

VOL. XXIX. No. 9

SEPTEMBER 1944

MECCANO

MAGAZINE



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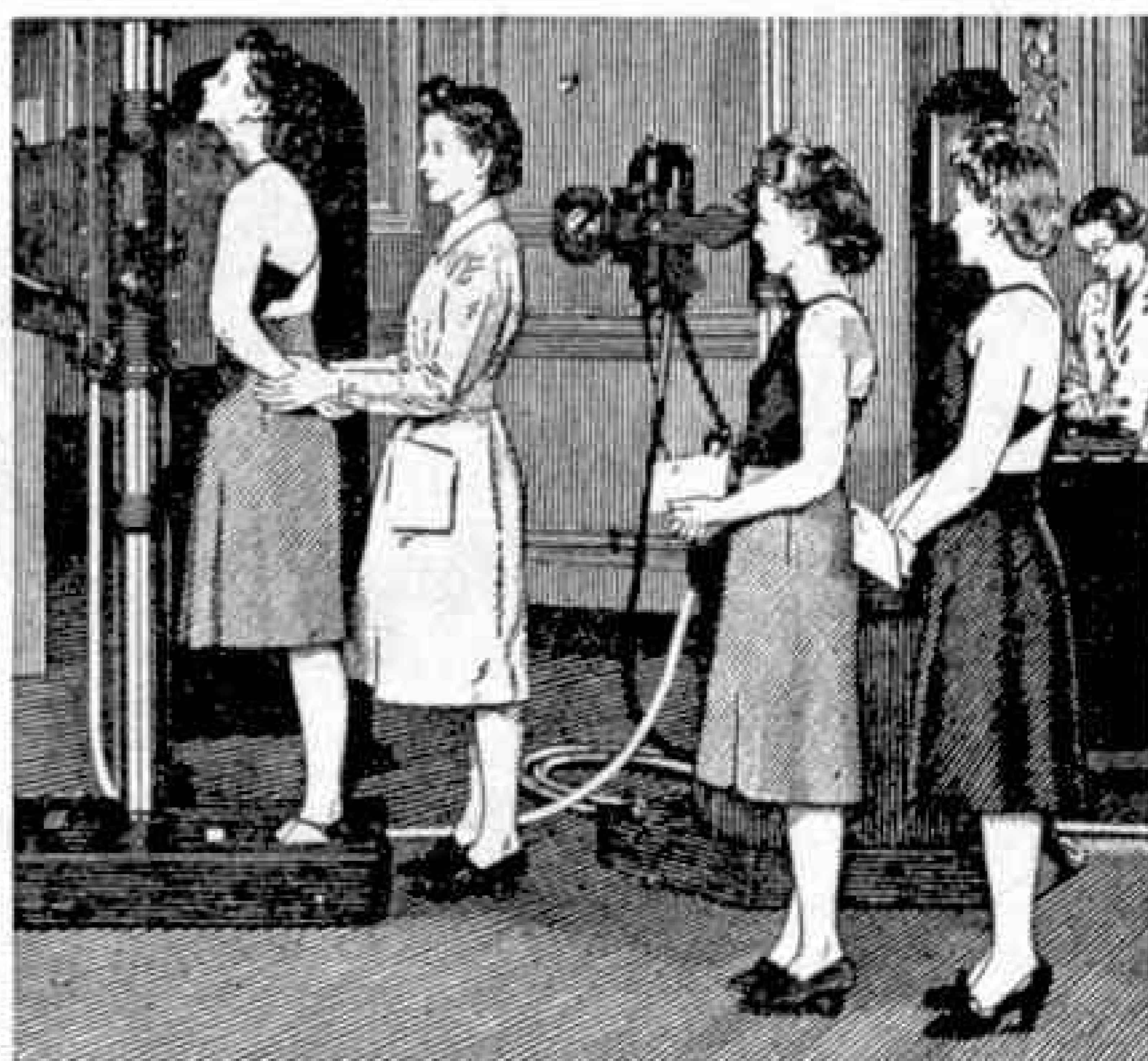


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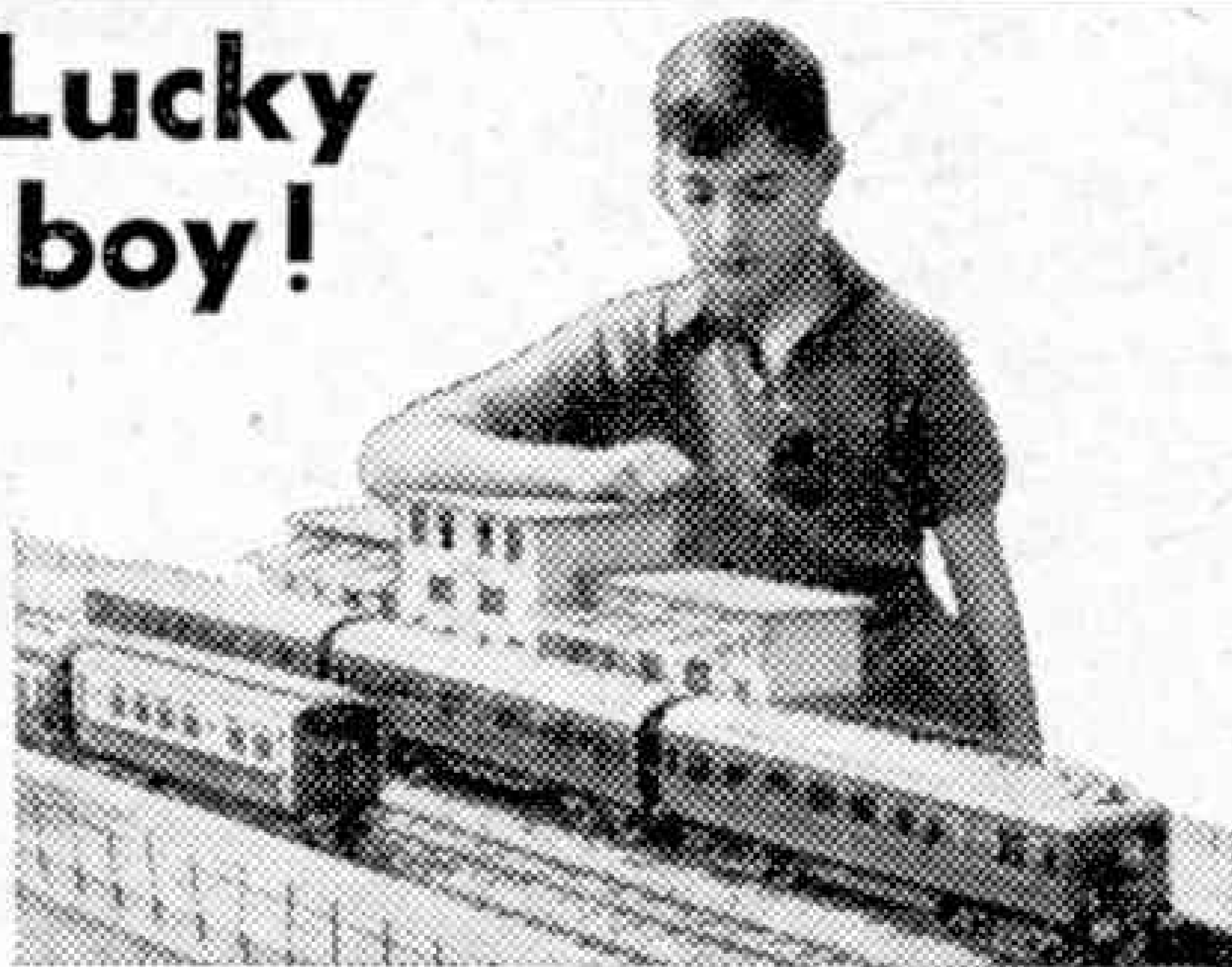
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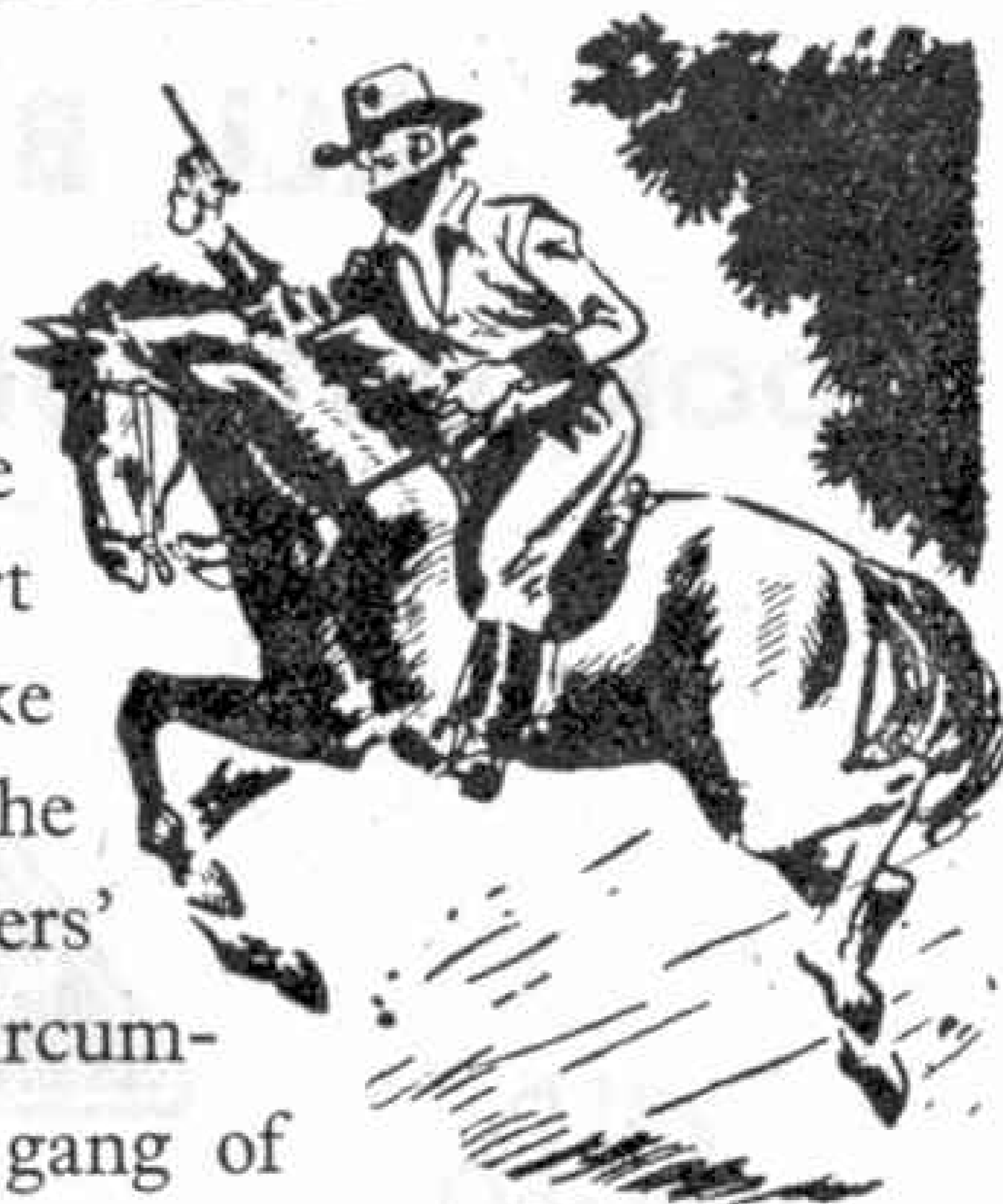
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ROUND THE WORLD WITH **BSA** No. 2



Can you imagine what modern transport means in a country of vast distances like Australia? Think of the middle of the last century when horses were the settlers' only link with civilisation. Ideal circumstances, these, for Ned Kelly and his gang of Bushrangers to begin their reign of terror which lasted until June, 1880, when they were rounded up in Victoria. The gang were given a chance to surrender but when they refused the building was fired. Three perished in the fire, two were shot and Ned Kelly was wounded and captured. In October he paid the penalty for plundered homesteads, coach hold-ups and bank robberies—he was tried, convicted and hanged. Today coaches speed along interstate highways, and bicycles, many of which bear the letters B.S.A., make



distances neighbourly. Yes, the new B.S.A. Bicycles that are so famous over here. You would like one? Ask your parents to see your local dealer — if you are patient enough he will help you get one.



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Next Month: "RECENT BRITISH LOCOMOTIVE PRACTICE." By O. S. Nock

MECCANO

MAGAZINE

Editorial Office:
Binns Road
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Vol. XXIX
No. 9
September 1944

With the Editor

The Song of the Wheels

One of the things we all notice, even the youngest of us, during a railway journey, is the rhythmic beat of the coach wheels over the rail joints. This "song of the wheels" has a peculiar fascination, but unfortunately it has always provided a headache for the permanent way engineer. The fish-plated joint produces a series of shocks that have a bad effect on rolling stock, and to keep the trouble within the smallest possible limits a great deal of work on the permanent way is necessary. For many years past attempts have been made to reduce the number of rail joints by increasing the length of the rails. The 30 ft. and 45 ft. rails formerly in use on British railways were generally replaced some years ago by 60 ft. rails, and on certain main line sections of the L.N.E.R. and the L.M.S. 90 ft. and later 120 ft. rails were successfully introduced. The welding of rail joints has made possible the production of even longer rails, and lengths of 180 ft. are now in use on many British main lines. Recently London Transport has installed several lengths of 300 ft., and it is interesting to note that with these lengths no trouble is experienced from buckling due to expansion.

So the song of the wheels is changing, and railway enthusiasts who calculate the speed of a train by counting the beats will have to revise their methods.

M.M. Subscriptions

Almost every day I receive urgent letters from boys and grown-ups who want to become subscribers to the "M.M." Unfortunately I have to refuse these applications, and I want to make the position clear. Paper is now strictly controlled, and I am allowed a definite amount each

month. This enables me to print a certain number of copies, and the number cannot be exceeded in any circumstances. At present the destination of every copy that I print is fixed. No copies are left over, and there is a waiting list of would-be subscribers. Now and then a subscription is terminated for some reason or other, and then I transfer this copy to the next person on the list. That is all I can do.

This state of affairs is likely to continue for some time, and once more I urge every reader to share his copy with others as far as possible.

* * * *

Next month will appear the first of three articles on how ships are built, by Denis Rebbeck, M.A. (Cantab.), M.I.N.A. There will also be an article on past and present types of U.S. Fairchild Aircraft by John W. R. Taylor, and an interesting note on the work of the United States Coast Guard, by Michael Lorant.

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Peaceful Air Transport

By C. G. Grey

(Founder of "The Aeroplane," 1911, Editor until September, 1939)

FOR centuries, ever since Roman times anyhow, wise men have been saying: "In time of peace prepare for war." We English have habitually neglected that wisdom, and our milk-and-water pacifists substituted, between 1918 and 1939, the foolish answer: "If you prepare for war you get war." But we got war without preparing for it. So what? Now we are being told: "In time of war prepare for peace."

All this post-war planning seems to me to be taking just so many man-hours away from the war effort. And, as nobody can tell what is going to happen socially after the war, all the planning may go sour on us. Nevertheless, although we cannot tell with any certainty the shape of things to come on the political side of air transport, we can tell fairly well the shape of the aircraft to come.

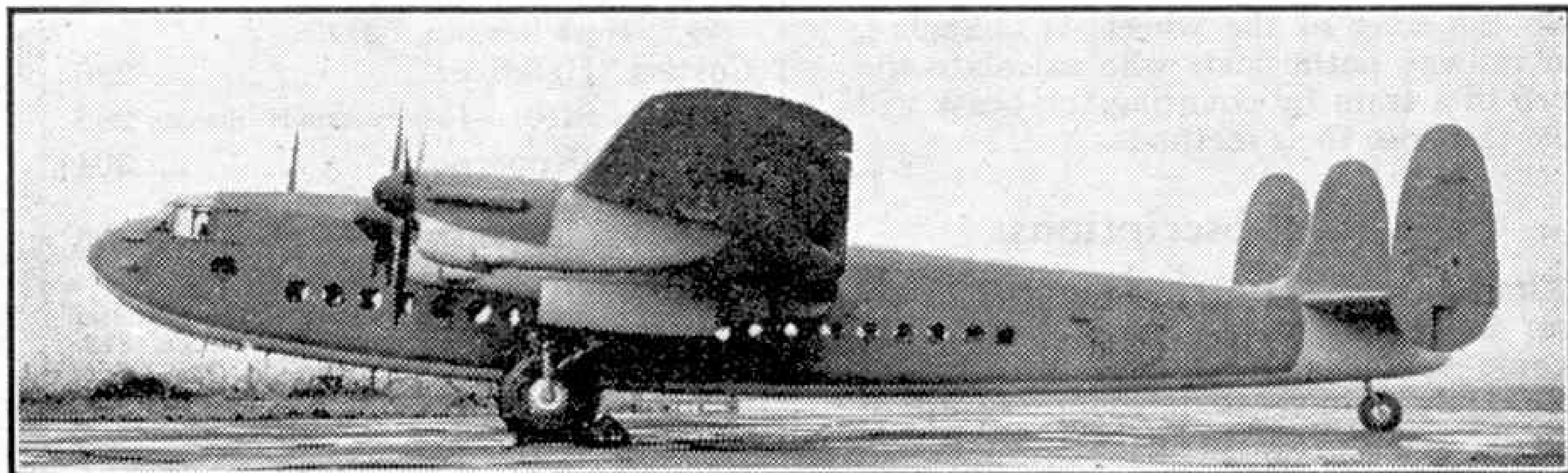
More nonsense has been written and more cock-eyed ideas have been published about transport aircraft of the future than about almost any other subject. That eloquent Polish-American, Alexander Severski, has produced a fat book about passenger craft nearly as big as ocean liners which are to have a range of thousands of miles non-stop. Then there are those who talk and write of giant flying boats as big as the "*Queen Mary*," which will carry hundreds of people at a time. Some of them say that such flying ships will be built by the great Mr. Kaiser, who has beaten all records in the U.S.A. for steamship production.

Some of our designers seem to have caught this ambition for the "*Kolossal*,"

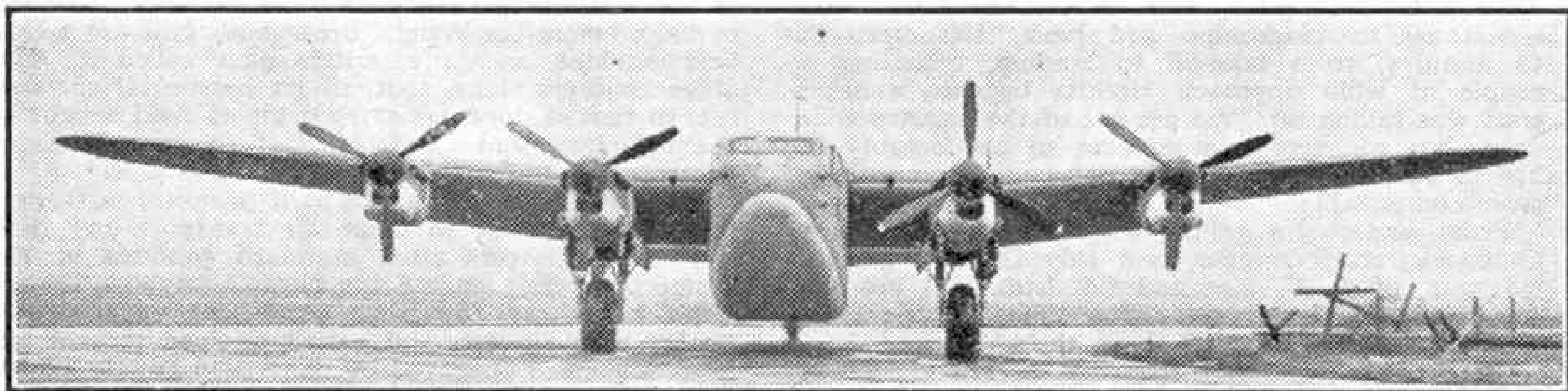
as the Germans call such ideas. They plan immense blown-up (inflated to scale) versions of existing U.S.A. types, with six or eight engines, each 50 or 100 per cent. bigger than any existing engine. Others have visions of huge jet-propelled aircraft, disregarding the fact that we are not likely to have jet propulsion on such a scale, combined with economical use of even the cheapest oil-fuel, for ten or twenty years to come, although we and the U.S.A. and the Germans may have excessively fast jet-propelled fighters, regardless of cost, in this war.

So let us take a look at things which we know can happen, in the light of what has been and is being done. I prefer to trust the views of the men who have the experience and are still young enough to profit by it, rather than the visions of young enthusiasts who have no experience, or the prophecies of white-whiskered old men who have never done anything except prophesy—generally wrongly.

The first function of air transport after fighting stops—which does not mean the official end of the war by a good bit—will, obviously, be to give quick communication between the conquering nations and those parts of the world which need help, as well as those which can give that help. Cables and wireless can do a lot in hustling communications, but there is some business which can only be done by letter, and some for which signed documents have to be sent, and some for which samples must be seen before orders can be fixed. And that is where aircraft come in.



Our First Transport Machine: The Avro "York" is admittedly an adaptation of the "Lancaster," and its successor, the "Tudor," will embody more modern ideas. But it is a very good aircraft and very pleasant to fly.



The Avro "York": Front view. Note the curious frog-like expression of the nose. It is fast, efficient, and comfortable, although it is only regarded as a stop-gap by its makers.

Now remember that in 1936 Sir MacPherson Robertson, the "Candy King" of Australia, put up a big prize for an air race from England to Australia. It was won by Charles Scott and Tom Campbell-Black in a de Havilland "Comet." Their time from Mildenhall to Melbourne, some 12,000 miles, was 72 hours start to finish, in spite of losing their way and flying some hundreds of miles needlessly. Their overall speed was 160 miles an hour.

The "Comet" was the direct ancestor of the "Mosquito," which is still the world's fastest fighter, or reconnaissance craft or bomber. In fact the "Mosquito" is almost a scaled-up "Comet," but it has getting on for 4,000 h.p. instead of about 400 h.p. Its cruising speed is much more than twice that of the "Comet." And, as it can carry a 4,000 lb. block-buster, it can obviously carry a lot of fuel plus a good load of mail or samples.

Which, by the simplest of arithmetic, means that we can run air mail to the farthest part of Australia in 36 hours, or to India in 20 to 24 hours, or to Cape-town in 15 hours. There now is the shape of a thing which can come, with very little foresight and organisation, within a week or two of clearing the Japanese out of Burma and the Netherlands East Indies. In fact we

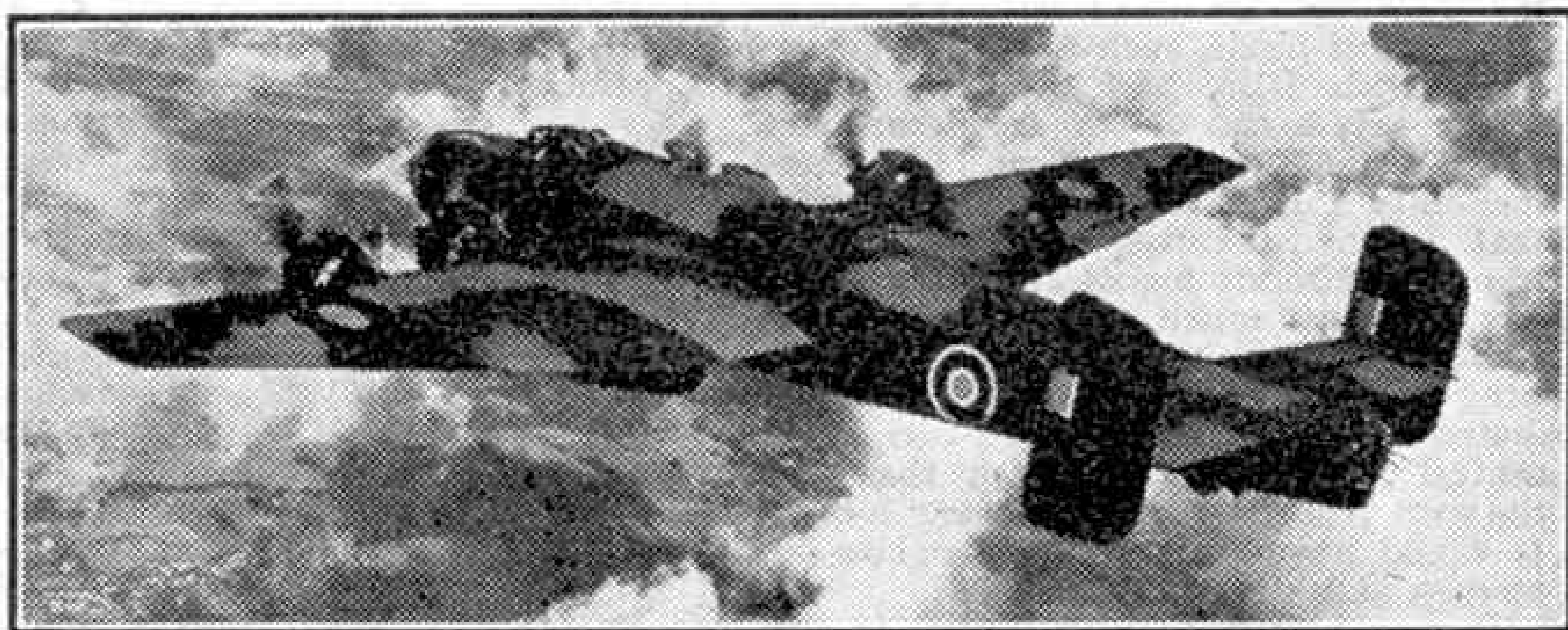
could run at that speed to India and the Cape right now, if anybody cared to do so.

We are in fact doing just as good a job already, without anybody making much song about it. British Overseas Airways—the Boa which swallowed all the other air-lines—is running "Mosquitoes" to Sweden. Stripped clean for high-speed mails they are so fast that once, when

there was an urgent job on hand, one pilot went to Sweden and back from Great Britain twice in one night. And, on occasion, "Mosquito" mail-pilots have gone to Russia and come back in the day.

You will admit that we mere English may be allowed to take some satisfaction from the fact that we already run a regular air line which is faster than any other in the world by *several hundreds of miles per hour*. Moreover, we also run the longest non-stop air-line in the world.

Then we have the Avro "York," the first aircraft to be built specially for civil transport. It is a civilised version of the historic "Lancaster," and so may be looked upon rather as an adaptation than as a new design. It has two drawbacks as a result. The fuselage is not quite wide enough to take four seats abreast plus a gangway, and with only three abreast the gangway is needlessly wide. Which means waste of space—a thing which is abhorred by air transport operators, brought up on



To be borne in mind: A Handley Page "Halifax" bomber from which H.P. Ltd. have developed a purely commercial aircraft, as yet un-named.

pence-per-ton-mile. Also it has a square-section fuselage, which means that if a super-charged cabin is wanted for flying very high up, it would have to be greatly strengthened to stand the internal pressure, compared with a circular cabin, and that would mean much added weight.

All the same it is a fine aeroplane. My son (aged 13½) and I had the luck to go

for a test flight in one with Capt. H. A. Brown, the Avro chief test pilot, from a certain Manchester aerodrome to Llandudno and back, 150 miles in 45 minutes, from take-off to landing, including a couple of wide approach circuits because another craft was taking off. We never had the engines wide open, but we were cruising ever so comfortably at 210 to 220 m.p.h. And I do not hope for anything more comfortable.

From experience gained with the "York," Roy Chadwick, chief designer, and Roy Dobson, general manager, of A. V. Roe and Co. Ltd., will produce something still better soon after the war. So there is no need to be anxious about the old firm.

Sir Frederick Handley Page has a civil version of the H.P. "Halifax" on the drawing-board, if not on the stocks. And an immense amount of knowledge has been got from the operation of the big bombers which will be valuable in the H.P. transport craft. And remember that the old H.P. four-engined "Hannibals" which were the most comfortable conveyances ever built, were in use for ten years and never killed or injured a passenger, until the last of them disappeared with all on board in the Persian Gulf.

H.P. is no believer in the colossal aircraft—in which I agree heartily with him. The success of air transport of passengers depends on the services being, like nourishment, "little and often." As I wrote many times in *"The Aeroplane,"* between wars, one does not want to go to the airport to catch an aircraft at a certain moment, one wants to go and catch the next one out. That is to say the services should be like those of trams and buses, and not like main line expresses.

The bigger non-stop transatlantic or transcontinental air-lines may carry 150 or 200 people and run several services a day on each line. But most machines are more likely to carry 20 or 30, or perhaps 40, passengers, like a motor-coach, and start every few minutes as the machines are filled with passengers. That will be for short hauls, such as certain cross-water lines in the British Isles, and to places on the Continent within say, a run of two to three hours.

An aeronautical engineer, of whose sense and reliability I think highly, told me some months ago that he had figured out that we could build a transport aircraft for short-haul touring which would pay its way much as passenger-cruises in ocean-going liners paid before this war. He foresaw a high-wing monoplane (for view) to carry 60 passengers seated four abreast—two-and-two on each side of a central gangway, with much the same comfort as the road vehicles which call themselves luxury coaches. It would have two very big engines—as cheaper for upkeep and service than four.

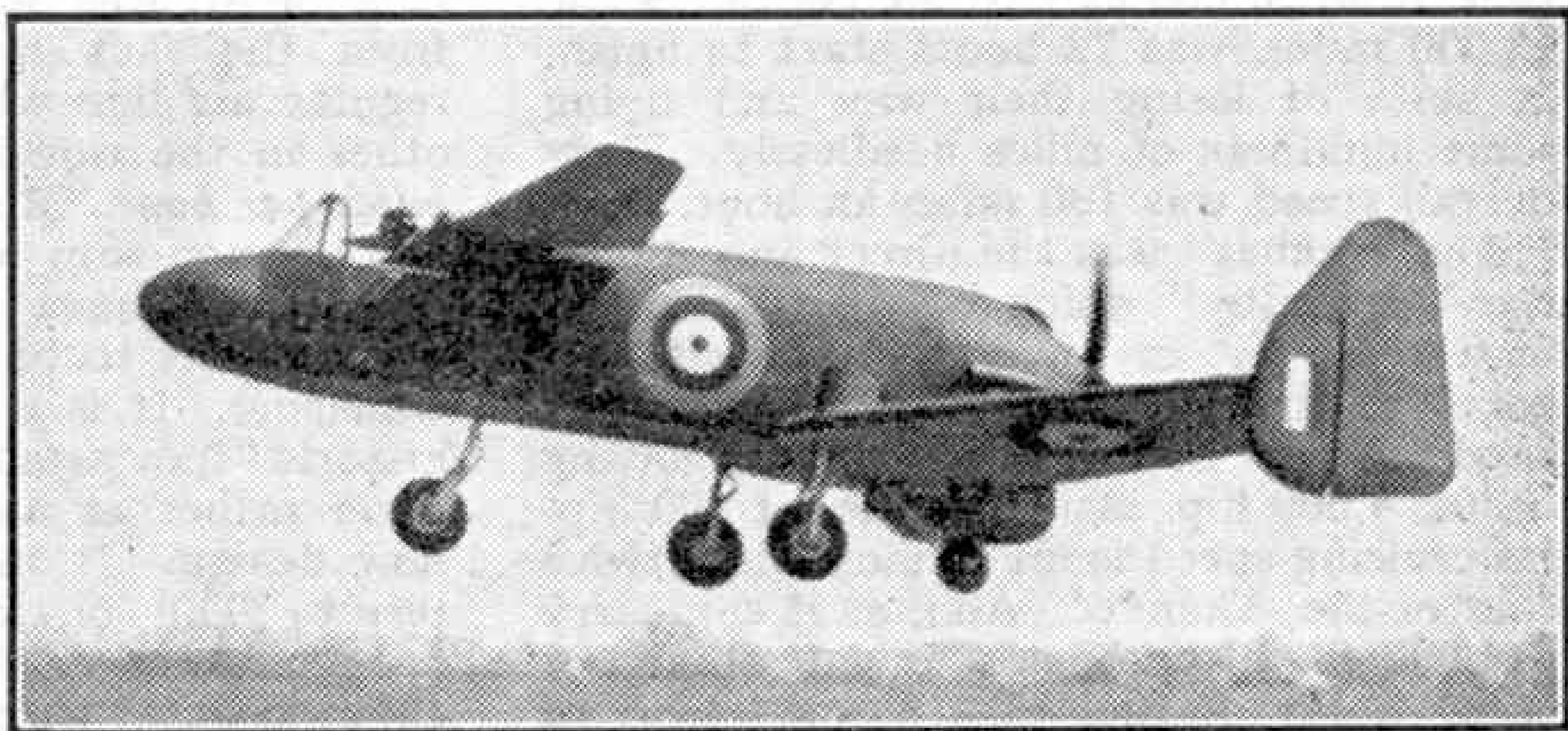
It would tour to, say, Paris, if any left by the Germans, Madrid, still alive and gay, Rome, still preserved, Vienna, untouched, and a flight over the ruins of Berlin, returning by, say, Stockholm and Amsterdam to London. And the fare would be, he calculated, a penny a mile—which was, fifty years ago and more, the Parliamentary third-class fare on our railways. Which sounds good if anybody can afford to pay for a holiday tour, even at a penny a mile.

One type of aircraft in which I am keenly interested is the "Libellula" or "Dragonfly," which is being developed by the brothers Fred and George Miles, of Miles Aircraft Ltd., makers of the famous "Hawk" and later of the "Magister," "Master" and "Mentor." This is a true tandem monoplane, on the same basic

principles as that which the late Professor Langley of the Smithsonian Institute of Washington designed in 1900, before the Wright Bros. flew. It is not a tail-first machine, as many writers have called it. The Miles brothers claim that all its horizontal surfaces lift, so that it does not carry a lot of dead weight in the tail-plane and elevators, just to keep it under control fore and aft, as do most aeroplanes.

If it works out in practice as it promises in theory, it should do more to make air transport pay than any one departure from standard practice in the design of aircraft since flying began. Anyhow, George Miles has flown the little single-seat experimental pusher with success, and a twin-engined version has been flown and approved by more than twenty pilots.

The greatest improvements of all to which we must look forward are those to make flying safe. Petrol ought to be abolished. No nation would dare to publish the number of its own people who have been burned to death during this war, or those maimed or disfigured for life, in petrol fires. And it has all been the result of lack of imagination, one might well say criminal negligence, among technical officials—in Germany, Russia and the States as much as here. We could have had Diesels, using heavy oil, ten years ago if we had tried. Germany did try, but



A future possibility: The Miles "Libellula," a tandem monoplane, not a "tail-first" craft. The picture shows an experimental machine, with a "pusher" engine.

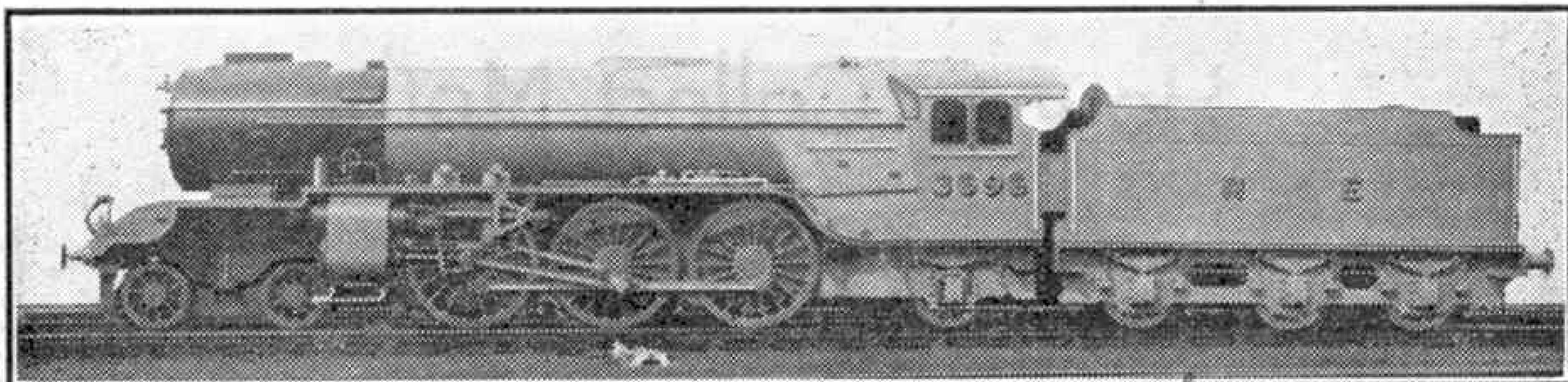
went off on a wrong track in design. Roy (now Sir Roy) Fedden tried and succeeded so far as he went, but had to drop it for lack of support.

Now, I am told, we shall not bother about Diesels, because if we did so they would be just about right by the time jet-propulsion would be ready to make them obsolete. Which is just sheer bureaucratic nonsense.

The other greatly needed improvement in civil aircraft is short take-off and slow-landing. We had to drop using Handley Page slots on bombers for reasons which the Authorities thought good enough. But Willy Messerschmitt still uses them on his high-speed fighters. We do use flaps to help take-off and slow-landing, but they could be developed a heap more for civil transport. At any rate we must stop this absurd idea of 3-mile runways and landing at 150 m.p.h. as some bombers do.

What the aeroplane operators of the future will have to sell is not speed—anybody can get speed by paying for it—but lack of speed, and brains are needed to get that. Every form of transport except aircraft can pull up and stop in its own element, and come alongside a quay or a platform gently. I am no believer in helicopters or gyroplanes of any sort, so I do not expect an aeroplane to stand still in the air. But I do expect it to land slowly.

On this subject a friend of mine writes: "Sooner or later one of the huge air liners they are contemplating building, landing on prepared aerodromes five miles in diameter at 150 m.p.h., will have on board the Prime Minister of the day and half the Cabinet, and it will crash (Continued on page 322)



The first L.N.E.R. "Pacific" of the new "A2/1" class, a modification of the 2-6-2 "V2" class.

New "Pacifics" for the L.N.E.R.

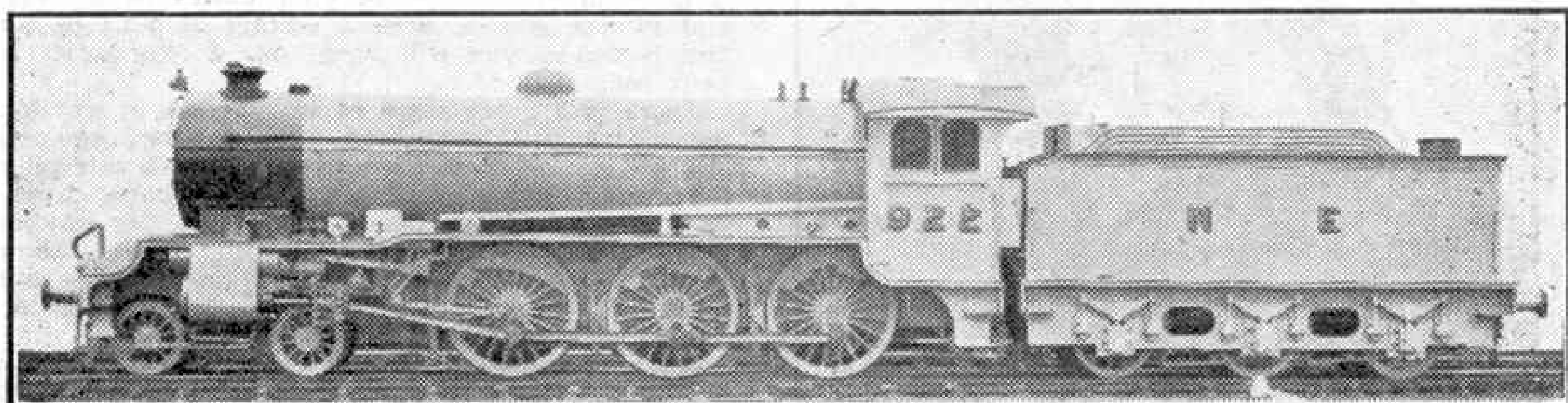
THE L.N.E.R. has built a considerable number of the mixed traffic engines of the "V2" type, which have the 2-6-2 wheel arrangement and are provided with three cylinders. The last four of a batch of 25 of these engines to be built have been modified in a very interesting manner by Mr. E. Thompson, Chief Mechanical Engineer. From "Prairies," or 2-6-2s, they have been converted into "Pacifics," and they are now designated class "A2/1." An illustration of No. 3696, one of the new "Pacifics," appears at the head of this page. Other interesting features of the new design are that the valve of the middle cylinder is actuated by a third independent Walschaerts gear, instead of by the Gresley "2 to 1" lever arrangement as fitted to the original engines. The cut-off in full gear has been increased to 75 per cent.

This modified construction has been undertaken as a result of the conversion of the company's 2-8-2 locomotives of the "P2" class to the 4-6-2 wheel arrangement with separate valve gear, as described on page 4 of our January issue. The boiler of the engine is the standard "V2 type," with a grate area of 41.25 sq. ft. and a total heating surface of 3,110.74 sq. ft. A modification has been made in that these last four engines have been fitted with a

complete rocking grate and a hopper ash-pan, so that the ashes can be released without the necessity for a man to go underneath the engine. The cylinders are 19 in. in diameter, which increases the tractive effort from 33,730 lb. in the case of the "V2s" to 36,387 lb. in that of the engine thus constructed. The bogie is identical with that fitted to the class "B1" 4-6-0 locomotives.

A second L.N.E.R. conversion concerns the "B16" 4-6-0 locomotives. From 1919 onwards the former N.E.R. built a number of 3-cylinder 4-6-0 goods engines, known as the "S3" class, with cylinders cast in monobloc formation. The life of the monobloc cylinders left a good deal to be desired. Consequently in 1937 engine No. 2364 was rebuilt at Darlington with outside Walschaerts valve gear and with the "2 to 1" lever motion applied to the middle cylinder. Six more locomotives of the class, Nos. 1372, 1374, 2366, 2367, 846 and 926 were similarly rebuilt and classed "B16/2."

Now each of the three piston valves of the "B16" locomotives is to be equipped with its own independent set of Walschaerts gear. No. 922 has been altered in this way to the designs of Mr. Thompson. The remaining locomotives of the class will be similarly dealt with, and the resulting engines will be classified as "B16/3."



L.N.E.R. 4-6-0 No. 922 after rebuilding. Illustrations on this page by courtesy of the L.N.E.R.

How to Collect Moths

By L. Hugh Newman, F.R.E.S.

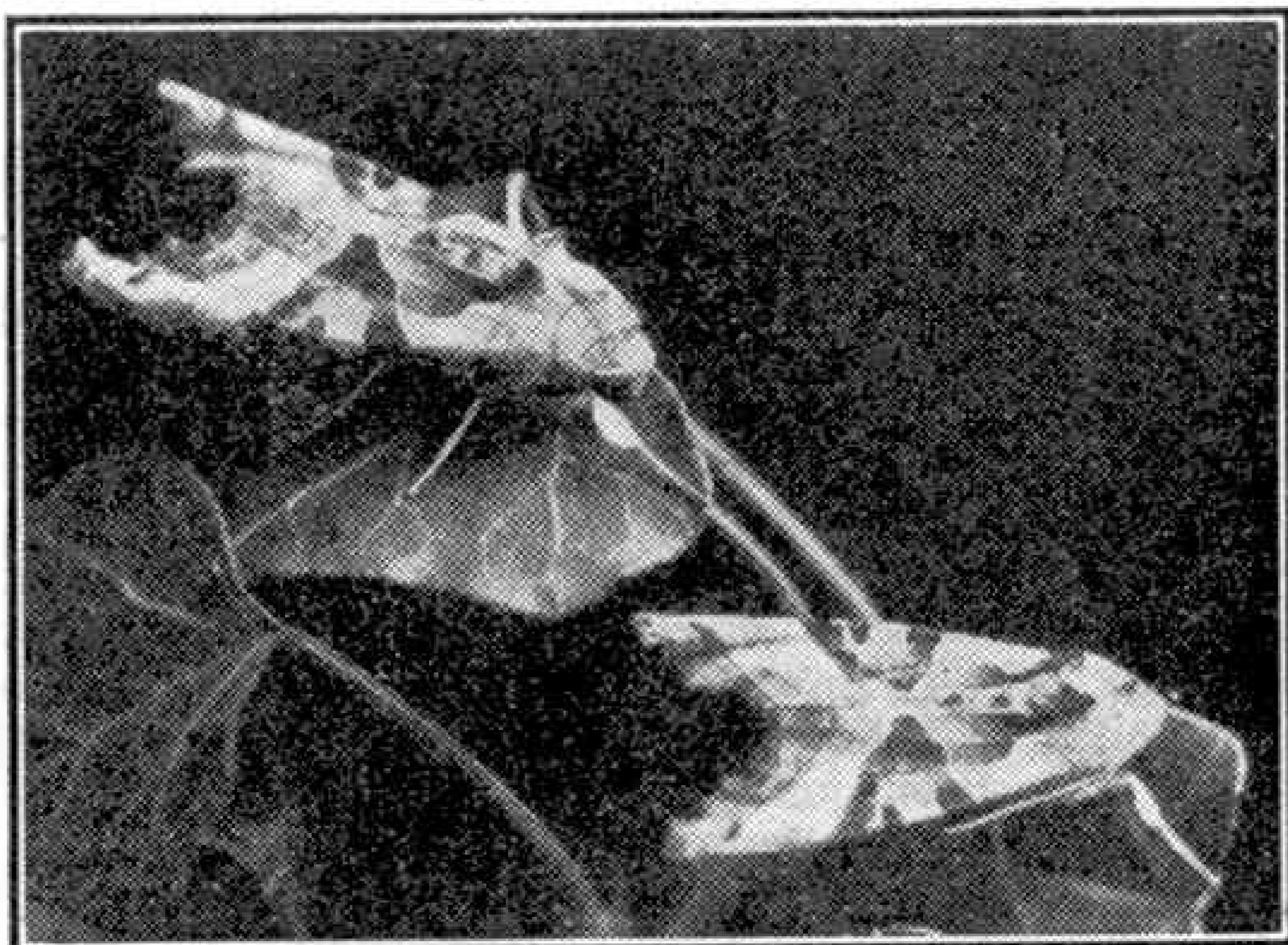
AUTUMN might be considered to be the season when the moths' year really begins, for it is during September and October that so many kinds emerge from their pupa cases. You can see them at dusk as they congregate round the ivy blooms where they come, with the other insects, for the last great banquet of the year. All day long sleepy flies and wasps, and late flying butterflies, have jostled together seeking the nectar from well-filled golden cups. At night it is the turn of the moths. They are rather a dull-looking crowd for the most part, but here and there you see one of the *Xanthia* family, with prettily tinted forewings of yellow or orange. During the day they sit about among fallen leaves and their colouration therefore serves as a great protection.

Now if you decide to take up the study of moths you must begin by learning to classify them into the four main groups. Unlike our butterflies, which number only some 60 species, the moths run into nearly 2,000 if you include the micro-lepidoptera! As a very simple guide you can group them under four headings, the *sphingidae*, or hawk moths; the *bombyces*, or eggars; the *noctuidae* or night-flying moths, which comprise by far the greatest number of the British lepidoptera; and the *geometers*.

It is not safe to rely upon the colour of their wings for the purpose of grouping, as shown by the classical error in the earliest published butterfly book, of putting the Red Admiral butterfly and the garden Tiger Moth in the same genus! The fact that both insects have red on their wings was evidently good enough for that author!

But with a few exceptions, one can safely say that any caterpillars you find with a pointed horn at the rear end are those of hawk moths. The familiar Poplar Hawk is one of the commonest moths in this

country, but how many of you have found it during the day as it hides under a leafy canopy of poplar leaves clinging to a twig with front legs raised in an attitude of supplication? Great care should be taken not to mistake the Angleshade moth for the Lime Hawk which it closely resembles—two of them are



These Angleshade moths show their beautiful markings.

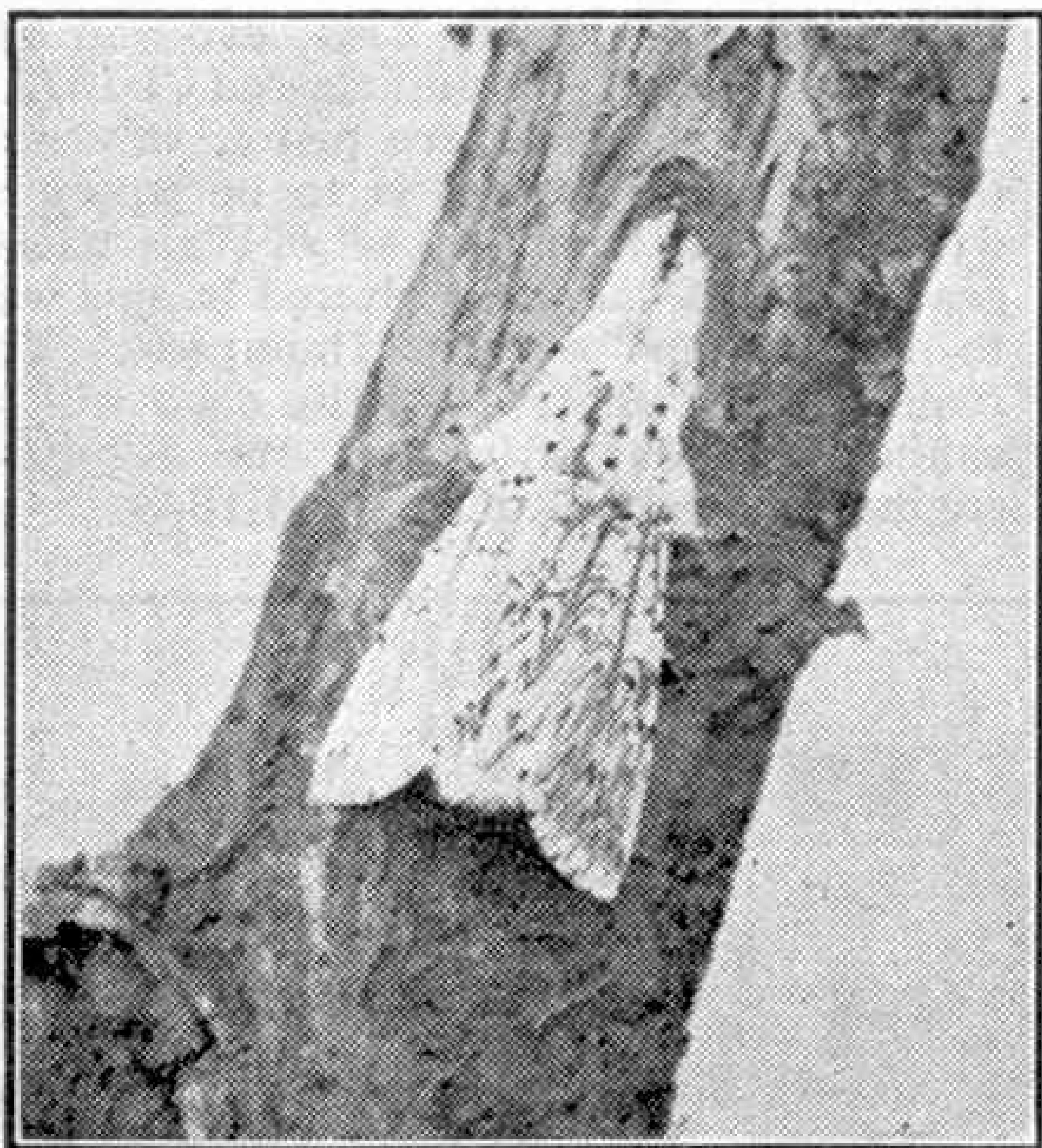
illustrated here sitting in a very "hawk-like" posture!

Most of the woolly-bear caterpillars come in the group of *bombyces*, with such well-known names as Oak Eggar, Lappet and Drinker, not forgetting the closely related Tigers and Ermines. Next come the *noctuides*, which are naked and fat in the caterpillar stage, and as I mentioned are the most numerous of the whole miscellany of moths. The *geometers* run them fairly close in numbers, but they are easy to distinguish with their thin stick-like bodies, and their habit of letting themselves down by single gossamer threads from trees and bushes where they feed.

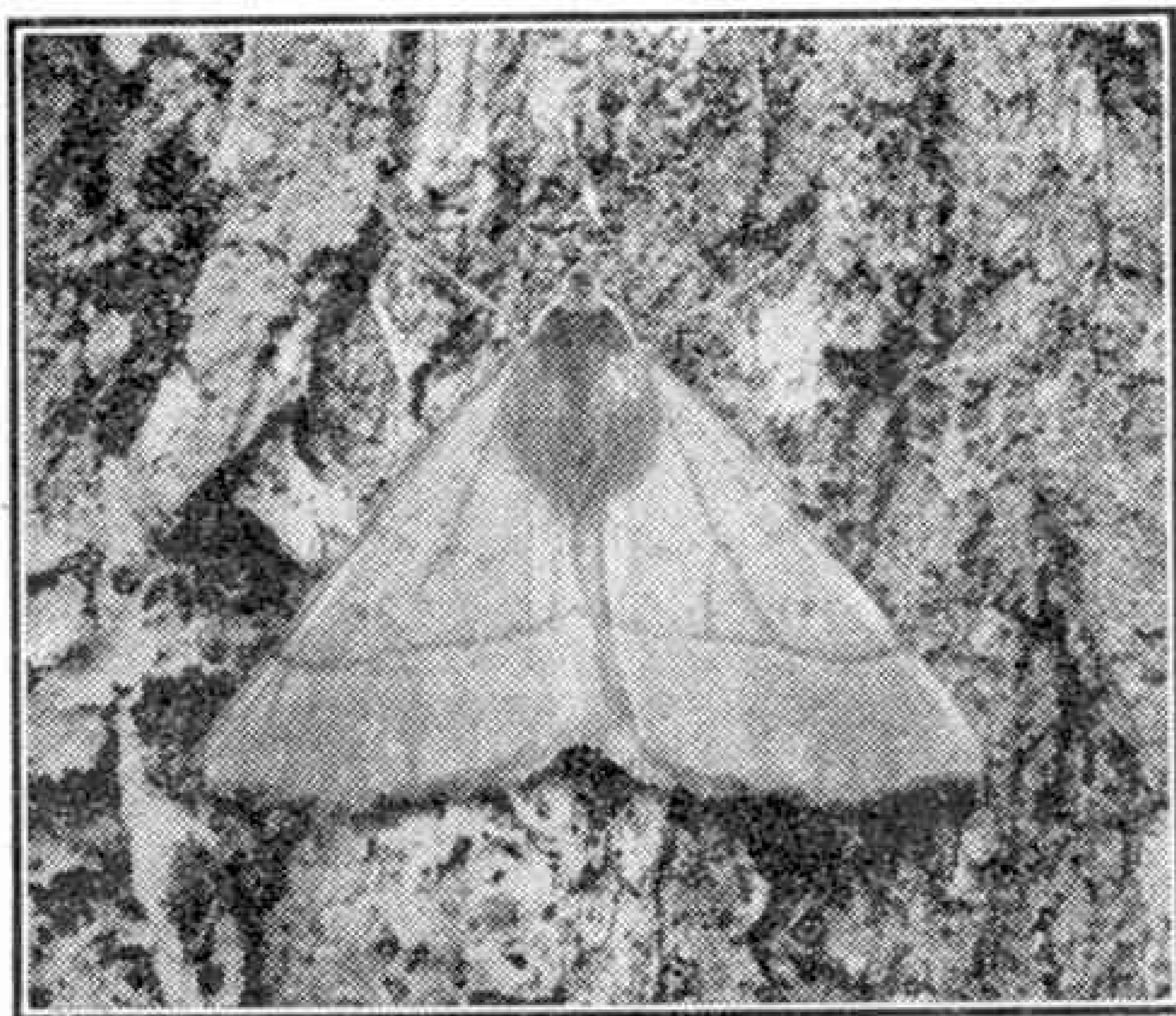
There are several ways in which you can start this hobby of moth hunting. If you wish to become a serious collector you will want bred specimens for your cabinet, and so you will first of all have to obtain information from a book, or a fellow entomologist, as to the best locality for the species you are going to seek. And then you must search for live females—the ivy blossoms in autumn is one place for this, as I pointed out earlier—and having caught one or two, take them home and rig up conditions as near to nature as possible. You will then find there is no difficulty in getting your moths to lay eggs, and in due course, with a certain amount of care and patience, you will breed out a long series for your collection.

There is a great sense of satisfaction in watching the moths you have bred from the egg emerging into the world. Even the lowly Puss moth caterpillar, the most popular of all among schoolboys, gives a splendid lesson in patience as it teases its way out of its seemingly solid cocoon with endless labour. Or again it is fascinating to watch an Emperor moth caterpillar constructing its complicated fortress in a thicket of heather in a breeding cage.

Many people have not the time to breed insects in captivity and prefer an occasional day out in the field, with no special object in view except to get a good "mixed bag." It is not so much keen eyesight



Puss moth at rest on the trunk of a tree.



The Feathered Thorn, a moth that emerges in November.

that will help you to spot the various moths that sit about on walls, trees, and fences during the day, as knowing exactly what you are looking for! Before you start on an expedition, therefore, it is as well to study a good book on the subject, consulting the index as to the locality and time of appearance of the various moths that might presumably be expected in your neighbourhood.

My own favourite method of collecting moths in the daytime is to walk through ridings in woods where the hazel is higher than my head, or along high-hedged country lanes, tapping the herbage and bushes as I pass by. All manner of moths are disturbed in this way, and the most unexpected "finds" may come into the net during a stroll of a mile or so.

But it is at dusk that the true entomologist gets the call! If the portents are good, you will find yourself gathering up pill boxes and stowing them away in the satchel with lamp, treacle pot, and folded net, just as the Sun sets. There is nothing hurried about this night collecting business. You meander along, netting a geometer here and there as they begin to emerge from their leafy bowers, joining the twilight revels of the nocturnal birds and beasts. Soon the noctuidae will be on the wing, and great clumsy fellows they look after the delicate geometers—beautiful Emeralds, little Waves and Carpets with wings as soft and fragile as the finest lace.

Wartime restrictions have not put a stop to sugaring if you are prepared to sacrifice a modicum of treacle from your sugar ration. Mix the treacle with a little beer, boil slowly until it thickens, add a drop or two of jargonella, essence of pear, bought from a chemist, and you have the perfect sugaring mixture. A clearing in a wood, with one or two big trees standing apart is a very good place to begin sugaring. You may notice that some of the trunks already have large black patches on them at about the height of your head. This will tell you that you have come to a haunt already known to entomologists and that the trees have previously been sugared, and you may find that a few early feeders are already on the old patches. Get around with your fresh treacle as quickly as you can, painting it on with a large brush, and then sit down and wait for about half an hour.

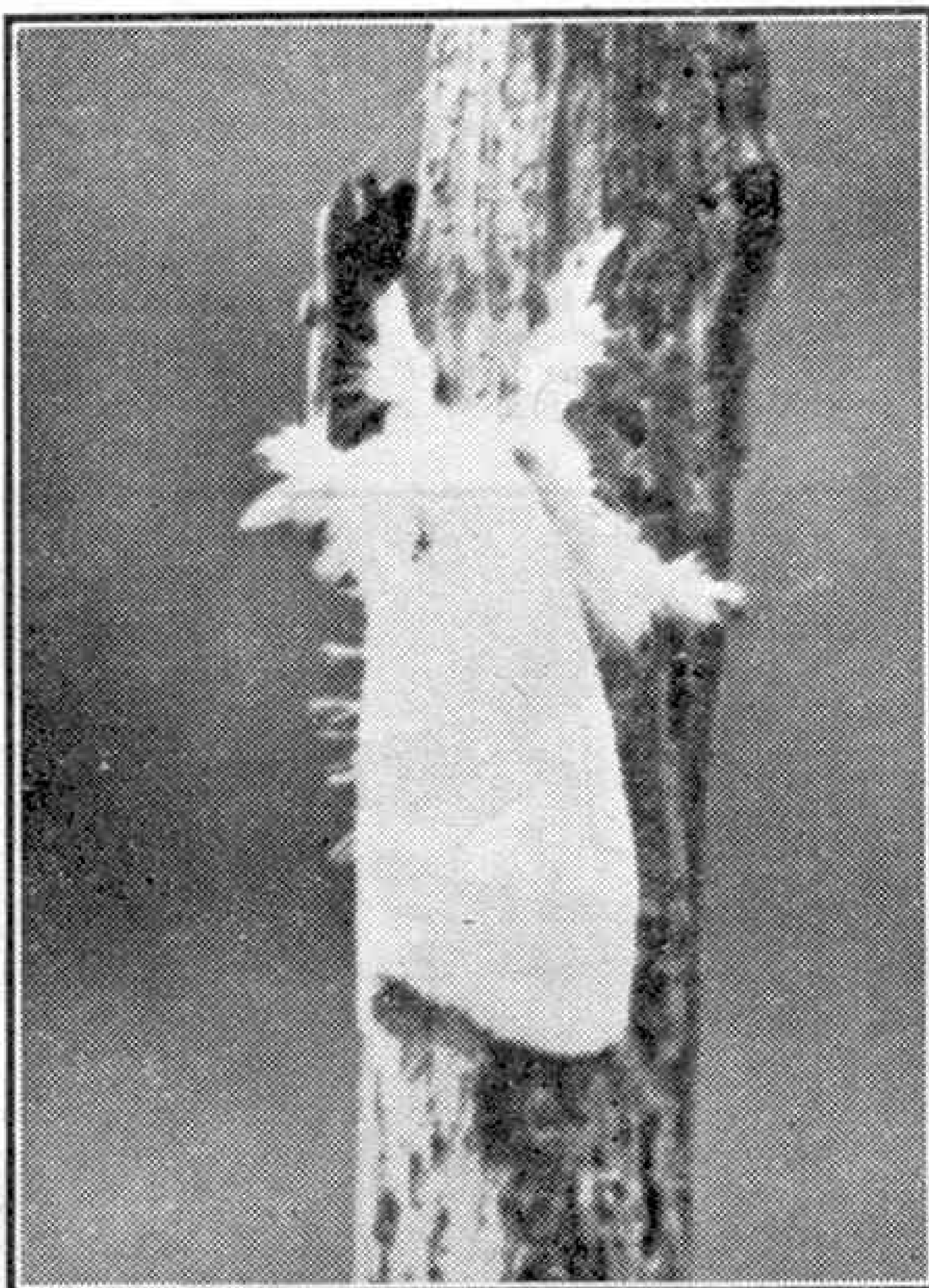
It will now be almost dark and you'll need a torch to see what moths have been attracted by your tree trunk treat, but I think that if it is properly dimmed you will not run the risk of offending the law! In my opinion a shaded electric torch is far superior to the smelly acetylene lamp that old-fashioned collectors always used on their moth hunts, as you could not control these lamps in the way you can a torch.

What a grand sight it is on a perfect September night as you carefully turn your light on to the black and shining patch of sugar. There are the moths, sitting around the edge of the patch, their scarlet eyes shining like miniature rubies in the light, reaching out for the sugar with their long quivering tongues, for they are dainty creatures and don't like getting their feet sticky. Do not be in a hurry to take any, unless you see a Crimson Underwing, which is a large moth, and notably shy and ready to be off. Look them over for possible rarities first. There is always the element of surprise in sugaring and you never know what may turn up.

Now it only remains to say a little about the times and seasons. Unlike butterflies, which are limited to the warmer months, you can find moths the whole year round. As I told you, the autumn is a great time of emergence, and in November you can sometimes find the beautiful Feathered Thorn moth, illustrated here, sitting on tree trunks, and it is quite conspicuous, unlike many of the species which emerge in winter. Some of them, such as *Pilosaria* and *Hispidaria*, both rather large and heavy-bodied geometers, are wingless females, which crouch all day in crevices in the bark of tree trunks and are almost impossible to see.

On fine days in January it is worth while beating stunted beech bushes where the leaves still hang, as a pretty little sepia and white geometer called *Leucophearia* often flies out; but choose a calm day, otherwise it will be whirled away into space. In March the brilliant Orange Underwing, *Parthenias*, can be seen flying high up among the birch trees, but if you wait until late afternoon it will always come down to earth.

As soon as the sallow blossoms are out, all the moths you saw on the ivy bloom in the autumn will be back again, freshly awakened from hibernation and very hungry.



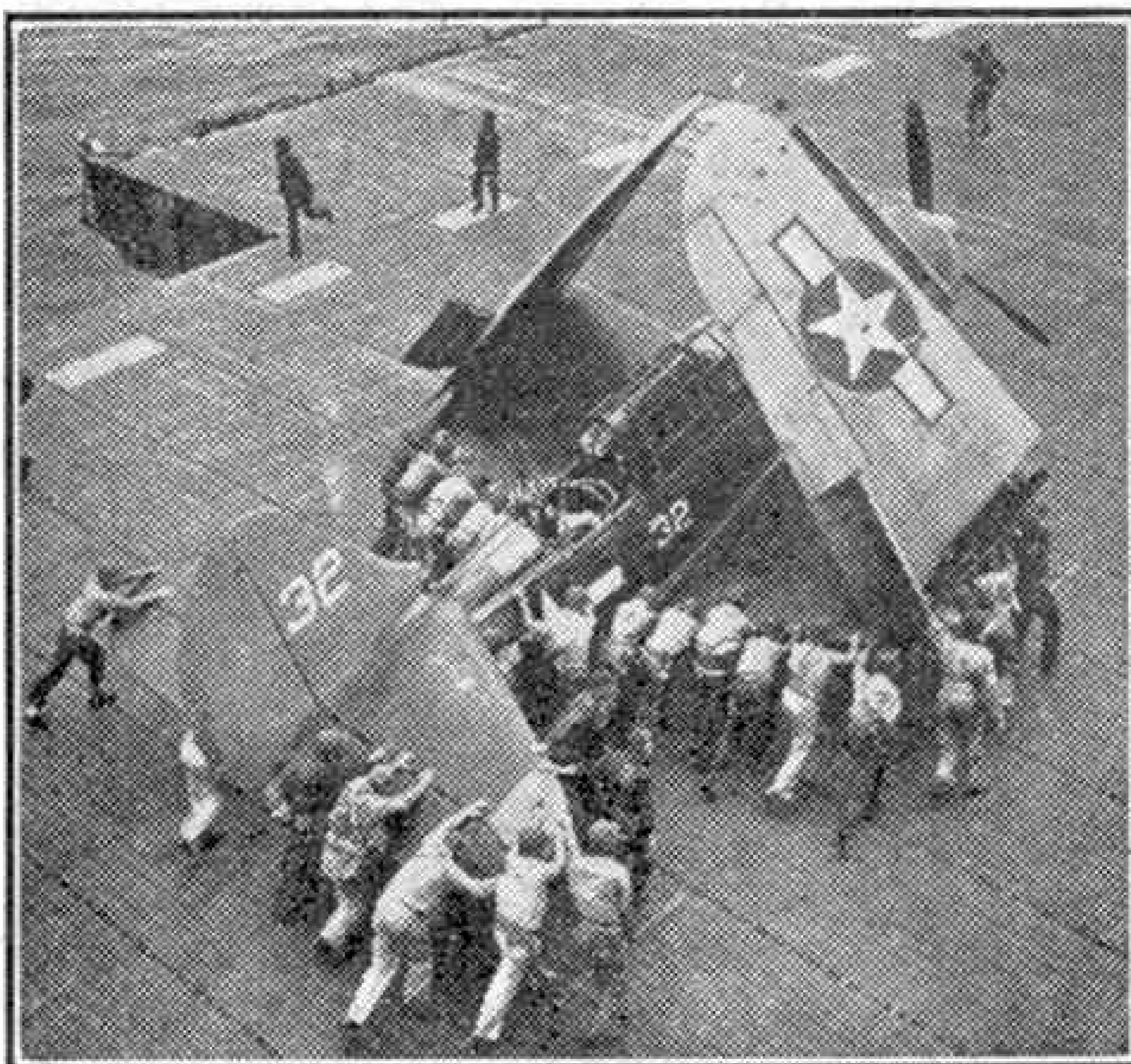
A Gold Tail moth, which looks conspicuous because it has no protective colouration.

The Curtiss "Helldiver"

WHEN aircraft of the U.S. Navy, operating from carriers in the South Pacific, carried out a highly successful attack on Japanese warships at Rabaul on 11th November last year, Curtiss "Helldivers" inflicted the bulk of the severe damage done to the enemy. This was the first time that these dive bombers had taken part in a major attack. The U.S. Navy's official communique reported that "the 'Helldivers' had a field day. The Jap warships tried frantically to escape to the open sea, but the big, bomb-laden aeroplanes, backed by fighters and torpedo-carrying aeroplanes, gave them little chance. A Japanese light cruiser bore the brunt of the 'Helldivers' attack, suffering three direct hits which sent it to the bottom. Towering bright yellow flames from a heavy cruiser led the Navy's attackers to believe their bombs had exploded the warship's magazines. This ship was probably sunk. Two other destroyers and a cruiser were damaged."

Barely a week later these Curtiss dive-bombers took part in a five-day action against Tawara, where they flew in ahead of U.S. Marine assault troops to attack the enemy ground forces, and dropped an average of 60,000 lb. of bombs a day. Another early success of the "Helldivers" was their part in a smashing two-day air-sea attack on Truk, the Japanese naval base in the Carolines, made by U.S. Naval forces in February last. The hundreds of carrier-based aircraft employed included also fighters and torpedo-carrying machines. The attack began at daybreak, and by the time it ended next day only 10 out of 36 ships in the anchorage survived, and 201 Japanese aircraft had been destroyed, 127 of them in the air and 74 on the ground. Since then "Helldivers" have taken part in attacks on many enemy strongpoints in the Pacific area.

The Curtiss SB2C "Helldiver" is said to be one of the best dive bombers in service in the world, and it is certainly the largest and heaviest machine of this type ever used by the United States armed forces. It has a wing span of almost 50 ft. and is 36 ft. 8 in. long. It was designed a year or so before the United States came into the war, to a specification



Curtiss SB2C "Helldiver" being pushed towards an elevator on a U.S. Navy aircraft carrier, after returning from an action. Photograph by courtesy of Curtiss-Wright Corporation, U.S.A.

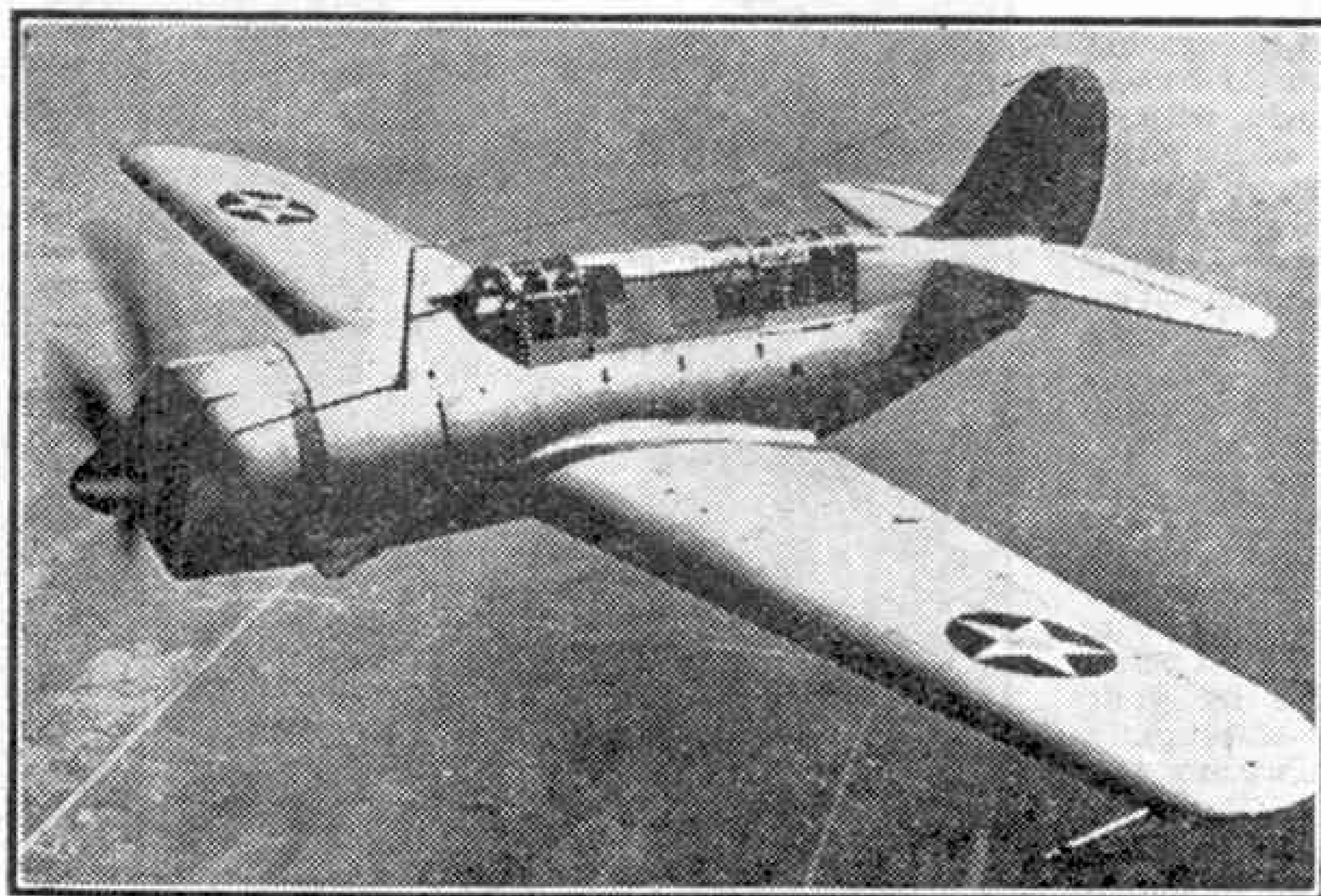
issued by the Navy Department of that country calling for a dive bomber able to carry double the bomb load of any existing machine of that type, and to fly 100 m.p.h. faster. Other conditions were that the new machine must have enough range to be able to fly 600 miles farther out to sea, and be able to remain in flight $4\frac{1}{2}$ hrs. longer than dive bombers then in service.

The Curtiss "Helldiver" design was accepted, and in May 1939 the Corporation were awarded an experimental contract. The prototype machine took the air in November 1940, but the first production model did not make its initial flight until June 1942. The delay however, allowed the design to be revised in the light of air war experience, and during those 19 months a total of 889 major changes and a vast number of minor adjustments were made in the design.

It is a two-seat, all-metal machine, with the bomb load carried inside the fuselage, and is heavily armed, but details of the bomb load and of the total fire-power of the guns cannot be given. Range is about 1,200 miles, and the service ceiling is said to be about 25,000 ft. It is fitted with a 1,700 h.p. Wright "Cyclone" engine and a 3-bladed Curtiss electric airscrew.

The wings fold upward to facilitate stowage, as shown in the upper photograph on this page, and in our striking cover illustration, which is based on a photograph kindly supplied by the Curtiss-Wright Corporation, New York, U.S.A. This cover picture shows a Curtiss test pilot jotting down his report after completing a test flight in one of the latest SB2C "Helldivers." With wings folded the machines take up so little room that two of them can be accommodated on the aircraft carrier's elevator thus enabling a squadron of them to be carried up to the flight deck in half the time normally taken, a most valuable saving when an action is imminent.

Another version of the "Helldiver," called the A-25, is in service with the U.S. Army Air Forces.

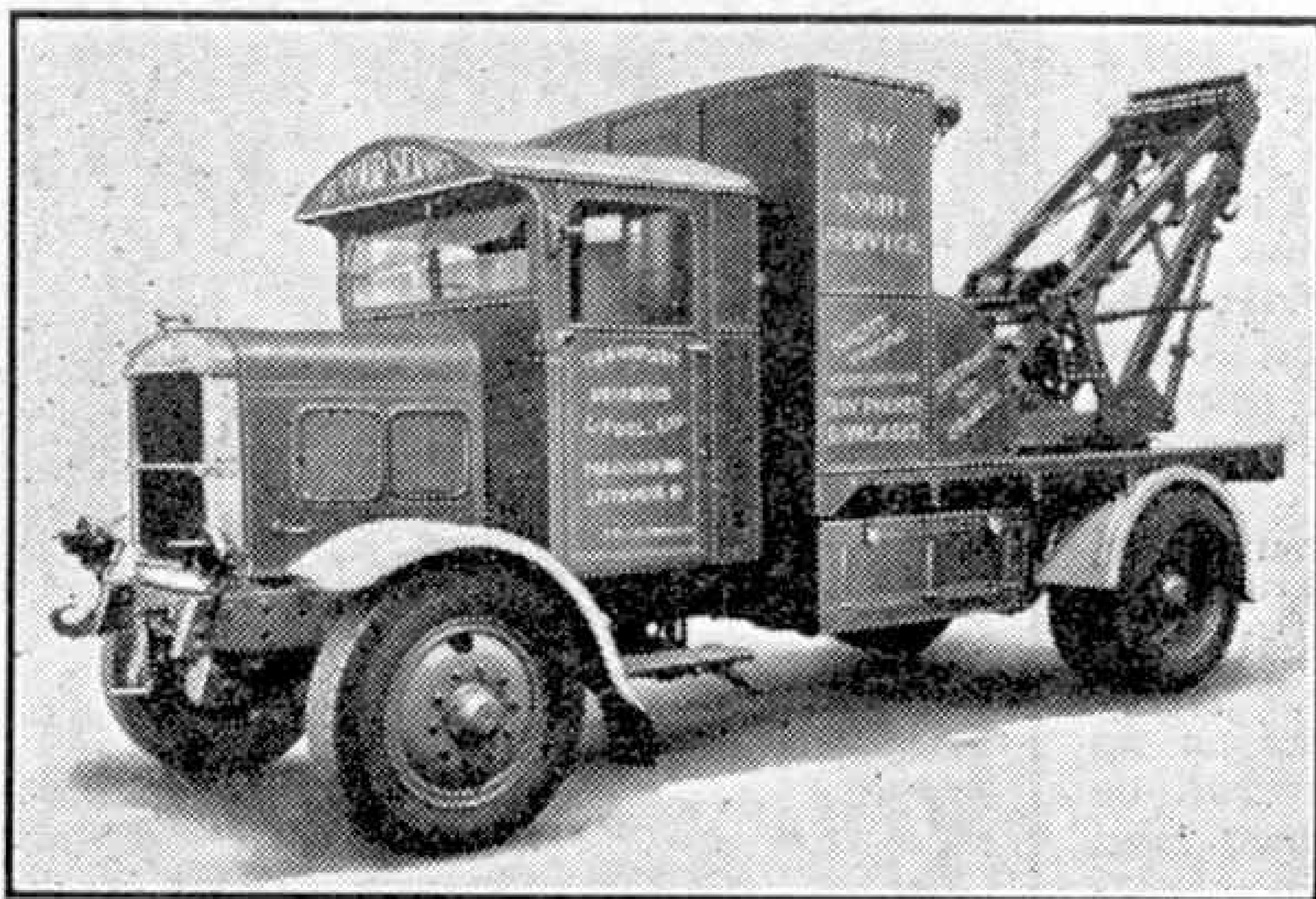


A "Helldiver" dive bomber in flight.

Engineering News

A Fine Breakdown Lorry

The illustration on this page shows a salvage vehicle that must be one of the finest in the country. It was designed by Mr. T. Nelson, of Transport Repairers (Liverpool) Ltd., and its basis is a Scammell petrol-engined chassis that has been modified for this special purpose. The wheelhouse was shortened, the rear axle and springs brought forward and the rear ends of the side members turned inward and welded to form a substantial cross-member. A sub-frame of steel was welded to the chassis frame to form a secure foundation for the crane, which can be swung round to pick up loads at the sides as well as the rear. The crane is worked by hand, and it is so well placed, and the weights of the lorry and its equipment are so designed, that there is little risk



A well designed and splendidly equipped salvage vehicle, a modified Scammell. Photograph by courtesy of Mr. T. Nelson, Transport Repairers (Liverpool) Ltd.

of even the heaviest load tending to make the front wheels rise from the ground when the crane is in service. Two tons of ballast placed well forward, just behind the driver's cab, help to ensure this.

The equipment of the lorry is remarkably complete, and enables every form of breakdown to be dealt with expeditiously. The roofed section behind the driver's cab contains a work bench, equipped with a vice and carrying a large range of essential tools; and in lockers on each side of the chassis are snatch blocks, saws, hammers and other tools, including an American felling axe for cutting out the sides of vans when that is necessary. There are also steel cable slings of various lengths that can be coupled together when required to give a length of 40 ft., and a set of blocks is carried that allows an additional 40 ft., so that the breakdown vehicle can be linked to a wrecked lorry that may be 80 ft. away and off the road. Chain slings also are provided, and are always used when lifting is necessary. Two of these are long enough to go round a van body, so that this can be made secure if it has been displaced in an accident.

The equipment includes also a range of jacks, and a noteworthy part of it is the ground anchor, a heavy piece of steel with a vertical lug. This can be fixed firmly to the ground by means of four or six stout bars, each about 4 ft. long, driven into the earth through holes provided, so that it can be used to take the strain when a vehicle off the road is being hauled

back from a ditch, or up an embankment, when there is no suitable tree to which the pulley blocks employed can be attached.

All the necessary equipment is stored on the vehicle, so that this can be taken out in response to a call without the least delay, by day or night. Floodlights are provided so that the work can be carried on without difficulty even in the dark.

The lorry and its staff have many fine salvage achievements to their credit. One of these concerned a lorry weighing $5\frac{1}{2}$ tons that had fallen over a 30 ft. embankment. Efforts to pull the lorry to the top of the embankment had failed before Mr. Nelson undertook the task, but with his vehicle he succeeded in getting the machine back on to the road again in half an hour. On another occasion a badly damaged six-wheeled lorry was lifted up at the front end and towed to its destination about 20 miles away in a few hours, although it carried a load of 13 tons.

Another Great American Dam

Almost unnoticed in wartime, another giant dam has been carried nearly to completion in the United States. This is the Denson Dam, which contains more than 18,000,000 cu. yds. of earth and is the fourth largest earth dam in America. Its purpose is to control floods in the Red River, which flows from the Rockies to the Mississippi, and to provide hydro-electric power. During its construction five towns that occupied the site to be flooded by the waters of the reservoir behind the dam were moved entirely or in part to higher ground, and several roads and railways also had to be moved. An interesting feature is that the labour of German prisoners has been used, chiefly in dealing with some of the 30,000 acres of woodland that had to be cleared.

All the earth for the dam had to be excavated, hauled to the site and there spread and rolled, and the dam indeed is the largest that has been constructed by rolling. The main embankment is 16,000 ft. long, with a maximum thickness at the base of 2,000 ft., while its greatest height is 160 ft. above the bed of the river. At its southern end there is a spillway surmounted by a concrete weir, while eight conduits, each 20 ft. in diameter and 800 ft. in length, stretch downstream under the dam from a concrete intake structure, which normally will rise 40 ft. above the water level, and is connected with the southern bank of the river by a bridge 300 ft. long. Five of the conduits will carry water for the generation of electric power, and the remainder will be used for flood control.

The reservoir behind the dam will extend 80 miles up the Red River and 60 miles up its tributary the Washita. Its shore line will be 1,600 miles in length.

A Tunnelling Record

In boring tunnels the usual plan is to work not only from the ends, but also from points along the route reached by sinking vertical shafts down to the tunnel level. A notable exception to this rule was the Simplon Tunnel under the Alps, $12\frac{1}{2}$ miles long, and until recently this was the longest ever driven from the end points only. Now this record belongs to a 13-mile tunnel bored through the mountains of Colorado, in the United States, to carry water from their western slopes to irrigate farmlands on the eastern side.

The Story of Steel

IV—Bessemer, Open Hearth and Electric Arc Processes

By Eric N. Simons

A TREMENDOUS tonnage of steel is made in Bessemer converters, or in furnaces of more modern type that derive from this converter. The process itself was first developed by Sir Henry Bessemer, one of the most fertile inventors Britain has ever had.

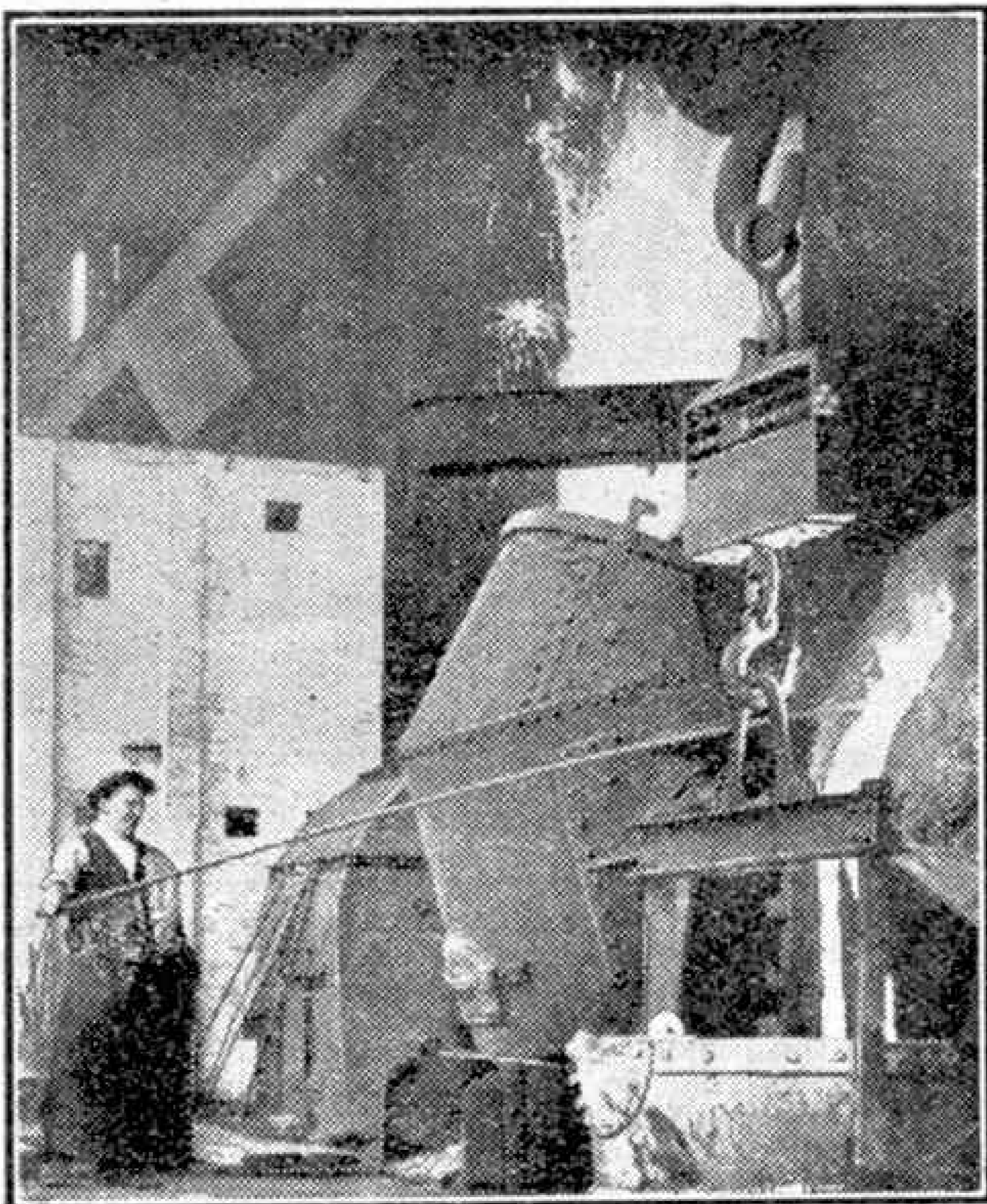
The process consists of melting liquid pig iron in a furnace of cylindrical form known as a "cupola" furnace, together with steel scrap, coke, limestone, and a small amount of fluorspar, a mineral mined in Derbyshire. The coke provides the heat to melt the charge. The limestone is designed to combine with impurities, and the fluorspar makes the slag or scum more fluid, so that it can absorb more of the undesired sulphur, which combines with the limestone and rises to the top.

At the proper time, the molten iron is allowed to run in a fiery cascade down a steel chute into the gaping mouth of a large, pear-shaped vessel known as the "converter." This vessel pivots on its axis, so that when required it can be turned completely upside down and emptied. Inside, it is lined with a heat-resisting material, and there are also openings in either the bottom (Bessemer converter) or side (Tropenas converter), through which a blast of air is mechanically blown.

The air blast is vital, because the oxygen it contains burns out some of the unwanted substance in the iron. This generates great heat, which helps to keep the iron molten. The oxides formed by the combination of oxygen and impurities combine together chemically, and form a fluid scum or "slag" on top of the iron. During the blowing, particles of this slag and metallic sparks are thrown out in a huge, white-hot stream, like a great vivid plume at the vessel's top. It is the most marvellous display of fireworks a boy could wish to see, and the illustration on this page gives but a feeble notion of the reality.

Once the iron has been run into the vessel, no additional heat is needed, but the metal has to remain molten, or it would grow pasty and sticky, and would not flow freely when poured into moulds.

It is the heat provided by the chemical action of the oxygen already referred to that ensures this. The metallurgists in charge of the process have to watch the colour, length and type of flame coming from the converter's mouth, as well as the shape and colour of the sparks, so

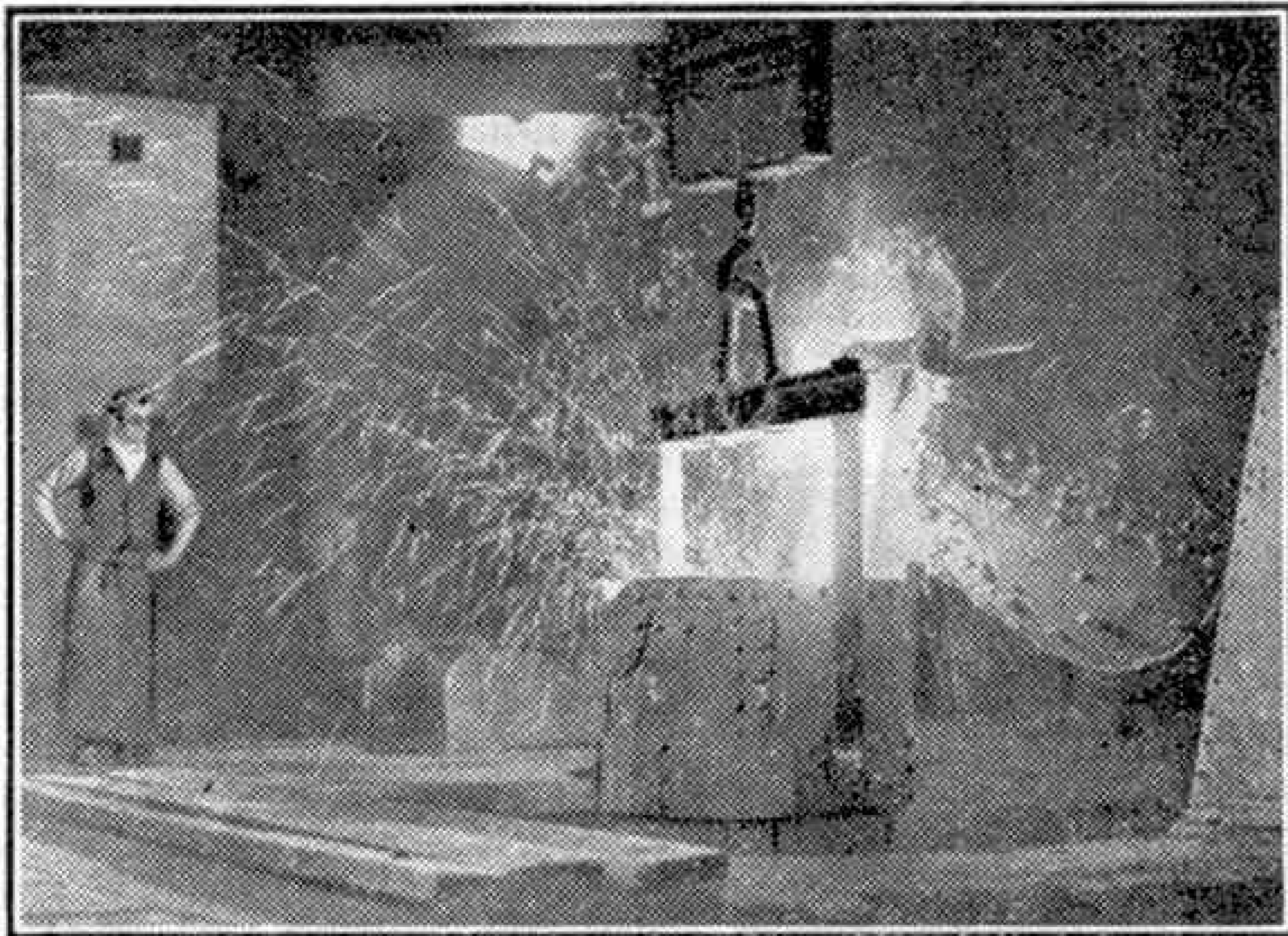


The Tropenas Converter is a variant of the Bessemer Converter. Here is one in action.

that they may know when to shut off the blast and prepare for pouring. If they misjudged, the whole of the charge might be rendered useless. What do they see that tells them?

At the start, the flame is short, and not particularly brilliant. The elements manganese and silicon are then combining with the oxygen in the air blast, and these do not produce great firework displays. When the silicon has nearly all been removed, however, the carbon is next attacked by the oxygen, and carbon monoxide is formed. This gas drives through the thick crust of slag, catches fire, and burns at the vessel's mouth. The pressure of

the blast produces a long and brilliant flame that steadily lengthens and is accompanied by a glorious discharge of what look like miniature suns, the white-hot sparks and particles. This phase is known as the "boil."



Pouring steel from the Tropenas Converter into a ladle.

The moment the carbon has been nearly all oxidized, the flame drops. This marks the end of the process. Fifteen seconds' misjudgment by the metallurgist would suffice to spoil the 30 cwt. to 3 tons of steel contained in the vessel, since having disposed of the carbon, the oxygen would then begin to attack the iron itself, forming iron oxide, which is most injurious to steel (you know it by another name—rust). Moreover, alloys introduced deliberately into the steel to give it special properties would be attacked and wasted.

On the other hand, to end the "blow" too soon would produce steel with too high a percentage of impurities in it.

The metal is not in its final state when the blow ends. It has too much oxygen in it in the form of iron oxide, as well as too little carbon. Consequently, "ferro-manganese" alloy is added through the converter mouth, as well as broken glass. The ferro-manganese provides manganese to react with the oxide of iron to form "manganous oxide." This is not dissolved by the liquid metal, but rises to the top and can be skimmed off with the slag. The remainder of the manganese stays behind and is essential to the steel. So you will see that in this process you first blow manganese out and then put it back—though it is not quite so silly as it sounds. The broken glass makes the slag more fluid, which means that it can take up more of

the iron oxide and so lessen the quantity of ferro-manganese required.

This process is mainly used to produce steel castings.

The next method of making steel, and one of the most important, is the "open hearth" process. This was the result of the combined brains of three great men. Sir William Siemens invented the furnace system known as "regeneration," which will be explained; but two Frenchmen, the brothers Martin, were the first to conceive the idea of melting and refining steel in an open hearth, as distinct from the crucible or the Bessemer converter.

In this process, the steel is purified by oxidizing it and thus removing the impurities in the form of slag. Here, however, the molten iron is lying in the "hearth" or floor of a special type of furnace. The actual melting chamber of the furnace is comparatively shallow, and is "open," that is exposed to the action of the flame, so that in proportion to the surface area of the molten metal, the depth of the iron is small. The furnace is lined with fire-resisting material, but the manner of heating is most ingenious and interesting. Before it goes into the chamber in which the charge lies, gas, produced by gas machines or gas producers, and air, are separately caused to travel through specially constructed chambers known as "regenerators" or "checkers." Simultaneously, the hot waste gases, after they have been burned and used in the melting chamber, are also caused to travel through another set of regenerative chambers, often called "recuperators." As they go through, these waste gases impart most of their heat to the brickwork in the chambers. "So what?" the reader asks. Well, at regular intervals the direction of the gas, air, and waste gases, is reversed, so that the incoming gas and air pass through the chambers warmed earlier by the waste gases, while the waste gases pass through the first set of chambers and warm those on their way to the chimney stack. This means that the incoming gas and air are always kept at high temperatures, which makes them mix and burn much more satisfactorily in the melting chamber itself. In fact, without this preliminary heating of gases and air it

would be impossible to melt steel in the open hearth furnace.

The hearth carries the charge to be melted, and is roofed over by an arch of heat-resisting bricks. At each end of the chamber are openings or "ports" for the passage inward or outward of the gases and air. The hearth or melting chamber is usually rectangular. The regenerative chambers comprise a series of flues built up of firebricks. They are almost entirely filled with bricks set on edge in staggered fashion, so as to create a large number of small openings called "checkers," because arranged like a draughtboard. The reversal of the gas and air currents takes place every 20 to 30 minutes, but in modern furnaces the reversal is regulated by temperature rather than by time. Often the waste gases, which still retain a good deal of heat, even after leaving the chambers, are made to heat boilers for steam production.

The charge of the furnace is made up of steel scrap

produce from 9 to 20 lots of steel, according to its size; the larger the furnace the smaller the number of melts a week. The furnaces used to be charged by hand, but to-day a mechanical charging machine is used. Steels made by the Siemens-Martin process are used for many different purposes, for example railway rails, boiler fire-boxes, locomotive crank axles, springs, railway tyres, piston rods, steel castings, gun forgings, shells, etc.

Lastly, there is the manufacture of steel by the electric arc furnace, which dates in this country from about 1909. The first firm to manufacture steel commercially in Great Britain by this process was Edgar Allen and Co. Ltd., Sheffield, who were also the first to introduce the high-frequency crucible process, and the first to develop the Tropenas converter process, which was an improvement on the Bessemer process. Thus, this old firm has been a remarkable pioneer of steel-making processes.

In the arc furnace, the desired degree of heat is

obtained from the arc or arcs formed between two or more electrodes, or between the electrodes and the material to be melted. An electrode is simply the terminal point, usually made of graphite or carbon, of an electric current passing through it. The current is powerful enough to leap across a relatively small gap between its electrode and another conductor, and in doing this it creates great heat. Some of us older folk remember quite clearly when streets used to be lighted rather fitfully and noisily by arc lamps working on this principle.

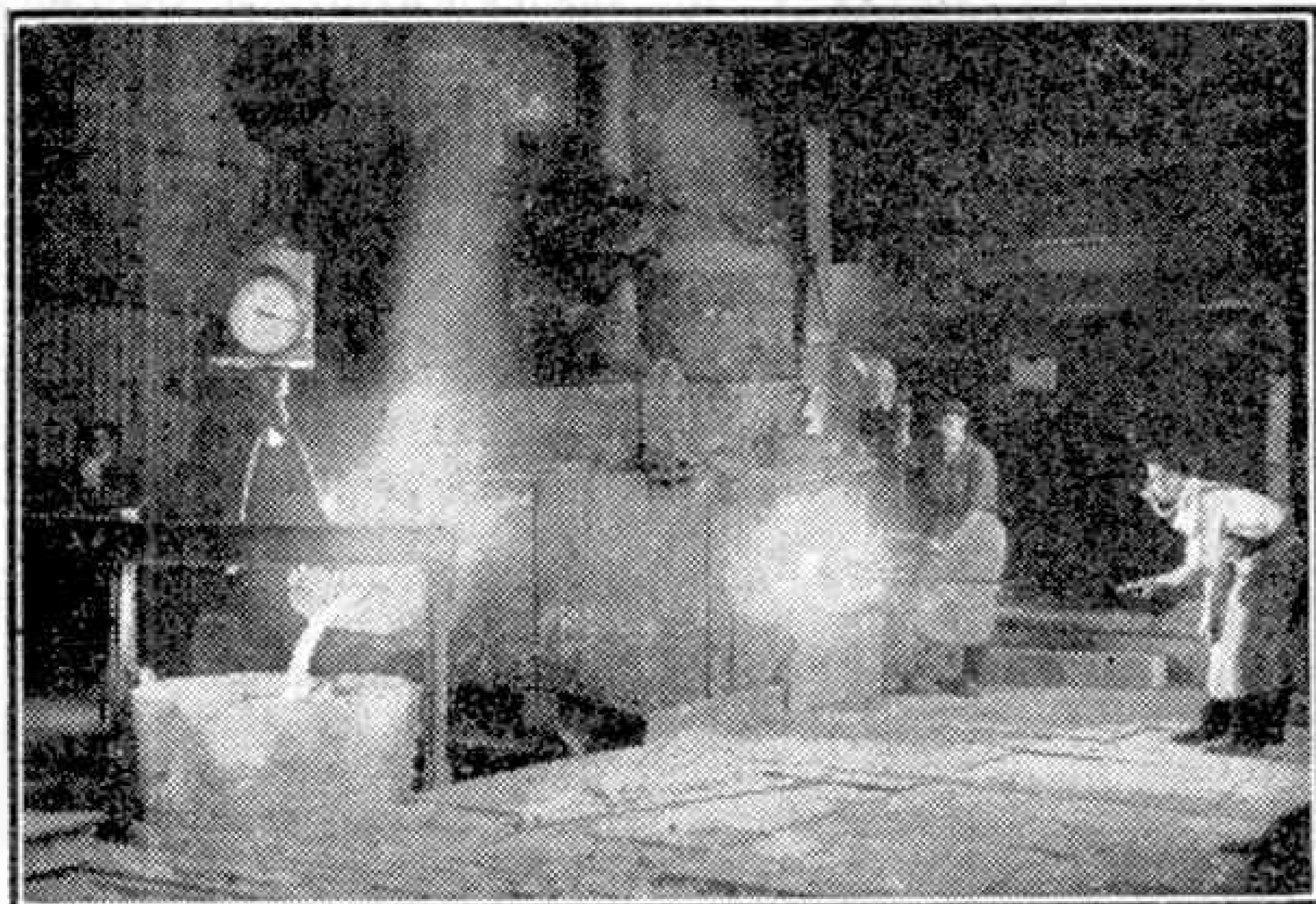
Electric current is expensive, so that the arc furnace process is not a cheap one; but to offset this high cost there is the possibility of using much cheaper raw materials, such as scrap containing a relatively high percentage of impurities. But there are other advantages of this process. There is virtually no limit to the temperature that can be reached, higher temperatures being obtain-

able by this process than by any other. The molten metal can be more completely purified. Steel can also be made with highly controllable carbon percentages. There are other technical points with which we need not deal.

The furnace is lined with fire-resisting materials. The first stage is the melting of the scrap under oxidizing conditions, the slag being deliberately so constituted that it assists in removing phosphorus, silicon and carbon to the required extent. Then comes the removal of the phosphorus-containing slag, after which a certain amount of carbon is put back into the metal. Lastly, a special kind of slag is formed in the furnace, designed to eliminate oxides and remove sulphur.

When the raw materials have been charged into the furnace, the electric current is switched on, and the electrodes, like long black poles, are lowered until arcs spring out between their ends and the piled up metal in the furnace. The terrific heat generated melts part of this solid metal, and eventually a pool of molten steel forms between the electrodes. At this point the metallurgist introduces into the furnace certain materials designed to produce the proper type of slag. These are lime or limestone, iron ore, fluorspar and sand. Melting and oxidation of the charge then proceed side by side. The oxidation eliminates phosphorus and silicon in the form of their oxides, which combine with the lime in the slag.

This slag must be removed at this stage, or at a later stage it would break up again and the impurities would return to the steel. The furnace is therefore tilted, and the surface slag skimmed off with special tools. Anthracite (Continued on page 322)



The Electric Arc Furnace pouring steel into a ladle.

and pig iron. The pig iron must be low in sulphur and phosphorus, as these two impurities cannot be removed during this process. The oxygen in the furnace gases forms oxides of silica and iron, which rise to the surface to form a slag. Metallurgists find out the carbon content and the general composition of the molten metal by taking a small spoonful—not the household spoon, but a special spoon-shaped receptacle at the end of a long steel rod. This is thrust into the furnace, first into the slag to give the spoon a protective coating, so that it will not be damaged by the white-hot metal, and then into the steel. When the metal in the spoon has solidified it is sometimes plunged into water, and broken open, so that the fracture may be examined by an expert. This is, usually, only in the early stages. Later, the metal is drilled and the drillings are chemically analysed.

The burning of the gases gives most of the furnace heat required. Temperature inside the furnace is mainly judged by experience, but a kind of thermometer has recently been invented which is claimed to give highly accurate indications of the temperature of molten steel, and is already in use. The appearance and composition of the furnace slag also provide a valuable indication of the condition of the molten steel beneath it. At the end of the process, a little iron-manganese alloy (ferro-manganese) is sometimes added to stop any further oxidation and elimination of the carbon.

Open hearth furnaces range in capacity from 10 to 300 tons. Furnaces of 150 tons' capacity and above are usually of tilting type. As a rule the entire process takes from 8 to 10 hrs., and a furnace will

BOOKS TO READ

Here we review books of interest and of use to readers of the "M.M." With the exception of those issued by the Scientific and Children's Book Clubs, which are available only to members, and certain others that will be indicated, these should be ordered through a bookseller. We can supply copies to readers who are unable to place orders in this manner. Order from Book Department, Meccano Ltd., Binns Road, Liverpool 13, adding 6d. for postage.

"THE GREAT WESTERN RAILWAY (IRELAND)"

By KEVIN MURRAY (G.N.R.(I), Dublin. 1/6)

This book marks the centenary of the Dublin and Drogheda Railway, one of the four lines that have grown into the G.N.R.(I), the main line of which connects Dublin and Belfast. It was only natural that one of the earliest railway projects in Ireland should have for its aim the linking up of the two great cities. The first step in the building of the lines came at the Belfast end, where the construction of the Ulster Railway, to connect Belfast with Armagh, was begun in 1837, and the first trains were run in 1839. There was no elaborate opening, but the spectators made up for the lack of display by crowding the stations and bridges to cheer.

In the meantime the Dublin and Drogheda railway had been planned at the Dublin end of the line. Here there was more excitement, for there was a violent quarrel about the route to be followed, one party advocating a line along the coast and another favouring an inland route. The coast route was finally adopted, and after many difficulties and alarms caused by rival proposals the line was completed and opened with great ceremony. In fact there were two ceremonies, for political rivalries in Ireland were very fierce at that time and it was not thought tactful to bring members of the Government and opposition parties together.

The details of these interesting beginnings are admirably related by Mr. Murray, who then passes on to the next step, the connection of the two railways by a new company with the resounding name of Dublin and Belfast Junction Railway, although this did not reach either of the two cities, and indeed did not possess terminal stations of its own.

The fourth of the companies out of which the G.N.R.(I) grew was the Irish North-Western Railway, which was begun in Dundalk in 1845, and by devious ways stretched out to Enniskillen, Londonderry and the Atlantic coast. It was not until 1876 that these railways came under a single control by amalgamation, and the present company came into existence. Since then it has had a varied and interesting history, and every aspect of this is well told by Mr. Murray, who traces its growth, recounting its triumphs and difficulties fully, and devoting special sections to particularly important features. There is no space to mention all these here, but it may be noted that the G.N.R.(I) is the only company in the British Isles making use of a modern compound locomotive, apart of course from the well-known Midland compound of the L.M.S., which is a development of the type introduced only 50 years ago. The company also has the distinction of having been the first in the British Isles to adopt electric lighting on all its passenger trains, passing indeed straight from oil to electric lighting without gas from 1896 onward; and it alone among railways in the British Isles has introduced air conditioning in its recently-built coaches. Its extensive development of railcars also is noteworthy, and many other interesting features of its story are well told in this volume, which is remarkable also for its splendid illustrations, 82 in number, showing locomotives, rolling stock, engineering features and stations.

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

"SCENIC RAILWAY MODELLING"

By P. R. WICKHAM

(Modelcraft Ltd., London. 5/9 post free)

The author of this book is no stranger to our readers, for his "Westcliff Branch Railway" has formed the subject of articles in the "M.M." on several occasions. In "Scenic Railway Modelling," a book of 52 pages, he sets down the results of his own experience for the benefit of other enthusiasts. The scope of the book is well indicated by the title, and it should be noted specially that with certain exceptions the schemes detailed can be employed by owners of portable systems.

Notes are given on the simple tools required for modelling on the lines suggested in the book, followed by a useful chapter on working to scale. Engineering features such as cuttings, embankments, bridges and tunnels in their various styles are then dealt with, after which we turn to the construction of miniature buildings of the "lineside" type. Passenger and goods stations have chapters to themselves, and these are followed by sections on open country details and scenic backgrounds, and suggestions

on "growing" miniature trees, obtaining effects of depth and distance, and so on. Finally come chapters on road effects and the art of model photography.

The book will appeal equally to all miniature railway owners, and many not particularly concerned with railway details will find much of interest in the general modelling chapters. The use of wood strip and card, often referred to in our pages, is here shown to be capable of great development, while Meccano Parts are included in several of the working items. Drawings or sketches illustrate the various schemes.

"OUR RAILWAY HISTORY"

By RIXON BUCKNALL. 3/-

This year has seen the coming of age of the railway companies as we now know them. Many of us remember the older concerns, but whether we do or not, we all welcome the appearance of this attractive little book, which forms the first of three similar publications telling together the story of 16 British railway companies up to the end of their separate existence.

The present volume covers the London and North Western, the Great Western, the Midland, the North Eastern and the Great Northern Railways. It succeeds admirably in its purpose of providing an interesting refresher for those who remember the older state of things, and a background to the past for those who have known only the "Big Four" of to-day. A brief history of each company is given, together with an entertaining survey of its routes and references to the great railwaymen of the past who guided its fortunes. Characteristic practices are described, and locomotives and famous trains come in for their full share of attention. Many fascinating little details help us to realise the character and fine traditions of the older times, while the illustrations help to convey something of the atmosphere of pre-grouping days.

Copies of the book can be obtained from Mr. Bucknall, 71, Witley Court, Woburn Place, London W.C.1, price 3/3 post free.

Railway News

Southern Tidings

A good deal of re-allocation of express and mixed traffic locomotives to various sheds has been going on lately. Among various types seen on freight trains to Southampton have been "N" and "U1" 2-6-0s; W.D. "Austerity" and L.M.S. "8F" 2-8-0s; "Lord Nelsons," "King Arthurs," and "Schools." "Pacific" No. 21C5 now has a slightly different alteration to front-end casing from No. 21C1, though with the same object of clearing smoke from the drivers' line of vision.

The suburban branch line in South London to the Crystal Palace High Level station has been closed temporarily, except for goods traffic and empty stock workings, on account of a falling off in patronage and shortage of manpower. It was opened in 1865 by a small private Company, but purchased by the London, Chatham and Dover Railway, which worked it, in 1875. It thus in turn became one of the South Eastern and Chatham joint lines in 1899 and part of the S.R. system in 1923, electrification being effected a few years later. There is a steep gradient of 1 in 78 going towards Sydenham Hill, where the Crystal Palace used to stand, up which many steam specials of various kinds have laboured in years gone by. Spare main line stock, including Pullman and buffet cars, is stored at the now closed Palace High Level station, which had direct access from a main road. The low level station some distance away is served by various Central Section electric services.

Larger engines than usual from the Central section are being repaired at Ashford Works, including Brighton 4-4-0s; Brighton works is also busy with steam locomotive work, and a good many more L.M.S. type 2-8-0 freight engines numbered 86xx and 87xx have been built by the Southern. The "H2" 4-4-2 express engines numbered 2421-6 are all back at Brighton and include in their duties the steam-worked passenger services to London via East Grinstead or Uckfield.

The one remaining "D3X" tank No. 2397 is still seen on passenger workings between Brighton, Tunbridge Wells West, and London. She is one of two "D3" 0-4-4Ts of Billinton design rebuilt in 1909 with a larger boiler than usual. The original design was introduced for the former London, Brighton and South Coast Railway in 1904. On the "D3X" tank the boiler is higher pitched with an extended smoke-box carried on a saddle.

The "01" 0-6-0 locomotive No. 1371 has been sold to the East Kent Railway, the third of this stout veteran class to go to that small private line. The "01" locomotives are rebuilds with Wainwright domed boiler of the standard goods type originally introduced by Mr. James Stirling for the South Eastern in 1878, with 5 ft. 2 in. driving wheels; 122 of them were built altogether. These still on the Eastern section of the S.R. date from 1891-6, being distinguishable by their small Stirling tenders having outside bearings.

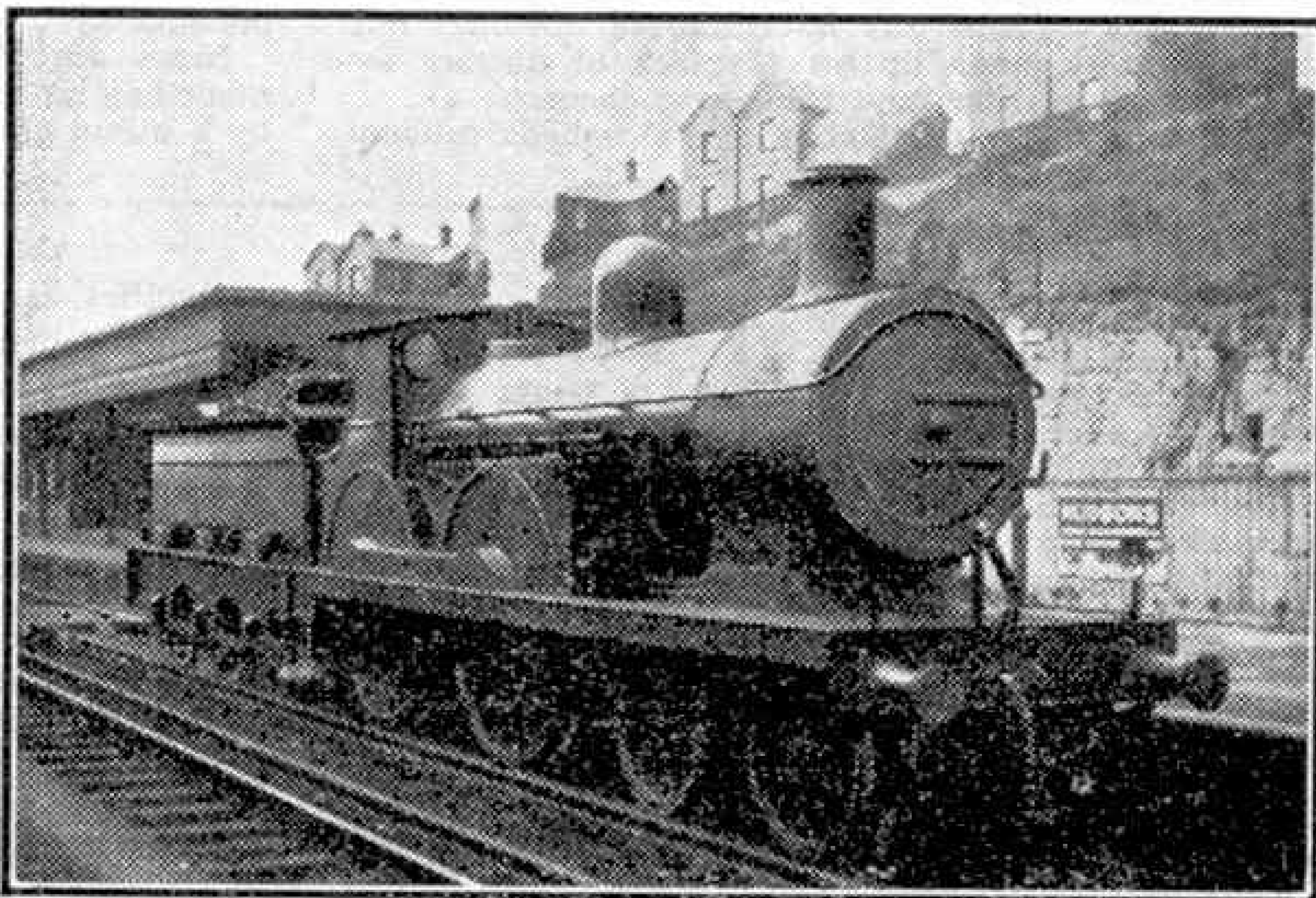
"T1" 0-4-4T No. 11, withdrawn for scrapping, is one of 50 built from 1888 onward for London suburban work to and from Waterloo. They are smaller than the later Drummond "M7" type which succeeded them, but rather larger and heavier than

their contemporary "02" sisters, which were built for country work and are familiar in the Isle of Wight as Nos. W14-33, graced with names and enlarged bunkers.

Old London and South Western 0-4-2 tender engine No. 555, mentioned recently as the last survivor for 12 years of the first batch of Adams' "Jubilee" mixed traffic locomotives and recently classed "A12," has been broken up. Veteran "F1" and ex-London and South Western 4-4-0 locomotives on loan to the L.M.S. are still to be seen on the Midland division.

Seven Million Sandwiches!

No less than 7 million sandwiches were sold at G.W. refreshment rooms during 1943, as well as 1½ million meat pies and 18 million hot drinks! Notwithstanding present rationing and shortage of supplies, these somewhat staggering figures show an increase of about 400 per cent. over average pre-war sales, as a result of the huge increase in Services' passenger travel and also on account of the partial withdrawal of restaurant cars. The latter were entirely



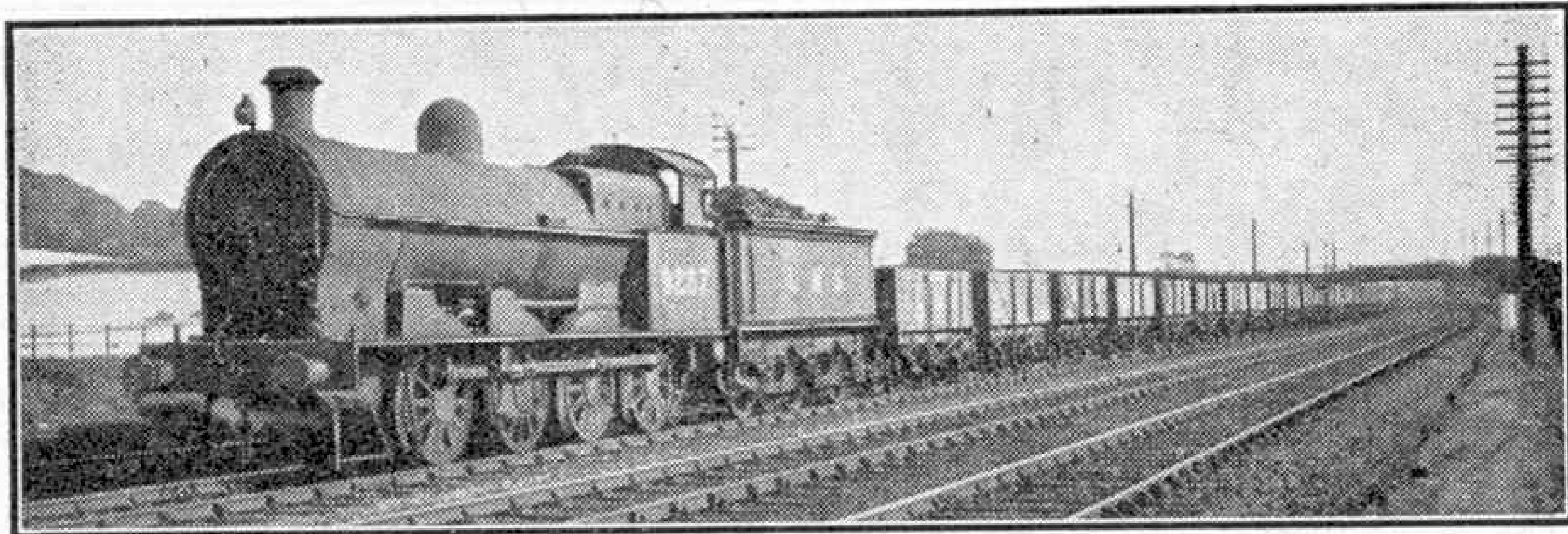
S.R. rebuilt 4-4-0 No. 1031, of Class "F1," with tender as on "01" engines. Photograph by A. C. M. Clements.

suspended as from Easter 1944 until further notice.

Fast Unbraked Goods Train Running

Many readers will be aware of the "express" coal and empties trains with through loads that have been reported from time to time as a feature of freight working on the G.N. section of the L.N.E.R., mainly between Peterborough (New England) and sidings near London. In peacetime "K3" 5 ft. 8 in. 3-cyl. 2-6-0 engines were used; during the war 2-cyl. smaller-wheeled 2-8-0 locomotives, chiefly of the W.D. British type, have been employed, though a Stanier "8F" built by the L.N.E.R. and an "01" rebuilt from Mr. Robinson's G.C. "R.O.D." class of the last great war have also been tried. With loads of or equal to 60 mineral up, and 70 empty down, timings of about 3½ hrs. have applied over approximately 74 miles, usually including one stop and possible diversion to relief lines.

Such schedules enable the same engine and train crew to complete the round trip within one turn of duty in about 8 hrs. if a reasonably clear road can be secured. Special precautions were taken in this last respect one day in June last, when a test run was made in each direction with 60 wagons of goods hauled by one of the big Gresley "Green Arrow" 2-6-2 3-cyl. locomotives having the large diameter driving wheels for this type of work of 6 ft. 2 in., and a *tour de force* it was! The engine was No. 4844 "Coldstreamer" and she covered the longer course from



Back for more coal! A train of empty coal wagons on the L.M.S., headed by ex-L.N.W.R. type 0-8-0 No. 9287, of Class "G1" rebuilt. Photograph by C. R. L. Coles.

the yard south of Finsbury Park to Spital Junction, north of Peterborough, 74½ miles, in 2½ hrs. without a stop. The mean speed was almost 30 m.p.h. overall, 1 in 200 gradients included. The 63½ miles between the first summit at Potters Bar and Peterborough station took just 2 hrs., so averaging almost 32 m.p.h. This was perhaps the fastest run ever recorded over so great a distance with a heavy, unbraked freight train; the speed actually was quite equal to that of the quickest peacetime "No. 2 express" goods, which included a considerable proportion of vacuum-braked wagons and was not always quite so heavy.

The return journey under similar conditions was also a fine performance over a road rather harder than the down. Including a signal stop at the foot of an up gradient the overall time to the yard, 2 miles from King's Cross, was just over 2½ hrs. Except for short distances at the beginning and end of the runs, the fast lines were traversed throughout; water was picked up from troughs once each way.

Thus was demonstrated again the power and versatility of the "V2" class, representatives of which have tackled the difficult and exceedingly fast "West Riding Limited" streamline express with only a few minutes loss and have touched 93 m.p.h. with the "Yorkshire Pullman," as well as proving invaluable as haulers of express and other goods trains, and the exceptional wartime passenger train loads.

The Railways' Colossal Contribution to Victory

It has been revealed that during the two months prior to "D-Day" 1,000 special trains carried 230,000 soldiers across Britain, together with 12,000 tons of equipment. A further 800 special trains, consisting of more than 30,000 wagons, conveyed stores, heavy vehicles, and armament, including thousands of tanks. In the last three weeks before the operations opened, no less than 9,679 special trains were run in Britain with little interference with the ordinary limited passenger services and in addition to the hundreds of daily workers' trains to and from factories; to the continuous large scale movement of coal, food, petrol and munitions; and to the running of many other special trains on Government account, such as the 12 required in one week on the L.M.S. for the conveyance of 265 vans of 75,000 bags of parcels destined for prisoners of war overseas—highly important traffic indeed!

A further instructive sidelight on the changes and problems involved in wartime freight handling is contained in the official news that on 32 branch lines served by 180 goods trains before the war, 500 and frequently more are now required. At many country stations traffic is more than

double its pre-war standard because of new industries, camps, etc., in addition to the present vast agricultural output, while there are instances, where large aerodromes have sprung up, of increases of up to 2,400 per cent. of goods tonnage handled during the past four years.

South African Locomotive News

Since the war began the South African Union Railways have been unable to put a single new locomotive into service, but it is hoped that in 1944 43 steam and 10 electric engines will be delivered, with more new arrivals expected in 1945. There are at the present time on that remarkable 3 ft. 6 in. gauge system over 2,000 steam locomotives and just over 200 electric units.

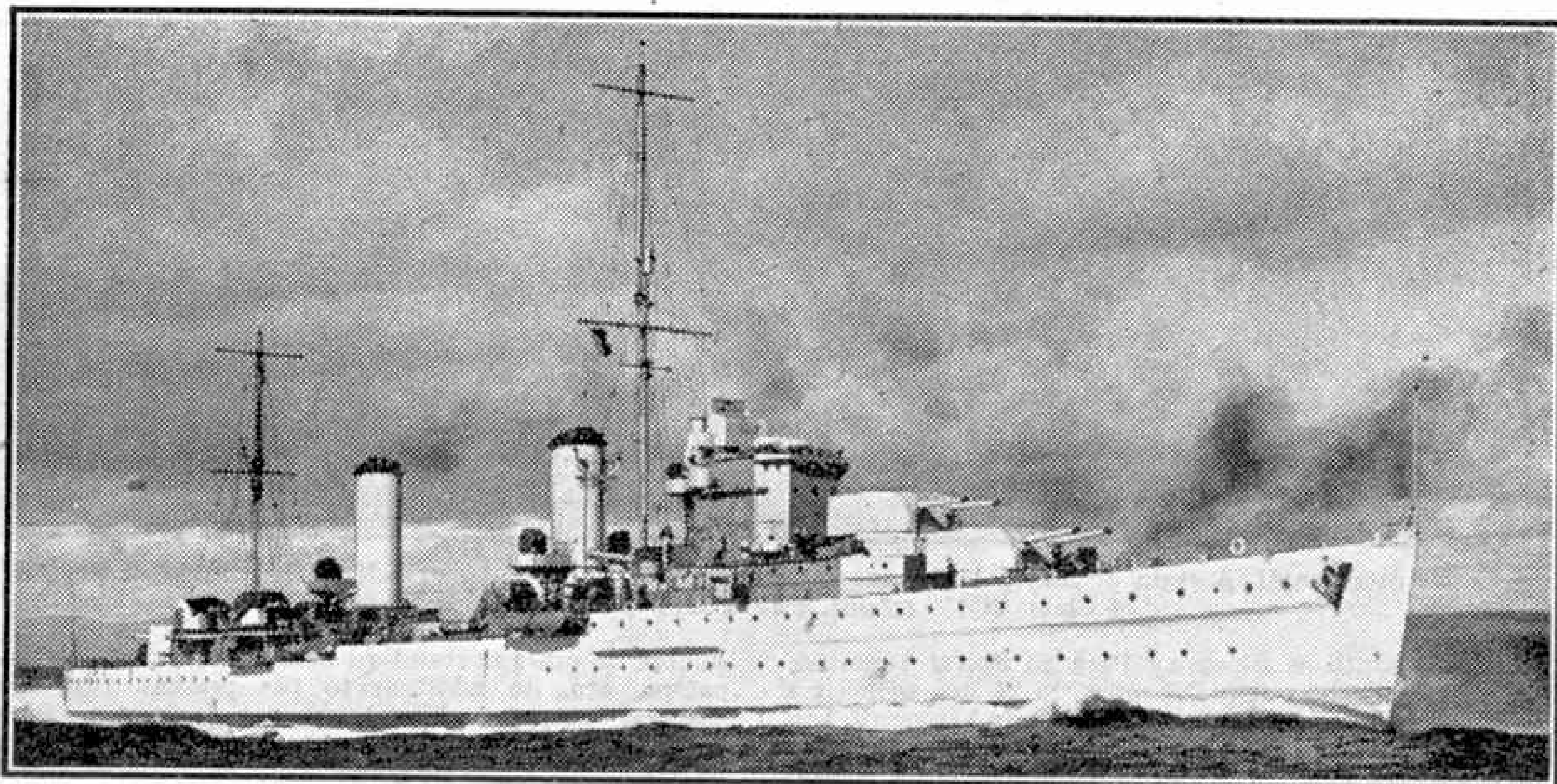
S.R. Electric Locomotive Braking

The heavy electric locomotive CC1, recently placed in main line service by the S.R., has been chiefly employed lately in Central Section goods working between London and Horsham, etc., but a number of trials have been carried out with trains varying from 80-wagon unbraked goods to passenger expresses loaded up to 16 coaches, the latter of course being vacuum braked.

An important feature of the locomotive equipment is the braking, which has been the subject of some interesting experiments, and in this connection the pioneer engine is now remarkably well provided. There is a straight air brake for engine use only, an emergency automatic air brake, and vacuum brake for the train with a combination of the latter and the air brake operating simultaneously on the fitted vehicles of the train as well as on the locomotive.



L.N.E.R. "V2" No. 4799 on an up fast goods train.



H.M.S. "Penelope."

H.M.S. "Pepperpot"

By Denis Rebbeck, M.A. (Cantab.), M.I.N.A.

THE "Arethusa" class of cruiser comprised four ships, H.M.S. "Arethusa," "Aurora," "Galatea" and "Penelope," every one of which has served her country well. Their number was depleted in 1941 when, on 15th December, the "Galatea" 5,200 tons, was torpedoed by a German submarine off the Libyan coast. The recent loss of the "Penelope" has ended the brief career of the most famous of these cruisers. As the author was connected with her building, was present on her trial trip, and knew many of her officers, he contributes this brief record as a small tribute to her great achievements.

H.M.S. "Penelope" was built and engined at Belfast by Harland and Wolff Ltd. Her keel was laid in May 1934, and she was completed in November 1936. Her displacement was 5,270 tons, and her length between perpendiculars was 480 ft. with a beam of 51 ft. and a mean draught of nearly 14 ft. Her machinery, consisting of Parsons turbines geared to four shafts, developed 64,000 h.p. and gave her a speed of 32.25 knots. She had a radius of action of 12,000 miles. Her main armament consisted of six 6-in. guns, eight 4-in. anti-aircraft guns and various smaller guns; while six 21-in. torpedo tubes in triple mountings were also carried. Other features were one aircraft which could be catapulted into the air, streamlined funnels, and an extensive amount of electric arc welding throughout the ship.

It is doubtful if any ship in this war has been busier than the "Penelope." She fought with battleships off Malta, took part in the Norwegian campaign in 1940, and assisted convoys in getting through to Malta. In November 1941 she, together with her sister ship "Aurora" and the destroyers "Lively" and "Lance" destroyed 10 enemy supply ships and an escorting destroyer. After a refit in the United States the "Penelope" returned to the Mediterranean late in 1942 and had many further adventures.

During fourteen days of incessant bombing at Malta H.M.S. "Penelope" had more than 1,000 holes blasted in her hull from the splinters of near misses, but still she fought on. The whole ship's company of 450, including even cooks and stewards, helped to feed the guns and unload ammunition from lighters alongside, in spite of bombs and falling debris. The damage the ship received was repaired while her guns were still fighting the Luftwaffe. She eventually sailed, on schedule, with plugged holes in her sides and an almost exhausted ship's company. She arrived in Gibraltar with her shell plating bristling with wooden plugs, like a porcupine, and while en route from Malta she fought off six further attacks. It was during this hectic period that she earned the name of H.M.S. "Pepperpot."

This gallant ship met her end off Anzio, being sunk by two torpedoes.

Post-War Coventry in Miniature

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

COVENTRY, the first British provincial city to receive a concentrated enemy air attack, has also been among the first to produce a comprehensive redevelopment scheme. This has been in course of preparation by the city architect, Mr. D. E. E. Gibson, M.A., A.R.I.B.A., A.M.T.P.I., since 1941, and

contains theatres, cinemas, concert halls, the main hotel with all the most modern amenities, and also a double-decker car park for accommodating over 500 cars, and a four-storey garage with spiral approach to each floor.

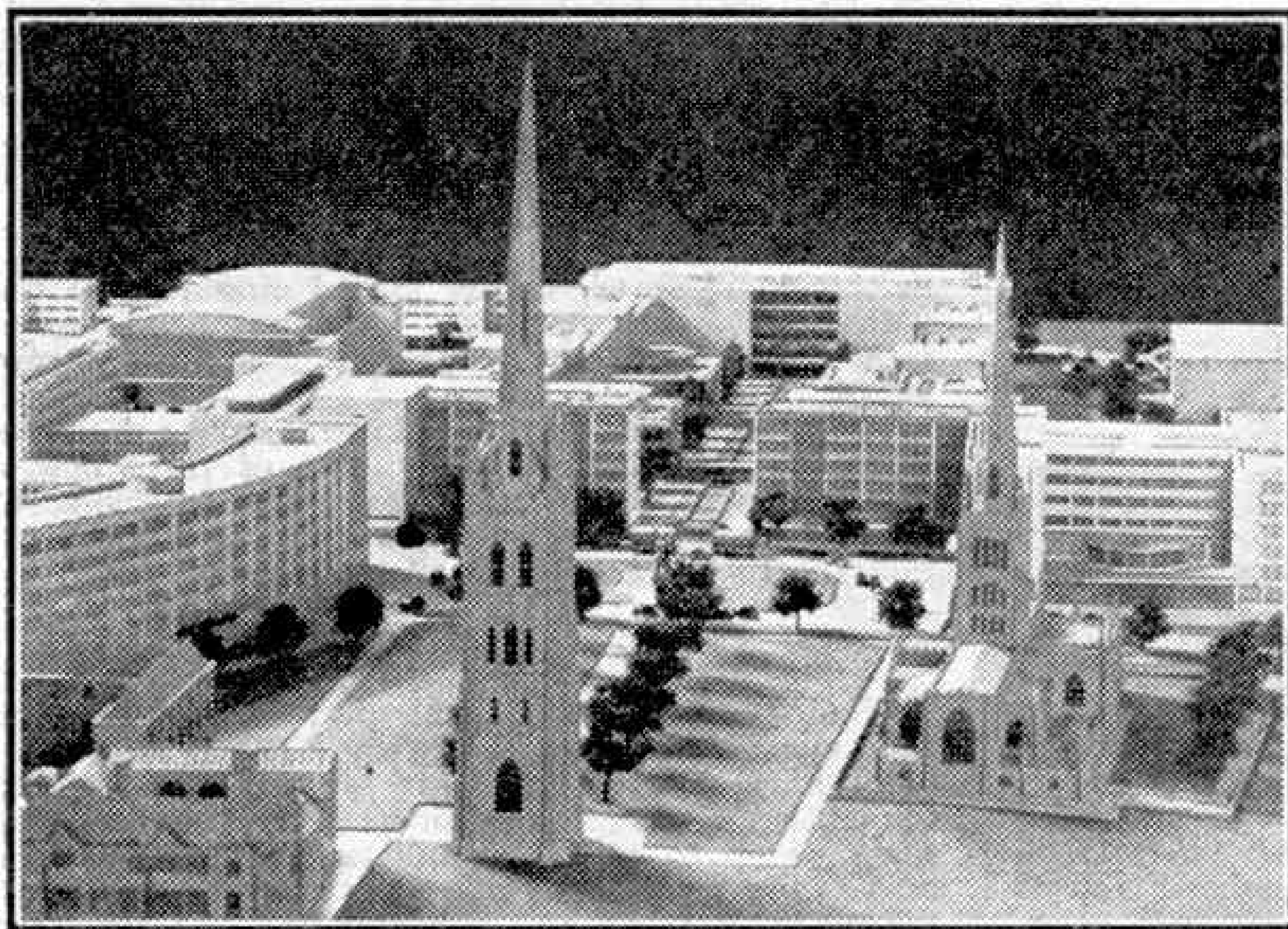
Last, but not least, there is the Cultural Centre, which contains the museums, libraries, technical college, art school, facilities for the drama, music and sports and pastimes of all kinds.

Certain old and historic buildings, such as the old Council house, the Bluecoat school and the Priory, are being carefully incorporated in the scheme. Near the large hotel is Holy Trinity church, the fabric of which is practically undamaged by blitz. Christchurch, a small church south of the Commercial and Civic Centres, is past repair, except for the tower. The site of the former nave is to be converted into a sunken garden with a Pool of Remembrance, but attached to the church tower will be a memorial hall for lectures and meetings.

Only the spire remains of the Cathedral Church of St. Michael's—the famous "Coventry Cathedral"—but interwoven with Mr. Gibson's scheme is that for re-building the cathedral and its associated Christian Centre, to the plans of Sir Giles Gilbert Scott, which however cannot be finalised until the future of certain Corporation properties has been determined.

The north-east corner of the model has been laid out as open grassland, pending further decisions as to the planning of this part of the city.

The model has taken over two years to construct, owing to pressure of Government work which has made it impossible to spare more than a small percentage of skilled working (Continued on page 322)



The model of post-war Coventry. In the centre background, seen between the spires of the Cathedral in the foreground and Holy Trinity on the right, is the shopping quadrangle. Behind Holy Trinity is the main hotel, and in the left background the market hall with commercial buildings round it.

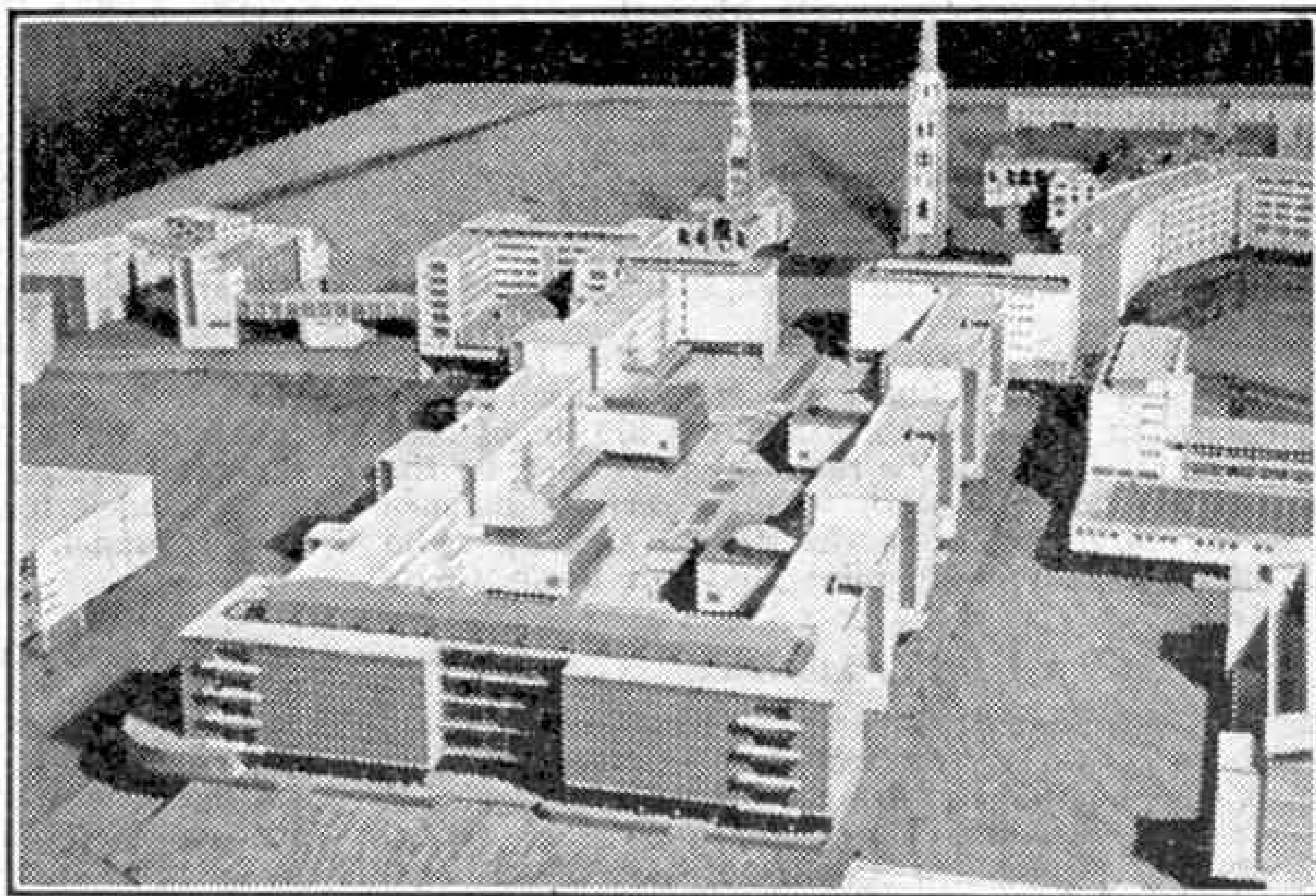
a remarkable model of his scheme recently left the works of Bassett-Lowke Ltd., the makers, for display in the city of Coventry.

The area covered by Mr. Gibson's scheme is approximately three-quarters of a mile by half a mile, which, modelled to the scale of 24 ft. to the inch, or 1/288th actual size, means that the model measures about 9 ft. 6 in. by 7 ft. 8 in. The plan divides the city into spaces each with a special function.

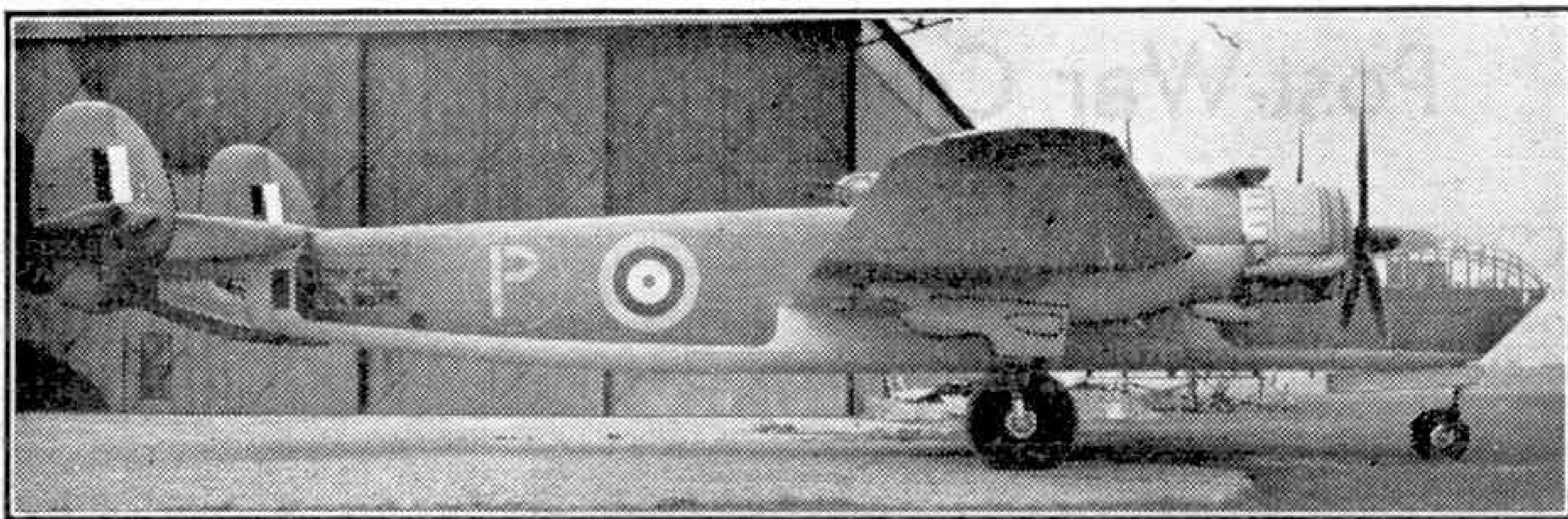
There is the Pedestrian Centre, where no vehicled traffic is to be permitted; and it includes shops, restaurants, etc., which can be reached by a covered way, so that bad weather need not hinder shopping. In the centre of the shopping quadrangle is a promenade and gardens with a cascade leaping downward by a series of over-shots.

Then there is the Commercial Centre, which contains the huge Market Hall, the warehouses and wholesale premises. Not far away is the Civic Centre, comprising the banks building, post office, telephone exchange, Government block, police station, police court and law court.

No city would be complete without its Amusements or Entertainment Centre, and this adjoins the Pedestrian "sanctuary." It



View from opposite end of the shopping centre taken while the model was under construction.



Armstrong Whitworth "Albemarle," now in service on a variety of duties including glider-towing and parachute troop dropping. Photograph by courtesy of Sir W. G. Armstrong Whitworth Aircraft Ltd.

Air News

The "Albemarle"

The illustration above shows the Armstrong Whitworth "Albemarle," of which details were released recently, although the type first flew in 1939 and has been in service since early in 1942. It was designed as a reconnaissance-bomber, with a crew of five, but production delays, due mainly to the urgent necessity of building as many fighter aircraft as possible in the early years of the war, prevented it from going into action in this role. Nevertheless it has been built in considerable numbers, and is operating on other vital, though less spectacular, jobs, such as glider-towing, light transport duties, and parachute troop dropping.

The "Albemarle" has many praiseworthy features. For instance, it is constructed of non-priority materials—wood and steel—thus facilitating production at slight cost in performance. It is the first British-built aircraft with a tricycle undercarriage to go into operational service with the R.A.F. Either a four-gun power-operated turret or two hand-operated guns can be fitted in the dorsal gun position at the rear of the wing. It is a mid-wing machine, with two 1,560 h.p. Bristol "Hercules" XI engines, and its top speed is about 250 m.p.h. J.W.R.T.

German Composite Aircraft

The first German "pick-a-back" composite aircraft to be shot down by a pilot fell to the guns of a Canadian night fighter pilot, Flt.-Lieut. W. Dinsdale, of Brandon, Manitoba, flying a D.H. "Mosquito." He encountered the enemy aircraft while on a routine patrol over the Normandy beach-head, shot it down, and it landed, with a terrific explosion, behind the German lines.

The composite aircraft used by the Luftwaffe consists of a Messerschmitt Me 109 mounted above a Junkers Ju 88 in which is about 4,400 lb. of high explosive. It is said to be remotely controlled by the pilot of the Me 109 who, when a certain distance from the target, releases the Ju 88 and by radio control of its automatic pilot guides it down to its objective.

A P.R.U. "Liberator"

Some Consolidated "Liberator" 4-engined bombers have been converted for photographic reconnaissance duties, the bomb gear being removed and replaced by six cameras and large additional fuel tanks. "Liberators" altered in this way have been used extensively in both the European and Pacific war zones, a great tribute to the aircraft's power of self-defence, as usually photographic - reconnaissance

machines are small, lightly loaded aircraft, like the "Mosquito" and "Spitfire," relying upon speed rather than armament to protect them from enemy fighter opposition.

The greatest feat of these "Liberators" to date was when, on 18th February last, two of them flew a round trip of 2,000 miles from the Solomons to photograph Japanese dispositions at Truk, in preparation for the attack by an American task force.

J.W.R.T.

New Boeing Wind Tunnel

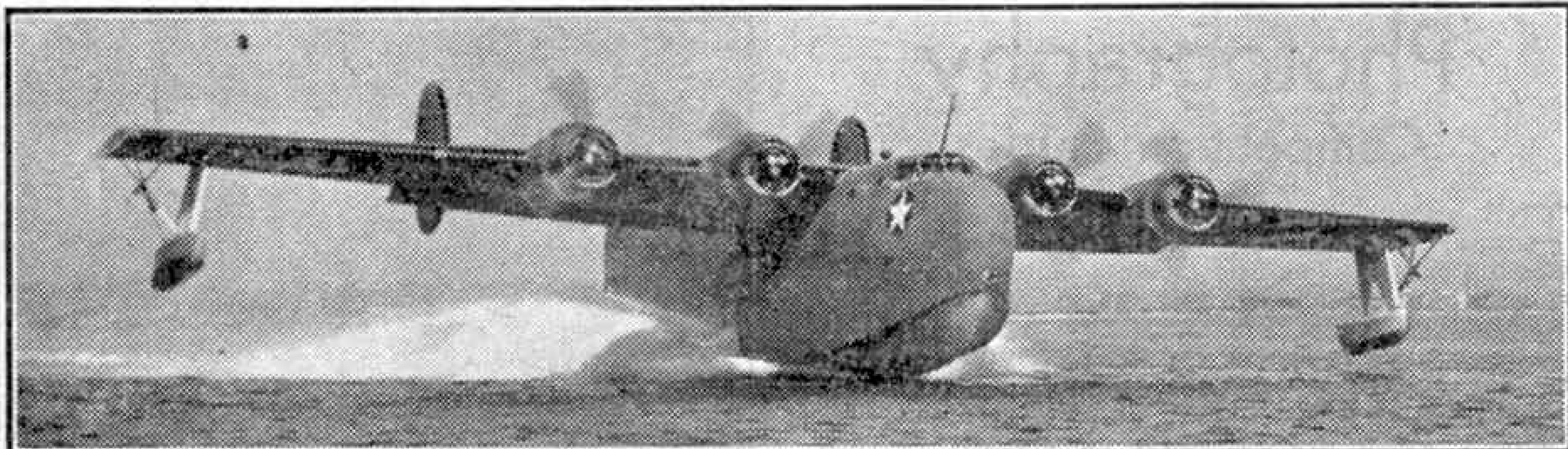
Wind tunnels are a vital part of the research equipment of an aircraft factory. The Boeing company have recently put into service a new wind tunnel large enough for model aircraft with wing spans of up to 11 ft., or full-scale aircraft sections of the same maximum size, to be tested in it. "Gales" of up to 700 m.p.h., approximating the speed of sound, can be made to roar through its 12 ft. wide "throat" or test section. This high-speed flow of air is created by a propeller-like fan 24 ft. in dia., with 16 laminated spruce blades, which was designed and built by the company's engineers. The fan is mounted on the end of a 37-ft. solid steel drive-shaft 16 in. in dia., that connects the fan with an 18,000 h.p. synchronous electric motor. All the tunnel controls are centralised on a panel outside the test section. An intricate system of balances capable of measuring "lifts" of from 1/10th lb. to 8,000 lb. records all the forces acting on the model or aircraft section under test.

The tunnel is a continuous-return structure that follows a roughly rectangular course 450 ft. long, and varies in size from 8 ft. by 12 ft. in the test section to 27 ft. square at the largest part. When it is operated at high speed the air in it completes the 450 ft. circuit in less than 2 sec., and is replaced entirely by fresh air three times a minute. The intake and exhaust of the air is done through an "interchanger tower," a pagoda-like structure on top of the tunnel building.

The aircraft models for test are constructed in workshops on the first floor of the aerodynamics building next to the wind tunnel. An overhead monorail system enables the engineers to transport these models from the workshops to the test section of the tunnel.

Yet Another "Mossie"

It was recently announced that yet another version of the versatile D.H. "Mosquito" is in action, a mine-carrying bomber. It was first used to mine the Kiel Canal on 12th May last, the result being that this vital waterway was closed to enemy shipping for 10 days. As soon as it was cleared the "Mossies" went back and closed it for another six days at the time when Germany was trying to dispose her Naval units to counter our invasion preparations. Normal airborne mines, modified slightly, are carried. J.W.R.T.



The Consolidated "Coronado," designed as a long-range patrol bomber and now in service as a transport. Photograph by courtesy of Consolidated-Vultee Aircraft Corporation, U.S.A.

The "Coronado" Flying Boat

The Consolidated PB2Y-3 "Coronado" flying boat, shown in the upper photograph on this page, is the largest aeroplane in large-scale production for the U.S. Navy, and is now giving good service as a long-range transport. Originally designed as a bomber, it is similar in many respects to the well-known Consolidated "Liberator," and like that aircraft uses 1,200 h.p. Pratt and Whitney engines. An outstanding feature is the way in which the wing floats retract during flight to form the wing-tips.

The "Coronado" XPB2Y-1 first flew in 1938, and at the outset had a single fin and rudder very like those of the "Catalina" flying boat, and only one gun turret, which was in the nose. Then the tail unit was re-designed and two circular fins and rudders were fitted. The type proved successful* and went into production as the PB2Y-1, and in 1940 the 13th Patrol Squadron of the U.S. Navy was re-equipped with this aircraft. Later modifications made to it included the fitting of "Zulu-shield" fins and rudders, the deepening of the fuselage, and the provision of power-operated gun turrets in the nose and tail. The bomb-load was carried in the wing centre section.

All the "Coronado" bombers have now been demilitarised, and as transports each can carry either 44 passengers, or 24 passengers and four tons of freight. This fine flying boat has a wing span of 115 ft., is 79 ft. 3 in. long, and fully loaded weighs 66,000 lb. It carries a crew of seven, has a top speed

of 220 m.p.h., and a range of 3,000 miles. An idea of the immense amount of work involved in building one of these great aircraft is given by the fact that 500,000 rivets are used in its construction.

J.W.R.T.

Mexico City to have Another Big Airport

Another big airport is being constructed next to the present one at Mexico City, according to an American engineering journal. It will be called the Aeropuerto Central; and is expected to be able to deal with 1,000 air travellers, 24 tons of baggage, and 20 tons of express air freight an hour. The passenger terminal will be large enough to accommodate 80,000 people, and there will be parking space for 900 cars! The facilities for handling air freight also will be on a very big scale. The new airport is to have five runways, varying in length from 5,740 ft. to 8,200 ft.

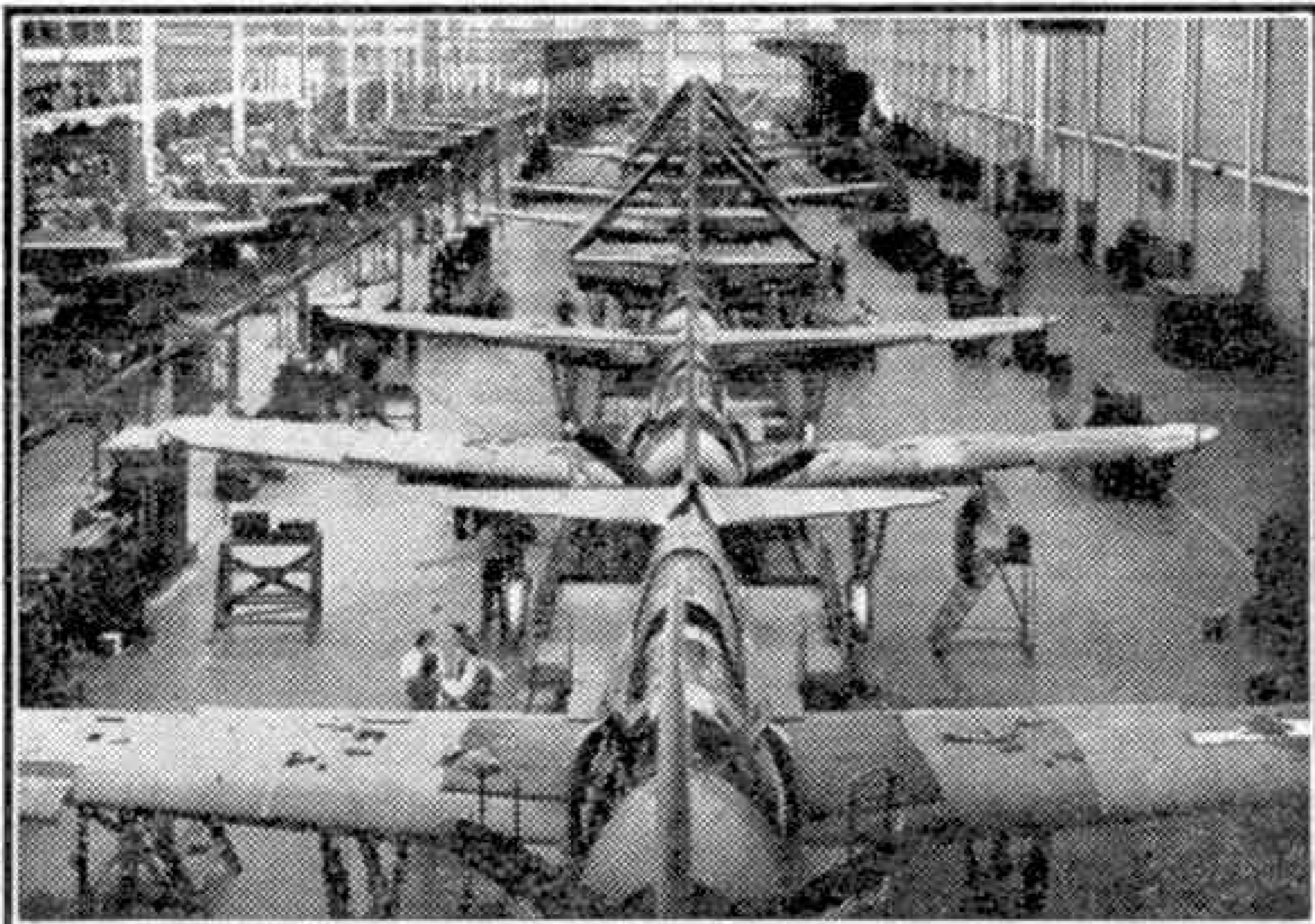
American Aircraft Developments

The new Allison V-3420 aero engine, some details of which have been released for publication, is the first "3,000 h.p." engine to come off the secret list. It is being used in several new American fighters, and basically is two standard 12-cylinder Allison engines placed side by side in "W" formation and driving a single propeller. The chief disadvantage of the new engine would appear to be its width, which is very much greater than that of the 2,200 h.p. British Napier "Sabre," but the V-3420 may prove useful in large bombers, where it could be completely enclosed in the wing.

The Bell Aircraft Corporation have announced that so far 4,000 "Airacobras" have been supplied to Russia under Lease-Lend. The Russians have nicknamed the type "Little Shaver," from the term "shaving" which they apply to all forms of low-flying attack.

The latest "Airacobra," the P-39Q, has one machine-gun under each wing, enclosed in a streamlined fairing. According to American reports a new and larger version of the machine, designated the P-63 and named "Kingcobra," is now in production. This version has a new Allison two-stage supercharged engine and is "heavily armed with cannon and machine-guns."

J.W.R.T.



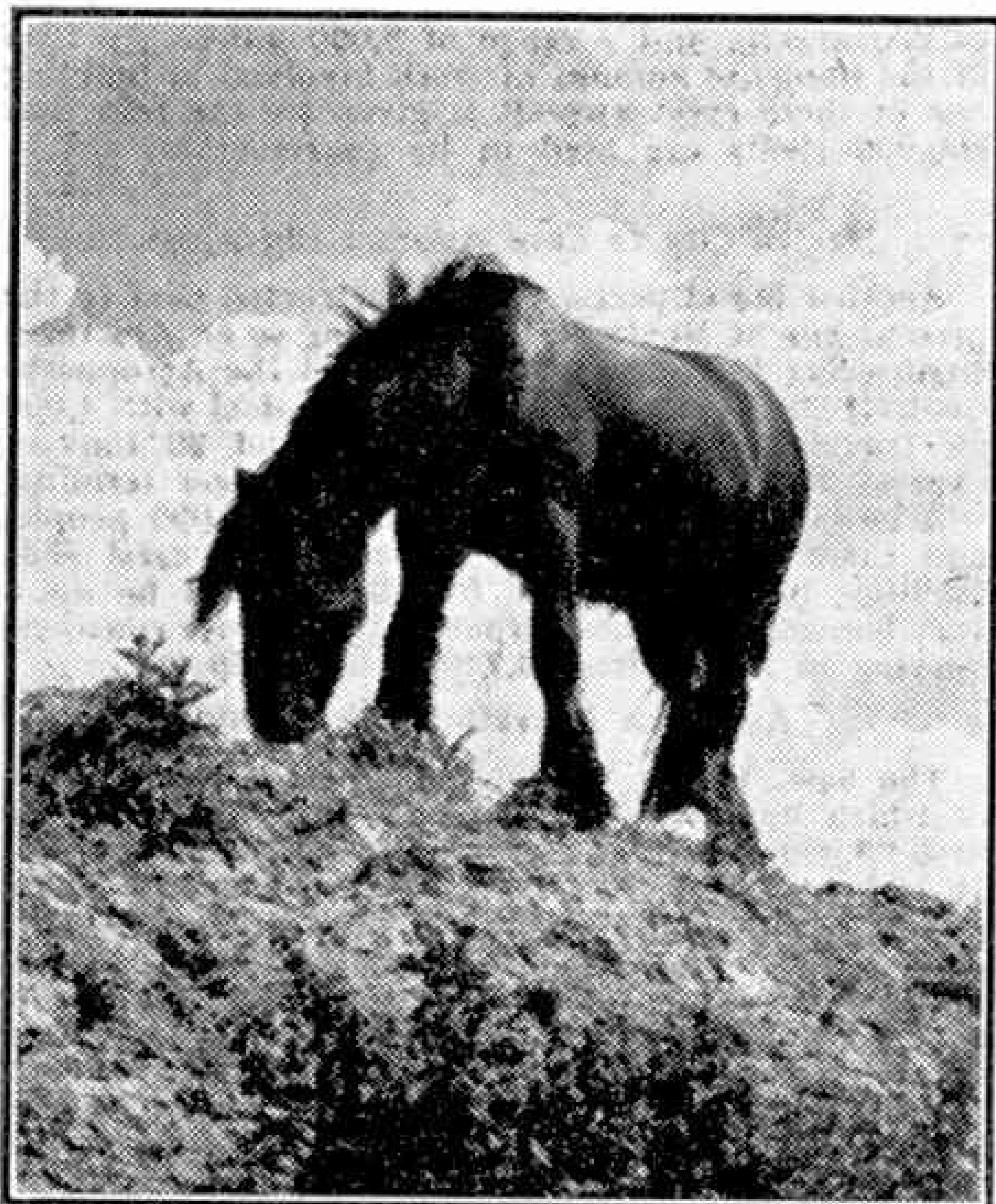
Curtiss SB2C "Helldivers" on the assembly lines in the Columbus, Ohio, factory of the Curtiss-Wright Corporation, U.S.A., by whose courtesy this photograph is reproduced. (See special article on page 296).

A new British fighter aircraft called the "Tempest" is in service with Air Defence of Great Britain, and is taking heavy toll of the German flying bombs. It is a Hawker product and is fitted with a 2,200 h.p. Napier "Sabre" engine. Other details are secret.

Photography

Competition Entries

THE prize-winning entries in the "M.M." Photographic Competitions may be divided roughly into two big classes. The first includes pictures of unusual subjects, or familiar subjects taken from an unusual standpoint. These win prizes by reason of their originality and freshness, and often they are favoured by the judges in spite of technical defects. The second class consists mainly of pictures of ordinary subjects which are successful on account of their technical perfection. Most of the entries in this class are sent in by experienced photographers.

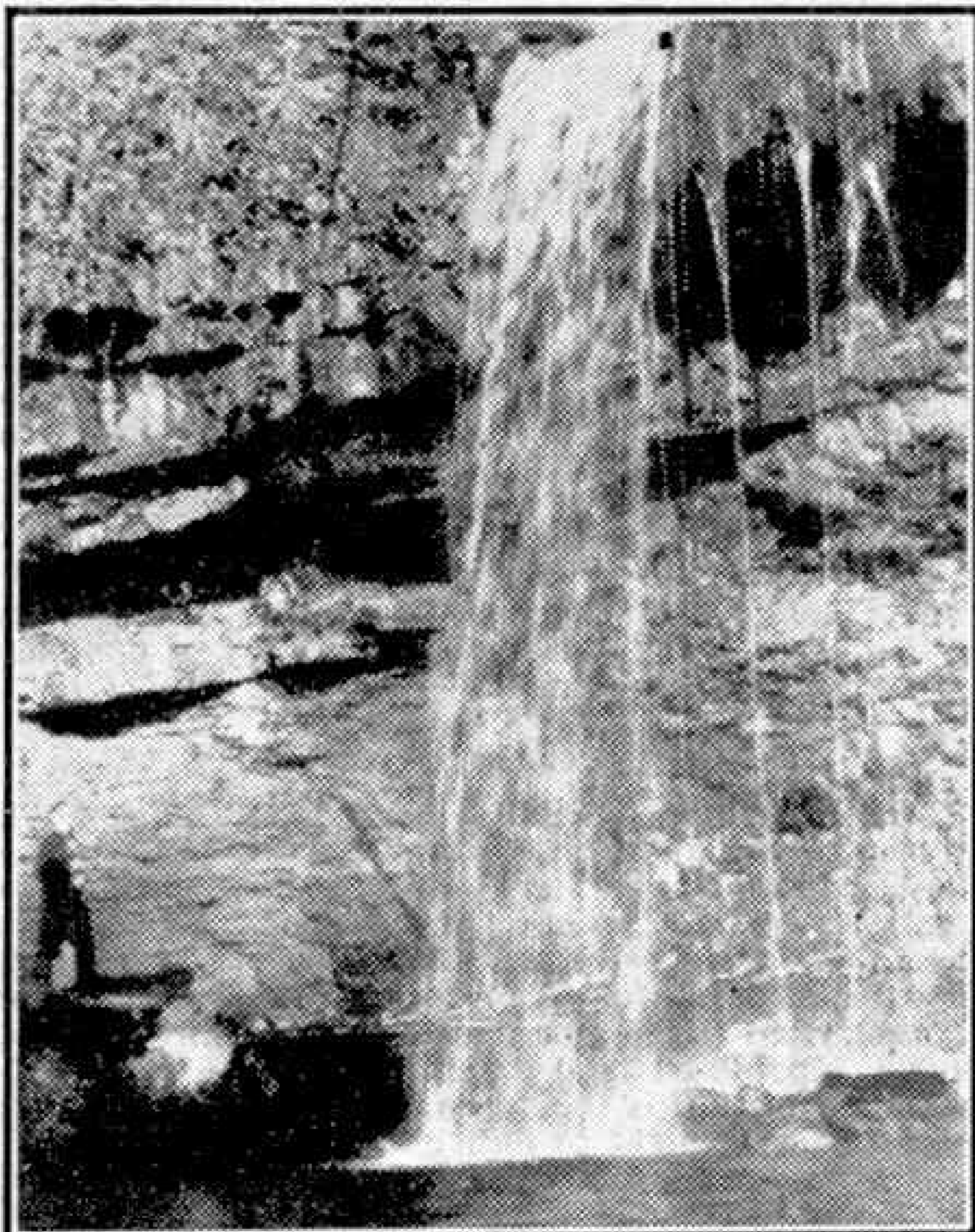


"Old Dobbin takes a rest." Photograph by E. E. Steele, Lincoln.

The first class is by far the larger, and it includes almost all the winning entries submitted by younger readers who, generally speaking, have little technical knowledge. To such readers, and to older ones who have only recently taken up photography, the best general advice that can be given is to look out for something that is really interesting. Having got your picture, enter it for one of the competitions even though it may be far from perfect judged purely as a photograph. If the interest is there, your entry may win a prize against much more perfect photographs of the monotonous "picture-postcard" type.

This of course does not mean that slipshod work will be successful. On the contrary, the print submitted should be the very best you can get from your negative.

It is surprising to note month by month how many entries by beginners are spoiled by lack of suitable



Waterfall Sgwd Gwladys on the River Pyrrddin, Breconshire. Prize-winning photograph by H. W. Jones, Gabalfa, Cardiff.

trimming. When you have made your print, examine it carefully to see if it includes anything that would be better out. For instance, try the effect of cutting off some of the sky, especially if this is just blank space. Sometimes a picture is greatly improved by removing the sky portion entirely. Next try cutting off some of the foreground. Very often the removal of a strip of empty foreground makes a great difference, bringing the main part of the picture forward and so adding to the "life" of the scene. Further, examine the sides of the print for unwanted objects such as odd bits of trees, buildings and the like that have been included by accident. Away with them! When you have made a few experiments in trimming you will be surprised to find how much better your pictures look.

Do not try to trim your prints with scissors. Always use a sharp knife and a straightedge.



The Cottage at the Churchyard Gate. Photograph by A. G. Dell, London S.E.27.

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 CEYLON RAILWAY PICTURE

The upper illustration on this page shows a train on the National Railways of Ceylon rounding a bend before stopping in the station at Colombo. I took it from a bridge when I visited Ceylon during a voyage to the Far East in pre-war days.

The railways of Ceylon are Government-owned, and altogether there are 951 miles of track, 834 miles of 5 ft. 6 in. gauge, and the rest of 2 ft. 6 in. The main line runs from Colombo to Talaimannar, where there is a ferry service that conveys passengers and goods to Southern India. At this point India and Ceylon are almost connected by a line of coral reefs and sand banks, known as Adam's Bridge, and the railway to Talaimannar runs along some of these. There is intense suburban traffic around Colombo, but the traffic peak on the railways generally comes during June, July and August, when vast numbers of pilgrims from all parts of Ceylon make their way to Anuradhapura, a city that is sacred to the Buddhists and is remarkable for its shrines and temples.

LEILA M. STRACHAN (Liverpool).

THE KETCH "IRENE"

There are few sailing coasters left round our islands now, and the "Irene" is one of them. She is a very trim little vessel of some 67 registered tons, and is the last of many coastal sailing vessels built at her home port in the West. She was launched on 29th May 1907 and has some good runs to her credit, among them being Glasgow to Teignmouth, 600 miles, in five days, and Bridgwater to Rotterdam in six days. Although she now has an auxiliary motor she still depends on her sails a lot.

I went over the ketch early this year and found her in excellent condition. I took the accompanying photograph from the end of the bowsprit and it illustrates how well she is kept.

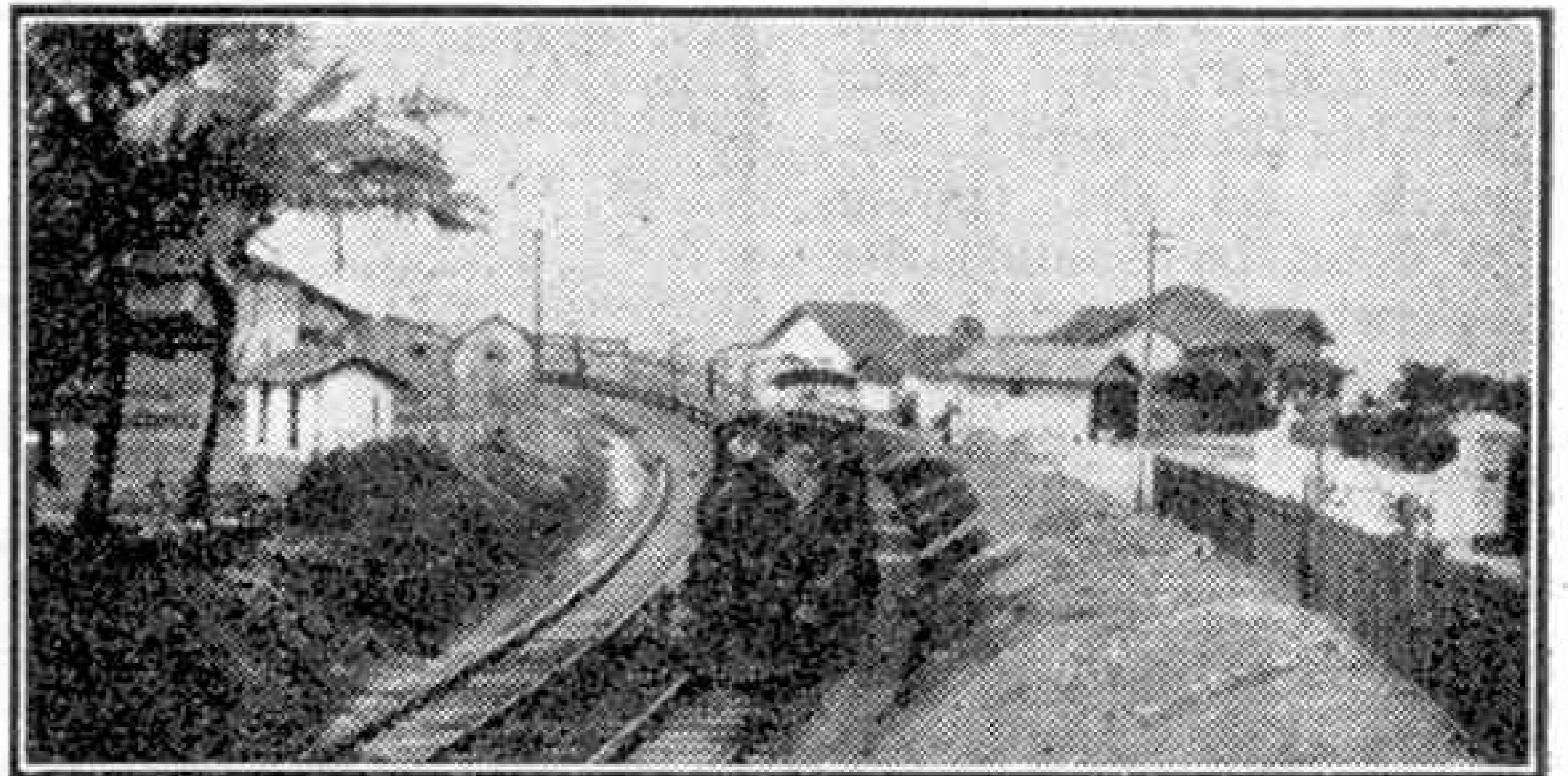
I. M. C. SCOTT (Hove).

EDUCATED WORMS

Some while back I was in Saulte St. Marie waiting for the ferry to take me over Lake Superior into Canada. "Surely," I thought, "this must be an angler's paradise," for it seemed as though every house and ship in that locality advertised the sale of worms. No ordinary worms these, but educated worms guaranteed to catch fish. "University trained worms will catch your fish," "My clever worms catch a da fish," and "No fish will refuse to meet these intellectual worms," ran the notices, and there were many other high-

power advertisements.

Further investigation revealed that for 10 cents one could buy a jar full of a solid writhing mass, and if the worms lived up to publicity claims, ardent lake fishermen would easily catch pickerel, pike and jackfish, to mention only a few of the fish that abound in the Great Lakes.



Train rounding a bend before entering the station at Colombo, Ceylon. Photograph by Leila M. Strachan, Liverpool.

This memory always amuses me. Now whenever I see a worm I find myself thinking "Are you educated, or are you just a working-class worm?"

K. CAMPBELL (Mortimer, Berks.).

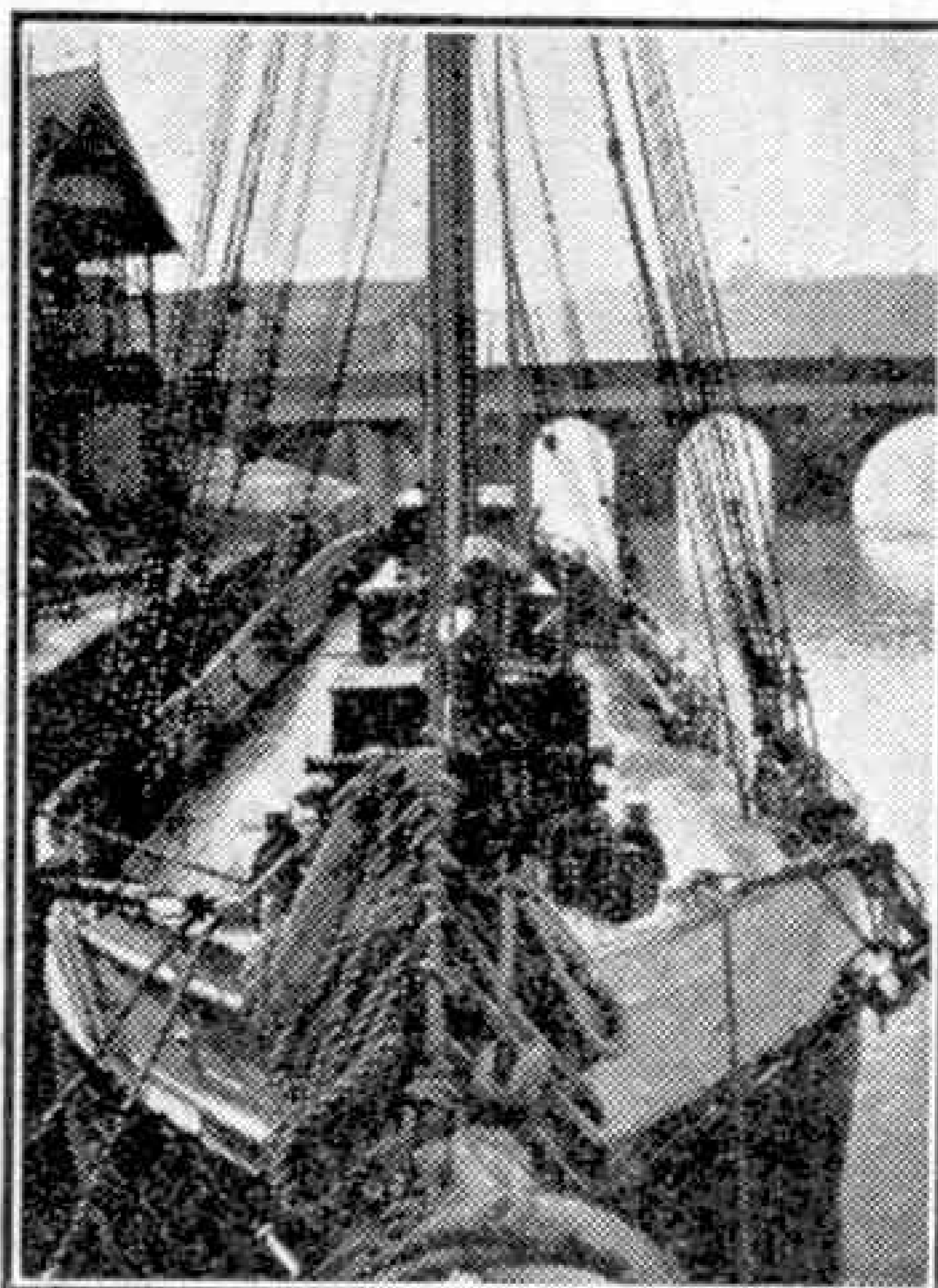
A RECORD ROAD HAUL IN AUSTRALIA

"M.M." readers will be interested in details of a record haul over the Blue Mountains, when a 60-ton mechanical scoop arrived at Lidsdale Colliery near Lithgow, New South Wales, after a four-day journey from Sydney. This was too big to be transported by rail, so it was hauled over steep and tortuous mountain roads by six heavy lorries, an escort of two police motor cyclists accompanying the convoy to warn motorists from the road ahead.

At Katoomba it was necessary to remove the railway level crossing gates and a panel of fencing so that the machine could pass through. The descent of Mount Victoria Pass took an hour. Three of the lorries had to be attached to the rear of the 30-wheel conveyance bearing the huge scoop, and the brakes were kept applied during the whole descent.

Six lorries were insufficient to haul the load up the River Lett Hill on the Great Western Highway, near Lithgow, so a winch was used to bring it up the hill in stages of only a few yards each.

J. R. CLARKE (Roseville, New South Wales).



The ketch "Irene" in harbour. Photograph by I. M. C. Scott, Hove.

Suggestions Section

By "Spanner"

(654) A Pendulum "Ticker" Clock for Photographers

(W. Caff, Batley)

A very simple device for the photographic dark room is a ticking pendulum for measuring exposure and development times. Nowadays proper photographic timekeepers are difficult to obtain, and the simple arrangement shown in Fig. 654 will be found far more reliable than mere guesswork. As the timing is done by sound, the operator's hands and eyes are free to concentrate on other business.

The accompanying illustration is largely self-explanatory. It shows a half-second compound pendulum mounted for use. A half-second pendulum is one that takes just half a second to sweep from one side to the other, and its length is measured from the centre of suspension to the centre of gravity of the moving part. Calculation shows that this length should be 9.78 inches. The overall length of the "ticker" is actually about 14 inches.

The pendulum comprises a long perforated Strip which carries at its lower end two tyred Pulley Wheels, which act as the bob. It is mounted on a short Rod pivoted in a convenient bearing attached to the underside of a shelf. A Rod Connector is squeezed through a Double Bracket and mounted, parallel to the direction of swing, one hole below the Rod so as to be as near the pivot as possible. Both ends of the Connector are closed by inserting short bolts as plugs, and these trap a ball bearing that is free to run from end to end of the Connector as the pendulum swings.

The long slots in the Wheels allow the pendulum to be adjusted by sliding the Wheels up and down over the bolts.

It should of course be remembered that the lower the Wheels and therefore the longer the pendulum, the longer the time of swing. The "ticker" will sound for $1\frac{1}{2}$ to 2 minutes, which is long enough for most requirements.

(655) A Meccano Gyroscope

("Spanner")

The gyroscope has many applications, one of its best known uses being in the gyro-compass. A simple Meccano model, which demonstrates the main features of a real gyroscope is shown in Fig. 655. The gyroscope proper consists of two Hub Discs 1 mounted face to face and secured to an Axle Rod by means of two Bush Wheels that form their hubs.

This unit is mounted in a swinging frame 2 consisting of a Circular Strip, which is pivotally suspended, by means of $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets and lock-nutted bolts, in a U-shaped stirrup 3 formed from a $12\frac{1}{2}''$ Strip. The Strip has a Double Arm Crank bolted to its central hole and in its boss is held a Rod 4. This Rod forms a pivot, and

is free to turn in a reinforced bearing consisting of a Double Bent Strip and a $1\frac{1}{2}''$ Strip bolted to the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate that forms the base of the model.

To spin the gyroscope, a length of string is wound on the spindle and its end is then pulled sharply so that the Wheel is set rotating in a clockwise direction. If now the U-frame is turned also in a clockwise direction the edge of the Circular Strip rises. This is due to the tendency of the axis of rotation of the gyroscope always to point in the same direction in space. If the direction is changed the gyroscope resists the change by executing a movement in a plane at right angles

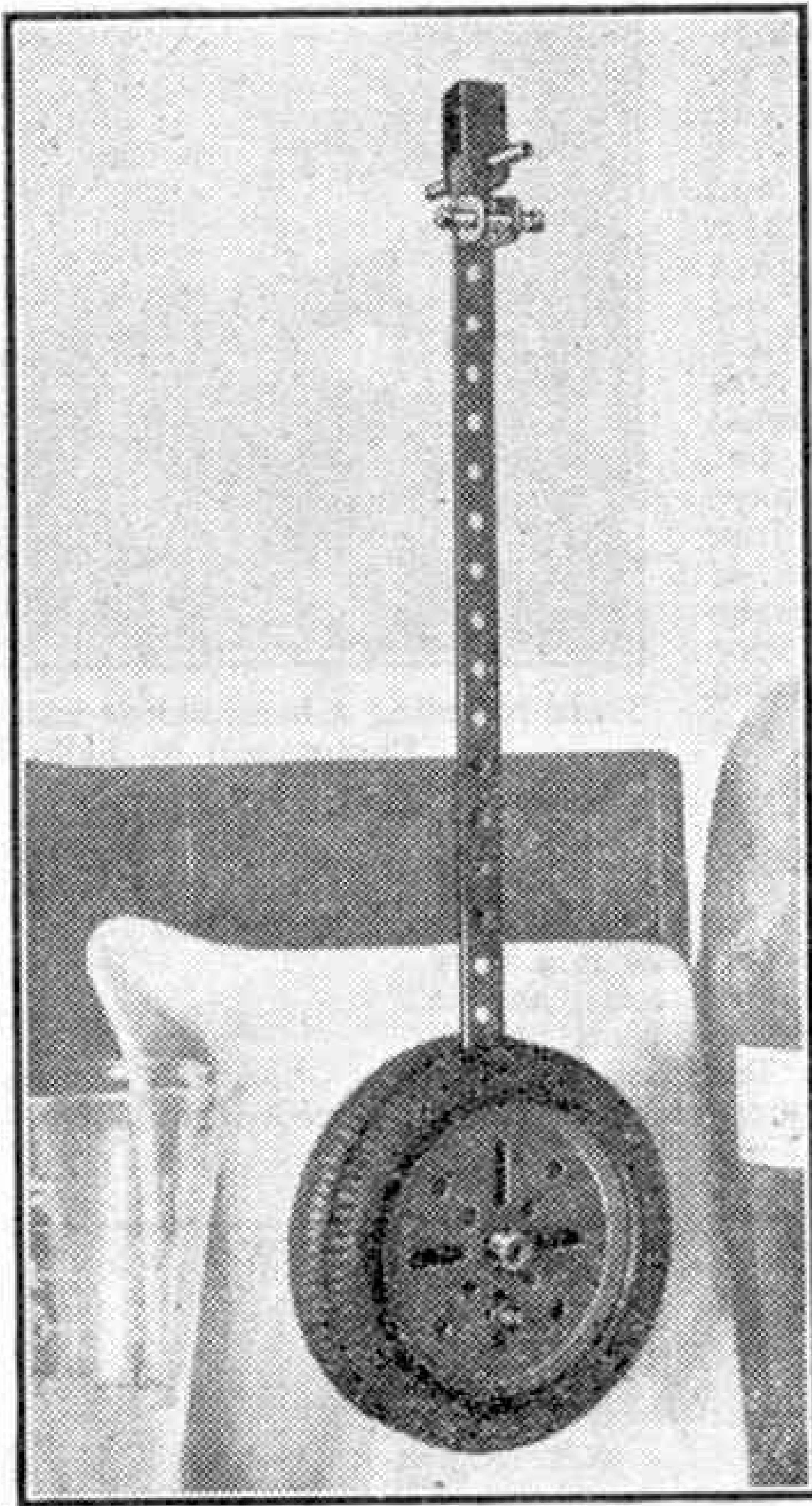


Fig. 654

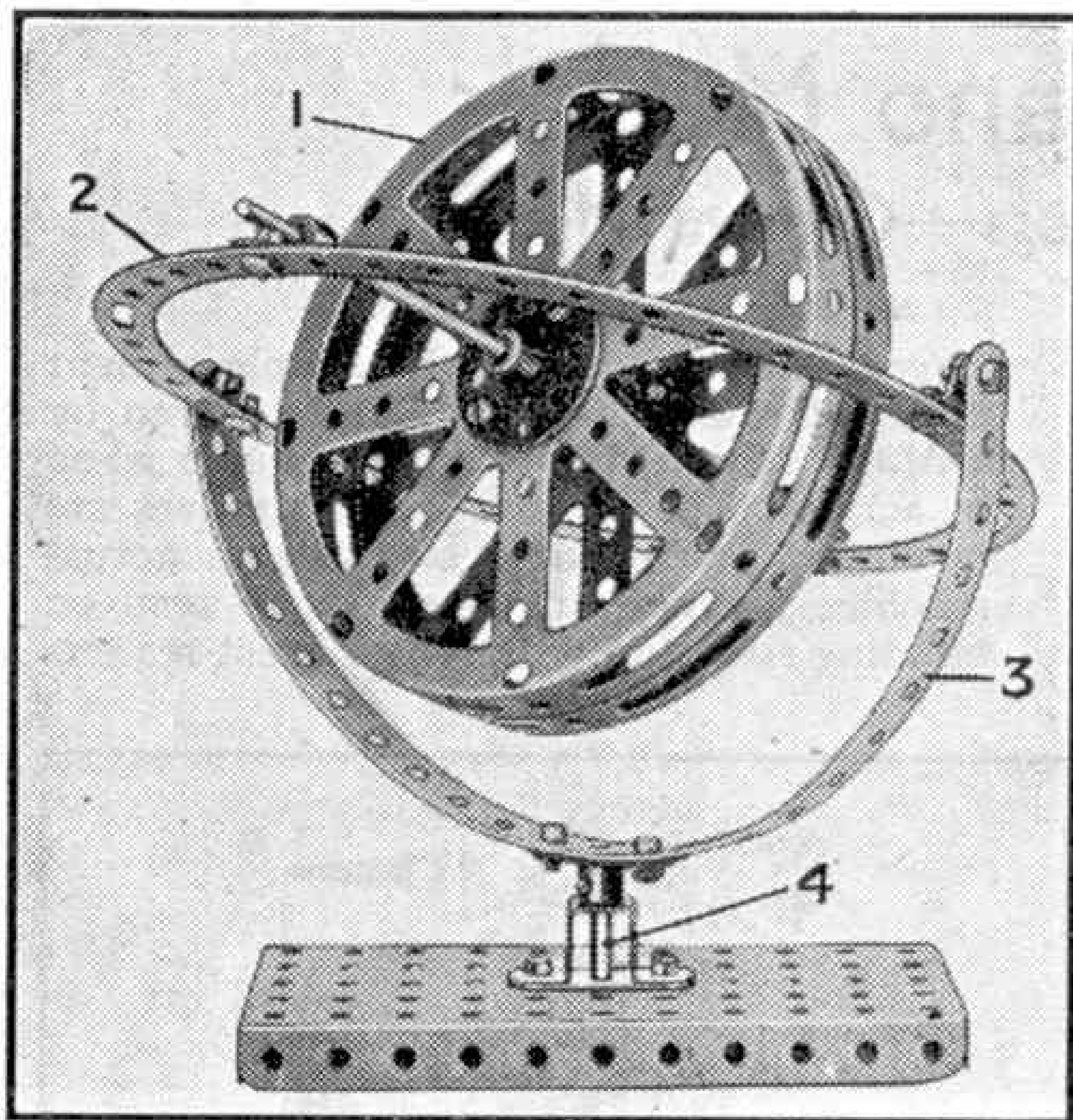


Fig. 655

to that in which the change occurs.

If we make the Circular Strip dip by adding weight to one side, the gyroscope shows its resistance by turning slowly about the vertical axis.

Other experiments in gyroscopic action may be carried out with this model.

(656) Collector Trolley for Model Tramcars ("Spanner")

Some model-builders seem to be puzzled as to a suitable method of constructing a collector trolley for use on model tramcars. One idea is shown in Fig. 656, and it will be seen that it is quite simple to substitute other parts for those shown in this example if these particular parts are not available.

The device is built up on a base formed by any suitable part, such as a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate. Pivoted on this is a Bush Wheel, to which is bolted a Double Bent Strip. A Handrail Support is fixed in the Double Bent Strip and this carries a 1" Rod. The trolley is a Rod of suitable length carrying a Collar. It is fixed at one end in a Universal Coupling, the other section of which is fixed to a 1" Rod held in the Handrail Support.

Two Springs are arranged to tension the trolley and keep it up against the overhead current conductor. Each of these Springs is attached at one end to a $\frac{1}{2}''$ Bolt fixed in the Collar on the trolley and at its other end to a second $\frac{1}{2}''$ Bolt fixed in the Handrail Support.

At the head of the trolley is a Handrail Coupling, to which a Fork Piece is pivoted by means of a 1" Bolt. The Fork Piece carries a $\frac{1}{2}''$ loose Pulley in its arms.

(657) A Novel Use for Film Spools ("Spanner")

Although photographic films are difficult to obtain nowadays, most amateur photographers have a few empty spools lying around somewhere, and they will perhaps be interested to learn of a novel use to which these spools can be put in Meccano model-building. They form efficient hoisting drums in Meccano model cranes, and when properly mounted and arranged they take up little space, especially those used for V.P.K. size film.

For large model cranes the best hoisting drums are those formed from a Meccano Wood Roller. The Roller should be mounted on the shaft with a Bush Wheel at each end. Besides serving to fix the Roller to the shaft the Bush Wheels form flanges that retain the winding cord in position on the drum.

(658) Miniature Cement Blocks (R. Blackburn, Glasgow)

Small blocks for use with model block-setting cranes can be made at home by mixing a little cement and sand with water. The result is then put in match-boxes and allowed to set, after which the boxes can be stripped away, leaving the blocks ready for use.

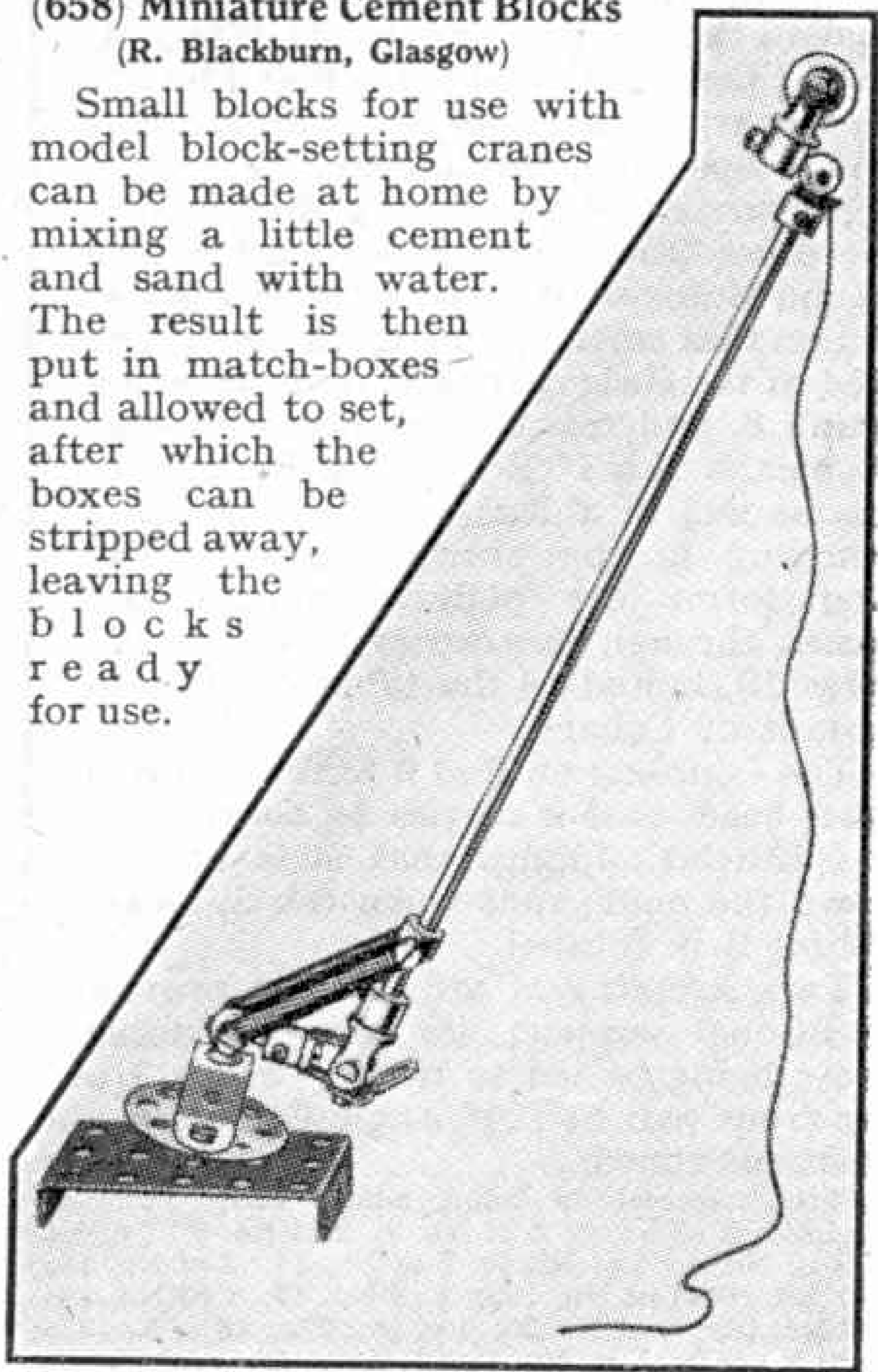


Fig. 656

New Meccano Models

Strip Punching Press—Cement Mixer

THE first of the two models described this month is a fine strip punching press, which is shown in Fig. 1. This interesting model is based on an actual press used for punching holes in metal strips, and although it will not pierce holes in metal, it will perforate thin cardboard or paper quite easily.

The model is driven by a Clockwork Motor, and its constructional details are as follows. Two $5\frac{1}{2}$ " Angle Girders are bolted to a $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate, together with four $12\frac{1}{2}$ " Angle Girders that form the uprights. A $5\frac{1}{2}$ " Strip 1 is then bolted on each side of the machine as shown, and these carry the work-table 2, another $3\frac{1}{2}$ " \times $2\frac{1}{2}$ " Flanged Plate. A clockwork Motor is bolted to the rear pair of $12\frac{1}{2}$ " Angle Girders and at their upper ends they are joined together by Strips of suitable length, the whole vertical structure being strengthened by means of two Corner Brackets 3. At the back of the machine are two $3\frac{1}{2}$ " Strips 4, and at the front is bolted a Flat Plate 5. These parts form the bearings for the rods of the operating mechanism.

A Sprocket Wheel 6 on a Rod 7 takes the drive from another Sprocket Wheel on the Motor shaft. Also on Rod 7 is a $\frac{1}{2}$ " Pinion that engages a 57-teeth Gear. The Rod of the Gear carries at its front end a Crank 8, and this is pivotally connected by means of a 1" Bolt and a Fork Piece to one end of a Rod 9, which carries a Coupling in the position shown. The Rod forms the piercing punch, and passes through the centre hole of a $2\frac{1}{2}$ " Strip 10, bolted to the table but spaced from it by Collars.

The Coupling on Rod 9 forms part of a cross-head, and it carries on short Rods two other Couplings that slide up and down the guide rods when the Sprocket Wheel 6 is rotated.

Two Architraves are used to provide additional support for the worktable, these being bolted to the $5\frac{1}{2}$ " Strips 1 and the front pair of $12\frac{1}{2}$ " Angle Girders in the positions shown.

Parts required to build model Strip Punching Machine: 2 of No. 2; 5 of No. 3; 2 of No. 5; 1 of No. 6; 4 of No. 8; 2 of No. 9; 2 of No. 14; 2 of No. 15a; 2 of No. 16; 1 of No. 16b; 1 of No. 17; 1 of No. 18a; 2 of No. 18b; 1 of No. 26; 1 of No. 27a; 44 of No. 37a; 45 of No. 37b; 7 of No. 38; 3 of No. 53; 8 of No. 59; 2 of No. 62; 6 of No. 63; 22 of No. 94; 1 of No. 95; 1 of No. 95a; 1 of No. 96; 2 of No. 108; 1 of No. 116;

1 of No. 140. 1 No. 1 Clockwork Motor.

Our second model is the simple cement mixer shown in Fig. 2. This is driven by a *Magic* Motor, and is most realistic when in action. The cement mixing rollers are fashioned on the lines of those in actual machines, which are often to be seen on building sites and with which most readers

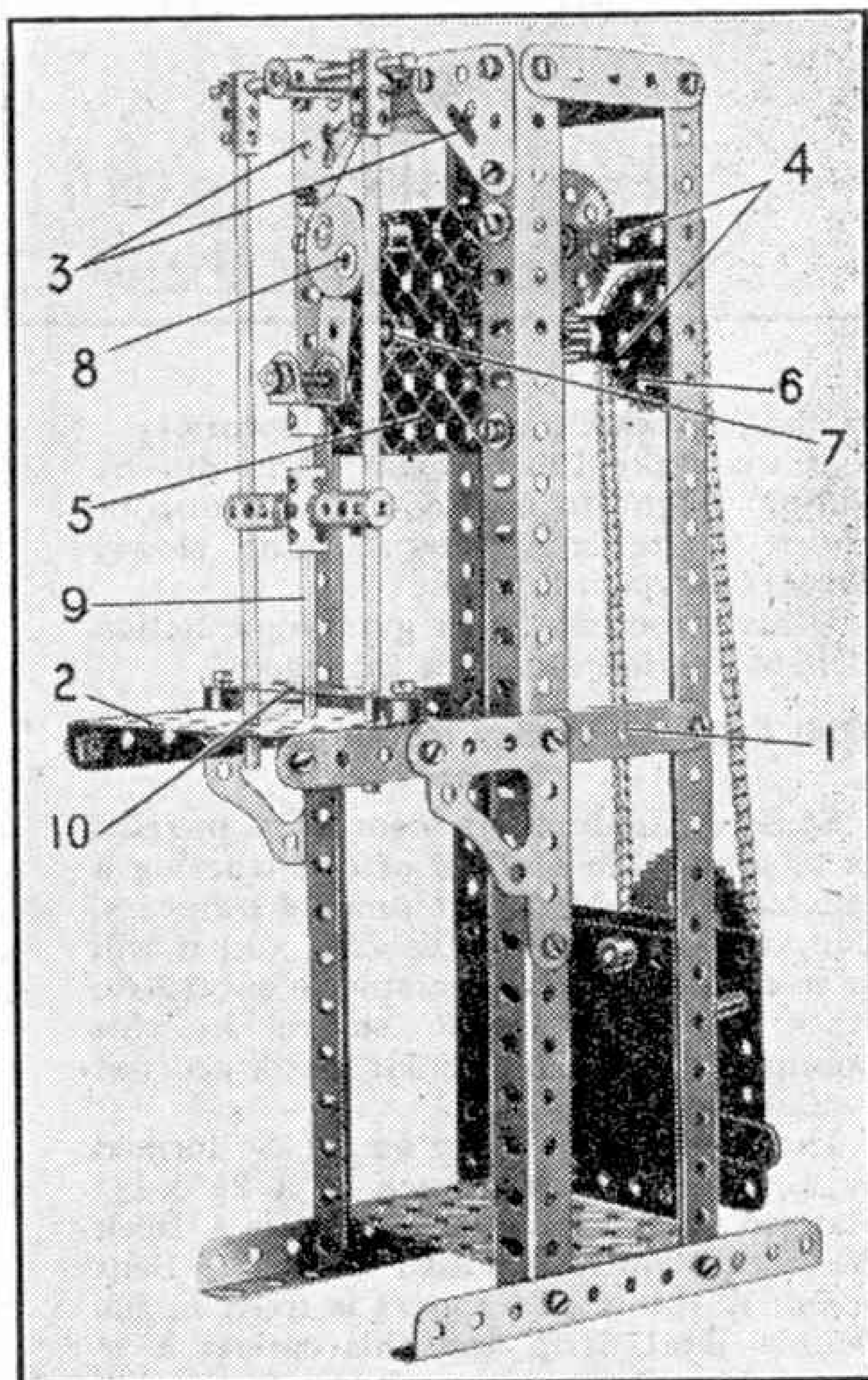


Fig. 1. A press that punches holes in strips of paper or thin card in a very realistic manner.

will be familiar.

The wheel frame of the model is formed from two $4\frac{1}{2}$ " Strips joined at their ends by two $2\frac{1}{2}$ " Strips. Across the centre of the frame is bolted a $1\frac{1}{2}$ " \times $\frac{1}{2}$ " Double Angle Strip 1, which forms a support for the pan. At each end of the wheel frame is an "A" frame formed from two 3" Strips, and these support a $6\frac{1}{2}$ " Rod 2. This Rod

carries a 2" Pulley Wheel, a $\frac{7}{8}$ " Bevel Gear and a Coupling 3, and is retained in place in its supports by means of Collars.

Journalled in the longitudinal bore of Coupling 3 is a $1\frac{1}{2}$ " Rod, the lower end of which rests on the end of a 1" Rod held in a Collar 4. This 1" Rod is pushed through the centre hole in the $1\frac{1}{2}$ " Double Angle Strip, so that the Collar rests on the Strip. The $1\frac{1}{2}$ " Rod carries a $\frac{7}{8}$ " Bevel Gear 5 and a Coupling. In the longitudinal bore, at each end of the Coupling, is fixed a Bolt that carries a Chimney Adaptor.

The *Magic Motor* is bolted to an "A" frame of the model by a Bolt 6 and is also secured to a $1\frac{1}{2}$ " Strip bolted to the "A" frame. The pulley of the Motor is connected by a Driving Band to the 2" Pulley.

Parts required to build model Cement Mixer:
4 of No. 4; 2 of No. 5; 1 of No. 14; 2 of No. 16b;
1 of No. 18a; 1 of No. 18b; 1 of No. 20a; 4 of No. 20b;

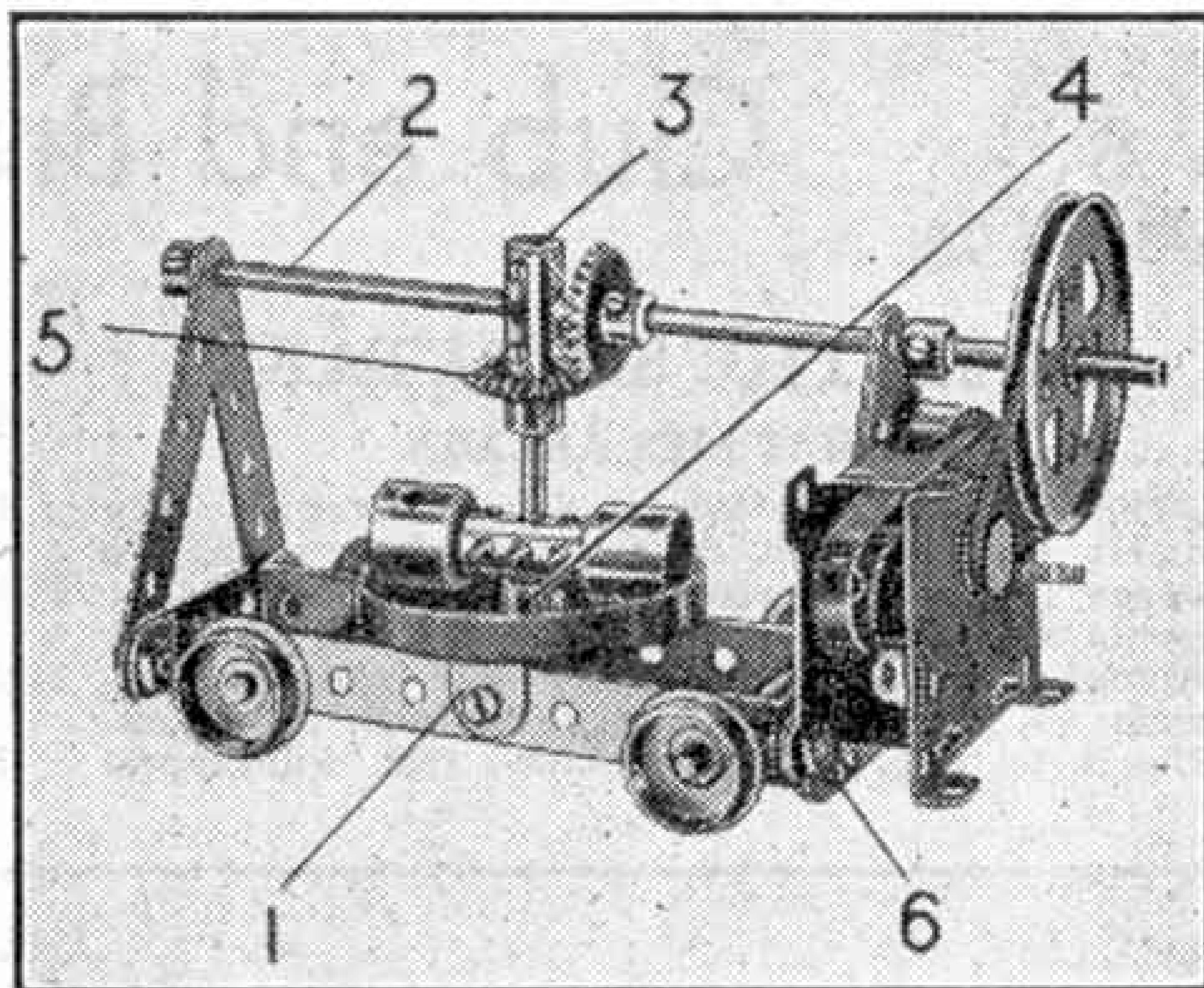


Fig. 2. This simple cement mixer is driven by a Magic Motor and is very effective in action.

2 of No. 30; 11 of No. 37a; 11 of No. 37b; 1 of No. 48;
2 of No. 48c; 3 of No. 59; 2 of No. 63; 2 of No. 111a;
1 of No. 137; 2 of No. 164. 1 *Magic Motor*.

Model-Building Competitions

By "Spanner"

Transport Through The Ages

There is still plenty of time to prepare entries for the great Summer Model-Building Competition announced in the August issue. No doubt model-builders have already planned their entries and are now busy with constructional work, but those who have been unable so far to make a start should do so at once. The competition is an attractive one, for all model-builders are interested in the story of transport, and we look forward to receiving a very large number of entries illustrating the transport of the past or of the present. The scope is very wide, including locomotives, road vehicles of all kinds, aeroplanes, ships and boats, and there is no restriction whatever in regard to the kind or number of parts that may be used.

As usual, actual models must not be sent in, what is required being either a photograph or a good drawing, with any notes that the competitor may think desirable to add in order to make construction clear. A group of models may be entered, but where this is done the entry will be regarded as a single one, as no competitor may win more than one prize. It is not necessary that the model shall be a new one, specially constructed for the occasion; a model already built can be entered, provided that it has not been awarded a prize in previous "M.M." contests.

Competitors should have no difficulty in finding illustrations of suitable subjects on which to base their models. There is no restriction of the quantity of parts that may be used in building models.

Entries will be divided into two Sections, A, for competitors under 14 years of age, and B, for competitors over 14 years of age. Entries should be addressed to "Summer Model-Building Competition, Meccano Limited, Binns Road, Liverpool 13," and should be posted in time to reach this office on or before 31st October next.

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

June "Simplicity" Contest Results

The "Simplicity" contests announced from time to time in the "M.M." are very attractive to model-builders, and we always expect and receive large numbers of entries. One of these special Contests was announced in the June issue of the Magazine and we are now able to announce the names of those competitors who were successful in receiving prizes. The full list of awards is as follows:

1st Prize, Cheque for £2/2/-, P. A. Walters, Billericay; 2nd Prize, Cheque for £1/1/-, A. Short, Birmingham; 3rd Prize, P.O. for 10/6, D. Pitts, Kenton. Consolation Prizes of 5/- each: J. Bass, Leicester; N. C. Ta'Bois, Woodford Green; J. E. Meggitt, Ipswich; S. T. Walters, Billericay.

A really good "simplicity" version of a pair of household scales won the First Prize for P. A. Walters, and it is interesting to note that this competitor's brother S. T. Walters also figures in the prize list, having won one of the Consolation awards for a novel model of a radio receiver chassis. I was particularly attracted by the novel ideas incorporated in the scales. For example a Wheel Disc forms the goods pan while a Triangular Plate is used for the weights pan. There are very few parts in the model considering the very realistic effect obtained.

The Second Prize model is a remarkably close reproduction of a "jeep" and it is impossible to describe in words the realism of this entry. Unfortunately space does not permit me to include an illustration of it this month.

The Hun's latest terror weapon, the flying bomb, forms the subject of the entry sent by D. Pitts, who lives in the south of England and I hope the fact that his model is very realistic does not signify that he has had too close an opportunity to discover its features from actual experience.

Of the Consolation Prize winners, N. C. Ta'Bois also chose for his entry a representation of a flying bomb. J. E. Meggitt's entry consisted of a realistic excavator and a mobile crane, and J. Bass submitted a group of models, ranging from a very effective bicycle and a model electric truck to a fine little garden seat.



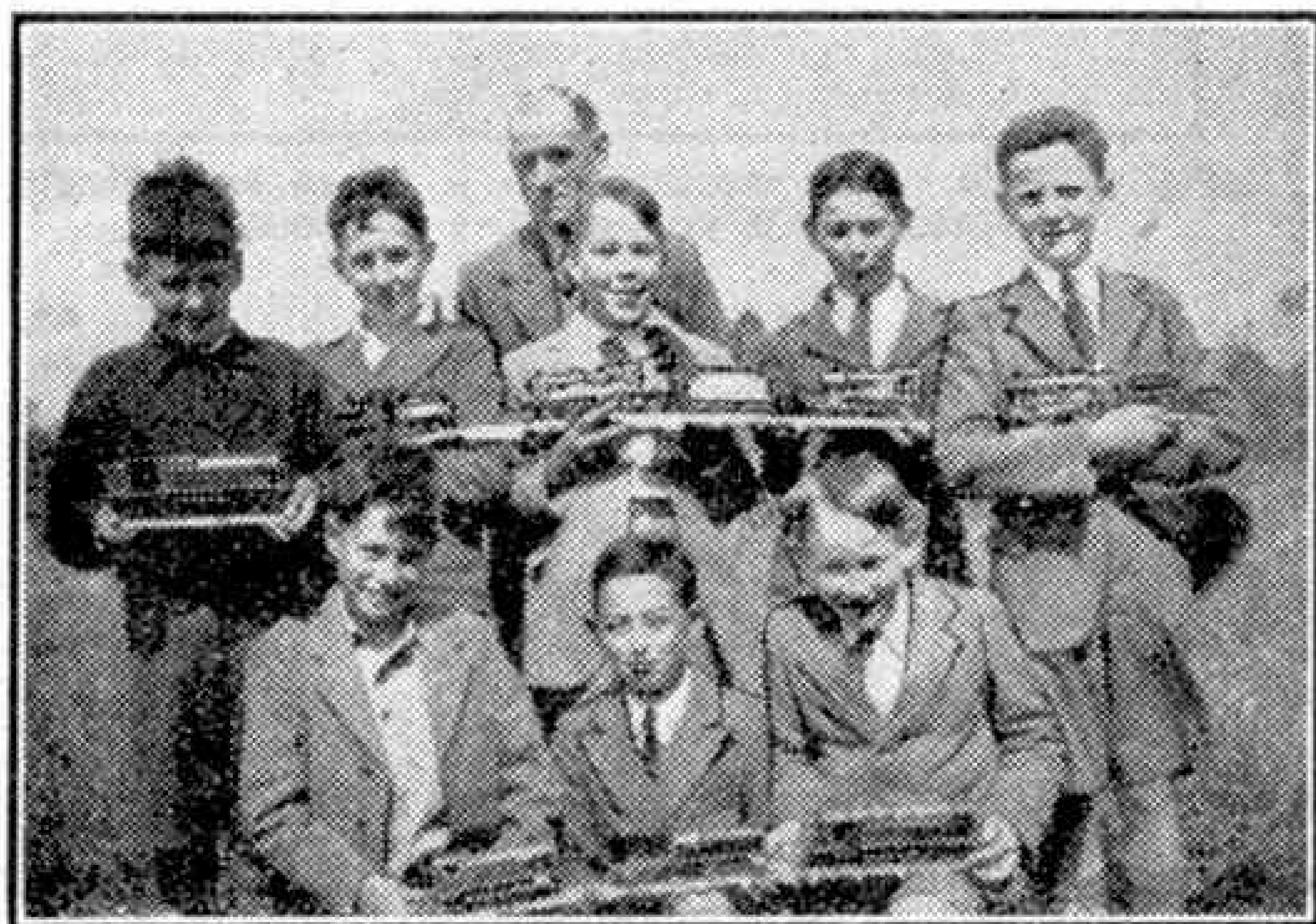
Club and Branch News



WITH THE SECRETARY

WHAT LIES AHEAD?

The success of the Winter Sessions depends very largely upon what is done during September. To plunge into a somewhat haphazard programme of meetings is only to invite disaster, and this must be avoided at all costs, especially now when we can begin to look ahead to more normal conditions. Efforts to plan out programmes that will appeal



This fine group shows members of the Three Bridges Branch, No. 453, with their Chairman, Mr. G. C. W. Baldwin. The Branch has been very active since receiving incorporation in September of last year. The extensive layout is operated in realistic style, with attention to such details as engine head codes and bell call signals, and every member has his official post while running is in progress.

strongly to all members will have a double reward this year. They will not only ensure good times for members of Clubs, but they will also guarantee that those who have been absent on war work will share in the good things when at length they return. Leaders therefore should talk things over with their officials, and towards the end of the month a general meeting should be called at which the plans they have made can be thoroughly discussed.

GUILD BADGES

The stock of Guild badges is exhausted and cannot be renewed in present conditions. For the present therefore qualified applicants will be enrolled without charge. Certificates of membership will be sent them, and badges will be supplied when they can be obtained. Notice of this will be given on this page.

WAR WORK

It is always interesting to hear of former Club officials and members now in the Forces. I cannot of course give details of what Guild and H.R.C. members are doing in various parts of the world, or even say where many of them are, but I can assure readers that they are doing their share in every branch of Allied activity. The immediate cause of this note is a fine article in a South African newspaper by Mr. E. W. Sykes, peacetime Leader of the Malvern (Johannesburg) M.C., in which he describes the work that he is doing as a Y.M.C.A. Hut Leader.

PROPOSED BRANCHES

EDGWARE—Mr. E. Smith, 27, Melrose Gardens, Stag Lane, Edgware, Middlesex.

PORTSMOUTH—Mr. R. R. Smith, 348, Havant Road, Farlington, Portsmouth, Hants.

MORDEN—Mr. D. Thiele, 26, Garth Close, Morden, Surrey.

CARSHALTON—Mr. J. W. Whitton, 153, Carshalton Park Road, Carshalton, Surrey.

HUDDERSFIELD—Mr. B. Ingham, 145, Lockwood Square, Newsome, Huddersfield, Yorks.

PORTLAND—Mr. H. Collings, "Ormond," 8, Ventnor Road, Portland, Dorset.

WELLINGTON (NEW ZEALAND)—Mr. C. T. Grant, 26, Welford Street, Lower Hutt, Wellington, New Zealand.

CLUB NOTES

KESWICK M.C.—More new members have been enrolled and model-building is being carried on very actively in preparation for the Club's Annual Exhibition. A special "Court" has been set up to deal with minor offences against Club rules. Club roll: 14. *Secretary*: I. Bentley, 53, Blencathra Street, Keswick.

ST. MARY'S (TWICKENHAM) M.C.—Model-building Competitions have been the chief feature of the programme in recent months. The Club's Hornby Railway has been in operation, with excellent running to a new timetable. Other hobbies followed have been the construction of model aeroplanes and ships; every member made some special part of a large model battleship. Club roll: 9. *Secretary*: R. Davis, 26, Katharine Road, Twickenham, Middlesex.

STRATFORD-ON-AVON M.C.—Model-building Competitions, Film Shows and General Knowledge Tests have been enjoyed, and Games have been played. An interesting feature of the Summer programme is the camping weekends that have been organised, which are thoroughly enjoyed by all taking part. Club roll: 10. *Secretary*: D. P. Cull, 34, Wood Street, Stratford-on-Avon.

SOUTHPORT M.C.—Excellent progress has been made and members enjoyed all meetings. The programmes include Model-building, Games, Lectures and Debates, one of the topics for discussion being "Meccano Construction." A good outdoor programme of sports is being followed. Club roll: 10. *Secretary*: G. Dawson, 9, Clifton Road, Southport.

BRANCH NEWS

DURHAM SCHOOL—A new Branch room has been secured and the opportunity has been taken to change the layout to give a longer stretch of line and a large terminus. Provision has been made for an extension to docks. Two Committees have been formed, to deal with the layout and scenic surroundings, and with the installation of electrical equipment, respectively. *Secretary*: P. G. I. Green, Poole House, Durham School, Durham City.

GAINSBOROUGH—The Branch track has been extended by the inclusion of more solid steel rails. Lineside buildings, etc. are being made of wood, with Meccano for bridges, cranes and similar structures, and a further extension of the layout is being planned. An interesting visit has been paid by the secretary to a model railway at the Queen Elizabeth Grammar School. *Secretary*: F. J. Newman, 26, Birrell Street, Gainsborough.

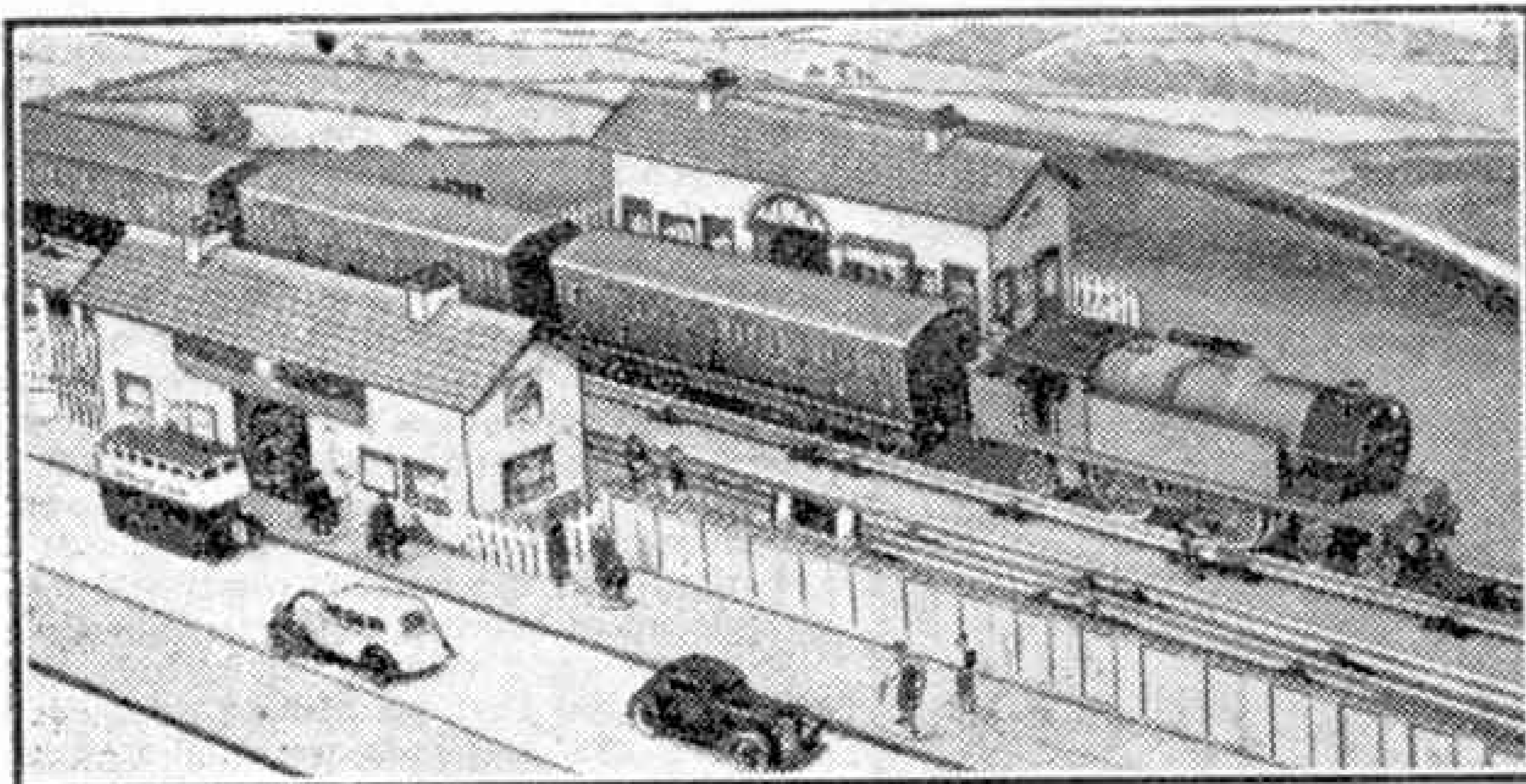
L.N.E.R. Operations for Hornby Railways

THE most true-to-type Hornby railways are undoubtedly those on which the owners endeavour to reproduce in miniature the services and working characteristics of one particular line, or perhaps just a section of it. Generally speaking, the articles that we have published on following the practice of this

use on loan of engines and stock of one company on the lines of another. This sort of thing presents golden opportunities to those who like to run the equipment of several companies together. The "foreign" engines and trains can always be regarded as "on loan."

So too when two or three boys combine their equipment to form one system for a set of operations, there is nowadays no need to imagine any special or through working arrangements to explain matters.

The special importance of freight traffic to-day gives an added interest to the running of goods trains in miniature. "Government Specials" of perishable Vans, mixed goods in sheeted Wagons and Covered Vans, Tank Wagons, and so on can all be made up in model form from Hornby stock. They will have to take priority as a rule over other traffic so that our working arrangements may have to be modified to suit. At the same time followers of the East Coast Route will scarcely need reminding of the importance of the regular "3.35 Glasgow Goods" from King's Cross, and probably



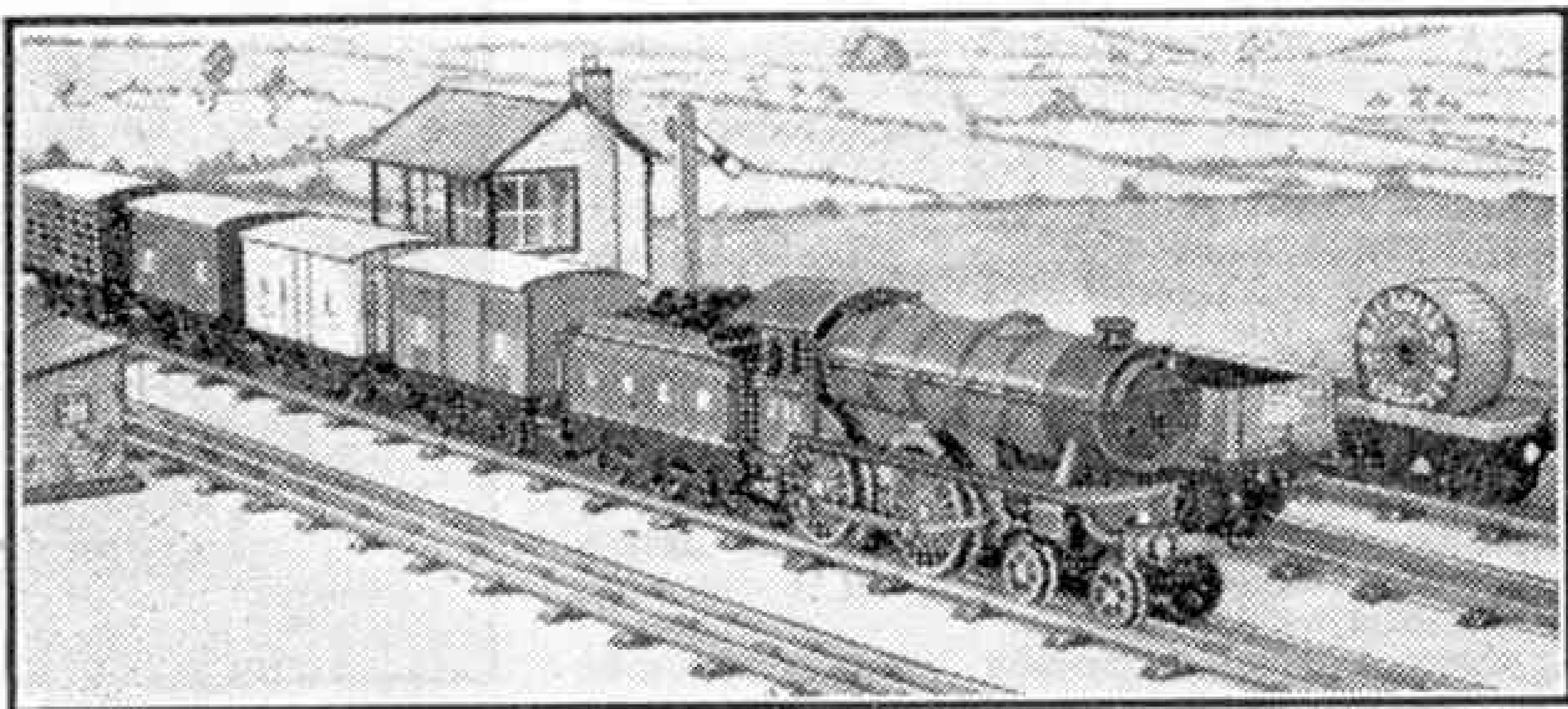
A local train at a station on a Hornby L.N.E.R. layout. The engine is an E220 Special Tank.

most L.N.E.R. layouts include a representation of this flying freight in their working scheme.

The lower illustration on this page gives a good impression of this train on a Hornby L.N.E.R. system. Vans and L.N.E.R. Containers on Flat Trucks are ideal for making up the load. The use of a 4-4-0 passenger engine such as "The Bramham Moor" is justified by the fast timing of our miniature freight flyer, the "big sister" of which is normally one of the fastest goods trains in the world.

Our suburban train arrangements will vary according to the particular district that our railway is supposed to serve. As a rule of course individual model railway owners choose to represent the district they know best. Whatever our choice, No. 2 Passenger Coaches of the compartment type are ideal, especially for the long-distance residential traffic on layouts of the more ambitious kind. We can, however, make very good use of the smaller No. 1 Coaches, which make up into splendid suburban "block trains." A set of them, preferably with a Guard's Van at each end, can always be used in the same formation as a suburban train. Tank locomotives are required for this train, and even the smaller members of the Hornby Tank Locomotive family can handle quite respectable trains.

A feature of present-day railway operation that can be applied to any miniature system is the



The L.N.E.R. "Glasgow Goods" in miniature. This realistic train is composed of Hornby Vans and is headed by an E220 Special 4-4-0 "The Bramham Moor."

A Hornby-Dublo Running Programme

HORNBY-DUBLO railway owners generally start their hobby with a miscellaneous kind of working, the various train movements being made according to the ideas of the moment. In due course, however, the keen operator wishes to set out a running programme in which the different movements are all

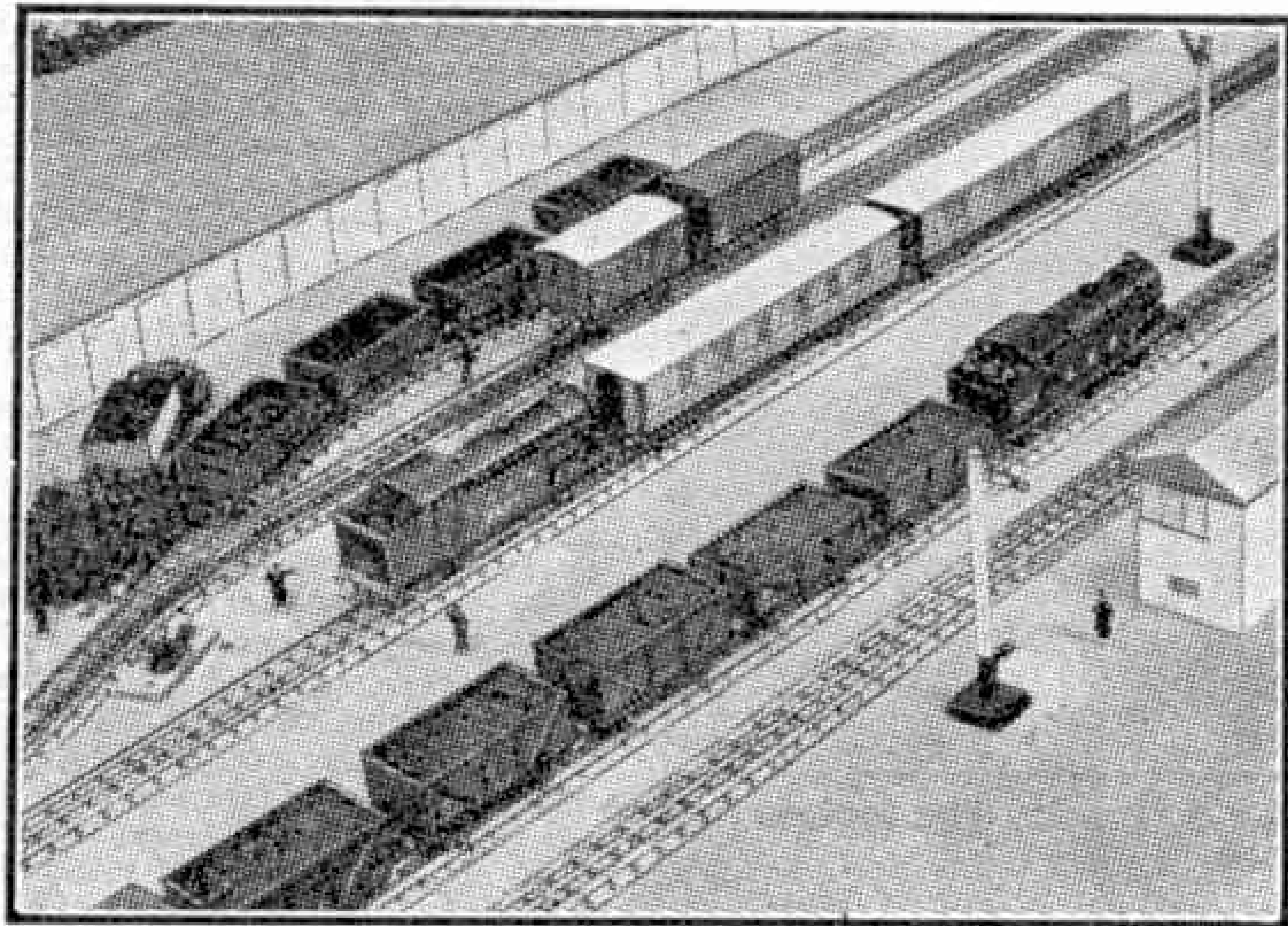
comments from visitors. This applies to engine sidings as well as those used for general purposes. Sometimes by a little rearrangement of points and so on it is possible to make an improvement easing the working; these sort of items are of course usually discovered in the preliminary runs that are made to try out the scheme as a whole. Loop lines are particularly valuable as they can be entered from either end and it is often worth while installing a loop even though this may have to be shorter than a dead end siding in the same spot would be. It will reduce its capacity for holding vehicles but the advantage of easier access will usually compensate for this.

This brings us to a point that is of considerable value to the operator. The number of vehicles of different kinds, with and without a locomotive that can be accommodated in each siding, platform road or loop line should be known. Different train formations should be worked into the various roads and notes made up of the line capacity as a result. It is no good making up a long train only to find that we cannot refuge it in any of our loops as we shall certainly want to in the course of running! Again the disposal of such a train at the end of its journey may cause a great deal of trouble. It is suggested therefore that we make a little plan of our railway, quite a simple drawing will do, and mark on it against the various tracks the vehicles that can stand on them

comfortably. This will be found most useful, at least in the early stages, and will be similar to the information that is in the possession of the real Control offices where the movement of trains is supervised.

Another item concerns the hauling power of our locomotives. We should find out their "best" loads; that is the number of vehicles that they can handle comfortably, rather than the number that they can only just move. Overloading is poor practice.

Finally, as all running programmes have to start at a given point, the disposition of the engines and stock at the commencement of operations has to be settled, to secure an orderly scheme of running.

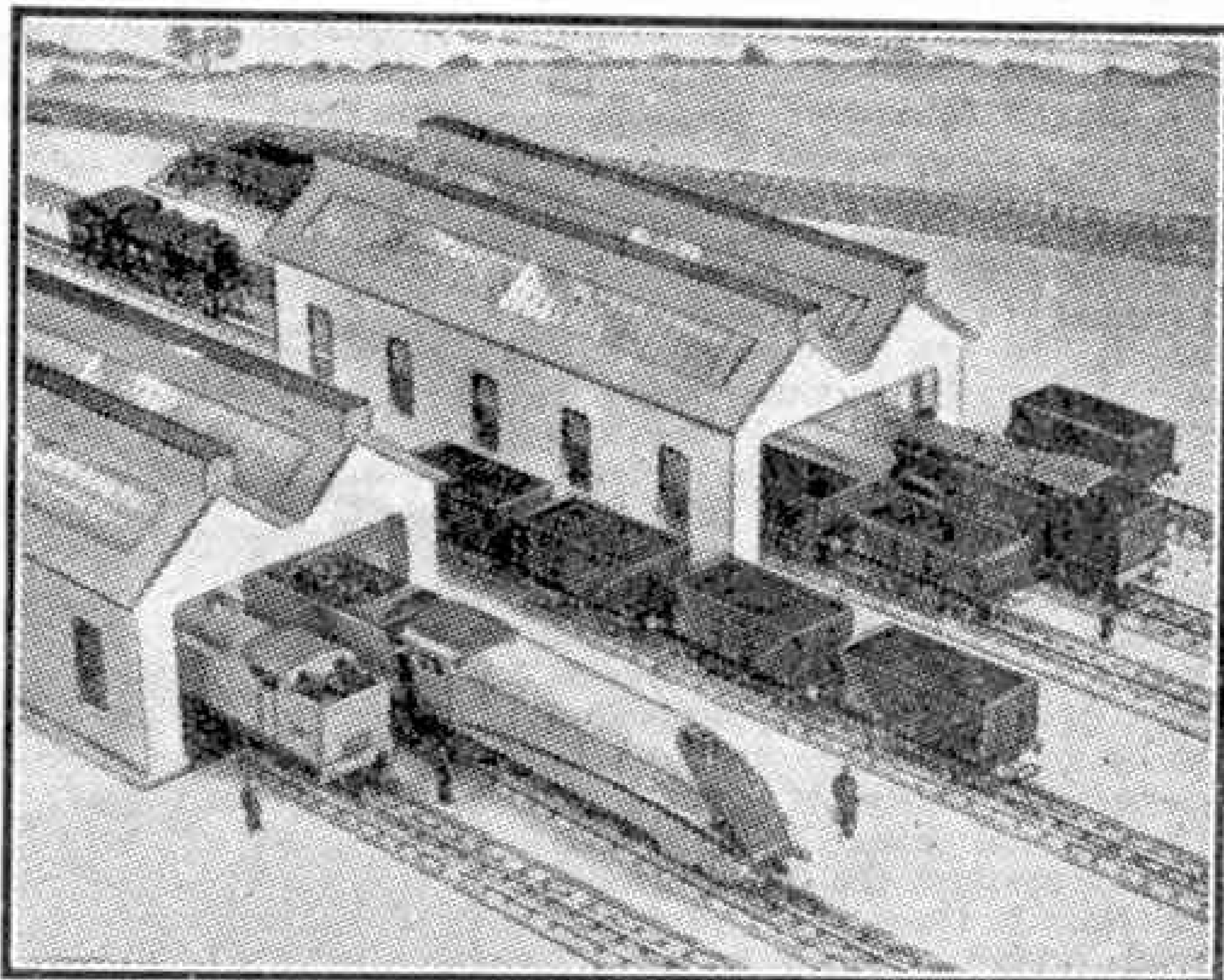


A coal train passes down a Hornby-Dublo main line while an engine fetches empty coaches from the sidings to form a passenger train.

related to one another in such a manner that the whole scheme closely follows that of the train services of full-size practice. In other words systematic operation becomes the order of the day, and in some cases a definite timetable is drawn up.

Such working is naturally a great improvement on the mere assembling of a train and starting it off on a run along the track without any definite idea of what to do when its journey is over. Probably working to actual times is a little over the heads of beginners and most younger boys, but systematic working is soon picked up and the actual timing can be left to a later stage. Another point is that the ideal layout for actual timetable working is a non-continuous system and in these days it is difficult to obtain sufficient length of run on a layout of this kind because of the shortage of materials and again for reasons of space. Thus a continuous line is practically a necessity but systematic operations on such a line can be carried out with success. In order that there shall be no hitch in the proceedings when once the working scheme is settled it is well to make sure that the track is clean and in perfect order and that the condition of engines and stock is at least satisfactory. Remember that the time taken to rectify even a small fault is quite out of proportion in the middle of a running programme and can cause a complete hold-up! This of course cannot be permitted to-day when to "keep traffic moving" is the aim of every railwayman! The hints given in previous issues, then, and the instruction leaflet belonging to the train set shall be noted and followed up. Then we can be certain that once the running details are settled our trains will not fail to carry out their part.

Layout details naturally have an effect on the running programme. Sidings that can be reached only by several reversing movements tend to slow things up and may cause adverse



At the sheds; Hornby-Dublo locomotives are being made ready to move out to their various duties.

Fun With Your Hornby-Dublo Trains

Working a Goods Yard

THE running of the "Goods Department" is a particularly interesting part of miniature railway working. Even on a simple Dublo system it is usually possible to include one or two sidings where goods traffic can be attended to. We may perhaps be fortunate enough to possess among our Accessories a Dublo Goods Depot. If so this goes a long way towards making the yard more complete and realistic. We have then at least somewhere to work our wagons to and from. Possibly we can move them from one set of sidings to another set elsewhere on the line; but if not we can have almost as good fun working them in and out of the same yard.

Generally the goods yard, as we may term our little set of sidings, is developed as an offshoot from the main line from which one or perhaps two further tracks are made to branch off by means of points. Where there is room to spare it is usual to bring

say, entirely of perishable Vans, or perhaps of Coal Wagons, is quite a straightforward operation. This is usually a regular feature in the programme of a layout in which particular traffics are dealt with. Strictly speaking, too, the return of the supposedly empty vehicles should be carried out, at least in the case of coal traffic. We can always suppose that a perishable load can be found for the Vans on their return journey; if not then they too will have to return "empty."

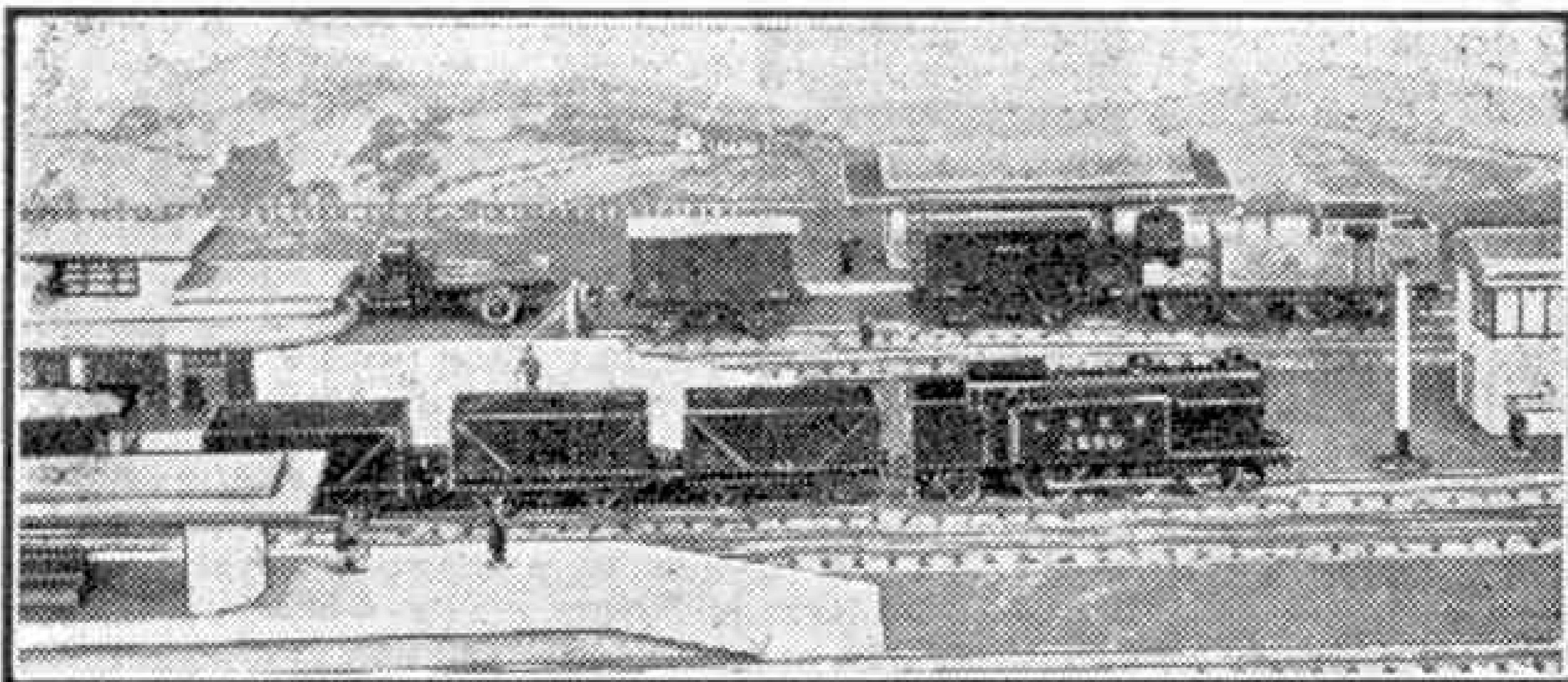
The operation of a "pick-up" goods train is full of interest. We can start operations with just the engine—a Dublo 0-6-2 Standard Tank is ideal for this—and run this light from the shed to the yard where operations are to begin. For further variety it can first pick up a Goods Brake Van and then supposedly take this further down the line to another point. Actually in most cases after one or two

circuits of the main track the engine and brake will put into the same yard again! This, however, need not worry us; we detach the van perhaps, and pick up a couple of vehicles standing ready in the siding, or maybe just "loaded" at the Goods Depot.

Attaching the van again in the rear, we set off along the main line and at our next call perhaps we leave one wagon and pick up three more. Every possible variation in the operations can be introduced according to the needs of the traffic, and the destinations of the different wagons. Finally, with a complete train we can make a few circuits of the main track and then

either shunt it as a whole into the sidings or gradually break it up a few vehicles at a time on successive calls at the yard, until we have only the engine left to return to the shed.

Similar principles can be employed in assembling a long-distance freight train and in distributing the vehicles to "local yards" after its main line run. For the long journey it will be better to employ the 4-6-2 streamliner "*Sir Nigel Gresley*," if we have one. Its use on an important freight train is quite in order, especially nowadays, and it will certainly be capable of hustling the train along in good style. Even in peace time "Pacifics" often took their turn on fast freight trains. As to the goods yard itself, we can easily fit up a number of accessories such as a water tank, coal merchant's office, coal stack, an odd hut or two for platelayers or for stores, on the lines of the schemes detailed in these pages in April and September last year. These involved the use of Plasticine and little odds and ends of wood, card and wire such as are usually included in the possessions of most model railway owners. A further idea is to arrange a boundary wall, or fencing, of thin wood or card, leaving an entrance for road vehicles to gain access to the yard. A lorry or two, either Dinky Toys if we have them or perhaps home-made ones, greatly improve the realistic effect. We have seen examples of quite successful home made motor vehicles of wood and card construction. Even if the wheels won't turn, the vehicles look quite good standing still! In addition there are of course various commercial articles of this kind still available. Miniature loads too can be provided for the different open Wagons and their use adds considerably to the realism of operations.



A local coal train on a Hornby-Dublo layout passing through a station while shunting operations are carried out in the goods yard in the background.

the sidings so formed parallel with the main line, and this gives quite a neat and symmetrical appearance to the whole. Frequently, however, if we have to lay down our goods yard inside the main oval of a continuous main line, the sidings have to be put down diagonally in order to get as much length as possible. This certainly spreads the railway out a bit, but the result is not unpleasing and realistic effects in the yard are readily achieved. There will be a bit more room for road features and the various odds and ends normally found in a wayside yard in actual practice.

When possible it is better to have the goods sidings running off a loop line or road separate from the main line, rather than to take the sidings straight off the main line itself. Quite often of course this cannot be done because of the lack of space, and, all too frequently nowadays, lack of material! The use of a loop or reception road helps to keep shunting operations clear of the main line. A loop too is always useful when there is any "running round" of the engine to be done in order to get it from one end of the train to the other. When there is no loop, then the only course for us to follow is to make the engine travel right round the main line, when this is continuous as is usually the case. This method of running round is not unreasonable. In actual practice engines sometimes have to make quite long runs "light" from one station where a shunt is going on, to another in order to use the crossover there, and then return to deal with the train that they have thus run round.

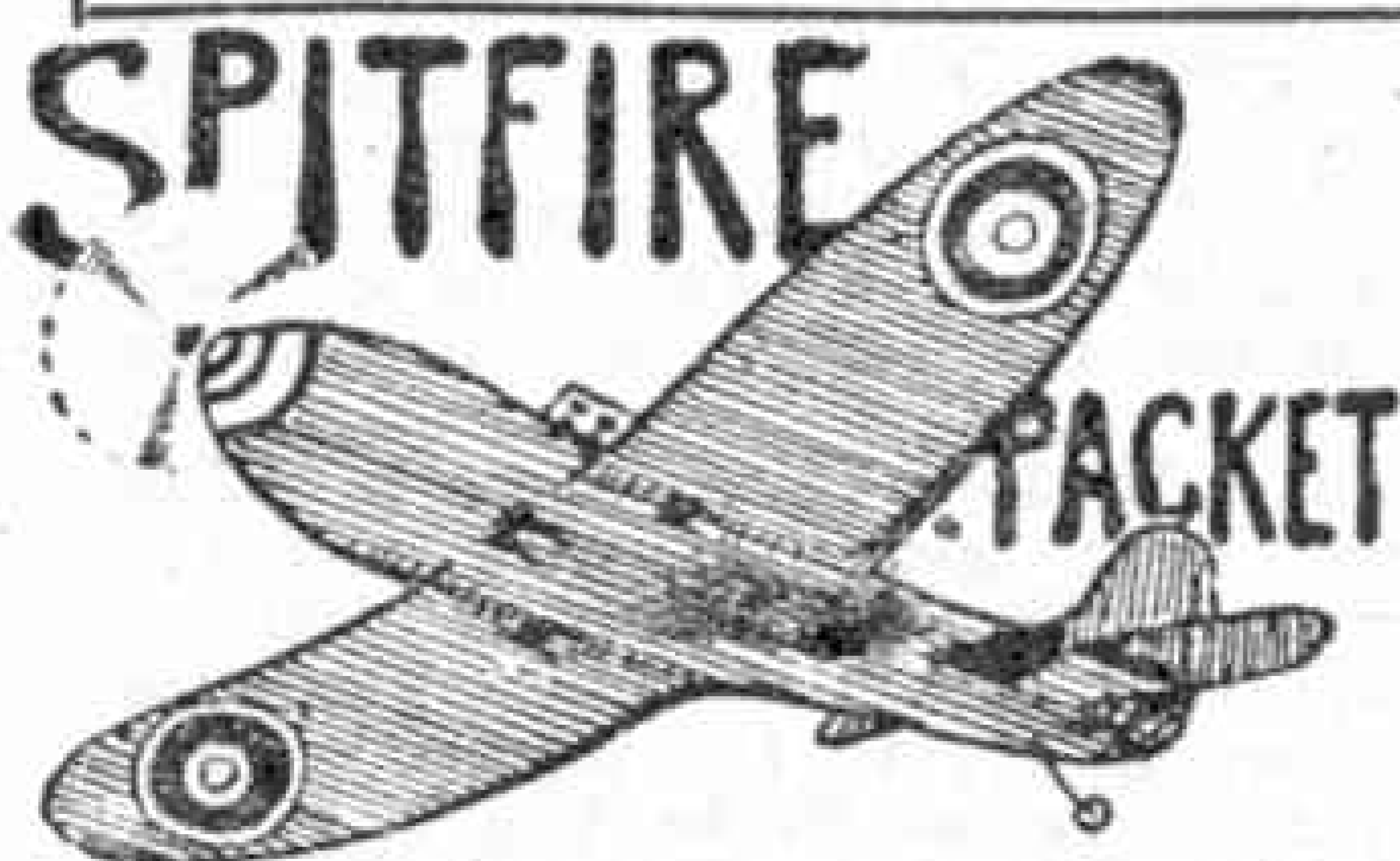
Even on the simplest layout therefore it is possible to deal with goods traffic in quite a realistic manner. The running of a complete train ready made up,

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Stamp Collecting

Stamps of the Seychelles

By F. Riley, B.Sc.

FROM East Africa we are this month going further east, to the Seychelles Islands, yet another British Colony where rupee values are in use for stamps, owing no doubt to Indian trade associations. The islands are about 1,400 miles South East of Aden. There are 92 of them, some mere dots in the Indian Ocean, and life on them must be pleasant, for they are delightfully green, with fine beaches, and although they are hot, the sea breezes appear to make the high temperatures bearable.

In spite of this there is a story to the effect that a not very good inhabitant who died, and did not go to Heaven, sent back for his blankets!

The largest of the islands is Mahe, which has an area of 56 square miles, and on which stands Victoria, the capital. The next largest has an area of less than 10,000 acres, and altogether the islands account for only

156 square miles, on which about 32,000 people live. The islands are really granite rocks, rising steeply out of the sea, Mahe reaching a height of 2,998 ft.; but on practically all of them vegetation is luxurious in the valleys and on the easier slopes of the mountains, for there are many brooks and torrents to keep the trees and shrubs green, especially during the rainy season, from November until May. The islands are too far north to be troubled by the hurricanes that sweep over Mauritius and other islands in the Indian Ocean, and even thunderstorms are said to be rare.

Like most islands in the Indian Ocean, the Seychelles have had an interesting history since they were first made known to Europeans by the Portuguese 400 years ago. The French were the first to take possession of them, but in 1794, when they had been in French occupation for about 30 years, they were taken by the British, and they have remained in our hands ever since. They were formed into a separate colony in 1903.

The Seychelles offer fine examples of the modern pictorial stamp. Their actual stamp history began in 1890, and for about 45 years the successive issues were all of the "tablet" variety, bearing a portrait of the reigning monarch with the value in a six-sided tablet below it. An example of one of these is reproduced on this page. It is from the issue of 1917-20, and the portrait is that of King George V. Earlier stamps of similar design show portraits of Queen Victoria and King Edward VII. Even the colours remain substantially the same for the various values until 1922, when certain new values were introduced, notably the 4 c. and 12 c., and the colours generally were changed.

The modern stamp story of the Seychelles began with the Silver Jubilee of 1935, when the usual four values with the well-known Windsor Castle design appeared. Those who have sets of the stamps should note carefully whether these include the double flagstaff variety, which is found in all values. Two years later came the Coronation issue, and finally 1938 saw the production of what can fairly be



described as a splendid pictorial series, although this comprised only three designs, distributed among 15 values. All the designs are illustrated on this page. The stamps are of good size and are beautifully reproduced in photogravure in a large range of colours; the designs are excellent and are of special interest because they picture directly something of the life of the islands.

The lowest value, the 2 c., shows a very fine specimen of the coconut palm, which appears also on the 9 c., reproduced at the head of this page, and on other values. This is the tree that produces the famous coco de mer, a double coconut that is peculiar to the Seychelle Islands. The name means "the coconut of the sea," a name given to it from a belief that it grew on a submarine palm, as originally it was known only from specimens cast up on the Maldiva and other coasts of the Indian Ocean. Its true home was not discovered until the Seychelles had been explored, and then it was realised that it was not a sea product at all. In the meantime it had gained a reputation as an antidote to poisons and commanded an enormous price. It grows on Mahe, and in still larger quantities on Praslin, the second largest island, where there is a valley famous for its palms.

Although its coconuts do not come from the sea, the colony certainly gains great wealth from the Indian Ocean, for fishes abound, many of them distinguished by splendid colours, and the inhabitants even get their building material from the sea, for they make great use of coral from the reefs that enclose the islands. This is hewn into square building blocks that glisten like white marble. This debt to the sea indeed is merely suggested by the pirogue, or fishing vessel, shown on the 6 c. and other stamps in the set. A whole series of Seychelles stamp designs could



be based on the theme.

The third design of the set shows a giant tortoise, a typical example of the animals of the Seychelles. There tortoises of many kinds are common, and the flesh of some of these is one of the colony's exports. Aldabra, a dependency of the Seychelles about 630 miles from Mahe is specially noted for its giant tortoises.

There have been no new designs since the appearance of this set of 1938, but certain values have appeared in new colours, and collectors will find it of great interest to trace these and to try to make up complete sets. The rupee values are somewhat highly priced, and values are rising, but even if these have to be left alone, a collection of the lower values easily can be made that will add greatly to the attraction of albums.



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Stamp Gossip and Notes on New Issues

By F. E. Metcalfe

IN peace time foreign stamps were much more easily come by than British Colonials, which may account for the fact that there used to be more collectors of the former than of the latter. The war seems to have changed all that, and nowadays Colonials have more than come into their own. Strangely enough stamps from South America do not seem to have lost much ground, and the new commemorative stamp from Argentina that is illustrated this month will probably interest a number of readers. There is nothing on the stamp to show what is being commemorated, but it probably has some political significance.

A new definitive set of stamps from 5f. to 20f. has been issued for Wallis and Futuna, French islands in the South Pacific, but as supplies are not yet to hand, we shall not be able to illustrate one until next month. The set that is being replaced is beyond the pockets of most

of us, costing as it does about £7. As only 3,000 sets can exist the price is justified, but the new set will be obtainable at as many shillings and that will have to do.

Before leaving foreign stamps for this month it can be mentioned that Poland will probably bring out a new short set before the end of the year. One can only hope that by the time they appear it will be possible to use them in Poland itself. Meanwhile the "Monte Cassino" overprints are now selling at twice the price prevailing when first issued a few weeks ago.

Many collectors would be pleased—and surprised, so closely was the secret kept—when they heard of the new edition of Gibbon's "Simplified" catalogue, covering as it does, and quite adequately too for "Simple-Lifers," stamps of the whole world. One may grumble a bit when one's favourite stamp has not risen as much as expected, but after all there is no catalogue for British collectors which occupies a place even near our "Gibbons."

A quick glance at the latest edition shows some startling rises in prices. Although there are still plenty of bargains for those who study their stamps, it looks as though the days when good stamps could be obtained at a big discount off catalogue have gone for ever.

We mentioned previously that the Postmaster at Bahrain was refusing to export mint stamps. He alone could understand why, but apparently he is now giving the matter further consideration, so we may be able to go on collecting current stamps of this popular country after all. In the meanwhile collectors should refuse all offers

of cancelled to order stamps of this country, for they will not be worth what they will cost.

Another of our illustrations this month is of the 2d. Gibraltar, which has just appeared in the changed colour of red. This is because of a rise in postal rates, and as there is always a possibility of a perforation change when it is again printed—as happened recently with the 3c. British Guiana—readers will be well

advised to buy their copies at once.

Another stamp to buy now is the current 1½d. Gambia, which is to appear shortly in the colours of the recently obsolete 2d. It will cost about 3d. to-day, but such is the demand for obsolete colonials that in all probability the price at the end of the year will be near a shilling.

It has been mentioned before, and it will be mentioned again, that the collector who only thinks about the price of his stamps is missing half the fun of collecting; at the same time there is no point in paying more than fair market value.

One more stamp that should be bought now is the overprinted "Ténpence" of New Zealand, which has just been issued to pay for air-mail postage. The stamp used for the purpose is the 1½d. value of the fine commemorative set issued by New Zealand in 1940 to commemorate the centenary of the declaration of British Sovereignty. This stamp can be used as a catch, for if you ask the average collector if King Edward 8th has appeared on any stamp but British and Morocco Agencies—as king of course—the reply will generally be "No." Yet here he is on this New Zealand stamp. Just try this little catch.

Not all of us noticed when the "Bantam" stamps and South Africa were overprinted for S.W.A. that the type used for the 1½d. and 1/- stamps was larger than that used for other values. Now all have been brought into line, as our illustration shows in the case

of the shilling value. It is rumoured that the 1½d. stamp has been dispensed with in South Africa. We are inclined to think that this will only prove a rumour, but if it is true then S.W.A. will no doubt do away with the same value and in that event the 1½d. stamp with the small overprint will be a very good stamp indeed, as is the 1/- value, which has just become obsolete.

It was mentioned previously that there was to be a further printing of Falkland Island stamps and an over-printing of the stamps for the dependencies. These are now to hand and are virtually similar to the first printing, which is going to disappoint holders of these latter stamps. The "No change" was expected by dealers, and had there been any difference, many of those who are now disappointed would have been the first to shout that they were being exploited.

No Crown Agent's list has appeared so far this month, so it is not possible to say exactly when the new 1½d. Grenada and 14a. Aden will appear, but they cannot be long delayed now, and it will be a wise move to buy the latter stamp as soon as available for there is bound to be a rush for it.



Peaceful Air Transport—(Continued from page 292)

and burn up; and then people will wake up. They will either say that it is a good thing that half the Government was wiped out, and encourage the aeroplane in its good work, or they will ground every machine until the makers can guarantee that they will not crash. It will depend on the popularity or otherwise of that particular Government. In any case the authorities would do something foolish."

I am not a bit afraid of competition from the U.S.A. They will find themselves cluttered up with tens of thousands of obsolete war-transport aircraft, quite unfit for civil passengers—at any rate the passengers will become very uncivil if forced to use them. They may be useful, but uneconomical, as freighters. We can start with a clean slate and produce the best aircraft, as we have always done and still do.

The Story of Steel—(Continued from page 300)

coal is then added (or broken electrodes) to restore some carbon to the charge. This floats on the surface, so it is stirred vigorously with a long wooden pole, producing a violent flare-up and agitation of the metal, so that it absorbs the carbon from the coal.

Oxides and sulphur must now be removed. To do this, certain elements must be introduced which, by their great affinity for oxygen, will reduce, that is remove, the oxides of iron, manganese, chromium, etc., in the slag. Lime, fluorspar, crushed coal, coke or electrode, and crushed ferro-silicon are added. The carbon in the coal and the silicon in the ferro-silicon combine with the metallic oxides in the slag, and also help to remove sulphur from the molten metal.

The technicalities and complexities of this process are so numerous that it would bewilder the reader to enumerate them in full. Enough has been said, however, to show roughly how this furnace works. It may be mentioned that the experienced furnaceman is able to tell a good deal about the state of the molten steel by merely studying the colour of the slag. At first it is dark brown, or even black, and of close texture. This gradually becomes almost a true white, while its texture changes from close to spongy or open.

Here, for the present, we must leave this story of steel, but at a later date we may return to the subject, and give some more fascinating facts about steel, how it is tested, and why it is sometimes heated to specific temperatures to produce remarkable results. There is also an interesting story or two to tell about the stainless steels, the tool steels, and the mystery steel—manganese steel.

Post-War Coventry in Miniature—(Cont. from p. 305)

hours per week on it. There is a tremendous amount of detail shown. Each building was separately made to a special drawing, and there are 350 trees on the model and nearly 1,000 cars, besides a number of buses. It has been made to the order of Lord Iliffe—Director of the "*Midland Daily Telegraph*"—and we understand is to be presented to Coventry.

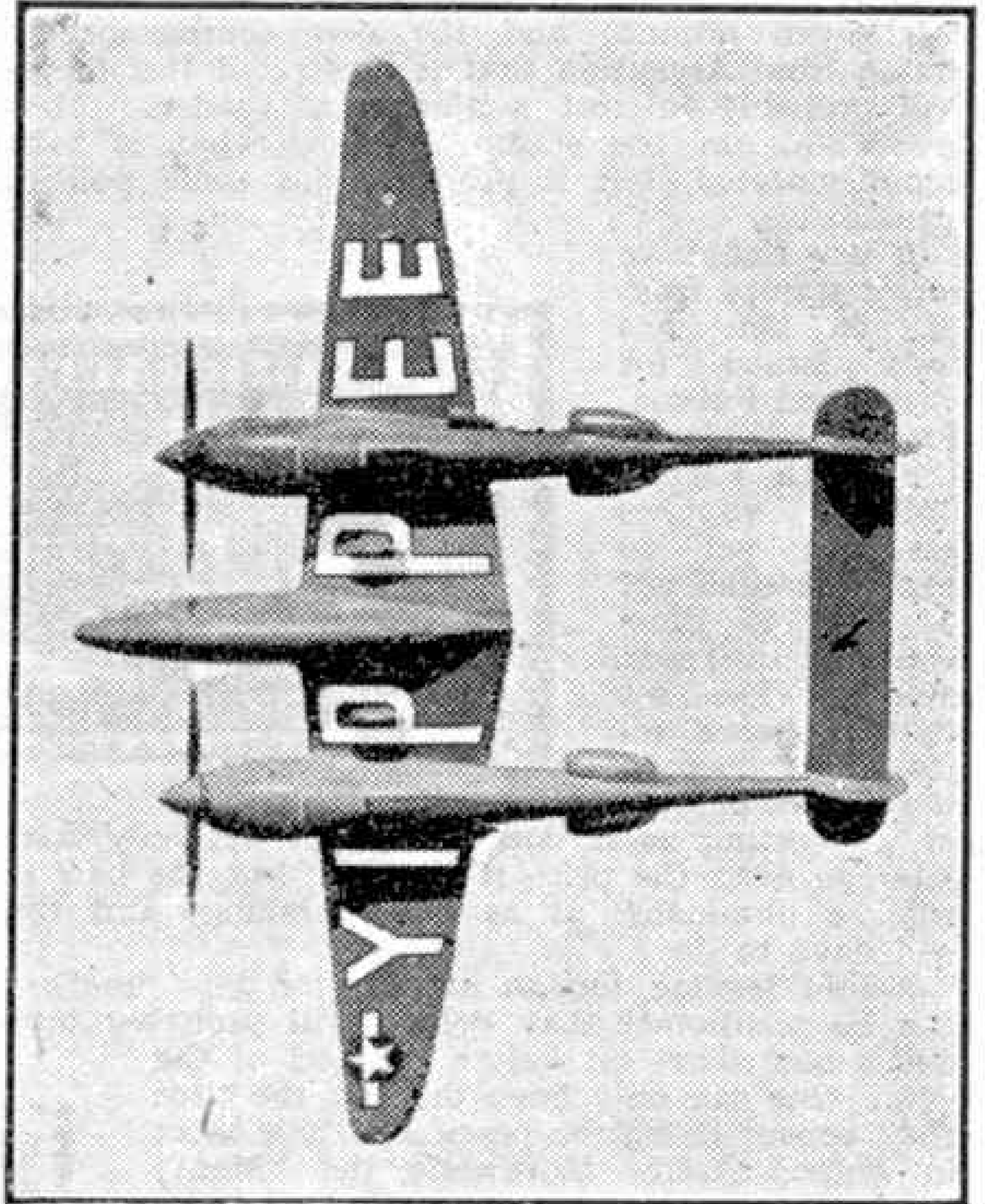
A New Zealand Railway Correspondence Society

We have received the first issue of "*The New Zealand Railway Observer*," which is produced by the newly formed New Zealand Railway Correspondence Society. The objects of the Society are to encourage interchange of information on the design, construction and operation of New Zealand and other narrow gauge railways and tramways, and to foster interest in railways generally. To begin with the chief activity of the Society is the publication of this journal, the first issue of which contains interesting articles on locomotive developments in New Zealand during the last 10 years and speed limits, together with news and comments on New Zealand railway matters. The subscription rate for New Zealand members of the Society is 10/- a year, the overseas rate being 5/-,

while there is a special rate of 3/- a year for school students. Those who are interested should write to the Hon. Editor, Mr. T. A. McGavin, 30, Plunket Avenue, Petone.

Johnson and Sons' June Photographic Contest

The two principal prizes of £5 each in this contest were won by Mr. P. Johnson, Peterborough, and Rev. R. Caudwell, Westwick, Norfolk. There were three second prizes of £2 each, awarded respectively to Mr. V. Tee, Gosport, Mr. W. K. Chadburn, Birmingham, and Mrs. D. L. Rowan, Ventnor. The prize winners' list included also 10 prizes of £1 each, 20 prizes of 10/- each and 25 consolation awards.



Lockheed P-38 "Lightning" painted red and named "Yippee" to symbolise the 13,000th warplane turned out by the Lockheed Aircraft Corporation, Burbank, U.S.A., by whose courtesy this photograph is reproduced. This machine was the 5,000th "Lightning" aircraft completed by the company.

COMPETITION RESULTS
HOME

March "Cypher" Contest.—1st Prize: D. C. Morton, Nuthall; 2nd Prize: L. A. Burman, Southport; 3rd Prize: G. H. Mallett, London N.8. Consolation Prizes: D. Rawson, Boston Spa; G. Roberts, Liverpool 11; W. H. Beauchamp, Ickenham; P. Mera, Newnham.

April "Doublets" Contest.—1st Prize: P. W. E. Bridle, Chichester; 2nd Prize: J. Stonham, Ilford; 3rd Prize: M. R. Shepherd, Sherborne. Consolation Prizes: M. Fryer, Melton Mowbray; C. C. G. Salway, Coventry; J. A. Lawler, Greenford; Wm. L. Falconer, Aberdeen; G. Mechan, Dundee.

April "Locomotive Jumble" Contest.—1st Prize: C. Thomson, Bearsden; 2nd Prize: A. P. Nuttall, Torquay; 3rd Prize: F. Nailer, Wembley. Consolation Prizes: G. H. Walker, Accrington; G. D. Stephens, Penzance; J. H. Clegg, Davenport; A. Short, Harborne.

May "Crossword Puzzle" Contest.—1st Prize: G. Roberts, Liverpool 11; 2nd Prize: D. Chandler, Port Talbot; 3rd Prize: K. B. Fenton, Harrow. Consolation Prizes: F. Mills, Kearsley; B. T. Gillyatt, Chesterfield; J. C. Lambie, Biggar.

Competitions! Open To All Readers

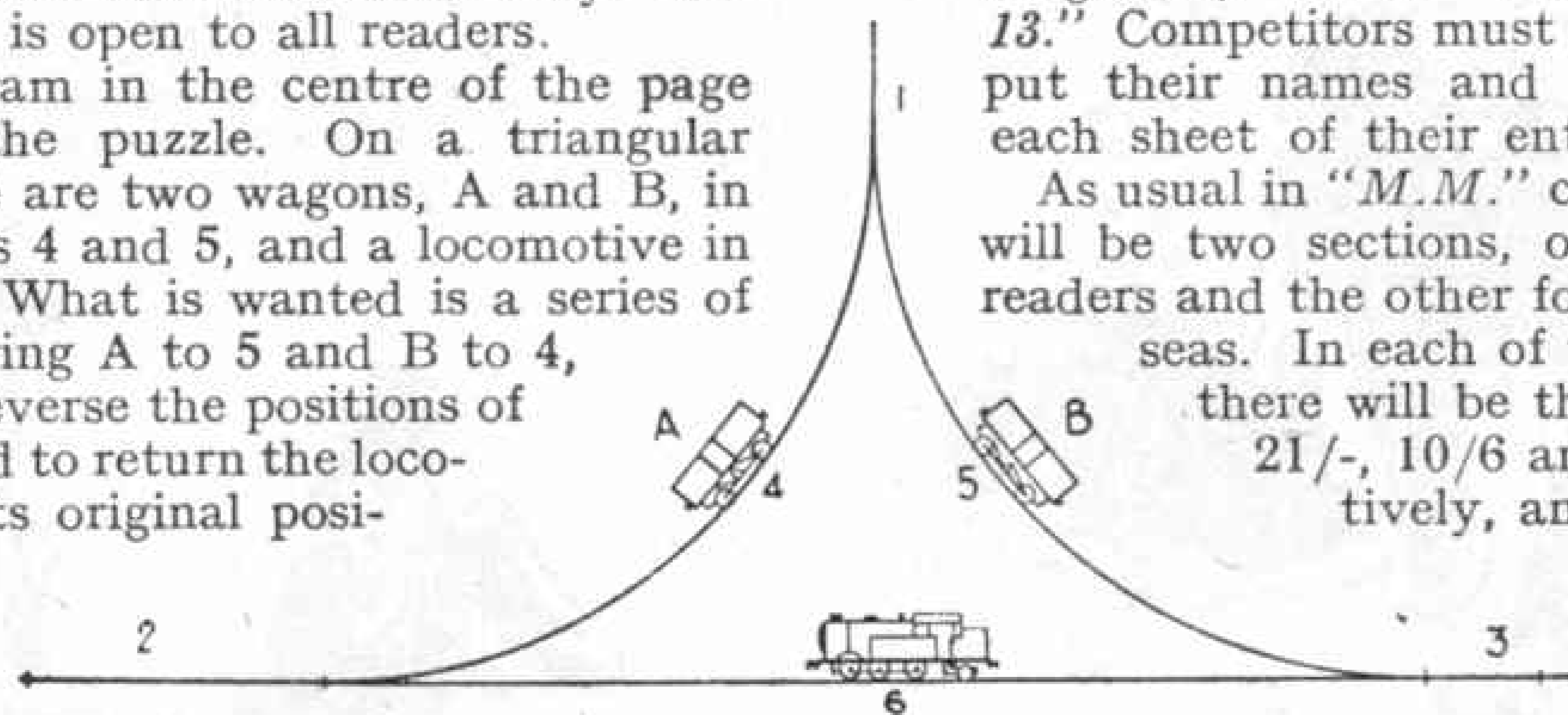
Try This Shunting Puzzle

Here is a neat shunting puzzle that does not call for special knowledge of railways and railway operations, so that every reader of the "M.M." should be able to find the solution and send in an entry. The competition is open to all readers.

The diagram in the centre of the page illustrates the puzzle. On a triangular layout there are two wagons, A and B, in the positions 4 and 5, and a locomotive in position 6. What is wanted is a series of moves to bring A to 5 and B to 4, that is, to reverse the positions of A and B, and to return the locomotive to its original position 6.

Siding 3 is just long enough to hold one wagon. Siding 2 will hold two wagons, or the locomotive and one wagon, and siding 1 can be considered to be prolonged indefinitely, so that if necessary it will hold both wagons and the locomotive at once.

When the solution has been found the successive moves should be written out in



order on a sheet of paper, using the letters and numbers in the diagram to make them clear. The entry should then be forwarded to "September Shunting Puzzle, Meccano Magazine, Binns Road, Liverpool 13." Competitors must remember to put their names and addresses on each sheet of their entries.

As usual in "M.M." contests, there will be two sections, one for Home readers and the other for those Overseas. In each of these sections there will be three prizes, of 21/-, 10/6 and 5/- respectively, and in addition

consolation prizes of 2/6 each

will be awarded to other competitors whose solutions are deserving of recognition. In the event of a tie for any prize the judges will take into consideration the neatness and novelty of presentation of the entries.

The closing date in the Home Section is 31st October. In the Overseas Section it is 30th April, 1945

A Codeword Contest

On one or two occasions in the past we have given readers simple price codes contests that have proved remarkably popular. This month we have another one for them and we are sure that they will enjoy tracking down the prices that are disguised by the simple code used. The competition is based on the plan adopted in many shops and stores of using a code word of 10 letters, all different, in which the successive letters represent the numbers 1 to 9 and the cypher 0. Assistants in these stores quickly memorise the letters of the code word, and are able to read off the prices from the labels without difficulty.

In this competition readers are asked to imagine that they are in a motor cycle and cycle dealer's showroom, where everything from motor cycles down to puncture outfits can be purchased. A selection of these items is given below, in each case with the price marked in accordance with the code word. From their knowledge of the range of prices they should soon pick out the numbers to be assigned to certain letters, and the others can then be tracked down. Thus step by step the code word is revealed, and competitors are asked to give this word as part of their solution, which also should include the actual prices of the articles, and explain briefly the steps by which the result was reached.

Motor Cycle	EN/CN/N
Cycle with 3-speed gear and hub brake	CR/CN/N
Sports Cycle	O/CN/N
Puncture Outfit	E
Pump	L/N
Mudguards	CN/N
Bell	C/N
Dynamo Outfit	C/N/N
Gear Case	S/E

Handle Bar Grips	H/N
Saddle Bag	A/E
Outer Tyre	T/N

There will be two sections in this contest, for Home and Overseas readers respectively, and in each there will be prizes of 21/-, 10/6 and 5/- for the best solutions in order of merit. In addition there will be consolation prizes for the next best efforts where these are specially deserving of recognition, and in making their decisions the judges will take novelty and neatness into account where necessary.

Entries should be addressed "September Code Word Puzzle, Meccano Magazine, Binns Road, Liverpool 13." The closing dates are : Home Section; 31st October. Overseas Section; 30th April, 1945.

September Photographic Contest

This month's contest is the 9th in our 1944 series, and in it, as usual, prizes are offered for the best photographs of any kind submitted. There are two conditions: 1, that the photographs must have been taken by the competitor; and 2, that on the back of each print must be stated exactly what the photograph represents. A fancy title may be added if desired, but entries on which the conditions stated above are not observed will be disqualified.

Entries will be divided into two sections, A for readers aged 16 and over, and B for those under 16, and all entries must be clearly marked with the section letter. They should be addressed: "September Photographic Contest, Meccano Magazine, Binns Road, Liverpool 13." There will be separate sections for Overseas readers, and in each prizes of 15/- and 7/6 will be awarded. Closing dates: Home Section; 30th September. Overseas Section; 31st March, 1945.

Fireside Fun

Mother: "You shouldn't have thrown stones at that boy who was throwing them at you. Why didn't you come and tell me?"

Johnny: "What good would that have been? You couldn't hit a house, never mind a boy."



"I can't eat stew," grumbled the recruit. "Don't we get any choice here?"

"Of course you do," beamed the corporal. "You get two choices—take it or leave it."

"What your husband wants is plenty of exercise."

"He gets it. He was out six nights running last week."

Bore: "Talking of bombing reminds me of the time..."

Listener: "Heavens: You're right. I'd no idea it was so late. Goodnight."

BRAIN TEASERS A CALENDAR PUZZLE

In 1940, which was a Leap Year, there were five Thursdays in February. In what year will this happen again?



"No, sonny. Not that kind of point."

EASIER THAN IT LOOKS

It has just been announced that we are to get oranges again during the coming months. If they are twice as many pence per pound as the number of pounds that I shall be able to buy for 4/2. what will they cost.

AGE MIXTURE

Mrs. Smith had four children, John, Mary, James and Kathleen. Although she was 48 years old and therefore old enough to know better, she actually adopted yet another child, to whom she gave the name Hope. Now John was three years older than Hope, Mary was three years younger, James was three times as old, and Kathleen was only a third the age, and together the ages of the four amount to that of Mrs. Smith. Can you find the actual ages of all the members of Mrs. Smith's family?



"Goodness, George, that isn't our baby. You've brought the wrong pram."

"Sh! This one's got rubber tyres."

TRAVEL BY AIR!

Aunt Maria had been a great traveller, and her battered trunk bore evidence of this in the remains of label of stations to which she had travelled. Some of the labels had been torn at one end, others at both, and by chance they had been stuck on in such a way that the remnants could be read to form the sentence "Mad aunt came hopping right over hatstand." This didn't really describe Aunt Maria, but it did provide a clue to seven places she had visited. What were they?

SOLUTIONS TO LAST MONTH'S PUZZLES

To solve the first of last month's teasers it must be borne in mind that a range of 100 deg. Centigrade is equivalent to one of 180 deg. Fahrenheit, so that 10 deg. C. are equal to 18 deg. F. Working downward in "tens" on the Centigrade scale, we find that—40 deg., or 40 deg. C. below freezing point, is equal to 72 deg. F. below freezing point. As freezing point on the Fahrenheit scale is 32, the reading on this scale also will be—40 deg.

In our second problem it will be seen that the total distance travelled was 16 elevenths of that already covered; then if five elevenths take 30 min., 16 elevenths must take 96 min., so that the arrival time is 12.40 p.m.

A pound of gold is heavier than a pound of feathers. The unit of weight for gold is the troy ounce, which is equal to 480 avoirdupois grains. Feathers are weighed on the avoirdupois scale, and this ounce is equal to 437½ grains.

"Places in the News" are as follows: RIGA; BAYEUX; ANCONA; LEGHORN; VILNA; EAST PRUSSIA; CHERBOURG; SAIPAN; BOBRUISK; KAUNAS.

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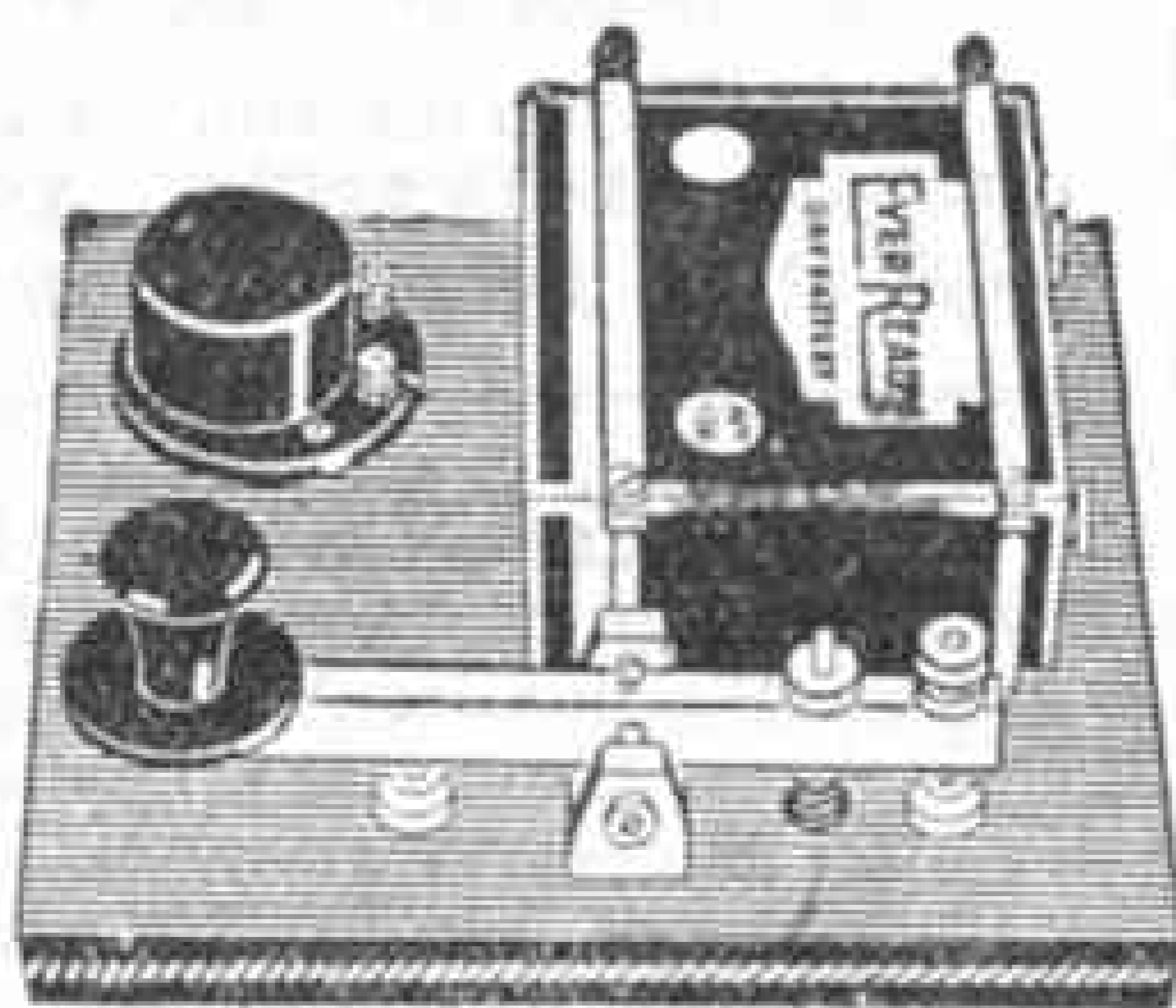
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These binding cases are supplied so that readers can have their Magazines bound locally, but where desired the firm mentioned above will bind the twelve issues of the 1943 "Meccano Magazine" at a charge of 10/6 including the cost of the binding and also return carriage. The covers of the Magazines may be included or omitted as required:

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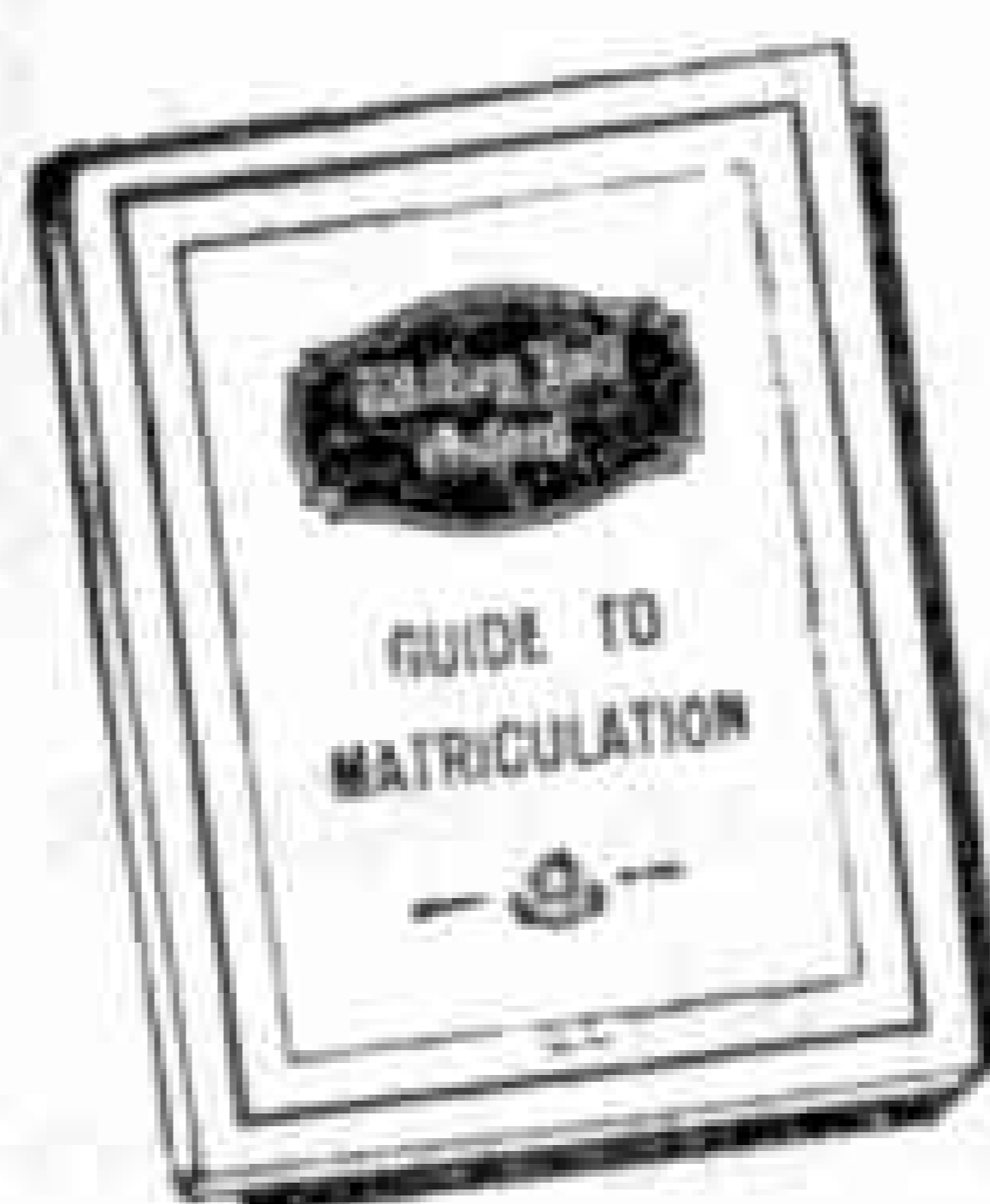
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(See also pages 318 and 320)

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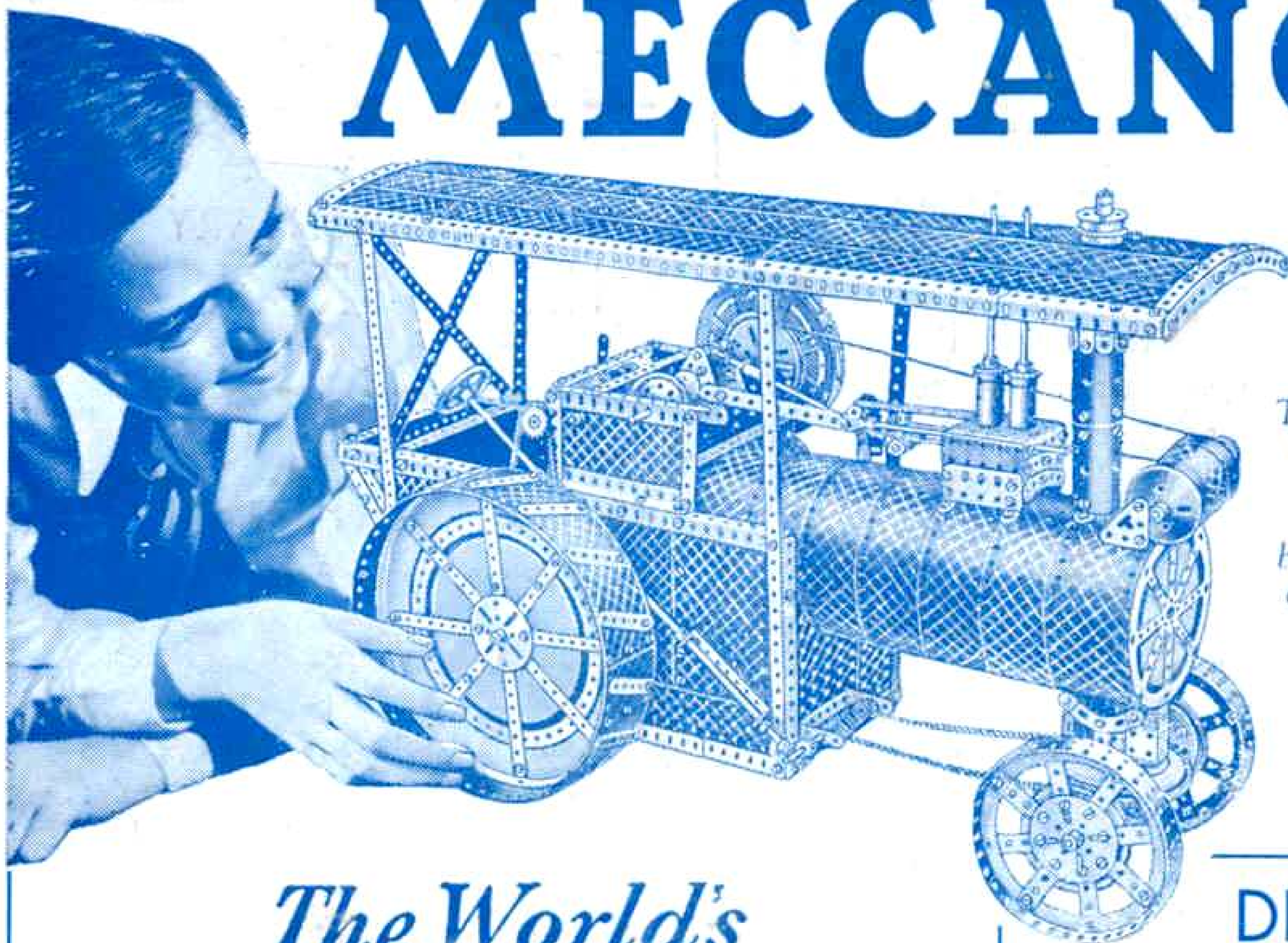
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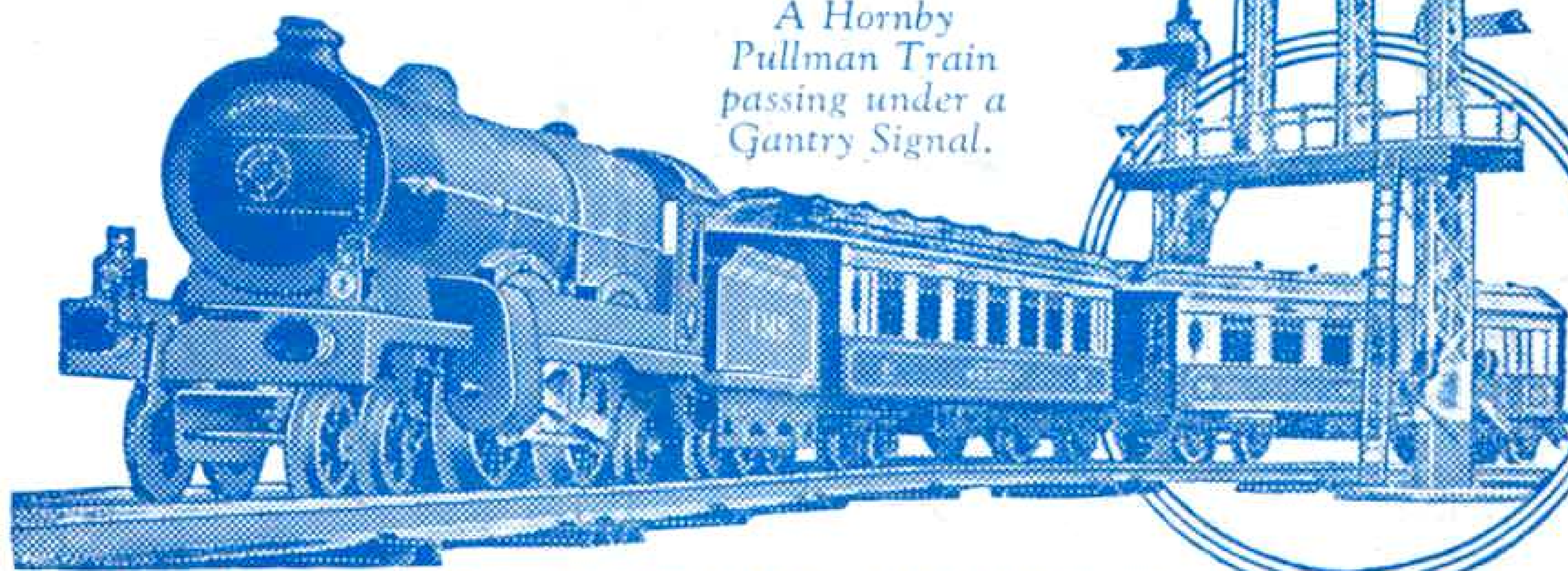


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