5054. Work began in January 1935 and K5054 made its first flight on 5th March 1936. The Spitfire had been born.

From the start there was no doubt that Mitchell had produced an outstanding fighter. Finished in highly-polished cream seaplane enamel, it could fly at 349 m.p.h. and handled beautifully. On 3rd June, only three months after the prototype left the ground, the Air Ministry ordered 310 Spitfire Mk.Is, little realising that by the time the last "Spit" came off the line in October 1947 production would total an incredible 20,351, to which must be added 2,408 Seafire naval fighters.

Few advanced aircraft are easy to put into production and service, and the Spitfire presented its share of problems. The relatively new stressed-skin fuselage construction required expensive jigs and tools and the distinctive elliptical wings were far less simple to manufacture than a rectangular or tapered wing. In the end, a total of 339,400 man-hours of design work went into the Spitfire Mk.I and no fewer than 800,000 man-hours were required to produce the jigs and tools on which it was built.

This was only the start. Between 1938, when the first Spitfires were delivered, and the end of the war in 1945, nearly 1,100 major changes were made to the design and countless minor modifications. Altogether, nineteen basic new Marks were evolved, each requiring anything from 3,685 to 168,500 additional design man-hours and up to a quarter of a million man-hours on jig and tool work. This was part of the cost of keeping the Spitfire in the front line. The cost in terms of money was astronomical.

Reginald Mitchell never saw a production Spitfire. He died on 11th June 1937, when he was only 42 years old, but he left his little fighter in the capable hands of "Joe" Smith—another of Britain's truly great aircraft designers.

What a fighter it was. The standard Mk.I Spitfire had a top speed of 355 m.p.h. at 19,000 feet when powered by a 1,030 h.p. Merlin II engine. Its eight Browning guns were installed in the wings, outside the propeller "disc", so that any aircraft caught in a two-second burst of concentrated fire was shattered by 276 bullets.

Supermarine felt confident that they had the finest fighter in the sky; they decided to prove that they also had a basic design able to outfly any aeroplane ever built, by setting up a new World Speed Record. The 48th production airframe, K9834, was fitted with a specially-boosted 2,160 h.p. Merlin III engine. Its wing span reduced from 36 ft. 10 in. to 33 ft. 8 in., a more streamlined cockpit hood was fitted and other changes were made, with the idea of making possible a speed of at least 410 m.p.h. Before the Speed Spitfire was ready for its attempt, the Germans set up a new record of 469.22 m.p.h. in a Messerschmitt Me 209, which has not been beaten to this day by any piston-engined aircraft.

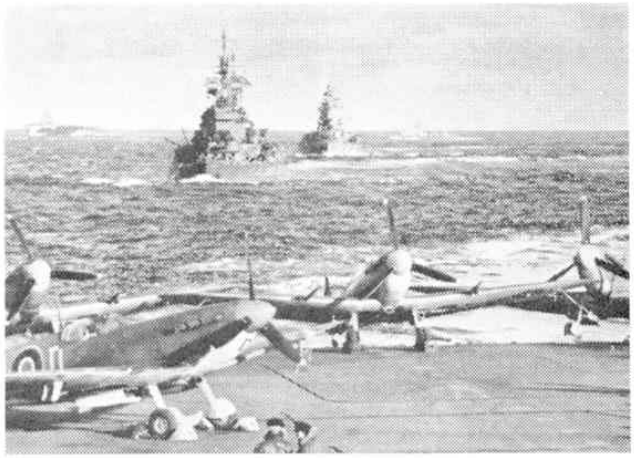
There was no time to feel disappointed. War was near and Spitfires were at last flowing off the assembly lines in satisfactory numbers. Supermarine was by now a division of Vickers-Armstrongs Ltd., and the vast production resources of this great company were supplemented by a huge "shadow factory" built at Castle Bromwich for operation by the Nuffield Organisation (Morris cars). Before long Westland Aircraft and innumerable subcontractors were brought into the programme to meet Fighter Command's ever-growing demands.

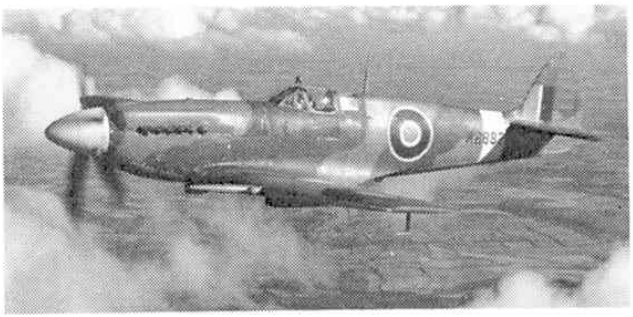
The war was six weeks old when Spitfires made their first kills. On 16th October 1939 fourteen Dornier Do 215 and Heinkel He 111 bombers attacked the Forth Bridge and warships at anchor nearby. Nos. 602 and 603 squadrons each destroyed an He 111, and these were the first German aircraft shot down over Britain since 1918. If Hitler had realised how many more would be added to the tally in the Battle of Britain, in the summer of 1940, he would never have started it.

It is usually claimed that during the Battle the Hurricanes tackled the German bombers while the Spitfires dealt with the higher-flying Bf 109 fighters that were supposed to protect the bombers. This may have been the idea, but it seldom worked in practice, as there was not usually time to form up a balanced force of the two types of British fighters to launch against a particular attack. Everything with black crosses on its wings and fuselage and swastikas on the tail was fair game for both the Hurricanes and the Spitfires, and they swept the once-invincible *Luftwaffe* from the daylight skies over Britain in just seven weeks.

Britain, and the world, had been saved by about a thousand young men in R.A.F. blue—some speaking strange languages, for in addition to pilots from the Commonwealth many survivors of the Polish, Czech and other vanquished air forces escaped to fly and fight in Spitfires and Hurricanes. Between 10th July and 31st October, 1,733 German aircraft were destroyed, for the loss of 915 R.A.F. machines, and the *Luftwaffe* never recovered from the loss of so many of its best airmen.

After the Battle of Britain, it was inconceivable that this country would lose the war. As it dragged on for five more years, the Spitfire protected Allied ground and air forces almost everywhere they fought throughout the world. Huge sand filters were added under the graceful nose of aircraft flying over the deserts of North Africa. Arrester hooks and folding wings converted Spitfires into Seafires for operation from carriers of the Royal Navy. Two (and later four 20-mm. cannon were packed into the wings to increase fire-





Above: Another view of a Griffon-engined Mk XII as shown in the heading photo. At left: Seafires on board a British carrier of Naval Force H, nearing the Algerian coast during the Allied invasion of North Africa in November 1942.

power, and bomb racks were fitted so that Spitfires could harrass ground targets when there were few enemy to fight in the air. Most important of all, the airframe was adapted to take the 1,735/2,050 h.p. Griffon engine—a direct descendant of the S.6B's racing engine—when this became available.

First version of the "Spit" fitted with a Griffon was the Mk.XII, and it came just in time. Earlier Marks were being outflown by the *Luftwaffe's* new Focke-Wulf Fw 190 fighter-bombers which were making regular hit-and-run raids on targets in Britain in 1942-43. Wingtip-to-wingtip with the Hawker Typhoon, the Spitfire XIIs soon remedied the situation. Their top speed was 393 m.p.h. at 18,000 feet, but they usually flew low and had the "clipped" squared-wingtips that identified versions intended for operation at low altitude. By comparison, Spitfires used at very high altitudes had extended and more pointed wingtips.

Not all Spitfires were used for fighting. In fact, some of the bravest of all Spitfire pilots were those who had no opportunity of firing at the enemy as their aircraft were unarmed. These were the men who flew deep into enemy territory on reconnaissance flights, searching out targets for Bomber Command and photographing the results of its raids. Relying on speed alone for defence, they usually flew very high; but some times the need for close-up pictures demanded a dash over a heavily defended target area almost at ground level.

Alone of all Allied fighters, the Spitfire remained in continuous production throughout World War II. The final versions, Marks 21, 22 and 24, had a new wing of different shape. In addition some Mark 21s had contra-rotating propellers, while the 22s and 24s had enlarged tail surfaces and "blister" type cockpit canopies. Some pilots claimed that these versions no longer looked like Spitfires, but they certainly behaved like "Spits". Even after Germany and Japan had been defeated, they still made life unpleasant for Britain's enemies in Malaya and elsewhere, while Seafires of the Royal Navy continued to operate against bandit hide-outs in Malaya and to play their part in the Korean War until 1950. Nor was this the end of the story, for many foreign air forces received and flew Spitfires, not least those of Russia and America, and some small nations kept their "Spits" in service long after the R.A.F. had re-equipped with jets.

Today the Spitfire is almost a legend. Glimpses of airworthy examples at air displays are becoming more and more rare; even the once-familiar "gate guardians" parked by the entrance to R.A.F. stations diminish in number year by year. But, in an age when some fighters cost £2½ million, we can still marvel at Reginald Mitchell's supreme creation, which was reckoned to cost a mere £5,000 in the wartime years when youngsters were proud to give pennies of their pocket money to "Spitfire Funds" and so help to buy the "toys" that beat the *Luftwaffe*.

The final version of the Seafire for the Royal Navy was the Mk 47, with a 2,375 h.p. Griffon 85 and contra-rotating propellers.