VOL. XXXI. No. 5 MAY 1946

MECCANO MAGAZINE

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Next Month: "JOURNEYS BY AIR." By C. G. Grey.

MECCANO MAGAZINE

Editorial Office:
Binns Road
Liverpool 13
England

Vol. XXXI
No. 5
May 1946

With the Editor

The Air Taxi of the Future

Readers who were not lucky enough to be in London to see this year's Oxford and Cambridge boat race may have seen a newsreel film of it in their local cinemas. Many of the "shots" included in the newsreel were taken from the air by a cameraman flying in a Sikorsky R4B helicopter, similar to that shown in our cover illustration.

The newsreel companies have been quick to recognise the usefulness of the helicopter for this kind of work. It can fly slowly over the race and then comparatively fast across country to deliver the film in the quickest possible time. The boat race film was flown to a point near the film studios and handed down through the sunshine roof of a motor car while the helicopter hovered a few feet above the ground. So within a matter of minutes after the race the film was being processed.

But that is only one of the many practical uses of the helicopter, and Mr. John W. R. Taylor has more to say about the possibilities of this type of aircraft in his article on pages 188–190. Most of the development work so far has been done in America. But, out of hundreds of designs, only two or three have met even preliminary requirements, and although the helicopter is potentially the most promising of all types of aircraft, it is still in an early stage of development.

A hint of the future for rotating wing aircraft was given by Mr. John Wilmot, Minister of Supply and Aircraft Production, in January last. He said: "The possibilities in an aircraft which is not tied to specially prepared aerodromes, and can land and take off from any clear space slightly bigger than its own dimensions, are obviously far-reaching. It is possible that the helicopter will become the air taxi of the future, transporting passengers from the main airports, situated outside towns because of their very large size, to town centres. I would anticipate that in the not too distant future large stores, clubs, and office blocks will provide themselves with flat roofs for the landing of helicopters. I expect also that the helicopter will be used on a large scale for private flying."

Now it has been announced that the Fairey Aviation Company are developing a helicopter air taxi. It will be some months before the prototype is flown, but, as it will be backed by 30 years of design experience, we can confidently expect it to put Britain right in the forefront of world helicopter design.

This Month's Articles

The Passing of the Forecastle

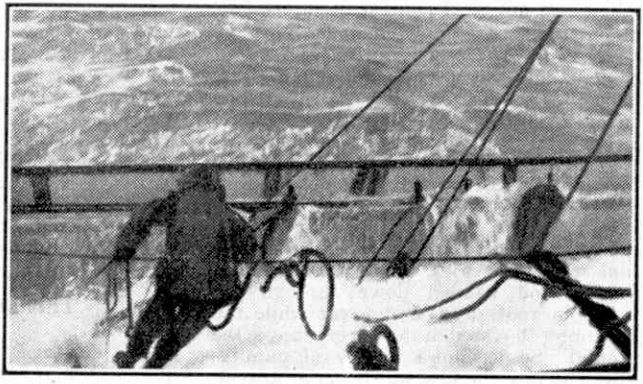
By Frank C. Bowen

ONE of the principal matters discussed by the Maritime Section of the International Labour Organisation, at its first post-war meeting at Copenhagen, was the accommodation of the merchant seaman, a matter of great concern to practically everybody connected with the shipping industry for years past. The whole world's representatives did not find it any easier to settle off-hand than other people have done; there are all sorts of factors of which the layman knows nothing. Quite apart from the essential points of welfare and comfort, balanced with economics, there are divers national laws for reckoning the tonnage on which all dues are paid and, above all, the tastes of the seamen themselves, which do not always agree with the opinions of their scientific well-wishers ashore.

The conference very wisely decided to express many of its decisions in general terms, so the question of whether the seamen's quarters should be aft or amidships still remains to be settled according to circumstances; but opinion was quite definite that they should never be forward unless the special circumstances of the ship or her functions made it absolutely unavoidable. So passes one of the oldest sea traditions, already very generally condemned.

The date when the forecastle was first introduced for the accommodation of the seamen is not definitely known, but it is certain that for many years the sailor got what rest he could, wrapped in his cloak, wherever he could find a corner of deck space away from the quarters reserved for the officers. The forecastle then lived up to its name; it was the forward castle for the ship's secondary function of fighting. Every early merchant ship expected to do her share of fighting, either in self-defence or what would now be regarded as piracy. So, at either end, a rough platform was built on trestles whenever the ship was likely to sail into danger. The after one was also the navigating position of the officers, the only place possible when they had to control the sails and steering. Then the rough platforms became more solid, and were finally built into the structure of the ship. The after castle, in time renamed the poop, continued to house the officers, and the forecastle—which the sailor invariably pronounced fo'c'sle—the sailors.

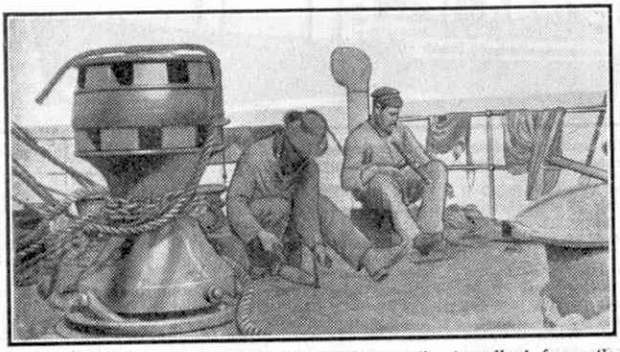
Not the slightest effort appears to have been made to secure comfort; the Tudor gentlemen adventurers, capturing Spanish ships, found that their seamen had borrowed from West Indian natives the idea of sleeping in hammocks and they were soon adopted, but, instead of being slung, as they obviously should be, they were simply laid on the deck for years, affording very little comfort or warmth. These old below-deck forecastles—in only the biggest ships was a topgallant forecastle rising above the main deck considered—were dark and unventilated and were constantly washed out by seas coming through the hatch, so that the discomfort of laying a hammock on the deck is obvious.



When the life-lines had to be rigged in the sailing ship's waist the seaman had to think of his own safety, and the crew's dinner being carried to the forecastle had to take its chance. Photographs by Nautical Photo. Agency.

Yet there were men still living only a few years ago who could remember the custom, although in their day it was only a survival in one particular type of ship, the sailing ships built on speculation in the middle of last century in Canada. Most of them were sent across to Europe

for immediate sale. They carried a first cargo of timber, and to increase the amount the after bulkhead of the below-deck forecastle was cleared away so that the ends of the planks went as far forward as possible. Then the hammocks—only



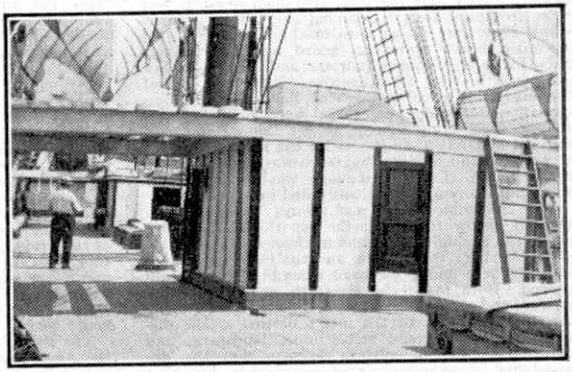
As it naturally got most strain, the deck over the topgallant forecastle would leak into the quarters below, and caulking it was a constant job in fine weather.

one between two men—were laid on the ends of these planks and the men got what sleep they could. As many of them had a cash interest in the ship which they had helped to build as well as sail, there were remarkably few complaints.

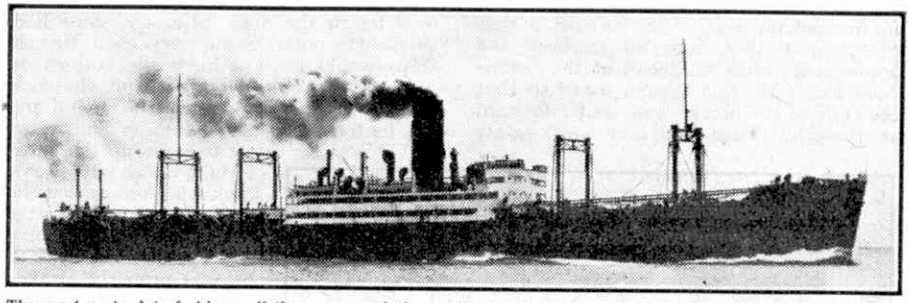
Later the freeboard forward was often increased by building up a topgallant forecastle in the naval fashion and this permitted the accommodation to be improved. But it was only a matter of comparison.

The average sailing ship's forecastle within living memory was a place of horror. Means of heating were generally non-existent for fear of fire; often there was only an old paint drum with holes punched in it, but that ate up the fuel so that everything handy was burned and that was discouraged by the owners. It gave a certain amount of warmth, but many old-timers preferred to do without it as it woke up the vermin which were never far away. The back-wind from the sails always prevented the chimney drawing properly, and there was often fighting as to whose job it was to clear the ashes. Lighting was as poor as heating; for natural light often nothing more than bull's eyes let in the deck, although some had small side ports. Some very good British ships would allow a hurricane lantern or a farthing candle per night; but the concession did not always extend to oil for the lantern, and the man who had to go aft to wake up the mate to take his watch always took the precaution of carrying a small bottle with him and milking the mate's lamp before he was properly awake. Very often the only artificial lighting was the slush lamp, an old meat tin filled with fat skimmed off the top of the pot when the salt pork was being boiled, the wick made out of shredded sail canvas. It gave a great deal of smoke and smell with very little light, and when the cook was not feeling kindly disposed—and sea cooks were very touchy gentlemen—there was no slush and no light.

Forecastle tables were rare; most men had to eat their food from their knees or from the top of the sea chest which also served as a seat. The law demanded minimum deck space from the fifties onwards—nine square feet of deck per man if the crew slept in hammocks and 12 if they were in bunks. The original law covered deck space only, and it was not until the sixties that each man was



The midship house accommodation in a sailing ship, generally appropriated as the apprentices' half-deck, had the advantage of letting its occupants crawl through the skylight in the roof when the door, in spite of its high sill, had to be tightly caulked because the waist was filled with water.



The most up-to-date fashion—all the accommodation, galleys and mess-rooms amidships. Officers have the upper promenade deck to themselves, and ratings the lower.

entitled to 72 cubic feet, increased to 120 in 1907 if the men ate where they slept, still 72 for sleeping space only. Sailors did not fail to point out that the capacity of the average-sized coffin was 54 cubic feet.

Lighting and heating caused hardship enough, but by far the most bitter complaints were caused by the hawse-pipes for the anchor cable passing straight into the forecastle where the windlass, or "piano" as it was usually called, was placed. When the ship was in soundings the anchors were kept shackled to the cables for immediate use, and every time she dipped her head into a sea she brought a cascade of water into the crew's quarters. When the anchors were no longer likely to be needed they were unshackled, the cables drawn inboard and the hawse-pipes plugged with wood, but it was doubtful whether there was a single case of their being really watertight. No wonder the old shellback always suffered from rheumatism.

An immense difference was made in the very last days of sail when several thoughtful owners, appropriating as much space for the crew as the Board of Trade regulations would allow, divided the forecastle into two and placed the windlass in a clear space between them. The water from the hawse-pipes ran straight through on the main deck, there was space over the windlass to hang clothes up to dry, and the watch below could sleep undisturbed.

All the early steamers inherited the sailing ship's tradition of putting the seamen's quarters right in the eyes of the ship, but the sailors and firemen were separated, largely because they were always fighting if they were together. Although steamers had more freeboard than the sailing ships, the speed at which they were driven into head seas brought just as much heavy water on board and the passage between their sleeping quarters and their place of duty was nearly as dangerous. That was one of the inevitable disadvantages of having the accommodation forward, and there were many others. It was even more difficult to get the men's meals forward in safety than it was for the men themselves to get out, and dinners that were washed away were not replaced. Collision damage was generally forward and many a seaman was killed in his bunk.

The triangular shape was always uncomfortable. Directly below the forecastle was the chain locker where the anchor cable—seldom cleaned of its mud—was stowed for the voyage, and the fore peak where the salt beef and pork were generally stored until needed. Both made the forecastle smell foul. The forward end of the ship naturally strained first, making the decks leak on to the men's berths. The disadvantage that would strike most landsmen, and quite a number of modern seamen, was the impossibility of securing proper ventilation, but that was the last thing that worried the old shellback; if any ventilation were detected it would soon be blocked up with an old pair of trousers. He reckoned that he got quite enough fresh air during his watch on deck.

The officers still had their quarters aft, although it was no longer necessary in order that they could keep an eye on the sails, and had the disadvantage of the screw's vibration. Their logical position was amidships as close to the bridge as possible so that they could reach it without a moment's delay in an emergency, but it was not until the seventies of last century that such a logical move was made and its adoption was very gradual. Even so the poop was left unoccupied, and the seamen's quarters were not put there immediately as they should have been. It was used for passengers, or even for stores and cargo, for some years before that was done, and then it was regarded as a revolution but was very popular.

The width of the poop and its shape gave the opportunity of much more comfortable quarters, more easily furnished; while the after well deck was only occasionally swept by a wave and communication with the bridge was seldom interrupted. The crew's galley could be close handy, so that food was neither lost overboard nor allowed to get cold; light and ventilation were easily supplied because a skylight could be fitted through the poop deck without danger. The vibration of the screw was the only disadvantage, but easily forgiven.

For some years past the great majority of cargo steamers have housed their sailors and firemen in that position. In passenger ships it is not so easy, especially in a three-class ship when the second class has the poop and the seamen are accommodated in the after end of the 'tween deck.

The latest cargo ship fashion, and one which is generally, although not universally, favoured, is to have the whole crew, officers and men, collected amidships. In the matter of comfort, safety, the service of meals and almost every other consideration it is most desirable, but a strong objection is that it puts the officers and men into too close proximity for discipline and good relations; the sailor wants to get away from his superiors in his leisure hours just as much as the city clerk wants to get right away from his employers. As far back as 1886 midship accommodation was tried in a tramp steamer built at Sunderland, the "*Cleveland*" of 2,063 tons, which belonged to a class which was normally very reasonably described as sea slums. She had her saloon and cabins for the officers and a few passengers under the poop, but her crew were in the fore end of the bridge deck, directly under the bridge, and the topgallant forecastle was used for the anchor gear and stores only. It is to be feared that her kindly owner received very little encouragement in his reform, and the idea was not heard of again for many years.

The revival came during the war of 1914–18 when the Americans were building up their merchant fleet and doing everything they could to attract seamen, not only for war service but as a life job. A few of the big cargo ships running from the East Coast to California fitted all their accommodation amidships, the seamen and firemen on the lower deck of the superstructure, (*Continued on page 216*)

Changes in Railway Track

By W. Philip Conolly

RAILWAY track is one of those things that are apt to be taken for granted. It is such an essential feature of the railway, and to the outside observer it always appears to be the same. From its very familiarity we do not take as much notice of it as we ought. Certainly little limelight is given as a rule to the platelayers, whose job it is to maintain the track in good order so that trains may travel safely over it.

The platelayer, as he is popularly called, may in fact claim to be the oldest railway worker, for his name is directly derived from the tramroads and plateways that were in existence for the conveyance of minerals long before railways as we know them to-day. For the timber beams or rails used originally to carry the wheels of the wagons developed into cast iron "plates," which at first were laid on top of timber rails. Then came the "edge rail" with flanged wheels and this in principle is the system in use to-day. The name platelayer has survived although the plateway in general has not.

Standard British permanent way may be described as consisting of bullhead rails keyed into chairs secured to cross sleepers of timber, although sections of flat-bottomed rail, which eliminates chairs, are in use and both steel and reinforced concrete sleepers also have been laid down. Short fish-plates having two bolts instead of four and spring steel keys instead of timber are among other items that have come into use in recent years, while experiments with longer rails of 90 ft. and even 120 ft. instead of the usual 60 ft., have been made. These changes in fact bear out the recent L.M.S. statement that all the main track components have been entirely altered during the lifetime of that company.

Track construction on bridges frequently differs in detail from that employed along the ordinary stretches having the usual ballast bed. Longitudinal timbers are often used and on these flat-bottomed rails are laid. The rather harder riding than usual can be detected when we are in a train passing over such lengths, and is accompanied often by a characteristic "bridge noise." The rail-bearing timbers are maintained at the correct distance apart by means of tie bars.

In the illustration on this page is shown a permanent way gang working on the track on an important bridge in the heart of London. The rail-bearing timbers have sunk slightly under the constant passage of heavy trains, and the gang are busy inserting packing boards under the rails in order to bring them up to the correct height and level, and so maintain a good "top." Many of the features of track construction already referred to can be seen in the illustration, such as the flat-bottomed rails, the timbers and the tie bars. A little-noticed detail can just be seen above the back of the man on the right. This is the group of fire buckets maintained at a convenient point at the side of the track.

The men are using various tools, among them a large auger for boring holes in the timbers; and the usual platelayers' hammer also is in evidence. The rail gauge is prominent in the foreground.

A permanent way gang at work on the track over a bridge. The photograph, by W. Philip Conolly, shows the special form of track construction described in this article.

Photographing Underwater Explosions

DURING the last 100 years there has been a steady increase in the use of mines, torpedoes and other weapons that involve explosions under water. Naturally efforts have been made to find out exactly what happens when submerged charges explode, and this has proved very difficult, largely because of the speeds of the explosions and their effects. Now high-speed photography has been brought into use for this purpose by Britain's Royal Naval Scientific Service. The idea has been to use very short exposure times, so that the movements concerned are arrested, and to extend this scheme by devising means of repeating the process at high speed to give a rapid succession of such photographs.

There are two ways in which high-speed photography can be carried out. In one the subject is illuminated continuously and the exposure is regulated by means of a high-speed shutter of some kind. This plan has been developed to give high-speed cine-cameras that take as many as 8,000 frames or pictures a second. In the second method the film is exposed continuously and it is the illumination that is regulated. By means of intense flashes of short duration good photographs with exposure times of less than five millionths of a second can be taken, either singly or in a series, at speeds up to 1,500 a second. Both methods have been applied to the photography of underwater explosions.

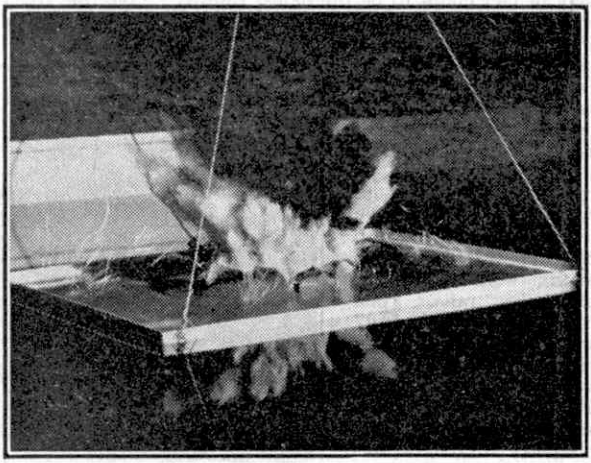
This article deals only with the second or flash method. This is essentially a development of spark photography, which has been in use for many years. The first requirement was more illumination than ordinary sparks can provide. With this aim a discharge tube fitted with an inert gas was introduced, through which an electrical condenser is discharged. The flash or discharge between the electrodes of such a tube is longer than a spark in air, and gives more light, sufficient indeed to allow the photography of objects at distances up to 15 ft. from the discharge tube. The voltage used is from 2,000 to 20,000, and the capacity of the condenser varies from 0.1 to 4 microfarads.

For the production of one flash at a time, charging takes place slowly through a high resistance. The discharge tube, or flash tube as it is generally called, is connected with the minimum of wiring directly across the condenser terminals in order to reduce to a minimum the duration of the flash, and in recent tubes this is limited to one or two millionths of a second.

The flash has to be synchronised with the explosion or effect that is to be photographed; that is it has to be "triggered." This is done by causing the discharge of the condenser at the required moment by means of a signal of some kind from the effect to be photographed. The signal must take the form of an electric current that is amplified if necessary, and is applied to the grid of a thyratron valve, which then permits the discharge of a small condenser through the primary winding of a spark coil. The secondary winding of the coil is connected to an external band on the flash tube or to an electrode within it. In either case pilot sparks are produced, and these bring about the flash required. The time from the arrival of the signal to the appearance of the flash is of the order of five millionths of a second.

The type of actual signal used to bring this about depends on what is being photographed. The closing or opening of an electric circuit provides a reliable signal, and an alternative is to make use of a shock or a sound wave. This is picked up by a microphone or hydrophone, but there is a delay equal to the time taken for the wave to travel from the source to the microphone, and this must be allowed for. In yet another method the explosion or effect being photographed is made to interrupt a beam of ultra-violet light falling on a photo-electric cell.

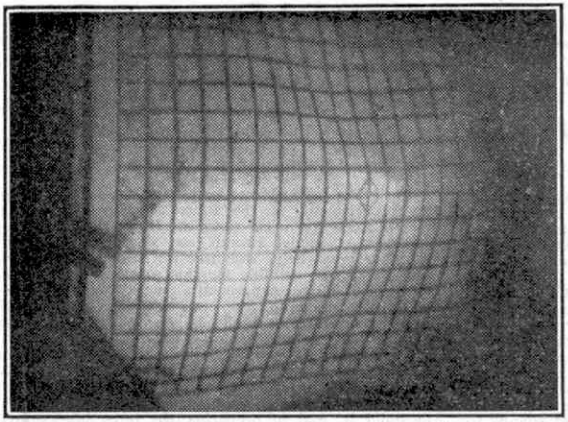
Basically the principle of multiple flashing is the same as that of the multiple spark; that is a condenser is repeatedly charged and discharged. Each discharge produces a short duration flash of light which is utilised to record a photograph upon a strip of moving film.



An underwater explosion tears a hole in a steel plate.

The Edgerton high speed camera used for taking sequences of photographs is of the continuously moving film type. It takes 100 ft. of 35 mm. cine-film which is driven by a small electric motor at speeds between 30 and 90 ft. per sec. There is no lens shutter. The spacing of the pictures is regulated by timing the flashes of the illuminating lamps, and the records so obtained can be projected at the normal cinema rate of 16 frames a second, so that the subject is slowed down 30 to 90 times. The special electrical circuit used for producing the flashes works on similar lines to the single flash equipment already described, but gives the high rate of 1,000 to 1,500 flashes a second.

One of the first underwater explosion effects examined by high speed photography was the behaviour of the gas bubble produced. This bubble is composed of explosion products, and grows in volume until the pressure in it has fallen considerably below that previously existing in the surrounding water. The volume then diminishes to a minimum, and increases again, oscillating in this manner until the bubble breaks up. Shock waves are sent out when the charge is exploded, and at every successive bubble minimum; and their behaviour is complicated by the fact that the bubble moves, its rise due to its lightness being modified by a tendency to migrate towards



A bulkhead frame after the impact of a shock wave from an underwater explosion. The distortion of the mesh of black lines shows how the bulkhead is affected.

rigid surfaces and away from free surfaces.

To find the damaging effect of an underwater explosive charge it is important to know exactly how the bubble migrates, and this is done by immersing the camera in a watertight container fitted with a window, or by pointing it vertically downward and viewing the charge and the field of its explosion by means of an inclined mirror placed below the surface of the water. The lamp and the triggering circuit are similarly arranged to illuminate the object photographed, and in this way the behaviour of the bubble has been followed throughout in various circumstances. Photographs have been obtained also of the shock waves themselves, and of the events that happen when they strike yielding surfaces.

It is of course of the greatest importance to know how structures such as ship's plates and bulkheads behave when subject to explosion charges under water. This has been done by photographing steel plates attacked by explosive charges. In one set-up a steel plate was placed upon the water surface, with the explosive charge fitted under the plate and in contact with its centre. In this instance the flash was triggered by means of a signal from a hydrophone placed 10 ft. from the charge. The resulting photograph is shown in the illustration on the opposite page, in which the white plume of water thrown up and the black cloud of explosion products are clearly seen.

This is an example of the use of a single flash. At the Admiralty Undex Works the Edgerton camera has been used to investigate failure of the multiple compartment protective system used in some large warships to withstand the result of underwater explosions. For this purpose a special tank has been constructed, which simulates on the model scale the conditions when a ship is damaged by a contact or near miss explosion. The tank is shown in the diagram on this page. It is made from 2 in. armour plate and is 11 ft. long, 6 ft. wide and 5 ft. deep. One end is vertical, and in this is an opening in which different targets can be bolted. In experiments the tank is filled with water and explosive charges are fired in it, either in contact with the target or at the required distance from it.

It will be noticed that the opposite end of the tank is not square, but slopes; the reason for this is to avoid the reflection of the shock wave back on to the target. The water in the tank represents the sea and the space in front of the vertical end of the tank the inside of the ship.

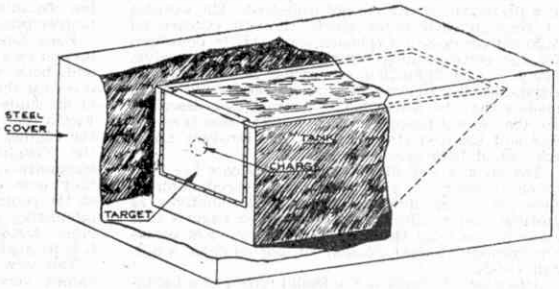
The whole tank is contained in a steel cover that serves both to exclude light and to confine fragments of the target if this breaks up. The camera is mounted to record what happens as seen from inside the ship, and steel covers with armourplate windows are used to protect it from explosive blast and fragments, while the lamps are spring mounted.

If the bulkhead under observation in a test of this kind is broken a silhouette photograph may give much information. In this case the camera is arranged to point at an oblique angle across the target, which appears on the left of the picture as a straight line. A frosted screen is erected on the side of the target away from the camera and is illuminated from behind, so that as the target breaks up fragments of it and water move across the field of view. From the sequence of pictures velocities and displacements are calculated. The moment when the bulkhead first breaks is shown by a streak on the film that marks the incandescent gases, which normally form the explosion bubble, pouring through the small hole first formed. The hole itself is later enlarged as the bulkhead tears and forms "petals" of distorted metal, a mass of water moving at considerable speed through the hole.

Reflected light can be used for these observations, but it is of the greatest value when the bulkhead does not break. Then the camera is pointed towards the target at an angle of 45 deg., and if plain bulkheads without stiffeners are under trial the target is painted white, with a network or graticule of black lines. Flash photographs then show how the bulkhead is distorted by the displacement of the lines, as shown in the upper illustration on this page.

An interesting feature is that stereoscopic photographs also have been taken by single flash methods. For this purpose two cameras are placed side by side, with their lens shutters open. The method has been extended to multiple flash photography, with two continuously moving film cameras taking 1,000 pictures a second. The first camera controls the rate of flashing, and each flash records on both films.

The information given here is based on an article by D. A. Senior, B.A., of the Naval Construction Research Establishment of the Royal Naval Scientific Service.



Tank used in tests of resistance to underwater explosions. This arrangement reproduces on a model scale the conditions that arise when a ship is damaged by a contact explosion or a near miss.

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.

"TITLED TRAINS OF GREAT BRITAIN"

By C. J. ALLEN, M.Inst.T.
(Ian Allan Ltd., London, 6/-).

The name of the author of this book, a very welcome addition to the growing list of Ian Allan productions, will be familiar to many of our readers as that of an entertaining and authoritative writer on railways. Older members will recall his articles on "*Famous Trains*" in the "*M.M.*" during 1927-9, in which he described many of the named and unnamed expresses of this and other countries at that time. In the present book he confines his attention to British trains, dealing in its 128 pages with some 70 train services, with most of which he is personally acquainted. Few indeed can be so competent as Mr. Allen to treat this subject in such an attractive way for, as he remarks in the foreword to the book, "Many of the trains in it, equally with their staffs, have become old friends to me, as a result of continuous travelling extending over 37 years and to nearly 2,000,000 miles."

In addition to trains bearing official names, it has been possible to squeeze in others that are often referred to by name, although they are not so distinguished in the timetables. All readers will welcome this step, and will share the author's regret that certain trains have necessarily been excluded by the mere accident of not having received distinctive titles. Among the trains dealt with are the various members of the "Scot" and "Scotsman" train families, the spectacular streamliners, lordly "Pullmans," notable "Limiteds," dashing "Flyers," "Continentals" and "Mails," and just plain "Expresses"; and there is ample justification for the inclusion of the essentially north-country "Club" trains. Scotland is well represented by such trains as the "*Granite City*" as well as the Anglo-Scottish expresses including the "*West Coast Postal*."

Mr. Allen is a recognised authority on locomotive performance and train working, so that these aspects of the services concerned are well covered in his stories. In addition the routes themselves receive attention, from the gradient and other standpoints; while reference is necessarily made to the principal changes in schedules that have occurred over the years. Readers will welcome also the references to the actual formation of the trains, the type of stock employed and the engine duties involved to-day, as well as notes on former practice on these details. Typical tonnage figures for the trains also are useful in assessing the locomotive work.

Spectacular locomotive feats in connection with any particular service are not neglected. The working of through sections or single through coaches on different services is explained, and this is done also for the corresponding return workings. This solves many of the difficulties of tracing in the ordinary timetables the running of through services in which readers may be interested. The workings described are the normal peacetime ones, but the effects of the war and the first stages of post-war recovery up to the end of 1945 also are noted.

The book is well illustrated. Special care has been taken in selecting photographs for reproduction to show as many different types of locomotives as possible, and to illustrate also the older engines that made a name for themselves on the services before the widespread introduction of big modern 4-6-0s and 4-6-2s.

Altogether the book is a splendid record of a fascinating period of railway history. It can be obtained from the A.B.C. Locomotive Books, Mail Order Dept., 33, Knollys Road, Streatham, London, S.W.16, price 6/6, post free.

"THE UPPINGHAM TWELVE INCH TUNNEL"

By G. W. GREGORY
(Harborough Publishing Co. Ltd. 25/- net)

Designing new aircraft involves much research and experiment, in the course of which extensive use is made of wind tunnels. Designers and constructors of model aircraft too would find a wind tunnel a great help, and here we have a description of a small one suitable for this purpose. It is used at Uppingham for experiments on resistance, streamlining, lift and drag, etc., and the details given will be of great interest to Model Aeroplane Clubs, Air Cadets and model Aircraft enthusiasts generally.

The tunnel has been designed by Mr. G. W. Gregory, of the Laboratory staff at Uppingham, and he has done model aircraft constructors a service by preparing this excellent book of instructions on how to build it, and in preparing the large blue prints that supplement the text. The prospective builder of the tunnel is further helped by a series of very good half-tone photographs of the tunnel itself and of its various components. The tunnel can be built by anybody who is at all handy with carpentry tools. The pages of instructions are in loose leaf form, so that by merely opening the binding pins the model-builder can remove the particular page of instructions from which he is about to work and have it beside him on the table or bench, instead of having to keep the entire book there.

The book costs 7/6 and the set of blue prints 17/6, a total of 25/-.

"GREAT EASTERN LOCOMOTIVES PAST AND PRESENT"

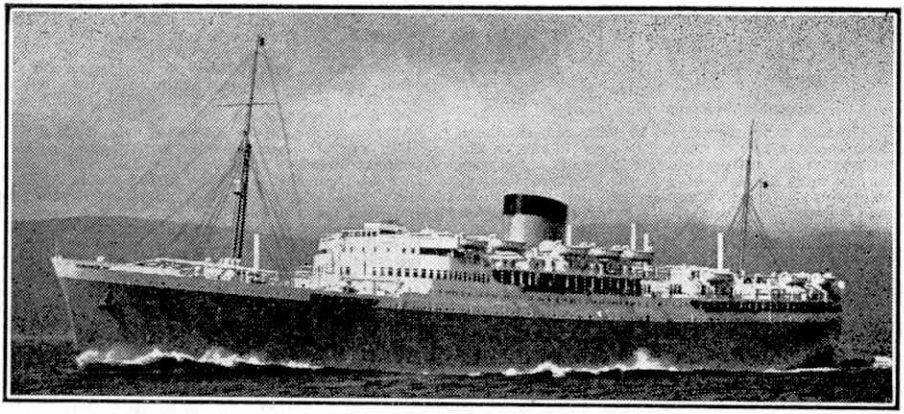
By C. LANGLEY ALDRICH (7/- net)

An earlier edition of Mr. Aldrich's book was reviewed in the "*M.M.*" for January of last year. The present volume is described as the "Victory Edition," and is an enlarged and revised version occupying 112 pages. The illustrations too have been increased in number, many being new and some full page. Other additions include a dimensions table in large type covering two pages, and the scrapping dates of all locomotives built since 1885; while a detailed list also is given of all engines in service on 1st January 1923, the date of incorporation of the G.E.R. in the L.N.E.R.

These additions and improvements increase the value of Mr. Aldrich's book, which is neither technical nor just a collection of numbers and dimensions, but an interesting account of Great Eastern locomotive practice.

Each class is dealt with in turn, with much information on such matters as building dates, dimensions and both G.E. and L.N.E.R. classifications; and it is clear that the author is writing with full knowledge of his subject, from both records and his own observation of the characteristics and performance of the engines concerned. A special section deals with the "Sandringhams." These are strictly L.N.E.R. locomotives, but they are included here because they were originally designed for the G.E. Section of the company. A further section gives the reader interesting glimpses of Johnson, the Holdens and other famous locomotive engineers who designed G.E.R. engines.

This new edition is bound in cloth, and will be valued very highly by all locomotive enthusiasts, particularly those specially interested in the G.E.R. It can be obtained, price 7/6 post free, from Mr. C. L. Aldrich, 104, Grove Crescent, Kingsbury, London, N.W.9.



Some Famous Union-Castle Liners

By Denis Rebbeck, M.A. (Cantab. & Dublin), M.Inst.N.A.

THE motorship *"Capetown Castle,"* which is the flagship of the Union-Castle Line fleet and is shown above, was built by Harland and Wolff Ltd., at Belfast, being completed in March 1938. This fine vessel, which has a gross tonnage of 27,500, covered over 450,000 miles on war service. She was fortunate enough to escape damage by enemy action, but was attacked by a German aircraft off the coast of Northern Ireland on one occasion early in the war, the bombs dropping astern of the ship.

The 20,000 ton Union-Castle motorship *"Carnarvon Castle"* has been for some time engaged as a transport, in common with many other units of the Union-Castle Line fleet. Early in the war, however, she had a more exciting career as an armed merchant cruiser, being converted from her original role of luxury passenger liner shortly after the outbreak of war. Later in the war, when the Allies were more in need of transports than armed merchant cruisers, the *"Carnarvon Castle"* was reconverted. She was one of the first British troop transports to arrive at Southampton with United States troops direct from New York, on which voyage she brought 4,750 men.

Another of these massive red-funnelled liners is the 20,000 ton *"Winchester Castle,"* which, like all her sister ships, was built and engined by Harland and Wolff Ltd., at Belfast. This fine vessel had an eventful career during the war years 1939–1945. In peacetime she was a mail vessel engaged in the weekly service between England and South Africa, and she took the last sailing for the Cape in that particular service before the declaration of war. In spite of the fact that for practically twelve months from 1941 to 1942 she was in Scottish waters acting as a training ship for assault troops, during which period thousands of men were schooled in invasion exercises, using the shores of Scotland as "enemy territory," the *"Winchester Castle"* covered over 270,000 miles during the war and saw service in many theatres of operation. When Madagascar was invaded in 1942, she was present, in company with another Union-Castle ship, the *"Llandaff Castle."*

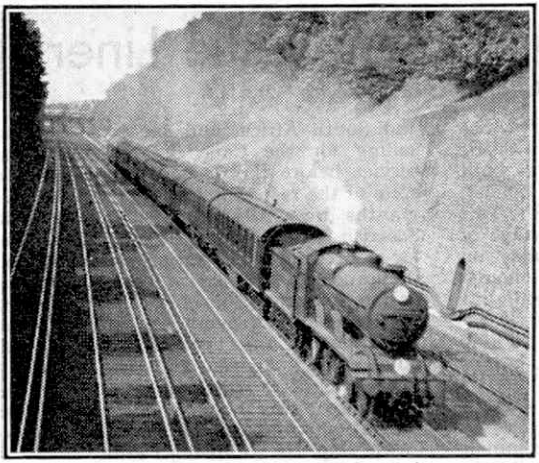
In July 1942 the *"Winchester Castle"* rescued 39 members of the crew of the U.S. freighter *"Honolulan"* which had been sunk by enemy action. She took part in the operations in North Africa in November 1942, and in 1944 was among the ships used when assault troops were landed on the coast of Southern France.

In common with many other shipping companies, the Union Castle Line lost many valuable units of their fleet during the war years. The 20,000 ton *"Warwick Castle,"* which was built in 1931 and re-engined and improved a short time before the declaration of war in 1939, was torpedoed and sunk when taking part in the North African landings. The *"Dunvegan Castle,"* completed only 10 years ago in 1936, was also lost, together with the three *"Dunbar, Llandaff and Windsor Castles."* Such fine vessels as these are not easily replaced.

Railway Notes

Southern Veterans' Fine "Sprint."

Although now upwards of 45 years old, the small Drummond 4-4-0s of Class T9, aptly known as the "Greyhounds," still perform sprightly work on occasion on the more lightly loaded of the Southern Railway expresses between Bournemouth and Weymouth and vice-versa. Even allowing for the favourable gradients, a recent run by No. 337, built in 1901, which with a five-coach train of 160 tons tare covered the 15.0 miles from Dorchester to Wareham in 15 min. 3 sec. start-to-stop, was distinctly "lively" for 1946! Passing Moreton, 5.5 miles from the start, in 6 min. 32 sec. at 73 m.p.h., No. 337 then averaged no less than 79.4 m.p.h. over the ensuing 8.4 miles to passing Worgret Junction, with a well-sustained 82 m.p.h. past Wool. From Wareham the 7.1 miles to the next stop at Poole were also run smartly in 10 min. 19 sec. start-to-stop, a maximum of 62 m.p.h. being reached before the service slack through Hamworthy.



The L.M.S. "Sunny South Express" running on the S.R. Brighton line in 1938, hauled by a B4x 4-4-0. Photograph by Capt. J. F. Taylor.

This spirited performance was recorded by Mr. D. S. Barrie, well-known as a regular "*M.M.*" contributor before the war, who has recently returned from Army service.

L.N.E.R. Locomotive Renumbering Scheme.

Renumbering is now in full swing, though it will probably be a considerable time before it is effected in full. The change usually takes place at a running shed during the weekend, but no locomotive has its new number put on until that number is blank, which means that several changes may have to take place in other engine numbers before the cycle of fresh numeration is complete in any given case.

Although places are left for them in the "A4" series, Nos. 580–613, the four streamlined "Pacifics" named after present high officials, Chairman, Deputy Chairman, Chairman of Locomotive Committee, and Chief General Manager respectively, are actually being renumbered 1–4, having hitherto been Nos. 4500, 4499, 4494 and 4901; in that order their names are "*Sir Ronald Matthews*," "*Sir Murrough Wilson*," "*Andrew K. McCosh*," and "*Sir Charles H. Newton*."

The numbers of "A1" and "A3" engines in order of building will run from 500–578, Class "A4" starting at 580 with the pioneer record-breaking "*Silver Link*." The "Green Arrows" or "V2" class are allocated numbers in approximate order of building from 700 to 883; the "A2/2" 4-6-2s, rebuilt from "P2" 2-8-2s, become Nos. 990–5, and the five Thompson "A2/1s"are Nos. 996–9 instead of Nos. 3696–9. The "B1" new standard 4-6-0s so far running are being renumbered 1000–1009, and the class will continue as built from 1010 up. The "B12" 4-6-0s return to their exact Great Eastern numeration after the scrapping of Nos. 1506, viz., 1500–5, 1507–80; "Sandringhams," rebuilt or not, take numbers 1600–72 instead of 2800–72, and in this connection it is interesting to learn that the rebuilt "B2" illustrated in our March issue as No. 2871 "*Manchester City*" has become No. 1671 "*Royal Sovereign*" as the Royal engine, painted green. The famous 4-6-4 No. 10000 will not be altered; the huge "Garratt" 2-8-0+0-8-2 banking engine, originally No. 2395, will be No. 9999 under the new scheme, so that the two most powerful locomotives of their kind bring up the rear of the list.

After the most powerful or new standard types, the new numbers are grouped according to wheel arrangement, with the oldest classes, likely to be withdrawn soon, placed first within each group. That is why the sequence of the "B-" 4-6-0s, for instance, may appear to be curious. "B1" is new standard, then come some old non-standard 4-6-0s before the later and more powerful examples.

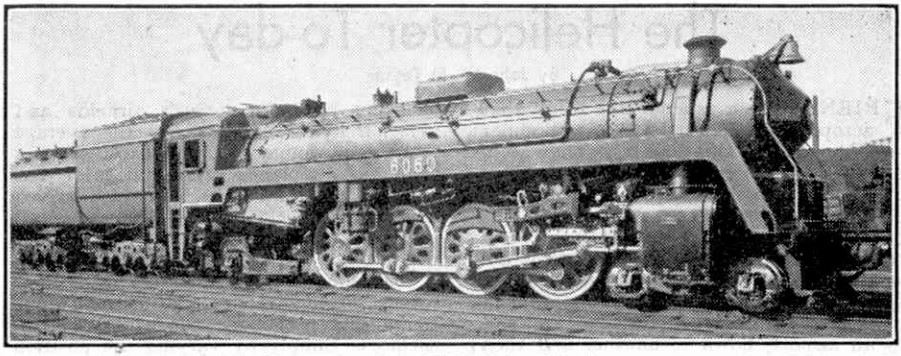
Locomotive Exchanges in the West

As we have reported from time to time, there are regular interchange workings between Exeter and Plymouth and elsewhere between the Great Western and Southern Companies. One Company's locomotive works the other's trains, as for example the 2.20 p.m. Plymouth to Exeter, G.W.R., on which the "N" class 2-6-0 hitherto seen has regularly been replaced by a "West Country" 4-6-2. Thus for the first time "Pacifics" are operating on a normal working over that extemely hilly section of the G.W.R. west of Newton Abbot, as well as along the level coast line past Dawlish. When that particular section was temporarily closed just before Christmas last year, on account of damage by high seas breaking over, G.W.R. trains were worked over the S.R. route between Exeter and Plymouth through Okehampton. The down "*Cornish Riviera*" diverted that way was hauled by two G.W.R. 2-6-0s, a "Saint" 4-6-0 also travelling via the S.R. During the test week in 1925, when L.N.E.R. "A1" No. 4474 was exchanged for G.W.R. 4-6-0 No. 4079 "*Pendennis Castle*," the former "Pacific" ran through without a stop from Paddington to Plymouth. The only Swindon 4-6-2 of years ago, No. 111 "*The Great Bear*," did not run west of Bristol.

Farewell to the Wantage Tramway

The Wantage Tramway, Berkshire, the last of Britain's very few roadside steam railways, has run its last train and is in process of being liquidated. Steam light railways, often of narrow gauge, laid alongside public roads used to be fairly common on the Continent of Europe, but such a line is most unusual here, particularly within 60 miles of London.

This Wantage railway of standard gauge ran for the most part alongside the public road from Wantage Road Station on the G.W.R. main line, to Wantage, 2½ miles away, conveying goods as well as passengers and parcels. Since 1925 freight only had been handled, as bus services swallowed



A "Mountain" semi-streamlined locomotive of the C.N.R. designed for fast passenger service. Photograph by courtesy of the Canadian National Railways.

up the passenger traffic. One of the funny little tall-chimneyed 0-4-0 tank locomotives retained on the line to the last was a veteran indeed, having been built by George England in 1857 and little altered to this day, apart from the addition of a large cab. It was originally on the Sandy and Potton Railway, Bedfordshire, passed into the hands of the L.N.W.R. in 1862, and was purchased from Crewe for the Wantage Tramway about 1878. There were also some small enclosed steam tram engines.

Naming of "West Country Pacifics"

We are informed by the S.R. that up to the time of writing only the following "West Country" class 4-6-2 locomotives have actually been named; Nos. 21C 101-4 in order, "*Exeter*," "*Salisbury*," "*Plymouth*" and "*Yeovil*;" Nos. 21C 106–9, "*Bude*," "*Wadebridge*," "*Padstow*" and "*Lyme Regis*;" No. 21C 112, "*Launceston*." It will be noted that in some instances the order of naming differs from that originally announced. It is the intention to apply names of West Country towns and stations to all the class in time, whether the engines may be working on that part of the system or not.

L.N.E.R. Track and Station Rejuvenation

During 1946 nearly 579 miles of L.N.E.R. lines are to be completely or partially renewed, including the laying of an additional 20 miles of flat bottom track.

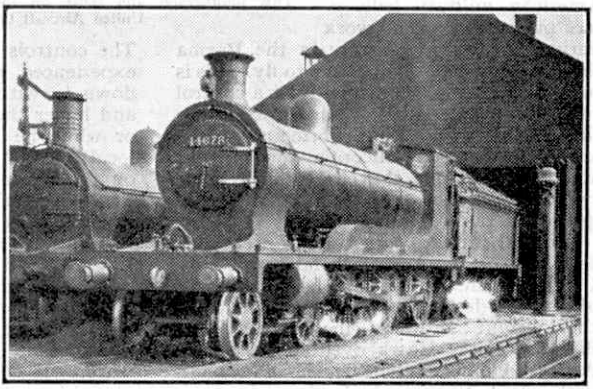
Over 300 passenger stations, goods depots or other buildings are to be repainted. Roofing glass removed soon after the outbreak of war as a safety measure is to be restored; this work of refitting glass has already commenced at King's Cross and Edinburgh (Waverley). Repainting alone will cost nearly £250,000. Among the stations in that particular L.N.E.R. brightening-up programme are King's Cross (Suburban), Newark, Retford, Lincoln, Grimsby, Ely, Colchester, Ipswich, Darlington, Manchester (London Road), Durham, Newcastle, (Central), Glasgow (Queen Street) and Upper Dunfermline.

L.M.S. Locomotive News

No. 6157 "*The Royal Artilleryman*" is now in traffic again, rebuilt with taper boiler, double chimney and new cylinders in latest style. This was the engine involved in the Bourne End derailment on 30th September last. No. 6104 "*Scottish Borderer*" is, we understand, now being similarly modified.

New locomotives placed in traffic during the four weeks ending 23rd February last were: Class "5" mixed traffic 4-6-0s No. 4923 allocated to Blackpool (24E); Nos. 4924/5, 4949 to Accrington (24A); Nos. 4926, 4948 to Southport (23C); Nos. 4927, 4947 to Rose Grove (24B). It will be noted that these sheds are all in Lancashire, on the Central Division. New 2-6-4Ts ex-Derby Works, class "4P," were Nos. 2219–20, to be shedded at Plaistow, on the Tilbury and Southend section of the Midland Division.

The following withdrawals are announced: No. 25674 "*Scott*" of the "Prince of Wales" inside cylinder 4-6-0 express type; No. 14678 "*Gordon Castle*," illustrated here, which belongs to one of the earliest of British 4-6-0 classes instituted for the former Highland Railway in 1900; No. 759 of the Midland first "Belpaire" boilered 4-4-0, class "3" series; No. 17908, one of the Caledonian 5 ft. 9 in. mixed traffic 4-6-0s with 170 lb. per sq. in. boiler pressure, this particular class being now extinct. Midland 0-6-0s withdrawn are "3F" No. 3316, "2F" Nos. 3141, 3343, 3470, 3478, 3666 and 3699. L. and Y. "3Fs" Nos. 12149, 12254, 12340, 12383, 12436 and 12606 are withdrawn.



Former Highland Railway 4-6-0 "Gordon Castle," later L.M.S. No. 14678, the withdrawal of which is announced this month. Photograph by H. C. Casserley.

The Helicopter To-day

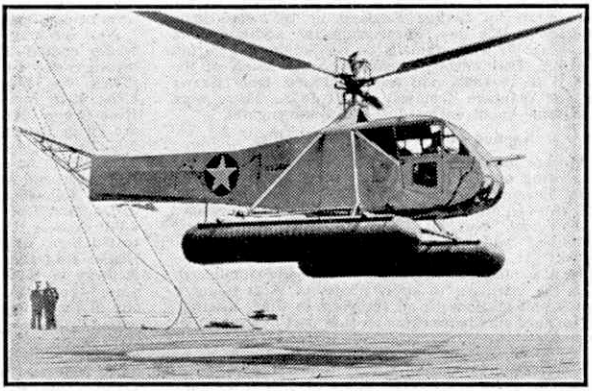
By John W. R. Taylor

FRIENDS often ask me if I think that aeroplanes will ever become as popular as motor-cars in this country. They seem quite disappointed when I reply that, in my humble opinion, the answer is "No." There are several good reasons for this belief. For instance, Britain is a small country and distances between towns are small. The peacetime railway services are good, and, consequently, by the time a passenger has travelled by road and rail to an airport, flown to another and then gone on from there to his destination, he might just as well have travelled by rail or road in the first place. Then there is the question of safety. Almost anyone can drive a car, but the thought of dear old grandfather "shooting up" Number 5, Acacia Avenue in a "Spitfire," or even of Aunt Ermintrude in an "Auster," is a little frightening.

The whole situation is different abroad, in Australia, Canada or the Western and Central States of America. There is plenty of open space and forced landings present fewer difficulties. But there is still one important ray of hope for the future of private-owner flying in Britain—the helicopter.

At the moment, although American military helicopters put in some good work during the war, especially in the Burma theatre, they are still not easy to fly. This is because the simple controls—just a control column, "rudder bar" and throttle—are rather sensitive. But enormous strides are being made in helicopter development and it is probable that the next year or two will see the evolution of a family 'plane on these lines.

The advantages of a helicopter over an ordinary aeroplane are fairly obvious. Until it came along, the basic principle of aircraft design had changed little since the Wright Brothers made their first flight at Kitty Hawk over 40 years ago. An orthodox aeroplane is still a machine with rigid wings which depends upon swift forward motion supplied by an engine and propeller to make it fly. The resulting need for longish airfields and personal flying skill has put the average man and woman in the back seat of to-day's aeroplane. The helicopter has changed all that. The name is derived from two Greek words—*helikos* (spiral) and *pteron* (wing) and that is just about what it is. It has no rigid wings, instead it has long narrow rotating wings, or rotors, on top which do everything done by normal propellers, wings and control surfaces. Simply by varying the position of the rotors by means of the control column and "rudder bar" the helicopter can be made to go straight up and down, forwards, sideways or even backwards.



A Vought-Sikorsky YR-4 helicopter landing on a platform 40 ft. square. This photograph and those on the opposite page are by courtesy of United Aircraft Corporation, U.S.A.

The controls are, in fact, so fine that an experienced pilot can bring a helicopter down to within a few feet of the ground and hover there while a wheel is changed, or while he picks up a basket from his local grocer. Another variant of this is shown on the cover of this issue—quite an idea for future smash-and-grab merchants!

Because of the helicopter's ability to fly straight up or down it needs no airfield. It can land in any forty-by-forty-foot area, whether on top of a house, on the back lawn or at the bottom of a quarry. With rubber pontoons instead of wheels it can land in mud or snow, on ice or water. If a helicopter pilot is caught in a sudden storm he can thus sit down practically anywhere until it is over or fly along slowly a few feet above the

A Vought-Sikorsky XR-5 helicopter hovering a few feet above the ground.

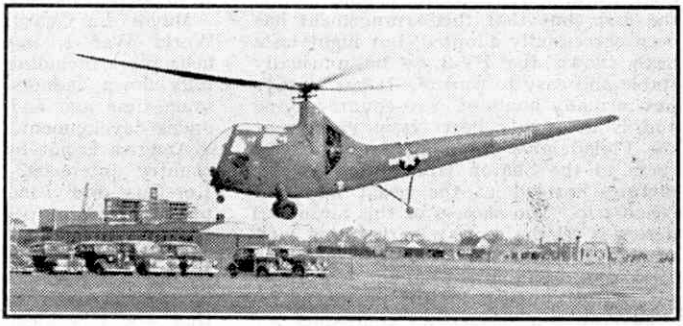
ground in weather that would ground other aircraft. Indeed the perfect aeroplane for the private owner would seem to be a small three or four-seat helicopter with "folding" rotors, that could be kept in a small garage and in which, when desired, the engine could be switched over to drive road wheels instead of the rotors, so that the helicopter could be used as a car in town.

If this dream becomes a reality, and there seems little reason why it should not, much of the credit may be due to a young American lad named Stanley Hiller. When he was only 16 he designed a special control system for helicopters that dispensed with the need for a tail rotor on a long and otherwise useless tail boom. Instead his "Hillercopter" is only 12 ft. long and is powered by a 90 h.p. Franklin engine driving contra-rotating rotors 25 ft. in diameter.

By using this special control system Hiller seems to have solved many of the snags connected with early helicopters. At any rate Henry Kaiser, the American ship-building genius, heard about the aircraft and asked Hiller to demonstrate it to him. Then, after only five minutes instruction on the ground, Kaiser flew it alone, which gives a good idea of the Hillercopter's ease of control. Kaiser was so impressed that he bought the patent of the control mechanism on the spot and engaged Stanley Hiller to design first a four-seat 250 h.p. military helicopter and then a two-seat 125 h.p. private-owner version. No doubt the Hillercopter will need a lot of development before it is on sale in large numbers to the public, but the prospects opened up by it are most promising.

Igor Sikorsky, who has been building helicopters since 1910, is also busy on new designs. His R-4 B, shown on our cover by courtesy of *"The Aeroplane,"* was the first helicopter in the world to go into production and since then he has produced improved versions known as the R-5 and R-6. The R-4 Bs, which saw service in Burma and over the Atlantic, were rather crude but efficient aircraft based on the VS-300 prototype, described in the June 1944 *"M.M."* Several of them are flying in this country, powered by 180 h.p. Warner "Scarab" engines. The R-5 and R-6 are much better streamlined and have bigger engines, and, consequently, improved performance. Their main undercarriage wheels are carried on single arms instead of the bedstead like arrangements of the R-4 B.

The R-5—the biggest Sikorsky to date—has a 450 h.p. Pratt and Whitney "Wasp Junior" engine and cruises at about 100 m.p.h. Its rotors have a diameter of 48 ft. The crew sit in a "glasshouse" in the nose, which gives them excellent all-round vision. The pilot of the R-6 has an even better view

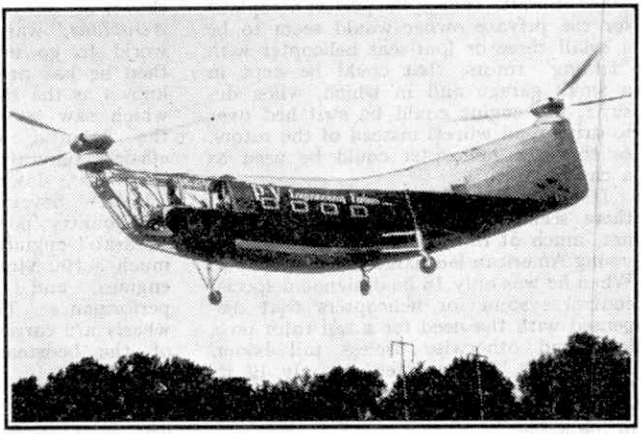


Another Sikorsky helicopter. An XR-6 machine hovering near the ground.

as the entire nose of this helicopter consists of a single plexiglass moulding. It has a 245 h.p. Franklin engine and a rotor diameter of 38 ft. The tare weights of the R-5 and R-6 are 2,735 lb. and 2,016 lb. respectively, both of which are satisfyingly low compared with orthodox aircraft. A good idea of the capabilities of these helicopters was given in 1944 when Col. H. F. Gregory of the U.S.A.A.F., with a passenger, flew from Washington to Wright Field, Ohio—387 miles—in 4 hrs. 55 min. This not only set up a new helicopter non-stop distance record but, as the route took the aircraft over the Alleghanies, was also the first time a helicopter with a crew of two had flown at over 5,000 ft.

The latest helicopters have a better performance than this, and Sikorsky has announced that he is now working on a larger machine that will be useful for air taxi work. One such helicopter has already been built by a newcomer to the ranks of helicopter constructors, the P.V. Engineering Forum of America. Their PV-3 is the largest helicopter yet flown, with a fuselage length of 48 ft. and accommodation for a crew of two and ten passengers. The most interesting feature of the PV-3 is that its two contra-rotating rotors are mounted in tandem, one at each end of the fuselage, and are driven through shafts from a single 450 h.p. Continental-Wright R-975 engine. It is the first time that this arrangement has been successfully adopted, but flight tests have shown the PV-3 to be unusually stable and easy to control. It has already put in many hours of cross-country flying and is used to collect Navy visitors at the Philadelphia Navy Yard and deliver them to the Sharon Hill factory in five minutes instead of the usual half-hour coach trip. The success of this ambitious design is all the more remarkable in view of the fact that the PV-3 flew in March 1945, only 13 months after the U.S. Navy placed the contract for the prototype.

Several other American companies are developing helicopters, including the Bell Aircraft Corporation, makers of the "Airacobra" and "Airacomet" fighters. Mayor Fiorello La Guardia of New York paid a special visit to Bell's Niagara Falls factory last year and was given a ride in one of the two-seat experimental models, which was piloted by Bell's chief helicopter test pilot Floyd Carlson. Afterwards he said: "It was a wonderful experience, entirely different from any other flying I've done. The helicopter gives you a feeling of complete assurance, and I can see that once these new kinds of aircraft are fully developed they will provide a kind of flight we never had before. They would be very, useful, for example, for travelling between airports and municipal centres. We will have to do a lot of testing under varying conditions to develop all the possible uses, but I have no doubt that the helicopter is going to be an important part of our aviation picture."



A new type of helicopter. The PV-3 designed for the U.S. Navy and Coast Guard air-sea Rescue work.

Mayor La Guardia, himself a pilot in World War I, saw several other Bell helicopters, including one that was successfully flown indoors at a demonstration some time ago and a larger model still under development.

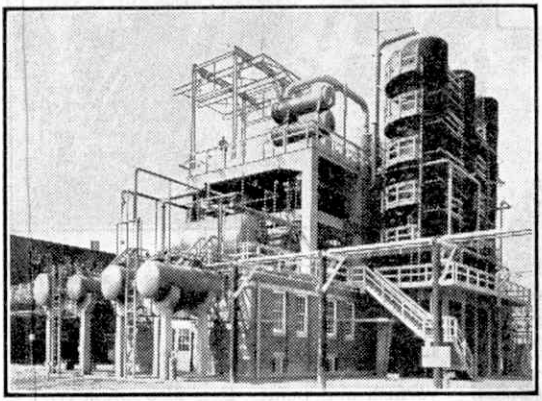
America is not by any means the only country interested in helicopters. The Russians and French have several interesting prototypes flying and here in Britain development work is proceeding quietly but very satisfactorily. The Bristol Aeroplane Company, for instance, is working on a neat helicopter air-taxi that would be ideal as a light feeder line machine to serve

(Continued on page 216)

Rubber from Potatoes and Coal

By H. F. Howson

IN this modern age we walk on rubber, ride on it, sit on it, wear it and perhaps sleep on it. One might almost say that without it nations would starve, for road transport would be paralyzed and food would not reach the markets. The Allied Nations were afraid of this when Japan overran all the rubber growing countries, and the loss of natural rubber forced us to develop a substitute. This was done with so much success that for some uses synthetic rubber is now preferred to the natural rubber.



The recovery building of a United States Government rubber plant built and operated by the B.F. Goodrich Company, Louisville.

Your new cycle inner tube may be rubber in name only. Probably it is made from coal, limestone and salt, or conjured from crude oil! "Conjured" is an apt description, for to produce elastic rubber from such unlikely things as coal and petroleum smacks of magic. And if this is not sufficiently remarkable, then it can be added that quantities of rubber have been derived from potatoes, corn, barley, beet, sugar and wine! But the basis of present-day synthetic rubber is acetylene.

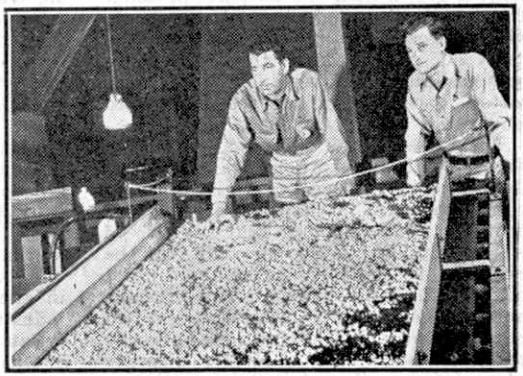
To the layman the works that produce components of synthetic rubber have every appearance of mystery. They are in effect large models of a chemical laboratory, where processes go on unseen inside furnaces, or in huge steel towers, and the only signs of activity are wisps of steam issuing from valves and pipes. To attempt to describe in detail these processes would probably confuse and bore the reader, but it is possible to give a general idea in a few words.

Acetylene is a basic ingredient obtained mostly from calcium carbide, which was used in the old-fashioned cycle lamps, and certain other sources. The carbide is produced from a mixture of coke and limestone, burned at a high temperature in electric furnaces, and it yields acetylene on the addition of water. In one process the gas is subjected to various chemical treatments that convert it progressively into chemicals known as acetaldehyde and aldol, and finally by de-hydration the liquid aldol is converted into a gas called butadiene. Methyl butadiene is found in natural rubber, and by a reverse process the manufactured butadiene can be converted into rubber, or something very near to it.

Now we come to petroleum or crude oil, that wonderful liquid from the depths of the Earth that has surprised us by the astonishing number of different products it has yielded when broken down. Eighty years ago only the kerosene in it was valued for lighting purposes. The other parts of crude oil, such as motor spirit and what we now know as aviation spirit, were thought dangerous and thrown away. Then came the motor car, and petrol became the most important derivative of petroleum, as it is still.

In the petroleum industry the word "cracking" has been introduced, and this suitably describes the separation of crude oil into its many parts. A cracking plant actually converts constituents that boil at high temperatures into fractions that boil at lower temperatures, such as motor spirit. There are so many processes by which these chemicals are changed into synthetic rubber that the very names and chemical reactions would lead us into deep water. Butadiene and isoprene are two of the raw materials obtained, and the former yields a rubbery, spongy material when it is treated with a reactive chemical. When a "filler," perhaps carbon black, is added, a rubber can be obtained that bounces like a tennis ball.

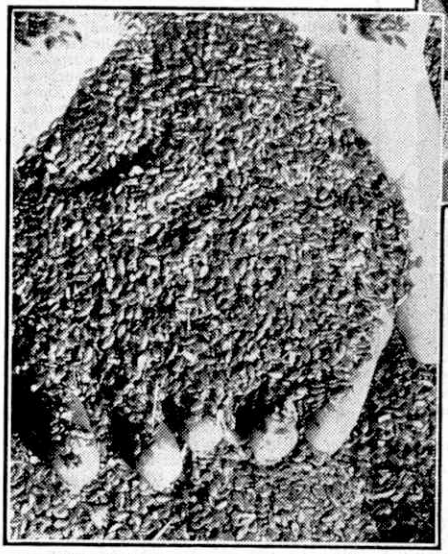
Mention should be made here of the "natural gas" that exists sometimes in pockets over oilfields, and when tapped blows off in a spectacular manner. Much of the gas is harnessed now, and it is "stripped" for petrol. Here, then, is an enormous amount of potential rubber, for this gas also will yield rubber. Regarding potatoes, corn, beet, sugar, etc., the starchy raw material is treated to give a sugar solution. The sugar is fermented and the resultant alcohol when distilled (*Continued on page 216*)

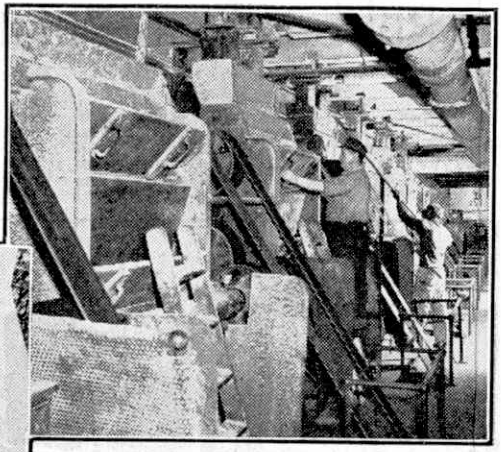


Flocs or crumbs of Buna S synthetic rubber. Photograph by courtesy of the United States Rubber Company.

Linseed Oil and Linen from the Flax Plant

By M. Lorant





On the left is a handful of the tiny flax seeds from which linseed oil is pressed. Above is a battery of five-roll grinders that crush the seed into meal ready for the extraction.

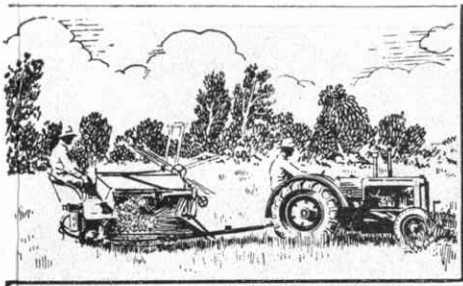
ONE of the most pleasant sights in the world is a field of flax in full bloom, looking like a lake of delicate blue colour as its flowers nod in the breeze. The flax plant is grown with two purposes in mind. The first is the production of seed, from which linseed oil is pressed; the second is its yield of the fibre that eventually becomes linen. Of vegetable fibres only cotton exceeds flax in the extent to which it is used.

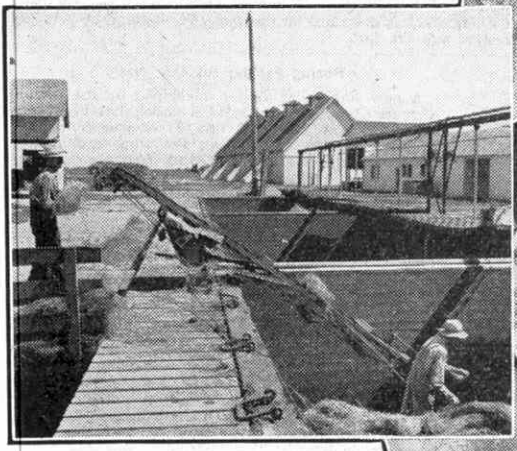
The flax seed is a very small one, as is shown by the illustration of a handful of these seeds on this page. It is brown in colour and oval in shape, and good seed contains up to 40 per cent. of oil, of which from 25 to 30 per cent. can be extracted by pressure. In making linseed oil from the seeds, these are first crushed, and the best quality oil is then pressed out in the cold. The application of pressure under heating yields a further quantity of an inferior oil, and it is interesting to find that the meal left after the oil has been extracted is used as food for cattle, so that no part of the seed is wasted.

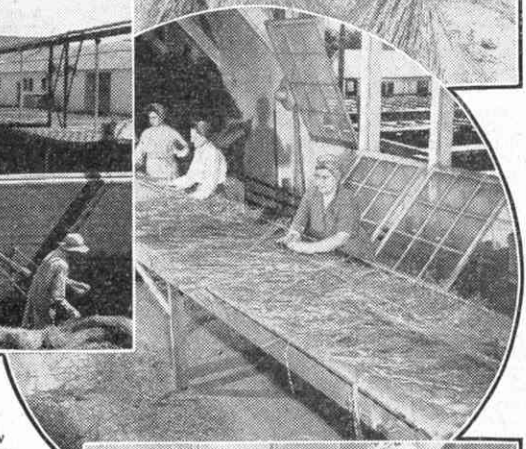
Linseed oil finds use in the making of varnish and paint. It is also employed in giving protective coatings to a wide range of machines such as tractors and cultivators and to storehouses and other equipment. It finds application in the production of soap, adhesives and printing inks, and in processing textiles and leather, while it is used on a very large scale in the production of oilcloth and linoleum.

If seed only is wanted from the flax plant this is harvested when the seeds are brown and ripe, but when flax is required the plant is pulled before they are mature. The pulled flax is dried and freed from the seeds, after which it is "retted," that is soaked in water in tanks, pools or rivers in order to free the fibre from the decaying woody part of the stalk, an action in which bacteria play a part. Then it is spread out to dry and bleach. The woody portions are next broken up by passing the flax between grooved rollers. This breaking is followed by scutching, in which the fibre is separated ready for combing out, or "heckling," the first stage in the production of linen.

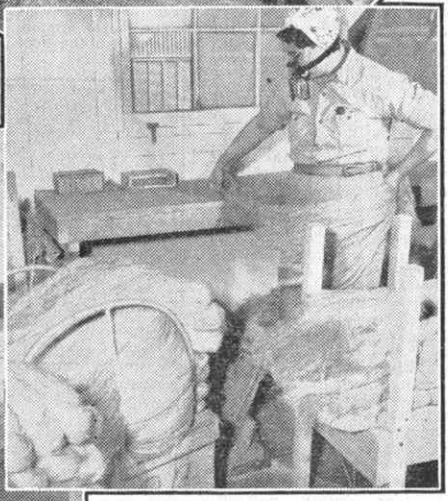
Flax is grown in many countries, and in the British Isles the flax and linen industry is chiefly centred in Northern Ireland. The growing of flax is increasing extensively in the United States, and our illustrations show stages in the production of linseed oil and flax in that country.

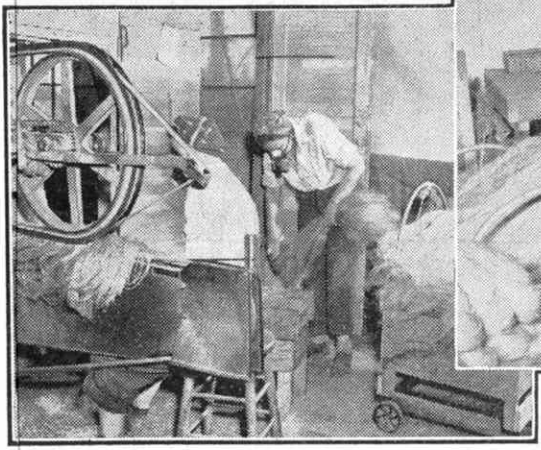




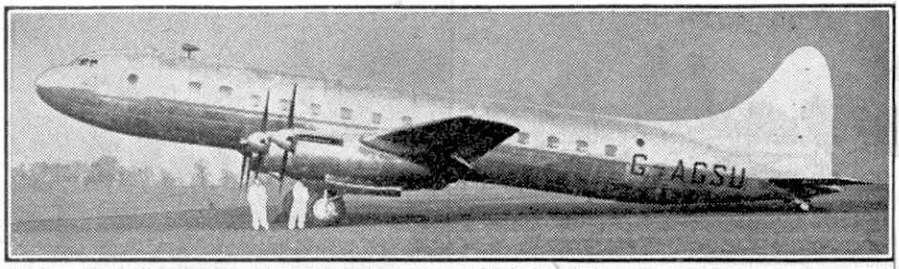


Steps in preparing fibre from flax plants. Above are tanks in which the plants are reted. On the right the top illustration shows the retted flax straw set up to dry. Below this the straw is spread out on a long table on it way to the scutching machines, seen in the bottom left illustration, which loosen the woody parts from the fibre.





The scutched straw is combed with a hackle to separate the short fibres, which are graded and prepared for spinning.



The Avro "Tudor" II, latest and largest British air liner, which is described on this page. Photograph by courtesy of A. V. Roe and Co. Ltd.

Air News

Avro "Tudor" II Largest British Air Liner

Britain's newest and largest air liner, the Avro "Tudor" II, flew for the first time at Manchester on 10th March last. This machine, embodying many features of construction combat-tested in the "Lancaster" bomber, and with the wings and engines of the later "Lincoln," will bring new standards of reliability and performance to Empire air routes.

The four 1,770 h.p. Rolls-Royce "Merlin" engines of the new air liner give it a top speed of 325 m.p.h. at 20,500 ft., and an important safety factor is that it can climb to 23,400 ft. with full load on only three engines. Take-off performance too is exceptional, as the "Tudor" II, which weighs 34 tons, is airborne after a run of less than half a mile. It has a wing span of 120 ft. and is 105 ft. 7 in. long. The 11 ft. dia. fuselage is cylindrical to facilitate pressurisation at high altitudes, and has a useful volume of 4,020 cu. ft. entirely free from restrictive structural members, so that a wide variety of interior layout schemes is available to operators. A good point is that the tailwheel type of undercarriage, combined with the small ground clearance of the rear of the fuselage, means that the entrance door is close to the ground, unlike some American transports in which the door towers some dozen feet above ground level.

As a 60-passenger air liner the "Tudor" II has a range of 1,850 miles at 230 m.p.h.; reduction to 40 passengers increases the range to 2,450 miles. Complete dining facilities are provided, full course meals being served from a fully equipped kitchen. The lounge deck adjoining. the bar has windows specially designed to give an unobstructed panoramic view. Alternatively, as a freighter, the machine has ample room for nine tons of cargo, which can be carried 1,100 miles at 200 m.p.h.

The first production "Tudor" IIs are already taking shape on the Avro production line, and between 40 and 50 of these machines will be delivered by the end of this year. Others are to be built in A. V. Roe's Canadian factory, and the Government-owned plant at Melbourne, Australia. Together with the "Tudor" Is, designed for B.O.A.C.'s transatlantic route, the "Tudor" IIs will put Britain right back in the front line of world airline operators. J.W.R.T.

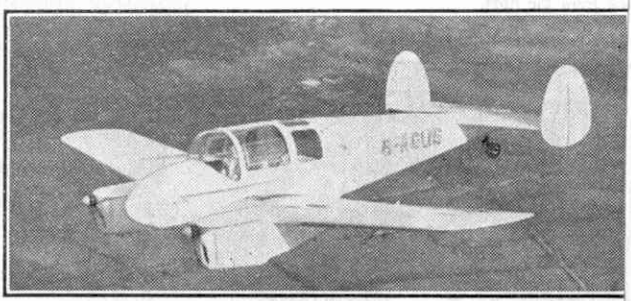
Boeing Fighter for U.S. Navy

A new single-seat fighter developed by the Boeing Aircraft Company for the U.S. Navy, has been test flown for more than 100 hrs. It is armed with six 20 mm. cannons mounted in the wing and sighted by remote control, and if desired six .50 calibre machine guns can be substituted for the cannons without any structural change in the aircraft.

The new fighter is known at present as the XF8B–1. In addition to being used as an ordinary fighter aircraft it can be employed as an interceptor, as a bomber with a 6,400 lb. bomb load or a torpedo carrier with two 2,000 lb. torpedoes, or as any combination of these types. It has a 3,600 h.p. Pratt and Whitney air-cooled engine, and is said to have a speed "considerably in excess of 450 m.p.h." and a service ceiling comparable to that of the Boeing "Flying Fortress" and "Superfortress" heavy bombers.

A Fine Record

Avro "Lancastrian" air liners continue to break long-distance records with amazing frequency. The latest record flight by "Lancastrian" VM–726 of R.A.F. Transport Command, captained by New Zealander Squadron Leader John Adams, has brought New Zealand within 2½ days of Britain. The machine left Northolt at 0131 hrs. on 6th March last and landed at Wellington on 8th March, 62 hrs. 5 min later. The actual flying time for the 12,500 miles was only 55 hrs. 15 min. Stops were made at Shaibah

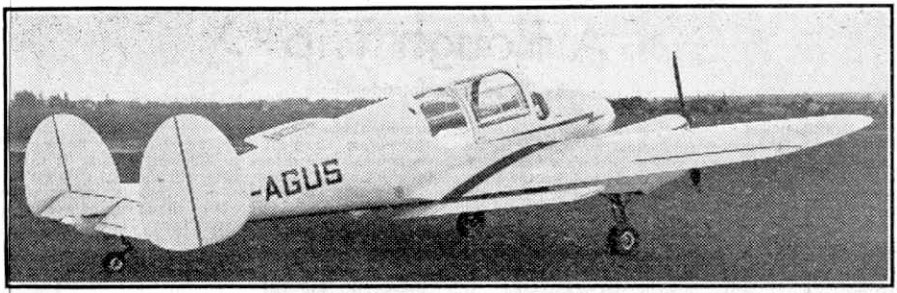


Another new British type, the Miles "Gemini" 4-seat cabin monoplane. This photograph and the upper one on the next page are reproduced by courtesy of Miles Aircraft Ltd.

Negombo (Ceylon), the Cocos Islands, Guildford (Australia) and Melbourne. J.W.R.T.

* * * *

Vancouver, Canada, will celebrate its diamond jubilee next July, and events being planned for the occasion include a London-Vancouver air race, with a prize of £5,000 for the winner.



A ground view of the Miles "Gemini." Its two Cirrus "Minor" II engines give it a top speed of 150 m.p.h.

The Miles "Gemini"

The recent lifting of the ban on civil flying has once more focussed attention on private-owner aircraft. Since the end of the war official emphasis on the design and construction of air liners had tended to overshadow the smaller machines, but there is little doubt that in this class of aircraft too Britain can certainly deliver the goods. One of the best of the new light 'planes is the Miles "Gemini," illustrated on this and the previous page.

The "Gemini" can best be described as a twin-engined version of the Miles "Messenger," one of which was used extensively by Field Marshal Montgomery during 1945. It is a four-seat, low wing all-wood monoplane with a retractable undercarriage, and fitted with two 100 h.p. Cirrus "Minor" II engines. The engines are underslung to facilitate servicing and to provide an unbroken airflow over the top surface of the wing. The two fuel tanks, which are carried in the wings, are of the flexible, "crash-proof" type, and carry enough fuel for over six hours' flying at a cruising speed of 130 m.p.h. The top speed of 150 m.p.h. with four passengers is exceptional on only 200 h.p.

This machine has a wing span of 36 ft. 2 in., is 22 ft. 3 in. long, and can land and take off in 125 yd. with full load in a 5 m.p.h. wind. It certainly seems a most promising design, and brings nearer the day when flying will be cheap enough, and safe enough, for all. J.W.R.T.

Night-Flying Air Services to Speed-up U.K. Mails

The introduction of night-flying air services as part of a scheme to speed-up internal postal services in the United Kingdom was forecast in a recent announcement by the Postmaster-General. Priority will be given to services of this kind between England and Ireland, and according to present plans the first of these night services to be introduced will operate between London, Edinburgh and Glasgow, and between Crewe, Belfast and Dublin. There will be cross-country night-flying services connecting with the long-distance air routes and operating between Bristol, Swansea, Peterborough, Newcastle and Carlisle, and between Crewe, Birmingham, Norwich and York.

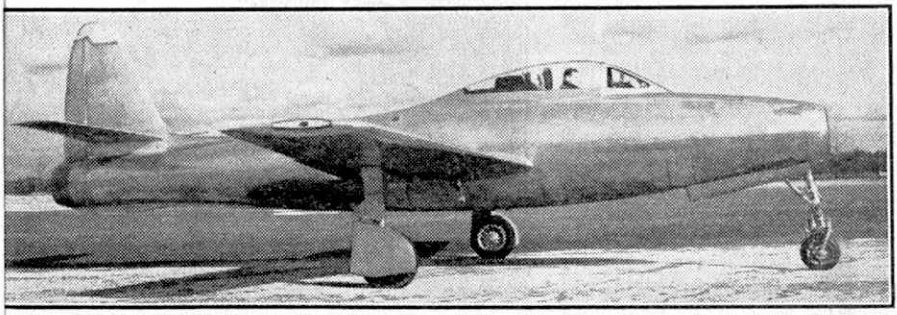
The aim of the scheme is to guarantee morning delivery in any part of the British Isles of letters posted overnight, and it is hoped that the first services will come into being within a year.

The Republic "Thunderjet"

The latest of the U.S. Army Air Force's new jet fighters is the Republic XP-84 "Thunderjet," shown in the lower photograph on this page. This machine flew for the first time on 28th February last. In general layout it is very similar to the original Gloster-Whittle E.28/39, as the air for its jet engine is taken in through its nose and exhausted at its tail end.

Unlike previous American jet fighters the XP-84 has an axial flow type of jet unit, which permits much slimmer lines than the more usual Whittle centrifugal type. This is, in fact, the first indication that the General Electric Company of America are developing axial-flow engines, although most German jet units were of this type and, in Britain, Metropolitan-Vickers have been developing them since 1942.

The XP-84 was designed and built under the joint supervision of technicians from the Republic Aviation Corporation and the U.S. Army Air Technical Service Command, Wright Field. When completed the machine was dismantled and flown in a C.97 "Stratocruiser" transport aircraft from the New York factory to Muroc Field, California. Performance of the new jet fighter is reported to be excellent, but no figures have yet been released. J.W.R.T.

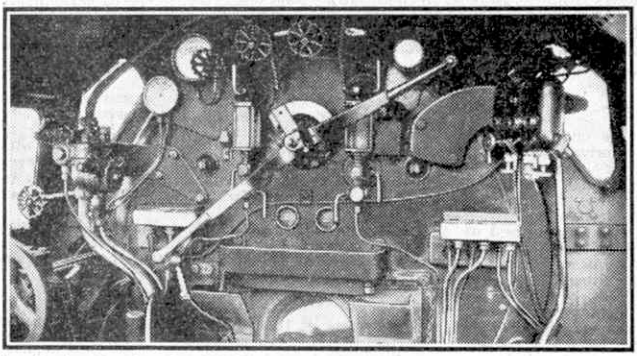


The Republic XP-84 "Thunderjet," shown here, is the U.S. Army Air Force's latest jet fighter. Photograph by courtesy of Republic Aviation Corporation, U.S.A.

A Rough Trip

By "Shed Superintendent"

"A ROUGH trip." That is the description commonly given by enginemen to one of those journeys, all too frequent now-a-days with war-weary engines, when it has been a struggle to keep the train moving at its scheduled pace. With a good engine and good coal, one normally expects an engine to maintain the boiler pressure within a few pounds of blowing-off point, say, 220 lb. The boiler feed, in other words the injector, can be put on at the beginning of the journey and set to supply fresh water to the boiler at the rate it is being used, with little variation in the level of water in the water-gauges. With a fire in good condition at the start, it is only necessary to add fresh coal at two-minute intervals to keep up the full pressure and so give the engine sufficient energy to keep the train to timetable speed.



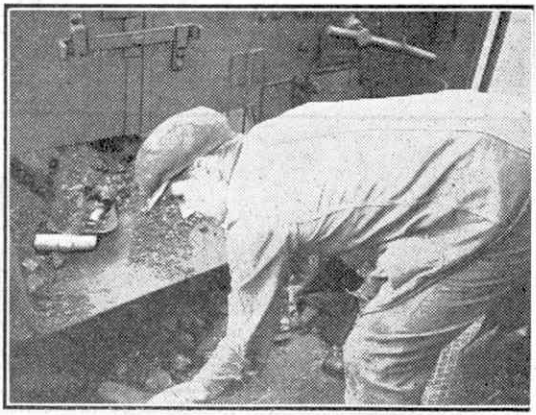
A cab view showing the fire-hole, water and pressure gauges and other fittings. Photograph by O. S. Nock.

A rough trip usually means trouble in the early stages of the run. The pressure drops back from 220 to 200, 190, 180; the driver eases the regulator and looks toward the fireman, who has already shut off the water-feed and is peering into the firebox for signs of leakage or improper combustion. He then takes a long fire-iron from the tender rack and runs it through the fire to clear it. To add fresh coal at the moment would be useless, as fresh coal absorbs heat before it starts to burn and chokes a dull fire.

Meanwhile, with the water-feed shut off, the water level in the boiler is dropping every minute and that cannot go on for long, or the firebox will be scorched and the fusible plugs will melt, stopping the engine altogether. The pressure, however, is steady at 170 lbs. by now and the injector is started again to get a little water back into the boiler. The train, perhaps, is running on a stretch of level road and the engine gets into her stride a bit, though still short of full pressure. The fire is still in poor shape and the fireman is selecting some choice pieces of coal from the tender and placing them carefully in the bright parts of the fire. If he can get the pressure round to normal there is a chance that, by carefully nursing the engine, the next stopping place may be reached without serious delays to following trains. If things go from bad to worse, they will have to stop on the road and have a "blow-up," that is, revive some of the lost pressure by use of the steam-blower while standing. The driver may stop at a convenient signal-box and ask for another engine to stand by to assist him from the next locomotive depot en route, or there may be a suitable engine at some junction which performs the double duty of shunting and of being available to come to the rescue of main-line trains.

The driver will decide what to do according to the nature of the road ahead of him. If there is plenty of hard work to come, in the shape of gradients, he will be wise to take an assisting engine, but with a favourable route he probably decides that "All is not lost" and that he can still make something of a show. Such circumstances bring a display of real skill on the part of the engine crew. Every slight down-grade or signal check provides an opportunity to get back some of the lost steam pressure, and the fireman is continuously on his feet, firing judiciously and adjusting the water feed. He may even turn off the train heating at times, to save a little precious steam.

Eventually the end of the journey comes in sight. Both enginemen heave a sigh of relief and the driver looks at his watch to see, with satisfaction, that although he has lost 12 minutes on the schedule, he has not done so badly, after all. A simple case of S.O.S. (Short of Steam).



Sweeping up the dust and loose coal. A view looking toward the tender coal chute.

Of General Interest

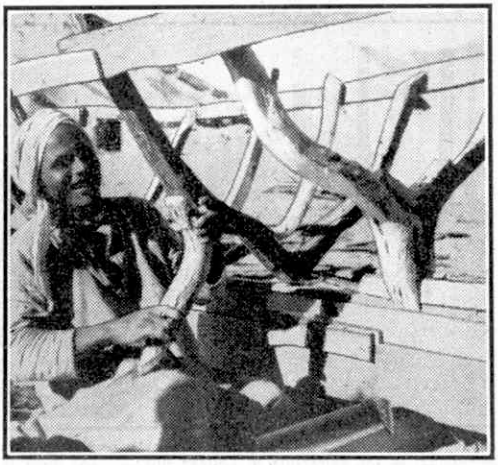
An Arab Boat Builder

While walking during the war along the shore of the Gulf of Suez, near Abu Zeniema on the west coast of Sinai, I came across an Arab fisherman leisurely rebuilding his small boat. I sat awhile and watched him at work, and as I did so I thought that probably the method of boat building he was using had changed little during the last thousand years. I had visited Aden a year or two previously and had seen there large sailing ships being built by much the same methods as my Arab fisherman was employing for his rowing boat.

I do not know how the fisherman's boat got into such disrepair as that shown in the accompanying illustration. I imagine that it was so old that most of the wood was rotten, or perhaps it may have been smashed by heavy seas. He had taken it to pieces most carefully, even saving the old nails, and when I saw him he had got most of the ribs in place. It was these ribs that really set me thinking. I remembered how the Aden builders had utilised naturally bent timbers for the ribs. Their wood was brought from East Africa, as apart from palm trees there was no wood for hundreds of miles around. My fisherman also used naturally bent wood, but he obtained this from groves of tamarisk bushes near by. Some of the ribs already in place were from his old boat; others had obviously been newly cut from the tamarisks. They were all naturally bent to the shape he required, and he had trimmed them roughly to give a flattish surface to which he could nail the planks. From the accompanying photograph it will be seen that the first rib is new and the second an old one.

Unfortunately neither of us could speak the other's language, so I could not ask him how he was going to replace the old planks forming the shell of the boat, which were stacked near by and were very rotten. I suppose he would search the shore for flotsam until he got enough, or he might obtain them by various means from a neighbouring manganese mine. As I left him, I compared his happy-go-lucky ways of boat building to the grim feverish activity of Western shipyards at that time.

F. L. NEWALL.



An Arab fisherman rebuilding his boat on the shore of the Gulf of Suez. Photograph by F. L. Newall.

A Reptile that Runs on Water

There is a crested lizard of tropical America that runs very much like a man, rearing up on its muscular hind legs and swinging its front legs as it dashes along at a pace far greater than that a man can achieve. This is the basilisk, which is strange and fearsome in appearance, with a high hood or crest and comb-like ridges on its back and tail. Its name is that of a mythical creature that could kill people by merely looking at them, but the crested lizards of tropical America are really quite harmless creatures. Few of them are more than 3 ft. in length, and the tail contributes more than half of this, but they look much larger when they are excited, for then their curious hoods are expanded.

The sight of the basilisk running in such a human manner is sufficiently astonishing, but it is even more amazing to find that it can run on water just as easily. It dashes down the bank of a stream or pond and continues to run across the surface of the water in exactly the same way as it does on land.

Why doesn't this lizard sink in the water? The explanation lies in its speed. It scales itself over the water at high speed in much the same way as a flattish stone can be made to skip along the surface of a pond, bouncing once or twice from it, when it is thrown almost horizontally. Its long tail helps it, serving as a rudder, and behaving also like the step on the bottom of a speed boat, which planes over the surface when at high speed. In this curious way the basilisk has been known to run over lakes nearly a quarter of a mile across.

A Prairie Preserve

The interesting discovery was made a short time ago that in the United States there is still a stretch of the old-time prairie. This has never been touched by the plough, and in it are prairie plants growing as they did when only Indians and bison roamed over the land.

There are neither Indians nor bison to-day on this stretch, which is only half a mile long. It is in fact a piece of land extending to a width of 100 ft. on each side of the Illinois Central Railroad north of Springfield, the capital of the State of Illinois, and it is being carefully preserved. In it the tall blue-stemmed prairie grass is still to be seen, together with many native flowering plants that to-day are very rare. One of the most interesting of these is the compass plant, the leaves of which point to the north and are said to have served as guides to pioneers. Others with picturesque names are the false bone-set, the partridge pea, which has pods only half an inch in length, and the lead plant, which earns its name by its metallic sheen.

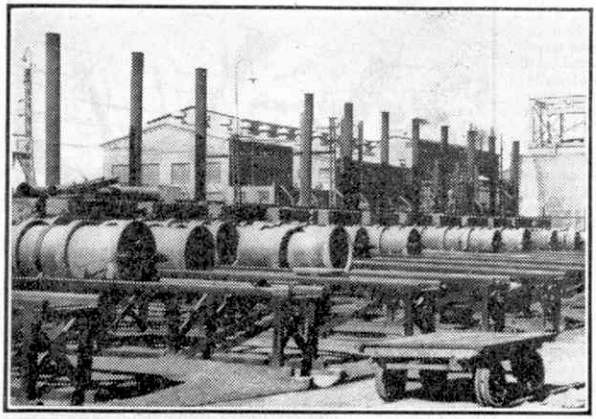
Camphor from the Pine Tree

Pine trees have long been a source of pitch and tar, which were so necessary to keep the old wooden sailing ships seaworthy. The tar was required to preserve the rigging from corrosion by salt spray, and the pitch was chiefly used with oakum for caulking seams. They are not the only products that the pine forests yield, however. From them come turpentines of various kinds, rosins and pine oils. Now camphor has been added to the list. This is not obtained directly, but pine tree products are the raw materials from which camphor is synthesised. In the past most of our camphor has come from a particular kind of laurel grown in China and Japan.

The Story of Iodine

IODINE is well known to every reader of the "*M.M.*" as a brown liquid that is put on cuts and bruises in order to prevent them from turning septic. To be strictly accurate we should call this liquid tincture or solution of iodine, because it is made by dissolving the element of this name in potassium iodide solution and alcohol. Iodine itself is usually in the form of greyish black crystals that look metallic. When they are heated they do not melt, but change directly into a rich violet vapour.

This characteristic vapour was the origin of the discovery of iodine in 1811. The discovery was a consequence of war, which always seems to speed up scientific work, although there is no doubt that the element would have been discovered later even if there had been no war. In the time of Napoleon the French were deprived of imported supplies of nitre or saltpetre with which to make gunpowder. Scientists were called in to find other sources of this chemical, and they set to work to construct nitre beds in which to produce it. One of the men concerned in this was Bernard Courtois, who had previously been assistant to a famous chemist.



An iodine plant in Chile, where the element is recovered as an important by-product in the extraction of Chilean nitrate. The illustrations to this article are reproduced by courtesy of the Iodine Educational Bureau.

The potash for the nitre beds came from wood ashes, which were scarce and expensive, so Courtois worked out a plan for using seaweed instead of wood. The seaweed was burned on the shores where it was collected, forming a heavy slag that was broken into lumps and carted to the factory. With this he made sodium nitrate in his nitre bed, and then transformed this into nitre with the aid of the potash from the wood ash.

Courtois' idea was to prevent waste of valuable potash, but it led to his discovery of iodine. He found that his vats became covered with thick insoluble material, and his practice was to clean them out by pouring sulphuric acid into them. One day he was using a stronger acid than usual and its action, with that of the heat applied, produced beautiful violet vapours. Courtois was astonished to see these, and the glittering crystals they formed on cooling, and he lost no time in collecting some of the remarkable new material. He made experiments with it himself, and later some of it passed into the possession of Humphry Davy, the famous British chemist, during a tour he made on the Continent in 1813. Davy revelled in the opportunity to make experiments with the new material and he soon proved that it was a new chemical element. A name was wanted, and the French chemist Gay-Lussac, to whom Courtois had sent his first samples, suggested that it should be called *iode*, after a Greek word meaning violet coloured. Davy was the first to use the English form of this name, the now familiar iodine.

Courtois gained little but fame from his discovery. When the wars came to an end in 1815 nitre was freely imported once more and his nitre-making business was ruined. He tried to recover his lost fortune by making iodine on a commercial scale, but this effort too ended in failure, for little was then known about iodine and there was no great demand for it. He was awarded a prize of 6,000 fr. for his discovery, but that did not go very far, and he died in poverty.

In the 135 years since iodine was discovered we have learned a good deal about it. One interesting fact is that it seems to be everywhere, for it is well spread throughout rocks, minerals and soils, and is found in the sea as well as on land. It occurs also in plants and animals. Nowhere is it present in large proportion, but it seems to play a very important part in life. For instance, there is no more iodine in a human being than is found in 10 drops or so of tincture of iodine bought from a chemist, but apparently the absence of this minute amount would be sufficient to bring about certain diseases. Most of our bodily iodine is present in the thyroid gland, which makes itself evident by swelling in the case of people suffering from the disease known as goitre. It has been proved that goitre is due to lack of iodine, and the disease is treated by medicines containing this element in order to supply the deficiency.

Courtois' discovery pointed to seaweed as the best source of iodine, and as the element became more important a regular industry was established for extracting it. Seaweed was burned for the production of soda for glass making long before the existence of iodine was known, but new chemical processes for making soda in large quantities from salt eclipsed the use of seaweed ash, or kelp, as it is called. When the demand for iodine increased the kelp industry revived, with one change—the substitution of deeper water seaweeds for those previously gathered, which were uncovered at low water and easily cut when the tide was out. The seaweeds now required were torn from the rocks by storms and cast ashore. They contained three to five times as much iodine as those previously used for making soda, but even then about 20 tons of fresh seaweed were required to make one ton of kelp. At best this could yield only 34 lb. of iodine, but unfortunately a proportion of iodine was often lost in the burning.

Improvements were made in the processes used, but slowly the iodine from the kelp industry had to give way to material from a much more prolific source—the huge caliche beds of Chile, in South America. Caliche is sodium nitrate, or Chilean saltpetre, and this is found in enormous quantities in a desert region in the north of the country. As a fertiliser it is invaluable, its use ensuring green fields,

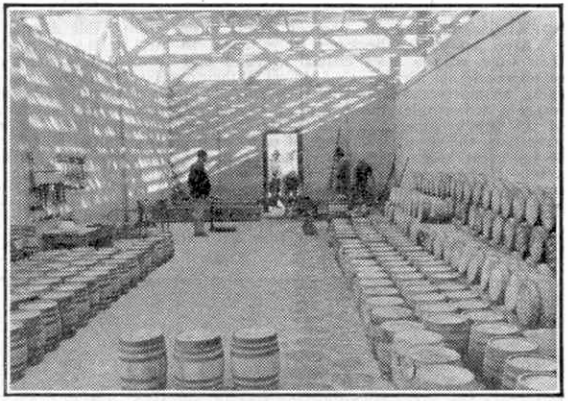
rich vegetation and life for crops of all kinds, and it is strange to realise that it is a product coming from a scene of desolation where it seldom rains and neither vegetable nor animal life can exist.

Where this caliche came from nobody knows, but it has been suggested that it is all that remains of a former sea in which were great masses of seaweed. The sea is supposed to have become isolated when volcanic upheavals created the Chilean tableland on which the caliche beds are found, and when the water evaporated the seaweeds underwent decomposition by bacteria, thus forming sodium nitrate. This suggestion certainly helps to explain why caliche contains iodine. The proportion is not large, the average being little more than one-tenth of one per cent., but the nitre deposits are so huge that here is a reservoir of thousands of tons of iodine.

For many years most of our iodine has come from this source. Chemicals introduced into the liquors formed by boiling the caliche with water cause the iodine to separate, and on further treatment this sinks to the bottom of the tank in which the process is carried on, from which it is taken out to be washed and dried. Finally it is purified by heating it and condensing the vapour by passing it through cooled pipes. There the iodine forms a solid mass in the lower parts, with fine crystals on the upper portions. The interior of one of these pipes is shown in the lower illustration on this page.

The demand for iodine has steadily increased since its discovery, especially since the beginning of the present century. In 1904 the total quantity of iodine used was 520 tons, but by 1940 this had increased to 1,548 tons. Formerly the greater part of the supply came from caliche, and the rest from seaweed, but since 1920 natural brines and mineral or volcanic spring waters in various parts of the world have provided increasingly large quantities. The three chief sources of this kind are the oil fields of the Dutch East Indies and California, and a group of mineral springs in northern Italy.

The largest and richest wells of the Dutch East Indies are on the north coast of Java, adjacent to a mountain range of volcanic origin. Some of the wells are 1,300 ft. deep, but others are less than 20 ft. in depth. In general the iodine is freed from the compounds in which it occurs by treating the brines from the wells with sulphur dioxide, the unpleasant smelling gas formed when sulphur is burned. The waters treated with the gas are passed through troughs in which bundles of copper wire are suspended, and there the copper unites with the iodine to form a compound that settles to the bottom. This is washed and dried, and is then exported to be converted into various pharmaceutical iodine preparations.



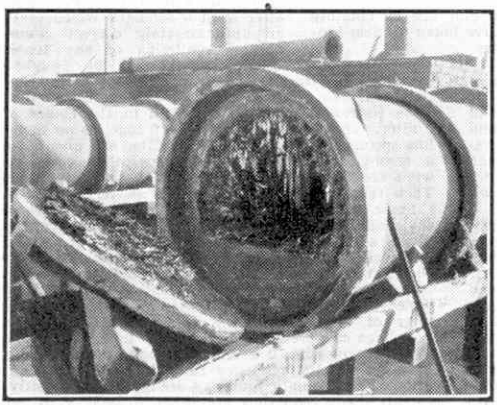
An iodine warehouse, in which this valuable product is kept under constant guard.

The Californian wells are in or near Long Beach, not far from the city limits of Los Angeles. The day of flush oil production in this region is over, and the flow from the wells now shows an increasing proportion of saline water, from which iodine is extracted. The Italian springs that yield iodine are in the neighbourhood of Parma, and their use has made Italy largely independent of foreign supplies. There are 17 of them, containing iodine in combination with magnesium.

It is interesting to find that iodine was used in medicine within a few years of its discovery. The pioneer in this appears to have been a Swiss doctor, Jean-Francois Coindet, who used it for curing goitre, and was awarded a prize of 3,000 francs for his work. The first time that what is now known as tincture of iodine was used appears to have been in 1839, when John Davies, a surgeon of the General Infirmary at Hertford, drew attention to its curative properties for wounds of all kinds. In war it was first used in the American Civil War, and there is a grim reminder of its value in the treatment of war wounds in the fact that the world consumption of iodine rose to more than 1,000 tons a year for the first time during the World War of 1914–18; before that time the average was 600 to 700 tons.

We have already referred to the various colours of iodine solutions. Colour compounds in which iodine plays a part are remarkably extensive in number. The best known is a blue one that it gives with starch. This is easily made by boiling a little starch with water and adding a drop or two of iodine to the solution after cooling. Immediately a very deep blue colouration is produced. The colour is lost on warming up, only to reappear when cooling again takes place.

This article is based on information given by the Iodine Educational Bureau.



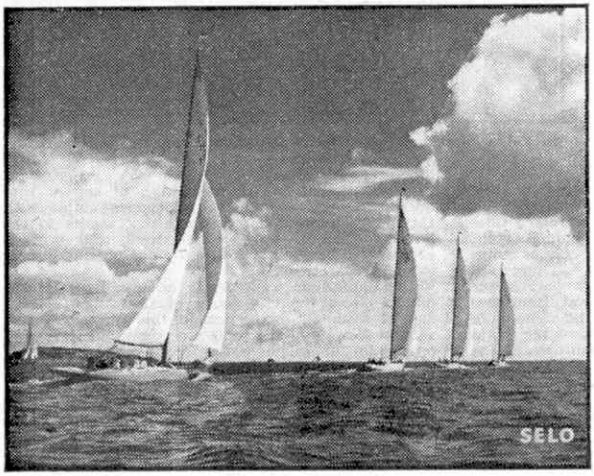
How iodine is condensed in the retorts of the iodine plant illustrated on the opposite page. There is a solid cake in the lower part and glittering crystals in the upper part.

Photography

Colour Filters for Landscapes

NEARLY all amateur photographers, once they have passed the beginner stage, begin to view their work with a more critical eye, and find themselves wondering why it is that almost all their outdoor shots, no matter how pleasing they may be in other respects, are complete failures so far as the rendering of the sky is concerned. No matter whether they have been the deep clear blues of early spring days, or the great fleecy masses of cloud standing against a blue background, so characteristic of the English summer, the result is always the same—a print in which the sky is represented by a blank white space.

A glance at the negative will reveal in many cases the interesting fact that cloud details have actually been recorded, which leads at once to the question as to why they are missing from the print. The answer is very simple, for if a closer examination of the negative be made, it will be noticed that cloud and sky, although clearly differentiated, are so exceedingly dense that insufficient light can pass through them during the relatively short time required for printing the foreground, to have any effect whatever on the paper.



A striking seascape illustrating the fine rendering that can be obtained with an Alpha filter in clear bright weather. Negative taken on Selo Fine Grain Panchromatic Roll Film.

How does it happen that landscapes, and outdoor scenes in general, produce results of this type? There are two main causes, of which the first is the fact that with such subjects the luminosity range, extending from bright sky down to deep foreground shadows, frequently exceeds the range which can be reproduced on a paper surface. Since in the ordinary course of events the photographer usually concentrates on obtaining a satisfactory reproduction of foreground objects or human subjects, which mostly occupy an intermediate position in the scale of luminosities, it follows that the sky portion, even if reproduced in the negative, will be so over-exposed as to be beyond the range of the print.

The second cause arises from the high sensitivity to blue, violet and ultra-violet radiation which is the characteristic of all classes of sensitised materials. Even with modern Orthochromatic (green sensitive) and Panchromatic (sensitive to all colours) materials, of which Selochrome and Selo H.P.2 films respectively are excellent examples, the blue sensitivity is so great that a satisfactory sky rendering is rarely possible.

Fortunately, a very simple means of overcoming this difficulty is available to every photographer in the form of colour filters, which are manufactured in a most comprehensive range by Ilford Limited. As their name implies, these are essentially transparent coloured discs which are placed in front of the camera lens in order to reduce the strength of certain radiations before they reach the sensitive surface of the film.

What kind of filter is required for improving sky rendering? The answer is very simple, since we must clearly reduce the amount of blue, violet and ultra-violet light entering the camera. This indicates the use of a filter whose colour may vary from a pale yellow, to a very deep yellow. It must be understood, of course, that since a filter works by absorbing actinic light, it is necessary to compensate for the loss by giving a longer exposure. A really efficient colour filter should interfere as little as possible, therefore, with colours other than those which it is specifically intended to absorb, so that the necessary increase of exposure is small in proportion to the amount of correction obtained.

A very useful and popular filter in the Ilford range, known as the Alpha, is pale yellow in colour, and multiplies exposures by as little as 1½ with panchromatic, and 2½ with orthochromatic materials. Its power of absorption is sufficient, however, to produce clear although not strong differentiation between cloud and sky, while at the same time it prevents that general over-exposure of the sky portion which places the negative beyond the range of the printing paper.

When a rather greater sky contrast is required, the ISO filter, which is a little deeper in colour, should be used. This filter is of a strength which gives an approximately correct monochrome rendering of sky tones, but it should not be assumed that it is therefore a universal landscape filter. Sky tones vary so much in depth from day to day that some judgment must be exercised in the choice of a filter. Thus, when skies are deep blue, as on many fine spring days, even the Alpha filter will give quite a strong contrast, but there are other occasions when the blue is pale and obscured by heat haze. Then the deep yellow Delta filter is recommended.

Some photographers are fond of those dramatic sky renderings, so popular in recent years with certain film studios, in which masses of white cloud stand out against almost black sky backgrounds. To secure these, it is necessary to use panchromatic materials in conjunction with filters which absorb not only violet and blue, but green as well, and a typical filter of the class is the Ilford Micro 5, orange.

Foliage can present a particularly difficult problem in springtime when it is very fresh and bright, showing in many cases a tendency to yellowish green coloration. Panchromatic materials are rather less sensitive to this shade than they are either to blue or to red, and it is helpful in certain cases, therefore, to use a pale green filter such as the Ilford Beta, which partially absorbs both the latter colours.

Club and Branch News

WITH THE SECRETARY

SECTIONS FOR SUMMER PURSUITS

Every Club can find some way of making the most of the warmer weather and longer nights that we can now expect. Last month I suggested a programme of summer excursions, and to these can be added such pursuits as cricket, photography, swimming, cycling and nature rambles. It is perhaps too much to expect that every member will be particularly interested in any or all of these, but all can readily be satisfied if special sections are organised for these outdoor activities.

Photographers should enjoy themselves more this summer than for the past six years or so, and a photographic section could provide a fine pictorial record of outdoor activities. This should be borne in mind when making plans. Photographs taken during a camping holiday or on an excursion, whether this is for business or pleasure, serve later as pleasant reminders of happy times. I hope that many such photographs will be taken during the coming summer, and that prints will be sent along for me to see and to reproduce in the Magazine if they are suitable.

GUILD AND CLUB AWARDS

Lone members can make good use of the outdoor season by wearing their badges regularly and keeping a lookout for others bearing the same distinguishing mark. In this way friendships are made and good Clubs are started. Recruiting should be kept going. Any member who brings in three others within three months is entitled to the Recruiting Medallion, supplies of which are now again available. A member who has already earned a Recruiting Medallion can have it engraved with his name and the words "*Special Award*" if he recruits a further three members within three more months.

I should like to remind Leaders of Clubs that the Merit Medallion is available for good work done during the Summer Sessions as well as for Club room activities in the Winter Sessions. Owing to war conditions this award has not been very prominent of late years, but I wish to see more presentations of the Medallion to members who have strengthened their Club in some way, such as by bringing in recruits, by introducing new and attractive programme items, by good model-building and generally by steady and efficient support of the efforts of Leaders to fulfil the aims and ideals of the Guild.

* * * *

The St. Oswald's M.C. is holding an Exhibition on Saturday, 25th May, at St. Oswald's Hall, Norbury, from 5-30 p.m. to 9-30 p.m. The charge for admission is 6d., children 3d.

Mr. W. T. Jaques is Leader of the St. Oswald's (Thornton Heath) M.C., which was affiliated in December 1935. He has now returned from active service and a long period as prisoner of war in Austria, and with the active support of other former officials is setting the Club on its feet once more. Details of an Exhibition to be held this month are given on this page.

CLUB NOTES

STAPLEFORD M.C.—Members have become interested in the construction of clock mechanisms, a Talk on which has been given by the secretary. Draughts, Chess, Table Tennis and other Games have been played, and the Lecture "*The Life Story of Meccano*" was greatly enjoyed. Club roll: 10. *Secretary:* P. R. Dennis, 36, Hickings Lane, Stapleford.

WINCHMORE HILL COLLEGIATE SCHOOL M.C.—The Club has been re-started after closing down for the war years. Meetings are held weekly, and at each three parties are engaged in Meccano Model-building, one on laying the track of the Club's Hornby Railway and another on the construction of a new Station. Club roll: 20. *Secretary:* J. Bartholomew Winchmore Hill, London N.21

HOLLAND

MAASTRICHT M.C.—A new room has now been secured and meetings are being held weekly. Good model-building is being carried on and there is promise of increased activity Leader, Mr. F. L. Bingen Koning Clovisstraat 69, Maastricht, Holland.

BRANCH NEWS

PERSE SCHOOL (CAMBRIDGE). Track meetings continue, and in addition there have been Lantern Lectures on the four British railways. A Film Show on railway subjects also has been enjoyed. A party of members visited Whitemoor Marshalling Yard, where they enjoyed a short trip on a diesel-electric locomotive. *Secretary:* D. M. Mann, 151 Shelford Road, Cambridge.

LOUTH.—Track meetings have been varied by a discussion of the features of the Hornby-Dublo Locomotives. Members have been invited to see a 2½ in. gauge railway, and are to have talks from the owner on its construction. *Secretary:* J. E. Starsmore, 62, Eastgate, Louth.

LONG ITCHINGTON—The track is now in splendid condition and operations on it are very good. Additional siding accommodation has been provided. A telephone system has been constructed so that there is easy communication between the two rooms occupied by the Branch. *Secretary:* H. Windsor, The Bakery, Long Itchington, Nr. Rugby.

STUART ROAD (EAST BARNET)—Meetings for track work have been very interesting, and the programme has been extended since the acquisition of additional locomotives. Discussions on various subjects also have been enjoyed, along with Games. A party early in the year was thoroughly enjoyed. *Secretary:* A. M. Loader, 12, Stuart Road, East Barnet, Herts.

HASTINGS—Very successful operations on the Branch track continue. Work has begun on a new station. Special attention is paid to loads on goods trains. Outdoor activities now include Cycle Runs. *Secretary:* A. J. Lawrence, 53, Collier Road, Hastings.

Among the Model-Builders

By "Spanner"

A NEAT GOVERNOR

The governor proper consists of two Bush Wheels mounted on a vertically placed Rod. Each Bush Wheel carries two Angle Brackets, to each of which is lock-nutted a $1\frac{1}{2}$" Strip. The Strips are joined together by Rods which pass through their end holes and carry two 1" Pulleys that act as weights. The upper Bush Wheel is fixed to the Rod, but the lower one is free. Also fixed to the Rod is a Contrate and the Rod itself is mounted in reinforced bearings consisting of a Plate and a Double Bent Strip. The Contrate meshes with a 1" Gear fixed on a Rod, which is journalled in $1" \times 1"$ Angle Brackets, and carries a Sprocket by means of which the drive is imparted to the governor.

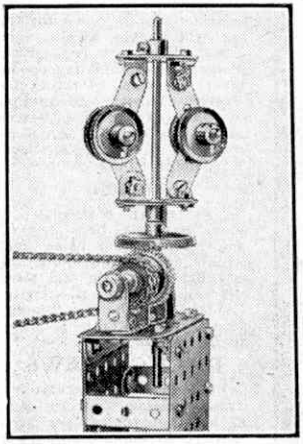


Fig. 1. This neat governor is easy to construct and looks realistic.

OUR PORTRAIT GALLERY

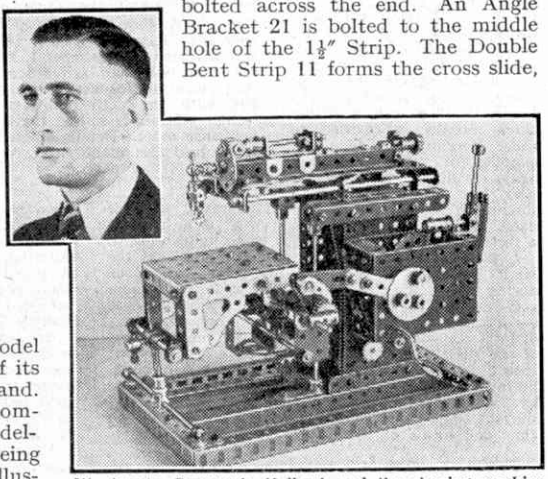
On this page we illustrate a model shaping machine with a portrait of its builder, W. Swarts, Beverwyk, Holland. Mr. Swarts was a successful competitor in a recent "*M.M.*" Model-building Competition, the prize being awarded for the shaping machine illustrated here. Mr. Swarts has been a model-builder for some years and has managed to maintain his interest in the hobby in face of the many difficulties caused by the war. It is very good to find our old friends on the Continent communicating with us again and taking part in the Competitions.

J. E. Boddy, Darlington, an "M.M." competition prize-winner.

Our other portrait this month shows J. E. Boddy of Darlington, a Meccano enthusiast who was successful in winning First Prize in the "*Most Useful Parts*" Contest, the results of which were announced in the February issue of the "*M.M.*"

A LATHE TOOL SADDLE

The frame of the tool saddle which is shown in Fig. 3 consists of two $4\frac{1}{2}$" Strips 14 bolted to the long sides of a $3" \times 1\frac{1}{2}$" Flat Plate 16, so that one hole of the Strips projects at one end and two holes at the other end. Two 2" Strips 10 are bolted at the latter end, with a Washer between them to serve as guides for the Double Bent Strip 11. A $1\frac{1}{2}$" Strip carrying two Angle Brackets is also bolted across the end. An Angle Bracket 21 is bolted to the middle hole of the $1\frac{1}{2}$" Strip. The Double Bent Strip 11 forms the cross slide,



W. Swarts, Beverwyk, Holland, and the shaping machine model with which he won a prize in a recent "M.M." Model-building Competition.

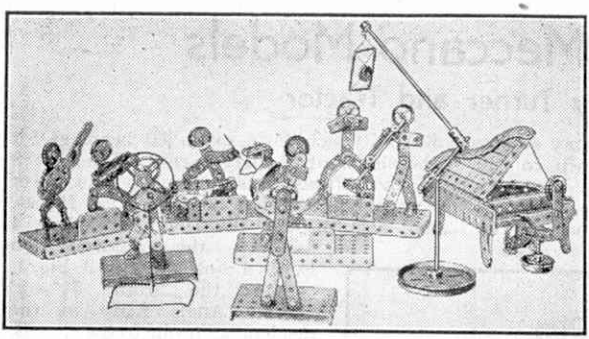


Fig. 2. Building action models of this kind is great fun.

and is secured to a Threaded Coupling 12 by Bolts. A 1½" Angle Girder is fixed to the top of the Double Bent Strip to form the tool rest. The strips 14 rest on the side Angle Girders of the lathe bed, and the 3½" Strip 15 serves to hold the saddle in place. The tool saddle moves to and fro along the bed on a Rod consisting of a 2" Rod and an 8" Rod which passes through the holes of the Double Angle Strip 9.

The 1½" Strips that form bearings for the Rod 22 are now bolted in place, and the Rod, Collars, a ¾" Pinion 13 and a 1" Pulley are arranged so that the Pinion 13 meshes with a Rack strip fixed to the bed of the lathe.

A 3" Screwed Rod is inserted in the bore of the Threaded Coupling 12, and collars are then put in position to prevent the Rod from sliding, so that when it is turned by means of a 1" Pulley the tool holder represented by the 1½" Angle Girder is moved towards or away from the work.

FUN FROM MECCANO MODELS

Many model-builders find it good fun to have an occasional change from ordinary model-building and to spend a few hours making up simple and amusing figures and caricatures depicting such subjects as sportsmen in action or workmen engaged in their various tasks. The Meccano orchestra illustrated on this page is a good example, and I invite all who have photographs of models of this kind to send them to me.

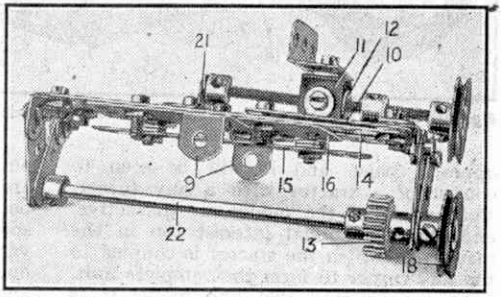


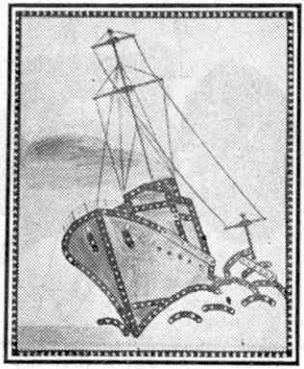
Fig. 3. A fine lathe tool saddle, the construction of which is described on these pages.

Our April "General" Model-Building Contest Still Open

Readers are reminded that the "General" Model-building Competition announced last month is still open. Entrants have until the end of May to prepare models and to send in photographs or good sketches. They can choose any subject that suits them, but should remember that this should be as new and original as possible. Any number of parts may be used, but the models submitted must be the handiwork of the competitor himself, both in design and construction.

The competition will be divided into two Sections: (A) for readers of all ages living in the British Isles; (B) for readers of all ages living Overseas.

When the model is completed a photograph or good sketch of it must be sent to *"April General Model-building Contest, Meccano Ltd., Binns Road, Liverpool 13."* More than one model may be submitted, but no competitor may win more than one prize. The competitor's age, name and address must be written on the back of each photograph or drawing submitted, together with the name of the competition and letter A or B indicating the Section for which the entry is eligible. Actual models must not be sent.



Prizes will be awarded in each Section of the competition as follows: First, Cheque for £2/2/–; Second, Cheque for £1/1/–; Third, Postal Order for 10/6. There will also be a number of consolation awards and Certificates of Merit.

Closing dates: Home, 30th May; Overseas, 30th September.

New Meccano Models

Hay Turner and Tractor

WITH the approach of the hay season we are turning this month to the farming world for the subject of a new Meccano model. The complete model is shown in the upper illustration on the opposite page, and it will be seen to consist of a tractor with a hay turner. Both parts of the model are attractive, and there is special interest too in the manner in which the tractor is coupled to the hay turner to form the complete unit.

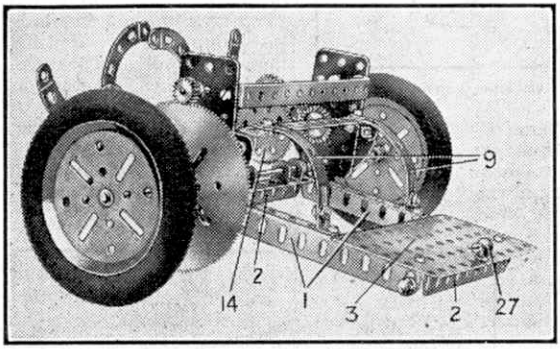


Fig. 1. The hay turner seen from the front, ready for coupling to the tractor.

In constructing this fine model it is best to commence with the hay turner. First a frame of Angle Girders is built up from two 5½" Angle Girders 1, Fig. 1, joined at their ends by two 4½" Angle Girders 2. Across the front end of this frame is bolted a 5½" × 2½" Flat Plate 3, and to the rear 4½" Girder two Double Brackets 4, shown in Fig. 3, are fixed to act as bearings for the rear axle.

The mechanism is carried in a frame built up as follows. To each of two Semi-Circular Plates, one of which is shown at 5, Fig. 2, a 3" × 1½" Flat Plate is bolted vertically. These two units are then linked together by three 5½" × ½" Double Angle Strips 6, one of which carries two Double Bent Strips, which form extended bearings for the shafts of the hay turner. The Axle 8 of the wheels passes through the lower centre holes of the Semi-Circular Plates, and also through the Double Brackets 4 fixed to the chassis. Two Formed Slotted Strips 9, Fig. 1, connect the front 5½" × ½" Double Angle Strip of the mechanism frame to the chassis, as shown.

The rear axle carries a 3½" Gear 10, Fig. 2, which meshes with a ½" Pinion 11 on a Rod 12, which is journalled in the 3" × 1½" Flat Plates. A ½" Pinion 13 on this Rod engages a 57-teeth Gear 14, Fig. 1, which is mounted on a Rod also journalled in the 3" × 1½" Flat Plates. This Rod carries also two ⅞" Bevel Gears arranged to mesh with two similar Bevels fixed on the ends of the shafts 7, Fig. 2, on which the blades of the hay turner are fitted. These are 2½" Curved Strips bolted to Bush Wheels on the shafts. Care should be taken to ensure that all the various bearings for the main axle are in line and that the gear wheels mesh exactly and not too tightly.

The tractor, Fig. 4, is built up around a No. 1a Clockwork Motor, and when it is constructed as shown and properly adjusted it forms a very powerful unit capable of hauling considerable loads.

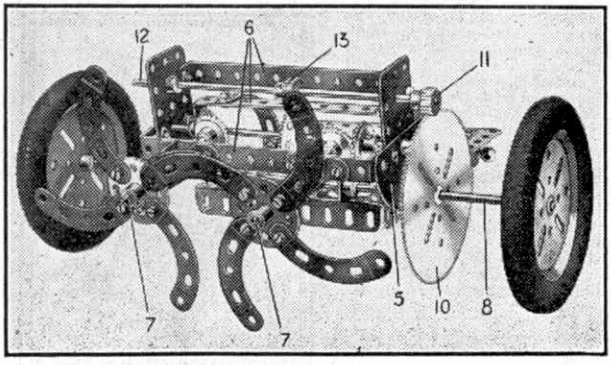


Fig. 2. Rear view of the hay turner.

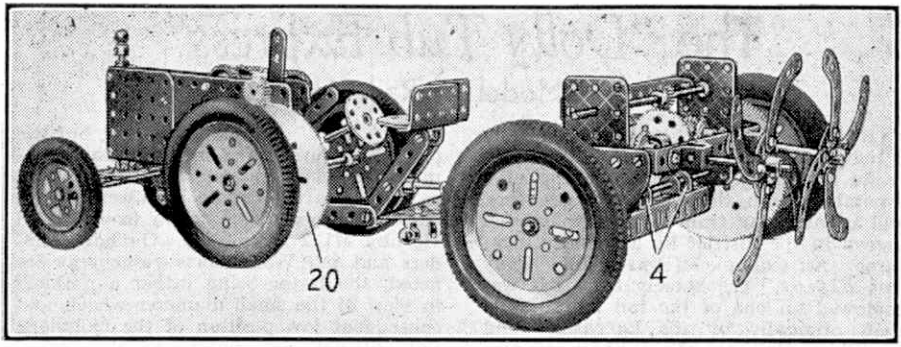


Fig. 3. The complete model, ready for action. The turner works most realistically when the machine is in motion.

Model-builders should note that it can be used with other models in addition to the hay turner.

To the front end of the Motor two 2½″ × 2½″ Flat Plates 15, Fig. 4, are bolted to carry the front wheel axle. Between these Plates two Double Brackets are fixed, these being held by the Bolts 16 in the positions shown. These Brackets provide bearings for a Rod 17, on the lower end of which is a Bush Wheel. A 3½″ Double Angle Strip is fixed to the Bush Wheel, and the front axle is journalled in the turned up ends of this. The axle is steered from a handwheel 18, which is fixed on a Rod passed through two Double Brackets bolted to the Motor sideplate. On the lower end of this Rod is a Worm 19 that engages a ½″ Pinion on a short Rod journalled in the Motor sideplates. A length of Cord is wound a few turns around this Rod, and the ends of the Cord are then tied to each end of the 3½″ × ½″ Double Angle Strip in which the front axle is journalled.

The shaft of the rear wheels is passed through holes in the Motor sideplates and carries a 3½″ Gear 20, Fig. 3, which meshes with a ¾″ Pinion 21, Fig. 4, on a Rod that carries also a ¾″ Sprocket. This Sprocket is connected by Sprocket Chain to a further ¾″ Sprocket 22, which is mounted on a short Rod journalled in the Motor sideplates and which carries between the Plates a 1″ Gear 23. The Gear 23 is arranged to mesh with the main gear wheel of the Motor mechanism. The driver's seat and its supports are arranged in the following manner. Two 3½″ Strips 24 are bolted on, one to each of the Motor sideplates, and they are joined to two further 3½″ Strips as shown. They are spaced apart by Double Brackets. The driver's seat consists of two Girder Brackets and a second Circular Plate, all of which are bolted to the Double Bracket 25.

The tractor unit is coupled to the hay turner by a Rod 26 held in a Large Fork Piece and Handrail Support 27, Fig. 1.

Parts required to build model Hay Turner: 2 of No. 9; 2 of No. 9a; 2 of No. 11; 2 of No. 12; 1 of No. 13; 2 of No. 14; 2 of No. 16; 2 of No. 19b; 2 of No. 24; 2 of No. 26; 1 of No. 27; 1 of No. 27b; 4 of No. 30; 35 of No. 37; 2 of No. 45; 3 of No. 48d; 1 of No. 52; 9 of No. 59; 2 of No. 73; 8 of No. 90a; 3 of No. 146; 2 of No. 142b; 2 of No. 214; 2 of No. 215.

Parts required to build model Tractor: 4 of No. 3; 6 of No. 11; 1 of No. 14; 1 of No. 15a; 1 of No. 16; 2 of No. 18a; 2 of No. 19b; 2 of No. 20a; 2 of No. 24; 1 of No. 25; 1 of No. 26; 1 of No. 27b; 1 of No. 31; 1 of No. 32; 25 of No. 37; 1 of No. 48b; 1 of No. 59; 2 of No. 72; 2 of No. 96a; 1 of No. 116; 1 of No. 136a; 1 of No. 161; 1 of No. 214.

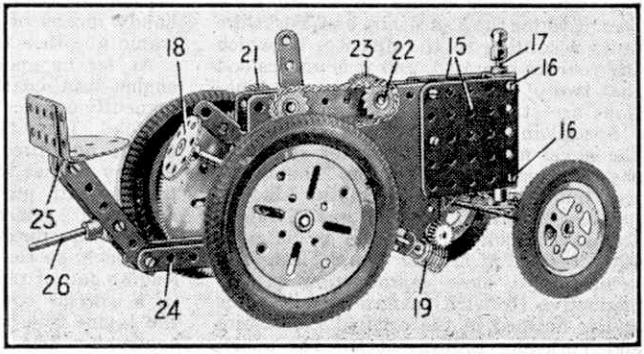
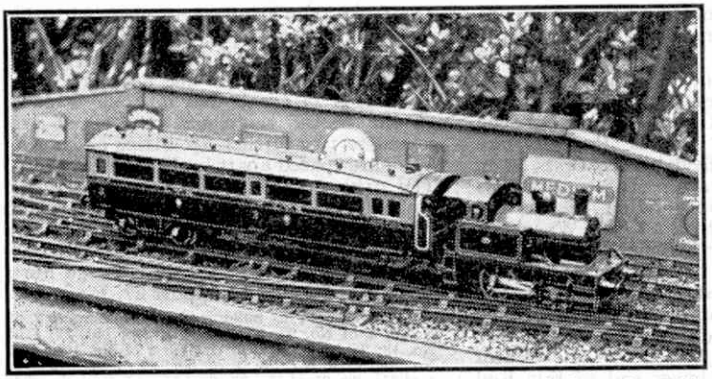


Fig. 4. A general view of the tractor. This can be used for hauling other models.

The "*Dolly Tub Express*"

Interesting Model of Rail Motor Unit

BRANCH or local services regularly operated by the same trains and crews invariably acquire something of a reputation with their regular passengers, and a particular train or service is often known in the district by a friendly nickname. An example of this is the "*Dolly Tub Express*," the homely title that was bestowed on one of the rail motor units built originally by the Lancashire and Yorkshire Railway about 35 years ago.



The "Dolly Tub Express" in miniature. This Gauge 0 reproduction of a former Lancashire and Yorkshire rail motor unit was built by Mr. C. B. Smith, Lincoln. The engine incorporates a Hornby M1/2 clockwork mechanism.

These consisted of a coach combined with its own small locomotive, the two being articulated together and forming a rail motor unit of the kind that was in fairly extensive use on most British railways at the time. Other names appear to have been used for the Lancashire and Yorkshire units according to the districts in which the vehicles operated, and it is understood that two of these rather curious combinations are still in use on the L.M.S.

Special interest therefore is attached to the novel miniature rail motor shown in the accompanying illustration. This model was built by Mr. C. B. Smith, Lincoln, for his "*Bincliff, Lakeside and Shedley*" Railway, which was referred to on page 120 of the "*M.M.*" of March last. The vehicle is a close reproduction of the distinctive Horwich pattern of rail motor and is finished in the original Lancashire and Yorkshire Railway style. The model was included in the illustration on page 386 of the "*M.M.*" for November last, but the present picture shows up the details in a more satisfactory manner.

The miniature engine is powered by a clockwork mechanism taken from an old Hornby M1/2 locomotive. Outside cylinders and full Walschaerts valve gear are fitted, the latter being rather a problem in view of the small diameter wheels and consequent low position of the cylinders. Cab fittings are provided, also seats, partitions and glazed windows in the coach section. The vehicle runs smoothly and silently, and its almost noiseless arrival at a station can sometimes surprise an operator who is already busy with other trains.

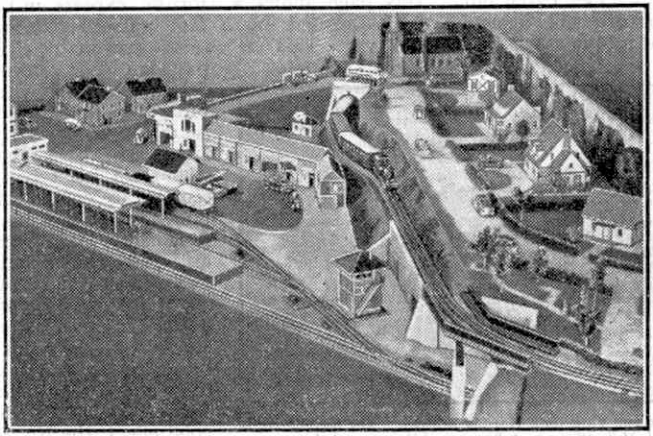
The "*Dolly Tub Express*" is a useful addition to the rolling stock of Bincliff line. It special duty is to provide a "workman's" service between "*Bincliff West Goods Depot*" and "*Lakeside.*" It also supplements the normal stopping train service in and out of Bincliff main station at busy times, and provides a handy means of dealing with the lighter traffic at other times of the day.

As far as operation is concerned, the engine and coach components are permanently coupled together as in the actual vehicle. Thus the engine runs chimney first in one direction, and for the return journey pushes the coach in the manner familiar with units operated on the "pull and push" principle. In actual practice controls are duplicated at the tail end of the coach, so that when this becomes the leading end of the "train" the driver rides in a special compartment and operates the engine to a certain extent by "remote control." The fireman remains on the engine all the time.

Hornby and Hornby-Dublo Queries

CHANGES brought about by the war have done a good deal to upset the smooth working of many Hornby and Hornby-Dublo railways. As a result we have received, and are still receiving, many anxious requests for information. We take this opportunity of dealing with a few of the queries that turn up most frequently.

Many owners of Hornby and Hornby-Dublo electric train sets, purchased with a transformer to be run from A.C. mains current, have found themselves moved to some other part of the country where the mains current is D.C.; and they ask whether they can run their trains from the D.C. mains through a lamp or other resistance. To this our answer is always "No!" We give this answer without hesitation because such a practice is definitely dangerous to the operator and therefore in our view should not be considered for a moment.



A good example of the possibilities of the Hornby-Dublo System, as shown by the layout of W. W. Mingay, Dunottar, South Africa.

Where the mains current is D.C. the only safe and satisfactory way to run a Hornby or Hornby-Dublo electric train is from accumulators. The charging of accumulators is rather a nuisance, but as a rule convenient arrangements can be made, and the running of the trains is thoroughly satisfactory in every way. The automatic reversing of Hornby 20-volt trains can be carried out with current from accumulators just in the same way as with A.C. mains current through a transformer. Hornby 20-volt trains require an accumulator current of 14 volts, not 20 volts. Hornby 6-volt trains require 6 volts from accumulators and Hornby-Dublo trains 12 volts.

An important point to be noted by Hornby-Dublo owners is that the No. 1 Dublo Controller sold with Hornby-Dublo train sets cannot be used when the current supply comes from accumulators. In normal times a No. 1a Controller is supplied for this purpose, but this is not available at present. To take its place a variable resistance is required and this can readily be made by a local electrician. It should have a total resistance of about 20 ohms and should be capable of carrying 8 amps continuously. No. 28 S.W.G. Constantin wire is suitable. The reversing of Hornby-Dublo trains is done by reversing the current, and the electrician should be asked to provide a reversing switch suitable for the purpose.

For Hornby 20-volt trains a variable resistance should have a total resistance of 12 ohms and be capable of carrying 1 amp continuously. For Hornby 6-volt Trains the corresponding details are a resistance of about 4 ohms and a continuous carrying capacity of 2 amps.

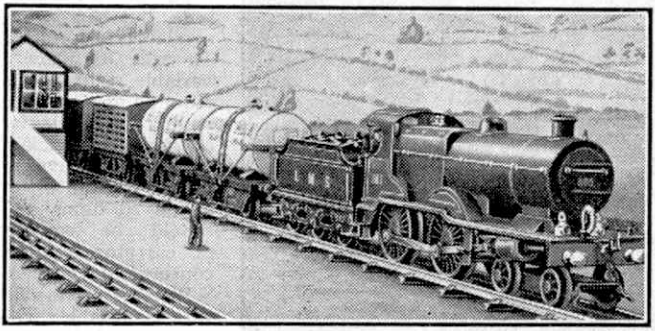
A very frequent enquiry relates to the oil to be used for lubrication. At present we are unable to supply special oil, but any thin oil of good quality, such as that supplied for sewing machines, will answer the purpose quite well. This seems a good opportunity to warn readers against over-enthusiasm in oiling. All that is required is a thin film on the moving parts. Any oil in excess of this collects dust and turns it into a sort of greasy mud, and also causes trouble by finding its way on to wheels and track. Do not use an oilcan. The best plan is to apply tiny quantities of oil with a piece of thin wire.

Fun With Your Hornby Railway

Special Trains and Other Matters

THERE is always a particular fascination in connection with the working of special trains of any kind. The normal passenger and goods workings called for by our running programme may be quite interesting and satisfactory, but we shall enjoy our operations much more if something that is a little "different" is introduced.

The extent to which we can carry out any schemes of this nature will depend largely on the variety of rolling stock that we possess. As a rule, however, we can get over these difficulties somehow; while the position is certainly eased if we are able to combine our stock with that of one or two other Hornby railway owners, and thus have a "pool" of "common-user" wagons or vans on which to draw.



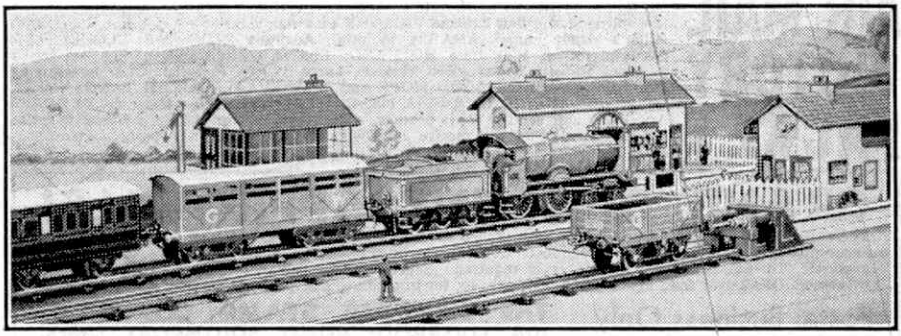
A milk train of Tank Wagons and Vans on a Hornby railway. The locomotive is an E220 L.M.S. "Standard Compound."

A favourite traffic working scheme with many enthusiasts is to arrange for the conveyance in a passenger train formation of an odd vehicle that may be intended for some particular traffic. Consignments of perishable or other goods are often handled in this way, and the operations involved in the attachment at a wayside station of a milk van, or tank wagon, and its subsequent setting down, may require some smart work if time is to be kept. The vehicle can be attached in the rear of the train if this is convenient according to the layout, or it can be placed behind the tender of the engine. If the latter method is followed the train engine can do the necessary shunting, but if rear-end attachment is called for it is desirable to use a separate shunting engine for the job.

This "odd van" idea naturally prompts the suggestion that a complete milk train should form part of our running programme. Such trains are important in real practice, while in miniature their make-up can be varied so that an interesting formation results. The illustration on this page shows a Hornby express milk train headed by a fast passenger locomotive. This is quite reasonable in present-day conditions when the fullest possible use is made of locomotives of all kinds. The train itself consists of a couple of Milk Tank Wagons, a Hornby Milk Van and several other vans. These last can be of different types according to the stock we have at our disposal. A No. 1 or No. 2 Luggage Van can be used with good effect, the No. 2 vehicle with its increased space and double doors being particularly useful for the loading and unloading of model milk churns. If we have no milk or luggage vans the corresponding Cattle Trucks might be used. These are similar in general construction, and as they have "open" upper sides they are suitably ventilated for milk traffic so that they make good substitutes.

The rear of the train should be completed with a Guard's Van, displaying of course the red tail lamp at the end. Several of these vans can be used if we have them, as they are reasonably like the "coach-built" vans for milk traffic that are often seen on real railways. Coming to the front of the train again, the engine should carry headlamps as shown in the illustration, one lamp on the centre bracket above the buffer beam and the other on the right-hand bracket.

A similar indication should appear on the locomotive of the type of train shown in the upper illustration on the next page. This represents a parcels or newspaper

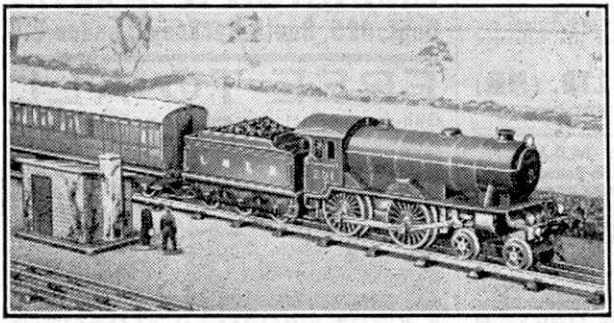


A Hornby G.W.R. parcels train made up as suggested in this article. The No. 2 Cattle Truck makes a good substitute parcels van.

train, and is an example of another kind of "special purpose" train made up of vans only. Here good use is made of the No. 2 Cattle Truck, although a No. 2 Luggage Van would do equally well if not better, and of the Guard's Van. Many daily, or rather nightly, trains of these two types are operated by British railways, and their inclusion in the working arrangements of a Hornby railway will strike a realistic note.

There is less chance of providing much change in train formation with passenger specials, but unusual destination boards, and sometimes even distinctive devices carried on the front of the engine, can provide a certain amount of variety. Of all passenger specials the most important on British railways is the Royal Train, the composition of which varies according to requirements. For extensive tours the familiar Royal Train of the L.M.S. is usually employed, though the other companies do maintain Royal vehicles of different kinds, and these are used for other journeys. The nearest approach in the Hornby system to the distinctive L.M.S. Train would be a formation of Hornby Pullmans, preferably the No. 2 Special type, and at each end of the train there should be a composite vehicle of this kind. For more restricted journeys, such as those on the L.N.E.R. Eastern Section to and from Sandringham, No. 2 Saloon Corridor Coaches in combination with No. 2 Corridor stock would be suitable.

Apart from the interest of its formation, the particular attraction to the miniature operator of a model Royal Train lies in the special head code displayed by the locomotive. This consists of four headlamps, one on each bracket at the front of the engine. On the L.N.E.R. Eastern Section, however, and on the S.R., four discs as employed on those lines are used, and this practice is featured in miniature as shown in the lower illustration on this page. This is a most effective arrangement, and where the standard discs as supplied with the Hornby *"Eton"* locomotive are not to hand it will be found easy to make a set of suitable discs at home. These can be cut from thin white card, such as a postcard, the diameter of the discs required being not less than $\frac{3}{8}$ in. and not more than $\frac{7}{16}$ in. To attach the discs to the brackets small strips of paper each formed into a loop should be attached to the back of each disc. Similar discs also can be used on the locomotives of ordinary trains. On the S.R. the routes of the trains are shown by the disc indications which are known as engine head signals.



A "Royal Special" on a Hornby layout. The locomotive is displaying the four discs as used on the Eastern Section of the L.N.E.R.

For other Stamp Advertisements see also pages 212 and vii.

Stamp Collecting

Steamship Designs

By F. Riley, B.Sc.

THIS month brings us to the third of our ship stamp articles, that dealing with steamships. There is no lack of fine examples of various kinds for this section, and we can make a good start with one illustrating the *"Normandie,"* the largest vessel yet shown on a stamp. This famous ship of 83,000 tons made her maiden voyage in 1935, and in the same year a 1 fr. 50 c. stamp was issued in France to commemorate the event. In the design the *"Normandie,"* for a short time the largest ship in the world, is shown ploughing the seas in lively fashion. The stamp itself is not a particularly attractive one, however, and looking at it makes us think with regret of stamps that we shall never see—commemoratives produced by stamp printers of our own country by modern methods to mark the appearances of such giants as *"Queen Mary"* and *"Queen Elizabeth."*

The reluctance of the British Post Office to issue commemoratives has indeed deprived us of opportunities of making a collection of British ship stamps that would have been unrivalled in extent and interest. Germany, Italy and other countries have had no such restrictions on stamp subjects, and their issues have included several interesting ship stamps. Thus the 51,731-ton German liner *"Bremen"* is seen on one of the values of the 1937 Winter Relief Fund issue, other values of which show a train ferry and other liners. The equally famous Italian liners *"Rex,"* of 51,062 tons, and *"Conte di Savoia,"* of 48,502 tons, are depicted on an Italian stamp of 1932 illustrating marine development during the 10 years of Fascist rule in Italy up to that time. Even Poland has been able to issue a ship stamp; this is the 15 g. value of 1935, the subject of which is the steamship *"Pilsudski."* Curiously enough Cuba also can be included among the countries issuing stamps showing famous steamships, although no notable liners have been built there; for in 1936 a series of stamps commemorating the free port of Matanzas included one, the 4 c. value, showing the *"Rex."*

Although there are no British ship stamps, the Empire provides us with interesting examples. From India we get the 6 a. value of the 1937 issue, a turquoise green stamp showing a Peninsular and Orient mail steamer. Another royal mail steamer is found on the Cook Islands 6d. value of the 1932 issue, showing the *"Monowai"* in a tropical Pacific setting. A mercantile steamer being loaded is seen on the 6d. value of a New Zealand issue of 1936 commemorating a Congress of British Empire Chambers of Commerce held in Wellington.

West Africa brings us other interesting ship stamps. One well known to all stamp collectors is the ½d. value of the pictorial Nigerian issue of 1936, which shows a steamship alongside Apapa Wharf. The republic of Liberia also has an example of a steamship on the 10 c. value of the 1923 issue, which depicts an ocean liner. This issue is a registration stamp, but it appears in the catalogues and can quite well come into our ship stamp collection. From the New World we have other good examples. Guatemala issued three air stamps in 1935, of values 10 c., 15 c. and 30 c., to celebrate the centenary of the birth of J. R. Barrios, who was President of the country from 1873 to 1885, when he was killed in battle while invading the neighbouring country of Salvador. Of these three stamps, all of which bore the portrait of this Guatemala statesman, the lowest value shows a steamer alongside the wharf at Port Barrios.

Canada's contribution to our collection is of outstanding interest. It is a stamp carrying a fine picture of the *"Royal William,"* which made the first authentic steamship crossing of the Atlantic. This vessel was built in Canada, with engines of approximately 180 h.p. by Boulton and Watt. She left Quebec on her historic voyage on 4th August, 1833, and arrived at London on 11th September. There is some uncertainty whether the crossing was made entirely under steam, but it is probable that her sails were used alone only for very short periods. The stamp was issued in August, 1933, to celebrate the centenary of this famous crossing.

The United States too has a stamp showing an ocean liner, the 10 c. value of the 1901 issue, while a lake steamer appears on the 1 c. value of the same issue and a mail steamer had been depicted on stamps of 32 years previously. Another stamp of outstanding interest from the same country was issued in 1909 to celebrate the achievement of Fulton in building the first steam vessel to be successful in the New World. This was the *"Clermont,"* and the stamp shows this famous pioneer steamship on the Hudson River, New York, where she made her first trip in 1807. In 1609, almost 300 years earlier, Henry Hudson had sailed up the river to which his name was given in the *"Half Moon,"* and this vessel also is shown on the stamp.

Examples of steamships in famous canals come from Panama and Greece. The first of these is a 1931 Panama Canal Zone issue of the United States; the second, which is illustrated here, shows the canal cut across the Isthmus of Corinth and was issued in 1927.

It is interesting to find that river steamers figure with some prominence in the steamship section of a ship stamp collection. Austria provides good examples of such vessels in three stamps issued in 1937, on the occasion of the centenary of steam navigation on the Danube. Each of the three values show a steamboat, the 12 g. value, the lowest, illustrating an early Danube steamer, the *"Maria Anna."*

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GREECE has just issued a limited quantity of these handsome large stamps (even larger than shown in this illustration). They show a picture of the late **President ROOSEVELT** and have black margins, and have been issued in Mourning for the American president. We have been fortunate in obtaining some of these stamps and will therefore send one **ABSOLUTELY FREE** to everyone who writes to us requesting our Approvals. Ask for Greece Roosevelt Mourning Stamp Free and send 3d. in stamps to cover our postages.

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3d. ea. 462, 504, 806, *813, 904, 916, 942, 945, 966, 971, 976, 977, 994, 995, 999, 1,000, 1,004, 1,005, 1,009, 1,010, 1,014, 1,015, 1,019, 1,020, 1,024, 1,025, 1,034, 1,039, E22A
4d. ea. 436, 844, 890, 902, 975, 985, 988, 990, 991, 992, 993, 1,047
6d. ea. 432, *607, 847, 891, 903, 962, 963, 978, 982, 983, 984, 989, 996, 997, 1,001, 1,002, 1,006, 1,007, 1,011, 1,012, 1,016, 1,017, 1,021, 1,022, 1,026, 1,027, 1,029, 1,030, 1,031, 1,032, 1,033, 1,037, 1,038, 1,040, 1,046, 1,048, 1,063, 1,064, 1,065, 1,066, 1,067, 1,067A, 1,068, 1,069, 1,072, 1,073, 1,074, 1,075, 1,076, 1,077
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For other Stamp Advertisements see also pages 210 and vii.

Stamp Gossip

and Notes on New Issues

By F. E. Metcalfe

NOW that more news is trickling through from the Far East of the stamps which the Japanese overprinted in British territories during their occupation, it is becoming more obvious that only the very rich collector can hope to own more than a very small percentage of them. Not only do they apparently run into hundreds of different varieties, but many of them exist in such small quantities that only a fat pocket book will be any use if one wants to go after them.

Still, some of them are fairly common, particularly those overprinted for use in Malaya, and we shall just have to put up with these; it will make a showing, and completion will have to be sought in other fields, such as the "Victory" stamps. Fortunately none of these is beyond the pocket of any of us, and this month we are illustrating a rather crude lithographed label from Hyderabad. This is printed in dark blue, and the theme, a soldier returning to his wife and child, is prosaic enough, but it does show that the same emotions move East as well as West. If for this reason alone, the stamp is worth a place in our collection. It is needed anyhow, if we are to have a complete set of "Victory" stamps of the British Empire.

By the time these words are in print Victory issues for New Zealand and Burma will have appeared, and next month we hope to illustrate some of them. We are all looking for something special from New Zealand, and advance illustrations seem to point to the fact that we won't be disappointed.

A magnificent new set has been issued by the Vatican, but as we shall not be illustrating them until next month we will reserve details until then. The complete set of 14 is at present obtainable at under four shillings a set, and interested collectors will be well advised to buy now. This is really the reason why we didn't leave mentioning them until our May number; they may be obsolete by then.

The overprinted stamp we illustrate is one from Hungary, and it shows how the cancer of inflation has eaten into the currency of that country. Such stamps were common after the first World War, and many of them were snapped up by collectors at fancy prices; not so this time, however, for collectors, besides having their own experience to guide them have been well warned by philatelic writers against falling a second time.

While on this subject it might not be out of place to refer to German stamps issued during the war years. These are exceedingly popular, as are for that matter other stamps issued in Europe during the same period; but German stamps are the most sought after and they probably will go up a good deal. As a matter of fact it is said that they are now much cheaper over here than in Germany itself. Dealers are finding it much harder to obtain supplies, but even so collectors will be ill advised if they buy with the sole object of making a profit later on. There may be big stocks, untapped, somewhere in Europe.

France continues to turn out well-designed and well-produced stamps, and the one we are illustrating proves this. The inscription shows for what object it was issued, and we will leave readers to make this out for themselves.

Another very beautiful stamp illustrated here comes from Surinam, the Dutch colony in America. This is one of a set of several values, each of which shows some aspect of the country's activities, printed—line engraved—in the U.S.A. The stamps are a delight, which is a bit more than can be said about the latest commemorative stamp which has arrived from Argentina. This lithographed stamp, in a dull brown, has been emitted in honour of the unknown soldier who rests in the mighty Andes. The design shows the magnificent monument erected, in the true Argentine manner, in homage. Unfortunately the execution of the stamp falls far short of the object. One cannot understand why Argentina, of all countries, is content with a continual stream of shoddy stamps. If they cannot do better, why issue them at all? It is certainly not done to make money, for in fairness it must be admitted that all these commemorative stamps are of only the smallest face value, and most of them are used for ordinary postage.

Norway before the war produced very ordinary stamps, but nowadays she issues very attractive commemoratives and the latest set of four is no exception. The method of printing is the usual photogravure, and a thing which strikes one about the design, which is the same for all values, is the likeness to General Montgomery of the figure depicted. Actually the portrait is that of Crown Prince Olaf, and the set is issued for National Help.

Egypt has produced another set of stamps, four in number this time, ostensibly to commemorate the 80th anniversary of the first Egyptian postage stamp. Why the 80th? It's simply an excuse for another set of stamps.

As for the monthly tip, the British Postal Centenary set overprinted for use in Morocco is a real bargain at to-day's price of about 5/-.

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 ROMAN ROAD IN YORKSHIRE

Most readers of the "*M.M.*" have heard what wonderful road engineers the Romans were, but how many have actually seen a real Roman road? The example shown in the photograph is unique, for

The Roman causeway on Wheeldale Moor, in north-east Yorkshire. Photograph by Raymond Mayes.

it is one of the few specimens in England which still has its large paving stones intact. Many of these have slipped out of position after 16 centuries of wear and neglect, and it is difficult to walk or ride along the road now, but it is fortunate that so much has been preserved.

The road is known as "Wade's Causeway" and runs across north-eastern Yorkshire, from York to the River Esk. Not all of it is in such good condition as the section illustrated, which can be examined on Wheeldale Moor between the villages of Stape and Goathland. This was uncovered by the Office of Works some years ago. It is believed to have been part of the road constructed during the fourth century to link the military base at Malton with the series of signal stations along the Yorkshire coast at Filey, Scarborough, Ravenscar, and other places.

When warning of attack by Saxon ships was flashed inland from the signal stations, squadrons of cavalry were immediately dispatched to the coast to beat off the attack. One can picture the Roman cavalrymen thundering along this road to meet their Saxon foes. It will be seen that the road bends considerably, thereby dispelling the misconception that Roman roads were always perfectly straight. Roman engineers certainly did build their roads in straight stretches when possible, but did not hesitate to make turnings when the nature of the ground demanded it. The moor here is very rough and is intersected by numerous streams, so the route taken by the road is circuitous.

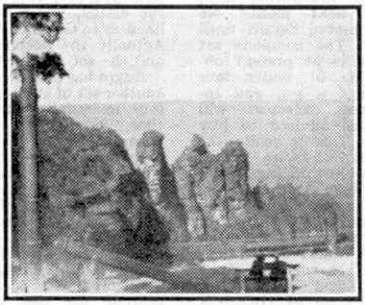
J. H. INGRAM (Manchester).

AUSTRALIA'S THREE SISTERS ROCKS

The Blue Mountains of Australia are visited by people from not only Australia itself but all over the world. One of their most popular and well-known features is the group of rocks known as the Three Sisters, shown in the accompanying illustration. They are best seen from Echo Point, a concrete landing built out from the side of the mountain. Underneath this platform is a battery of floodlights that illuminates them by night. The Three Sisters are tall and slender and are joined at the bottom. One can encircle them and finally reach their base by a stairway, which is joined to the adjoining cliff by a very small bridge. The stairway is the opening of a long scenic walk along the floor of the mountains.

Echo Point is one of the main places on a beautiful path called the Prince Henry Cliff Walk. This path is about five miles long, but it can be taken in stages of about one and a half miles each, as a bus service connects with the path at these intervals.

J. R. CLARKE (Rosedale, N.S.W.)



The Three Sisters Rocks, in the Blue Mountains of Australia. Photograph by J. R. Clarke, Rosedale, N.S.W.

MEDALS

Medals are very familiar things these days, but how many of us ever think of the history that lies behind them or on what grounds they were instituted?

The Chinese were the first people to award medals; these were made of clay, and had weird designs on them. Medals as we know them came into existence in Great Britain in the days when knights used to award copies of their badges to their soldiers who performed gallant deeds. Then came the founding or creation of the famous orders of chivalry. Membership of these was conferred for what their name implies, that is for gallant deeds or for great services to the country. The highest of these great orders is the Order of the Garter. In Scotland there is the order of the Thistle, and in Ireland that of St. Patrick. A more recent and very exclusive order is the Order of Merit, instituted in 1902.

In the year 1856 Queen Victoria created the most prized honour in the world, the Victoria Cross. This award is the prize of bravery, and the cross bears the words "*For Valour.*" Six years ago the George Cross came into existence. This is intended for civilians, and awards of the Cross to the fighting Services are made only for actions for which purely military honours such as the Victoria Cross are not normally made. There is a companion award for bravery that is known as the George Medal.

A. F. MANNERS (Liverpool).

Competitions! Open To All Readers

An Easy Figureword Contest

It is a long time since we had a figureword contest, and this seems to us a suitable one for the month of May, when the days are growing longer and, we hope, brighter and warmer. The figureword we are setting is an easy one, and readers will enjoy working it out.

On this page is a diagram with seven rows, each consisting of seven blank spaces. Into these spaces letters that make up seven words, each of seven letters, that appear on this page, have to be inserted, the words to be read horizontally. It will be seen that there are numbers at the end of each row and at the foot of each column. These totals are made up by giving numbers to the letters of the alphabet, beginning with A represented by 1, B by 2, and so on down to Z, the value of which is 26. The numbers representing the letters used in words forming the solution must add up horizontally and vertically to the totals shown.

Competitors must not cut the diagram from this page. Instead they should copy this out on a sheet of paper, and then complete it to form the actual entry. They may make their solutions as original and ornamental as they like, and in the event of a tie for any prize the judges will take features of this kind into consideration.

							96	HORIZONTAL TOTALS
							63	
							92	
							53	
							85	
							93	
							90	
59	104	71	97	70	71	100		
VERTICAL TOTALS								

There will be the usual sections for Home and Overseas readers, with prizes of 21/-, 15/- and 10/6, and consolation prizes for other deserving attempts. Entries should be addressed *"May Figureword Contest, Meccano Magazine, Binns Road, Liverpool 13."* Closing dates: Home, 29th June; Overseas, 31st December.

What Engines Are These?

In the following account of a rail journey, the author has hidden references to different types of locomotives, to each of which there is a reasonable clue.

"On a recent railway journey, I noted several interesting types of locomotives and will describe them by their characteristics. We had stopped in a large through station, and the first item of interest was a long and heavy goods train. The locomotive had eight small coupled wheels, a large high-pitched boiler, and the cab had double windows. The tender was very long and rather low sided, and like the engine, had eight wheels.

"Standing by the water tank was an express locomotive, not a new machine by any means judging by its appearance. It had straight frames and a continuous 'splasher' over the six coupled wheels, no side windows to the cab, and inside cylinders.

"Just then, a light engine clanked past, a 'mixed traffic' type which had a two-wheeled truck and six coupled wheels. The cylinders were steeply inclined and the frames were fairly high at the front end.

"Feeling a slight jolt, I assumed that engines were being changed, so alighted from the train to go and see. Our new engine had a large boiler with a sloping fire-box, smoke deflectors, and a large high-sided tender.

"It was now departure time, so I hurried back to my compartment. As we drew out of the station, a rather ancient-looking goods engine rolled past with a brake van. This engine had a rather tall chimney, large steam dome and a very small cab, with a square rear splasher and a five-figure number.

Entrants are asked to identify the locomotives referred to, giving wheel arrangements and class.

There are two sections to the competition, for Home and Overseas readers respectively, and in each prizes of 21/-, 15/- and 10/6, together with consolation prizes, will be awarded.

Entries should be addressed *"April Hidden Locomotives Contest, Meccano Magazine, Binns Road, Liverpool 13."* Closing dates: Home Section 29th June, Overseas Section 31st December, 1946.

May Photographic Contest

This month's photographic contest is the 5th of our 1946 series, and in it, as usual, prizes are offered for the best photograph of any kind submitted. There are two conditions—1, that the photograph must have been taken by the competitor, and 2, that on the back of each print must be stated exactly what the photograph represents.

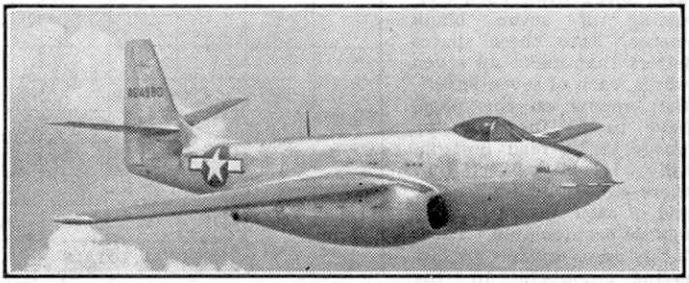
Entries will be divided into two sections, A for readers aged 16 and over, and B for those under 16 They should be addressed: *"May Photo. Contest, Meccano Magazine, Binns Road, Liverpool 13."* There will be separate sections for Overseas readers, and in each prizes of 15/- and 7/6 will be awarded. Closing dates: Home Section, 31st May; Overseas Section, 30th November. Prize-winning entries become the property of Meccano Ltd.

The Passing of the Forecastle—(*Cont. from page 180*)

and the officers, with their cabins close to the bridge, on the deck above them. Immediately after the war it was copied by Britain. It has been the best practice ever since and it has led to the next great reform; the men are no longer herded together in one big compartment, eating where they sleep, but have their cabins containing two or three bunks with entirely separate mess rooms and, occasionally, recreation rooms as well. These cabins, it may be mentioned, give as much space and comfort for the seaman as the first-class passenger received five-and-twenty years ago in all but the luxury ships. The seaman of a modern ship is excellently housed, but it is fully realised that it is physically impossible to reconstruct old accommodation completely, for it means pulling the whole ship to pieces.

The final move is now coming into fashion. It was first introduced in two little coasters, the "*Adaptity*" and the "*Stork*," but the Swedes, favoured by tonnage regulations which give the owners much more opportunity, have started to bring it into big ships and it is hoped that revision of the British regulations will permit the same to be done here. In these ships every man in the crew has his own single-berth cabin to which he can retire, while he can go into the mess room with the rest of the crew if he wants company.

Another great advantage is more appreciated by the officers and health authorities than the general public. It has to be confessed that the British seaman has a reputation for cleanliness far behind that of the Dutch or Scandinavians, and while it is possible to keep a big open forecastle reasonably clean, far more difficulties arise in the case of cabins containing two or three men. Then there is always the chance of "passing the buck" of the job on to other shoulders and letting the quarters get filthy, while if every man has to keep his own little cabin clean he cannot dodge the responsibility.



The Bell XP-83 experimental twin-engined jet fighter. It has a wing span of 53 ft. Photograph by courtesy of the Bell Aircraft Corporation, U.S.A.

Rubber from Potatoes and Coal—(*Cont. from p. 191*)

yields butadiene, from which, as has already been stated, synthetic rubber is made. According to a recent claim a bushel of corn will yield 10 lb. of synthetic rubber.

During the war natural rubber was very scarce, but synthetic rubber could be made in large quantities. The former has more "bounce" than the latter, but synthetic rubber stands up to oil and sunlight better. It was obvious that if tyres could be made with natural rubber carcases, and synthetic treads, the result would be an excellent tyre. This was done. The invention helped to carry our troops to victory, and now it is providing us with tough boot soles, among its many other uses. In peace it is proving as useful as in war.

The Helicopter To-day—(*Continued from page 190*)

airlines using the huge Bristol 167 transports. And one well-known British company has built a new and very revolutionary machine that promises to be a world-beater, but about which nothing can be said at the moment.

As might be expected the enormous new possibilities opened up by jet-propulsion have not been ignored by designers, and already a jet-propelled helicopter is flying in America. Built by one Antoine Gazda, and named "Helicospeeder," it has a small egg-shaped fuselage with an enclosed cabin and a single rotor, which one would imagine must raise stability problems. But the "Helicospeeder" is almost certainly the first of the many and it is quite possible that future helicopters will have a small jet outlet at the tip of each blade of contra-rotating rotors and perhaps another jet outlet in the rear end to boost the forward speed. Certainly Britain, the home of jet propulsion for aircraft, will not be far behind in developing such types.

So the helicopter may be the answer to everyone's dream of a small, handy private aeroplane. But it will need a lot of careful development before the dream comes true.

COMPETITION RESULTS

OVERSEAS SECTION

March 1945 "Locomotive" Contest.—1st Prize: A. H. London, Pretoria, S.A.; 2nd Prize: J. A. Markham, Ontario, Canada; 3rd Prize: F. Little, Cape Town, S.A. Consolation Prizes: L. R. Benny, Sydney, Australia; N. Macdonald, Edmonton, Canada.

March 1945 "Go As You Please" Contest.—1st Prize: J. R. Clarke, Roseville, Australia; 2nd Prize: H. Ekwensi, Kano, Nigeria; 3rd Prize: H. R. Harrison, Alexandria, Egypt. Consolation Prizes: R. Jones, Sydney, Australia; P. Geddas, Auckland, N.Z.

March 1945 "Photo" Contest.—1st Prizes, Section A: L. Humm, Geraldine, N.Z.; Section B: E. Wiseman, Durban, S.A.; 2nd Prizes, Section A: S. Tooms, Calcutta, India; Section B: P. Hunt, Wanganui, N.Z. Consolation Prizes: C. Ricketts, Potchefstroom, S.A.; A. F. Corlett, Brisbane, Australia.

April 1945 "Drawing" Contest.—1st Prizes, Section A; I. Benjamin, Transvaal, S.A.: Section B: H. Watkinson, Bombay, India; 2nd Prizes, Section A: A. I. Lewis, Quebec, Canada; Section B: G. T. Dey, Hamilton, N.Z.; 3rd Prizes, Section A: I. Boocock, Canterbury, N.Z.; Section B: D. L. Daniels, Toronto, Canada. Consolation Prizes: V. Schoffner, Heidelberg, S.A.; P. Williams, Invercargill, N.Z.

April "Names" Contest.—1st Prize: Cpl. Elvey, R.A.F. 347 Wing, S.E.A.A.F.; 2nd Prize: J. A. Markham, Ontario, Canada; 3rd Prize: R. A. Ogden, Victoria, B.C., Canada. Consolation Prizes: H. Ekwensi, Kano, Nigeria; R. Harvey, Madras, India.

April 1945 "Photo" Contest.—1st Prizes, Section A: L. H. Humphreys, Malta, G.C.; Section B: C. J. Ricketts, Potchefstroom, S.A.; 2nd Prizes, Section A: D. Wallbridge, Durban, S.A.; Section B: G. Watcham, Johannesburg, S.A. Consolation Prizes: N. Liversage, Claremont, S.A.; R. Hughes, Wellington, N.Z.

May 1945 "Layout Planning" Contest.—1st Prize: B. Lathlean, Westmead, N.S.W.; 2nd Prize: G. Barker, Melbourne, Australia; 3rd Prize: D. Colquhoun, Unley, S. Australia. Consolation Prizes: R. Sampson, Pretoria, S.A.; M. Beddow, Vancouver, Canada.

Fireside Fun

Tobacconist: "So you would like some cigars for your husband, Madam."
Lady: "Yes, please. Something suitable for an Army officer. A good rank cigar, you know."

* * * *

"They must ask you a lot for the rent of this house."
"Oh, rather. Some weeks they ask me every day."

* * * *

"Has your husband been promoted yet?"
"Yes. He's only been a corporal up to now, but next week he is to go for a major operation."

* * * *

"Why don't you sing "On the Banks of Allan Water?"
"Certainly. Is that your favourite song?"
"No, but it is my favourite place for singers who don't know when to give up."

* * * *

"Who gave you that black eye, Jones?"
"Nobody, sir. I had to fight for it."

* * * *

"What are you rushing about the streets like that for on such a hot day?"
"Don't stop me. I'm trying to get something for my wife."
"Oh, have you had any offers yet?"

* * * *

Tommy: "Tell me a story, uncle."
Uncle: "Certainly. What kind of story would you like?"
Tommy: "One about a little boy who had a kind uncle who gave him half a crown."

* * * *

THIS MONTH'S HOWLER

Ostracism means hiding your head in the sand.

* * * *

"How often should I oil my engine, Mister?"
Reproduced by permission from "Games and Toys."

BRAIN TEASERS
FIND THE FIGURES

For our first puzzle we have a multiplication sum in which we give two incomplete numbers of five figures each, with the missing figures marked by the letter x, together with the answer, in which the first five figures again are represented by the letter x. Here is the sum, with all intermediate lines omitted.

x4x3x
2x5x7

xxxxx96179

Can you find the missing figures?

* * * *

"Baby's swallowed the matches. What shall we do?"
"Here, use my lighter!"

* * * *

NUMBER CONJURING

For our second puzzle we have an addition sum from *"Tracks,"* the Magazine of the Chesapeake and Ohio Railway. Here all the figures are represented by letters.

H O C U S
P O C U S

P R E S T O

The wording of this puzzle suggests conjuring, but there is no illusion. Only one set of figures fits the problem.

* * * *

WEIGHING WITHOUT WEIGHTS

Our third puzzle in the March *"M.M."* was one in which readers were asked how to detect a counterfeit medallion in a batch of 12 by means of three weighings. This month we carry this puzzle further by having a total of 27 medallions, one of which is a "wrong 'un." In spite of the increase the counterfeit can be detected in three weighings, and the problem is to find out how. We remind readers that no weights are available; all that they have with which to solve the problem is an accurate balance.

* * * *

SOLUTIONS TO LAST MONTH'S PUZZLES

The quotation disguised in our first puzzle last month was the well known one from *"Hamlet:" "To be or not to be, that is the question."* The code used is a very simple one. The alphabet is written backward and the letters are then given the successive odd numbers, beginning with 1. Thus 1 represents Z, 3 represents Y, 5 represents X and so on, down to 49, which represents B, and 51, which is used instead of A.

The clue to the solution of our 2nd puzzle lies in the fact that 319 can only be broken up into 11 times 29; there are no other factors. As we cannot have half a shelf or half a book, these numbers must represent the numbers of shelves and of books respectively. The number 11 is selected for the shelves, as a bookcase of 29 shelves, each long enough to hold only 11 books, would be a somewhat unusual one.

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(See also pages 210 and 212)

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All in perfect condition: Johnston's "Royal Atlas," 15/- (cost 21/-); "New Illustrated Atlas," 5/- (cost 7/6); "Meccano Magazines," 1942-1945, four years, complete, as new, 24/-.—40, Bispham Drive, Meols, Cheshire.

Pre-War Toys, good condition: Model Zoo; Army; Ships and Aircraft; full particulars.—Antrobus, South Lodge, Forest Row, Sussex.

Large Chemistry Set, including 40 Chemicals, £2/10/-; Morse Set, 7/6; also Aeromodelling Books. Send for details.—R. Foster, 1, Sussex Rd., Southport.

Quality Toys: Soldiers; Circus; Garage; "Dinky" Aeroplanes; Ships. Send stamp for list.—Fallows, 27, High St., Dore, Sheffield.

Quantity Wireless Components: Coils; Condensers; Valves, 17/6; Pair of Headphones, 10/6. All carriage paid.—30, Ashwood Avenue, Coventry.

Electric Railway Set, Gauge 0, with T.20 Transformer and many Accessories; extra Lines and Points. Stamp for list.—Wilkinson, Stockbridge Rectory, Hampshire.

Clockwork "Flying Scotsman" and Tank Loco.; One Pullman Coach; Nine Wagons; approx. 50 feet of Line. First offer over £4.—Mottram, "Thalatta," St. John's Avenue, Harlow, Essex.

"Meccano Magazines" March, July 1945; perfect condition.—K. Carlisle, 1, Sherrard Road, Leicester.

Bingoscope 9.5 mm. Home Cinema, with Films; 5 gns.; write—Johnson, The Wye, Marston Road, Sherborne, Dorset.

Gauge 0 Electric Railway (4 ft. diam. circle); also number Hornby Wagons, extra Track, Points, Crossing; Bridge, etc.; Bassett-Lowke Scale Model Steam Loco.; £10 the lot.—Couzens, 7, Gordon Terrace, Higham Road, Rushden, Northants.

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"Meccano Magazines," 54 copies between May 1924 and February 1933; no reasonable offer refused.—Murrin, 20, Clarence Road, Bromley, Kent.

Large quantity "Geographical" and "Meccano Magazines"; also "Penguin" and other books; S.A.E. for full list.—K. Fenton, 29, Priory Gardens, Wembley.

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

EDITORIAL AND ADVERTISING OFFICES:
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Telegrams: "Meccano, Liverpool."

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Complete "Meccano Magazines," 1940, 1942, 1943, 1944 and 1945; state price. 6 volt Meccano Electric Motor with reverse, £2 paid if in good order.—A. Breeks, Hilbeck, Brough, Penrith.

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"Meccano Magazines," January to June 1944, inclusive.—Loader, 22, West Avenue, Wallington, Surrey.

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"American Science Magazines," i.e., "Mechanix Illustrated," from 1938 to present day; state price.—F/O. J. W. Irvine, Officers' Mess, Royal Air Force, Marks Hall, Colchester, Essex.

"M.M.s" January and February 1943, July 1944 and August 1945; must be in good condition with covers; write sending price to—Richardson, 28, Longcroft Avenue, Banstead, Surrey.

All "War Illustrated's" January 1943 to date.—Green, 25, Neville Avenue, Anchorsholme, Blackpool.

Gauge 0 20 volt Electric Reversing Locomotive; working order; state price.—Gunn, 39, Flood Street, Chelsea, S.W.3. Flaxman 8639.

"M.M.'s" Jan., Feb., Mar. 1944; good condition; write—Brunt, "Rotherwood," Wood Lane, Timperley, Cheshire.

"Meccano Magazines," January 1944 to September (inclusive); in good condition; state price.—Drew, 19, Mossley Avenue, Wallisdown, Bournemouth.

Butterfly Cabinet, 12 or more Drawers; must be in good condition.—J. A. Robertson, 15, Bonnywell Road, Leigh, Lancashire.

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Published by MECCANO Ltd., Binns Road, Liverpool 13, England.
Printed by John Waddington Ltd., Leeds and London.