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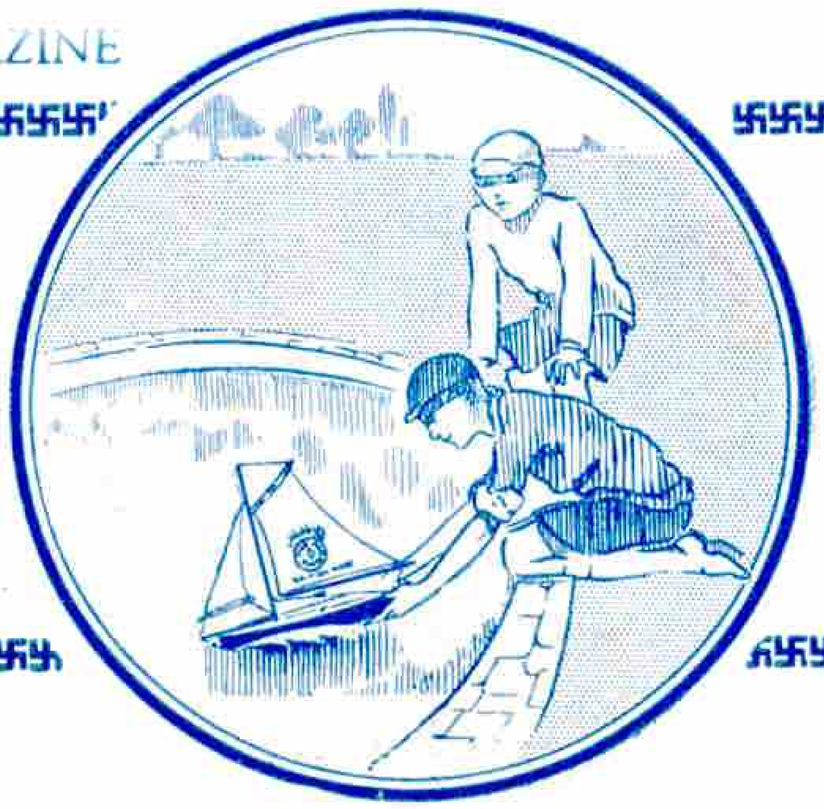

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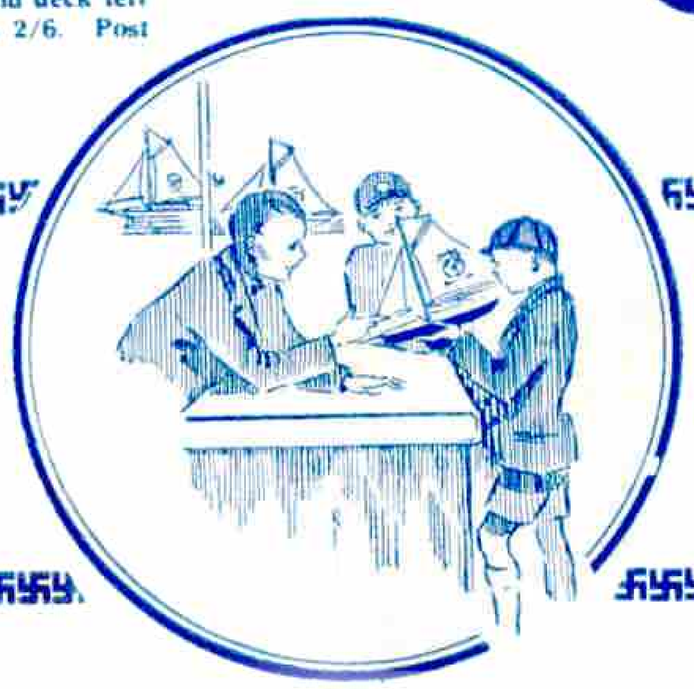

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NEXT MONTH: MARVELS OF ANCIENT ENGINEERING

MECCANO MAGAZINE

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Vol. XI. No. 9
September, 1926

With the Editor

Our Cover

Our cover this month shows part of the great bridge across the St. Lawrence, when it was being erected. There is perhaps no branch of Engineering that makes a greater appeal to the imagination than that of bridge building, in which are to be found some of the greatest structures and most creditable achievements in the history of the profession. Here we find the amazing adaptability of the engineer emphasised in many remarkable ways.

In many cases engineers have had to face what have seemed to be unsurmountable obstacles in the erection of their bridges, but in all difficulties they have shown undaunted courage, and have achieved feats that a short time ago would have been deemed impossible. Bridge engineers have never failed in any great feat that they have been asked to undertake, but have responded to every demand made upon them—they have even offered to erect a bridge across the English Channel between Dover and Calais! The massive towers of shining steel and the huge girders implying immense strength, not only embody the scientific distribution of weights and stresses, but are emblematic of the great ideas and lofty thoughts that are behind each one of our great bridges.

In future issues I hope to continue our articles describing the Famous Bridges of the World. In particular I hope soon to deal with that wonderful structure, now growing inch by inch, foot by foot, across the harbour at Sydney, and which when completed will be the world's largest bridge—a triumph, indeed, for the engineers that are associated with its design and erection.

Displacing Romance in the Whale Fisheries

I referred on this page recently to the introduction of science in the Arctic regions, and mentioned that seaplanes are now used for spotting seals and whales and that wireless communication between them and the whaling ships will replace the old-time look-out man in the crow's nest. The famous whaling cry "There she blows . . . . !" will not be the only link with the old whale fisheries that will disappear as the result of this introduction of more scientific methods in the killing of whales.

The extent of the business is well illustrated by the fact that one ship alone—the "*Southern King*" recently landed at Birkenhead, a cargo consisting of whale-oil and by-products valued at over £200,000. Originally a German cargo vessel, the "*Southern King*" was taken over after the war and altered beyond all recognition. She is now equipped as a carrier between Europe and the whaling-stations near South Georgia and has accommodation for 260 men. Her equipment includes special winches and derricks, and capacious tanks, which on her voyage out are filled with coal. These tanks hold 7,000 tons of whale-oil and special pumping machinery is capable of delivering 400 tons of oil per hour. Wherever she may be, the ship is always in touch with her headquarters by wireless, and carries an extraordinarily high mast and a specially powerful wireless installation. It is interesting to know that when she lies in the harbour at South Georgia, off Cape Horn, she is able to receive messages direct from Rugby—7,500 miles distant—so that her Liverpool owners are practically in immediate touch with her, although at the other side of the world.

Killing Whales Wholesale

Thus the old romance attached to whale-fishing is fast disappearing—to be replaced by the more wonderful romance of modern science—and the business is now becoming purely a commercial enterprise in which the latest devices are employed to ensure the greatest possible slaughter of whales.

Whales are no longer harpooned by hand from an open boat in the way we read about in some of the thrilling story books that have been written around the subject. To-day, a special craft has been designed to speed up the hunt. This vessel is 136 ft. in length; has a speed of 14 knots and is able to turn through a complete circle in one minute seventeen seconds. She carries a crew of fourteen and in the bows is mounted a 3.8 in. harpoon-gun with a glycerine recoil spring as used in naval guns. Harpoons in the old days were not much heavier than a spear, but to-day they weigh 160 lbs., and are charged with explosive, fired by a time-fuse that detonates the charge as required. Although a whale is to-day generally killed outright as soon as it is struck by the harpoon, should it be only wounded the vessel puts on "full steam ahead," and "plays" the whale by means of a 7 in. line 240 yards in length. The whale is "played" until exhausted, when it is killed and a flag stuck into the carcase. This is left to float until after the hunt is ended, when all the whales killed during the day are towed into the station.

The latest types of machinery and most efficient processes are employed to extract the oil from the carcases, and a floating factory follows the whale-catching vessels into the Arctic. The extent of the operations is better understood when we learn that recently four vessels, operating in the South Georgia region, made a record catch of 2,000 whales, each of which varied from 50 to 102 ft. in length and in weight from 50 to 175 tons.

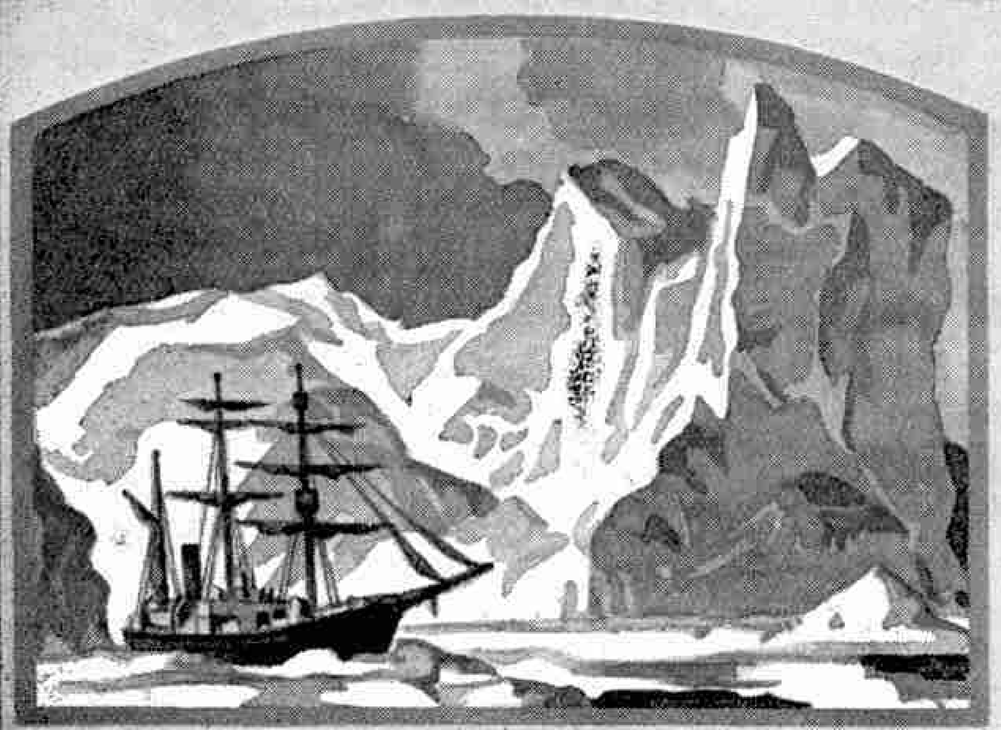
When the white man poured into America he began to "scientifically" kill the buffalo he found there. So great was the slaughter, made possible by the introduction of firearms as compared with the bow and arrow of the Indians, that the buffalo became practically extinct. In this same connection it is interesting to know that in spite of the large number of whales killed by modern methods there does not appear to be any fear of extinction here—at any rate at present—for more whales have been sighted in this region than ever previously.

The whale fisheries were only made possible by the explorations of the Arctic and Antarctic regions, and we owe much to the heroic men who carried out this work and in which many lost their lives. The story of their endeavours is being told in a series of twelve articles that commenced in our last issue. I commend these articles to the attention of my readers, as being an account of heroic endeavour and untold suffering by men whose only object was intense patriotism and their one endeavour to carry the Union Jack into unknown lands and seas, for the good of Britain and the glory of British seamanship.

A Curious Club and Its Customs

There exists in London a peculiar club, the Maccabeans, the members of which are remarkable for the fact that they insist on doing everything by contraries. This custom leads to some very remarkable developments, as for instance, when the members of the club meet, for then they do not express pleasure, but displeasure! At the Maccabean banquets a speaker on rising is greeted with hisses and groans, and these increase to a perfect tumult of disapproval on his sitting down! Appreciations of a popular speech are shown by the members interjecting with "Rot!", "Sit Down," and similar signs of disapproval. It is, of course, taken as a very high compliment if a speaker is interrupted by cries of "Throw him out!"

As may be easily imagined this peculiar mode of expression is at first somewhat disturbing even to a member of the club, but to a stranger who has been invited to make a speech it must be particularly disconcerting! Except as an amusing game for a wet day, however, it is difficult to see what useful purpose the procedure of the Maccabeans serves.



EXPLORING THE ARCTIC

Famous Explorers and their Attempts to Reach the Pole.

II.—SIR MARTIN FROBISHER'S ADVENTURES IN "META INCOGNITA"

FOLLOWING on the very successful voyage of Chancellor, mentioned in our last issue, Stephen Borough entered the Kara Sea in 1556. His ship, the "*Searchthrift*," passed through the Kara Straits between Nova Zembla and Waigatz Island—the most northerly point of Russia. Borough also discovered Kolguiev Island, a small island between the Kola peninsular and the Kara Straits and clearly shown on the sketch map on the next page.

In the following year Borough, again in the "*Searchthrift*," set out on the first Arctic Search Expedition. His object was to discover what had happened to Willoughby and his men, who, as mentioned last month, had perished in 1554 in a harbour on the Lapland coast. Borough only succeeded in finding a native who had bought the sails of the "*Confidentia*," however, and the full extent of the tragedy was not definitely known until some time later when the Russians found the lost ships and took them to the River Dwina. Willoughby's journal was also recovered and proved to be an orderly record of terrible suffering. The final entry in the journal, written when the brave men were very near the end, read: "Unknown and most wonderful wild beasts assembling in fearful numbers about the ships."

Willoughby and his men were the first Europeans to face a winter in the Arctic and when the terrible details of the tragedy became known, the interest in the frozen north decreased very materially! Sailors and merchant adventurers seemed to prefer the dangers of the tropics to the miseries so vividly recorded by the commander of the ill-fated expedition.

Sir Martin Frobisher

Frobisher Captures an Eskimo

After another 20 years had passed, however, the north again attracted attention. In 1576 Martin Frobisher was appointed to command an "expedition" consisting of two small vessels of 25 tons and 20 tons respectively and a pinnace of 10 tons, with a total crew of 35 hands. The ships met with stormy weather at the Shetland Islands, where the pinnace was sunk and where also one of the other ships deserted. Despite these set-backs, however, Frobisher proceeded on his way in the "*Gabriel*," the top speed of which, incidentally, was little more than a league an hour—as her good master Christopher Hall proudly records!

Cape Farewell, on the southern coast of Greenland, was sighted, and here the "*Gabriel*" narrowly escaped disaster. A storm arose and threw the vessel on to her beam ends, but by cutting away the mizzen mast the crew managed to right her.

Steering westward through the ice Frobisher discovered part of the coast of Labrador, and also discovered a strait, now known to be a wide opening on the American side of Davis Strait. To the new land discovered here the name "Meta Incognita" ("the unknown limit of the outward course") was subsequently given by Queen Elizabeth.

Frobisher next sailed northwestward for 50 leagues and landed on Butcher's Island, where he saw not only "mightie deere which ranne at him" so that "hardly he escaped with his life," but also noticed "a number of small things in the sea afarr off." At first he thought these objects were porpoises or seals, but coming nearer he found they were "men in small boates made of leather."

These Eskimos almost managed to capture Frobisher's boat before he reached it, and later on they succeeded in capturing five of his crew. Before sailing for home Frobisher—a man of great strength—retaliated by lifting single handed a native and his *kayak*, or boat,

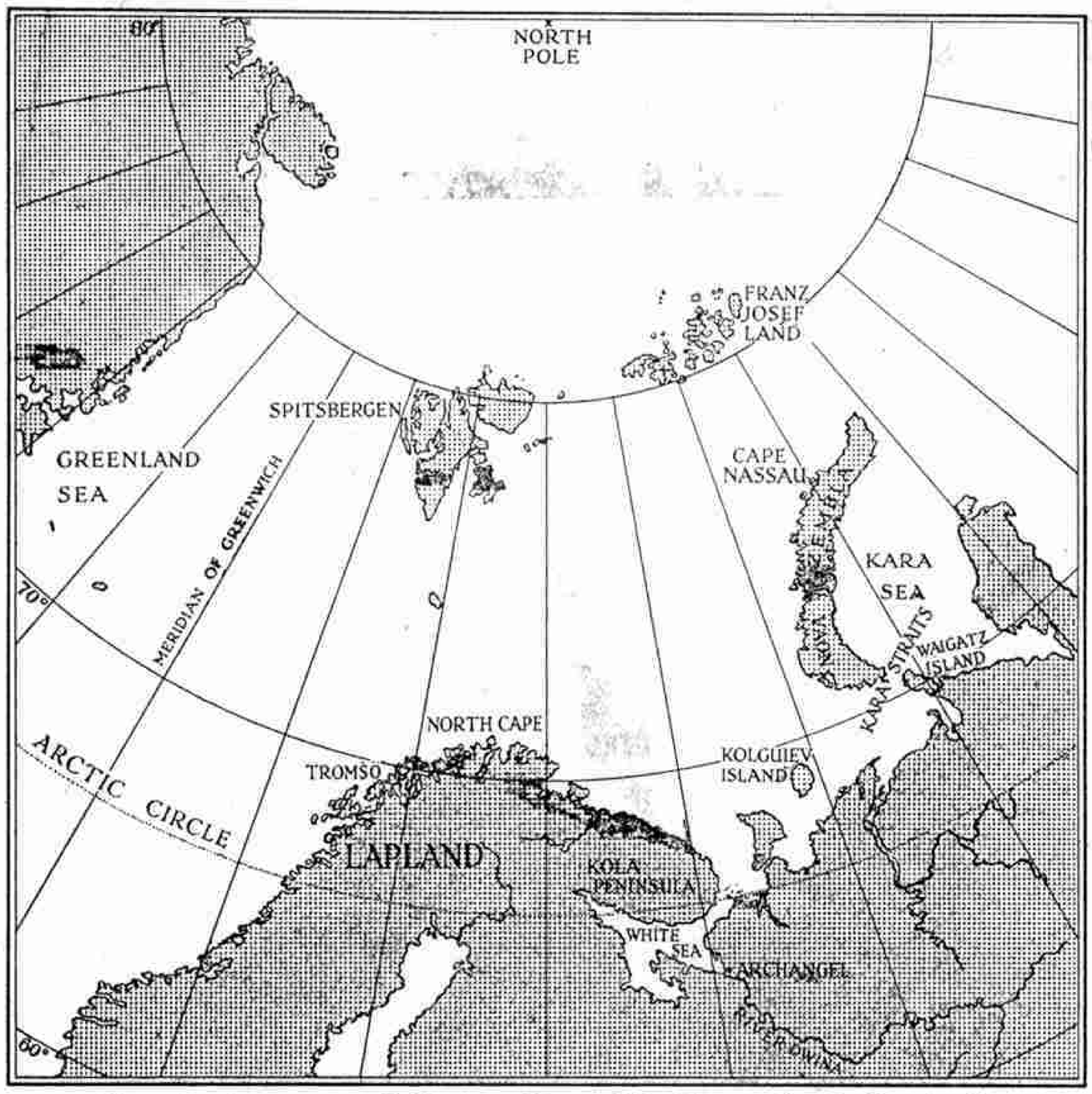
aboard the "*Gabriel*"! The Eskimo returned a prisoner to England, but soon died, however, leaving only his kayak and paddle as interesting souvenirs of the incident.

The Fateful Stone

Off Labrador, Captain Hall had landed on a small island, when out in a small boat seeking a road through the ice for the ship. Whilst ashore here he had picked up on the beach a piece of black stone that was destined to play a considerable part in Frobisher's future.

On the return of the expedition to England this stone, "the fyrste thynge found in the new land," created considerable interest for it was found to contain a number of small particles, yellow in colour, which many believed to be gold. A specimen was sent to the Mint and although the experts reported that the metal was marcasite or iron pyrites, an Italian who examined a specimen announced that "a very little powder of gold came thereout." A further test by the Italian resulted in his sending a "grayne of gold," which was later presented to Queen Elizabeth.

The news of the wonderful stone had spread like wildfire and as the value of the discovery increased every time the story was told, many came to believe that the stone was actually "the purest gold unalloyed with any other metals," as one version described it. As a result there was very little difficulty in financing a second expedition to the Arctic. The Queen herself, notwithstanding the unfavourable report from the Mint, subscribed £1,000, and many notable men also took up shares in the "Cathay Company," as the venture was named.



Map showing some of Stephen Borough's Discoveries in the Arctic

Frobisher's Second Arctic Voyage

Thus it came about that Frobisher set out on his second voyage to the Arctic in 1577, with three vessels, the "*Aid*" (200 tons) and the "*Gabriel*" and "*Michael*," the two ships used on his previous voyage. The quest of the north-west passage seemed now to be quite overshadowed by "the searching of this gold ore," but whether Frobisher himself believed in it is questionable. It is thought by some to be not at all improbable that he was astute enough to arouse the cupidity of those at home with dreams of gold, so that he might thereby have the means to realise his own dreams of discovery in the Arctic seas.

Frobisher took with him 120 officers and men, including 30 miners, and although they found nothing on Hall's Island they were more successful on the mainland, for they returned with 200 tons of the ore—to the great joy of the shareholders. Some of the precious ore was deposited in Bristol Castle and the remainder in the Tower of London, each consignment being secured by four locks! Here the ore lay whilst special furnaces were being prepared to smelt it.

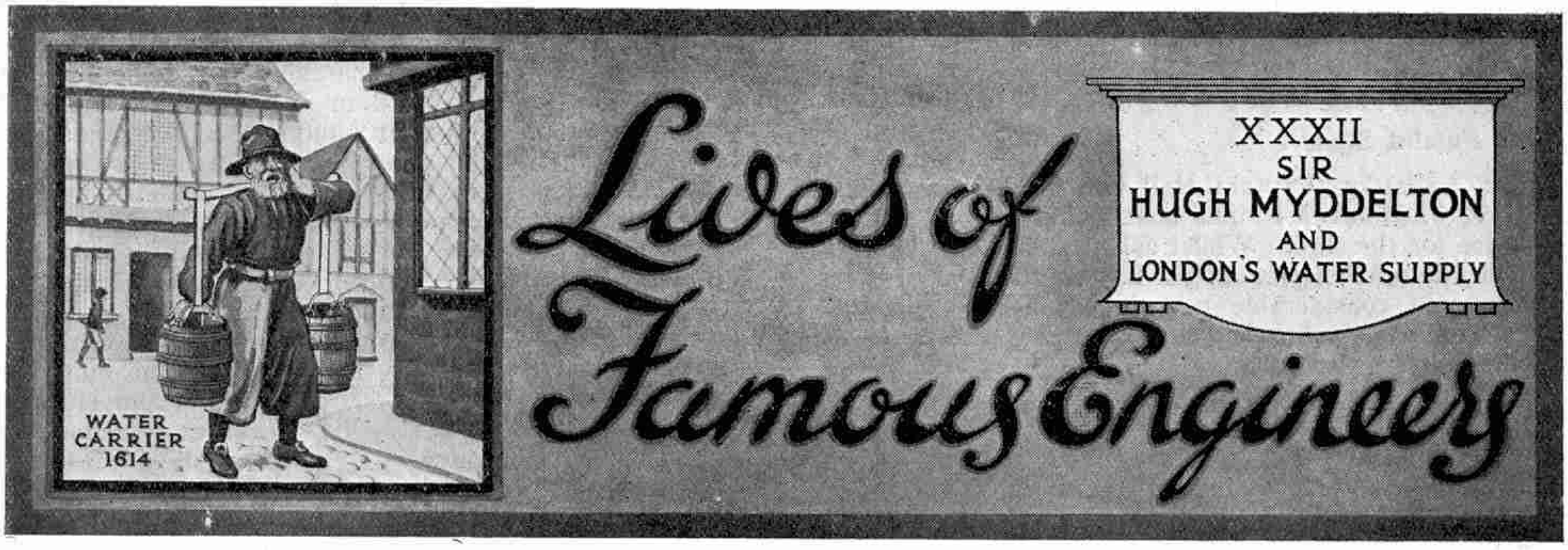
In the meantime a new expedition was arranged on a much larger scale. On this—his third—voyage, Frobisher had a fleet of fifteen vessels, his instructions being to bring home 2,000 tons of ore. The expedition sailed in 1578, landed on the south coast of Greenland, and then encountered ice floes and stormy weather. Some of the ships became "fast shut up and compassed in the ice" and had a terrible time, meeting with "great and extreme dangers." Frobisher lost his way, entered what is now Hudson Strait, turned back—had he but gone on he might have found his way to Cathay—and at last reached the land where the ore was to be collected. Having "fraight the ships full of ore" the expedition returned to England, but by this time it had been found definitely that the Arctic "gold" was not the precious metal but a mere worthless metal and Frobisher came under a heavy cloud of displeasure. This was dispelled later, however, for he commanded the "*Triumph*" in the Armada fight, and for his splendid services he, with four other distinguished men, was knighted by Howard in mid-channel after the fight.

Gold from Sea-water

It is of interest to note that even to-day the hope of getting gold from the Arctic is not dead. The modern version of the old story is that the waters of the Arctic Ocean contain gold in solution, and more than one suggestion has been made that a company should be formed to extract the precious metal.

In this connection it was recently announced that the gold content of a gramme of sea water in the South Atlantic Ocean is one hundred thousandth of a gramme of gold. The gold content in the Bay of San Francisco is slightly higher, but that of the Polar regions is as high as four to five hundred thousandths of a gramme.

Although the Polar Seas thus actually contain from four to five times as much gold as those of equatorial seas, the quantity is negligible, and indeed, is smaller than scientists have hitherto assumed to be the case. Even in the Arctic and Antarctic, profitable exploitation of the riches of the deep is out of the question



Lives of Famous Engineers

XXXII SIR HUGH MYDDELTON AND LONDON'S WATER SUPPLY

IN last month's "*M.M.*" we described how John Metcalf, a blind man with little education and no engineering training whatever, carried out the making of the first good English roads. This month we deal with the career of an earlier pioneer of public works, Sir Hugh Myddelton, whose artificial river from Chaldwell in Hertfordshire to Islington, North London, was a remarkable enterprise for which he had not been trained in any way.

Myddelton was born at Denbigh, probably about the year 1555. No record exists of his earlier years and we first hear of him as an apprentice of the Guild of the Goldsmiths' Company in London. Apparently he was successful in his work, for subsequently we find him carrying on a goldsmith's business of his own in what is now Basinghall Street.

London in the time of James I.

At that time London was a rapidly growing city of 150,000 inhabitants living in some 17,000 picturesque timber houses. The terrible state of the roads discouraged travel either on foot or on horseback, and the merchants of the city seldom wandered far, but preferred to sit during summer evenings in their cool doorways, sheltered by the overhanging gables. There the hours were passed in discussing affairs of trade and the latest local gossip.

Sir Hugh Myddelton

The business of a goldsmith in those days was one of great importance and dignity and Myddelton's shop appears to have become quite a fashionable place of resort. Among his clients Myddelton numbered King James I., who on one occasion purchased for Queen Anne a jewel costing £250. According to an interesting tradition handed down for many generations, Myddelton and Walter Raleigh used to sit together at the door of the former's shop and smoke the newly-introduced weed, tobacco. Their action created considerable amazement amongst passers by, who stood in groups to watch!

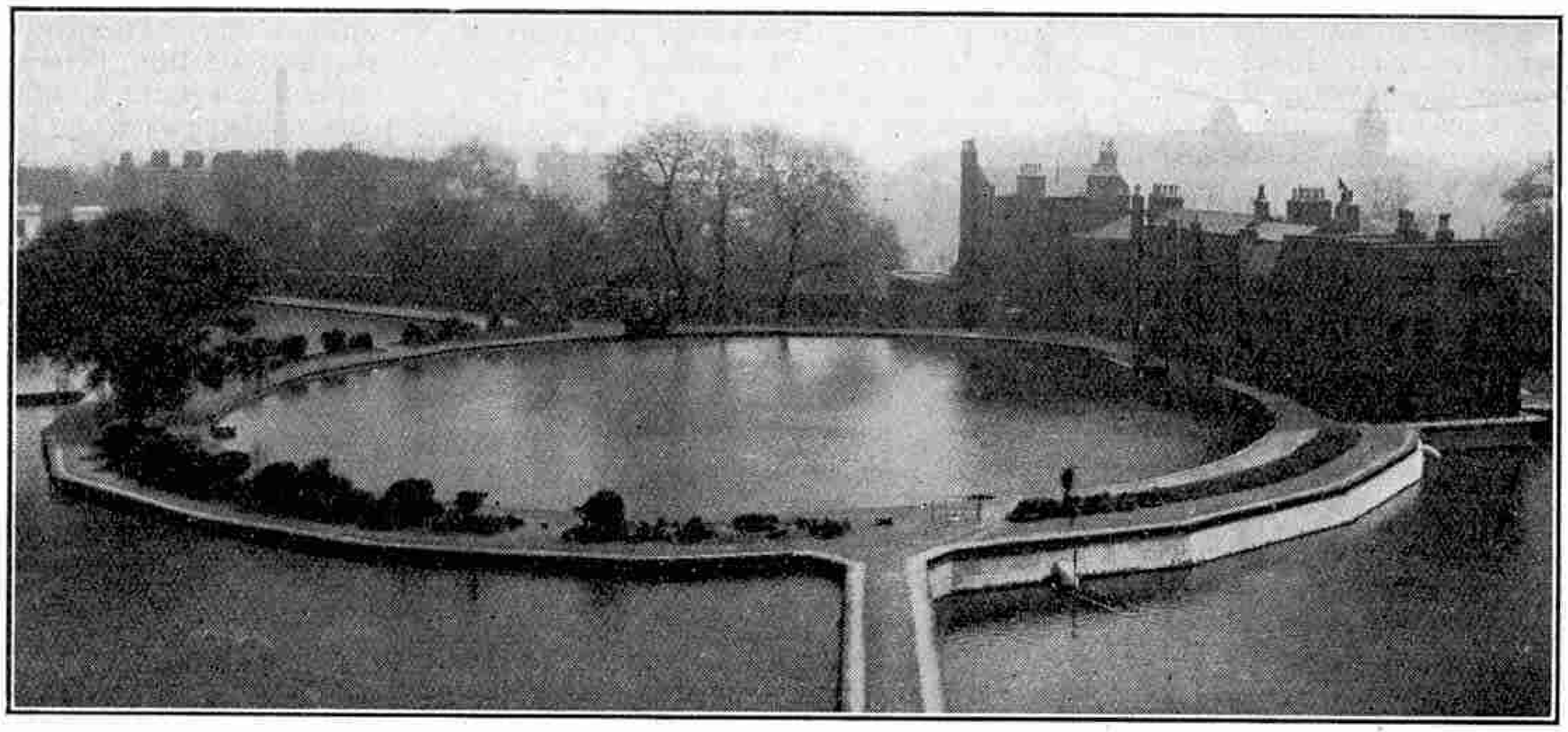
Inadequate Water Supply

In 1603 Myddelton entered Parliament as member for Denbigh, his native town. Parliament appears to have recognised his ability quickly, and he was soon appointed to various committees of trade and finance. In particular he developed a special interest in proposals to improve London's supply of water. The existing wells in the city had proved inadequate and the water from many of them was no longer strictly pure. A system of conduits conveying water from various springs was laid down, but eventually became useless owing to the drying up of the springs. Many people earned a living as water carriers by conveying water from the Thames or from the conduits to houses, at a price of so much per "tankard" of about three gallons.

In the year 1582, the Corporation of London permitted a Dutchman named Peter Morice to attempt to convey water from the Thames to the city inhabitants by mechanical means. Morice erected in the first arch of London Bridge an ingenious pumping engine operated by water wheels driven by the rise and fall of the tide, which rushed through the arches with considerable velocity. The engine forced the water through leaden pipes which were laid to the various houses. His contrivance succeeded beyond expectations, and at a public demonstration of its efficiency Morice astounded the Lord Mayor and Aldermen of the city by throwing water over St. Magnus's steeple! The machinery worked so well, in fact, that a few years later the engineer was authorised to use the second arch of the bridge for the same purpose.

Morice's machinery was not adequate to supply all the

water needed, however, and the prevalence of fever among the population stirred the Corporation to further action. An Act was obtained in 1605 authorising them to conduct a stream of pure water from the springs of Chaldwell and Amwell in Hertfordshire, but at first no one could be found to undertake the work. In 1606 a man named William Inglebert proposed to construct brick trenches from the springs to London but nothing definite was decided. Two years later a Captain Edmond Colthurst offered to carry out the project, but on being informed that the Corporation would not share any of the cost he withdrew his offer.

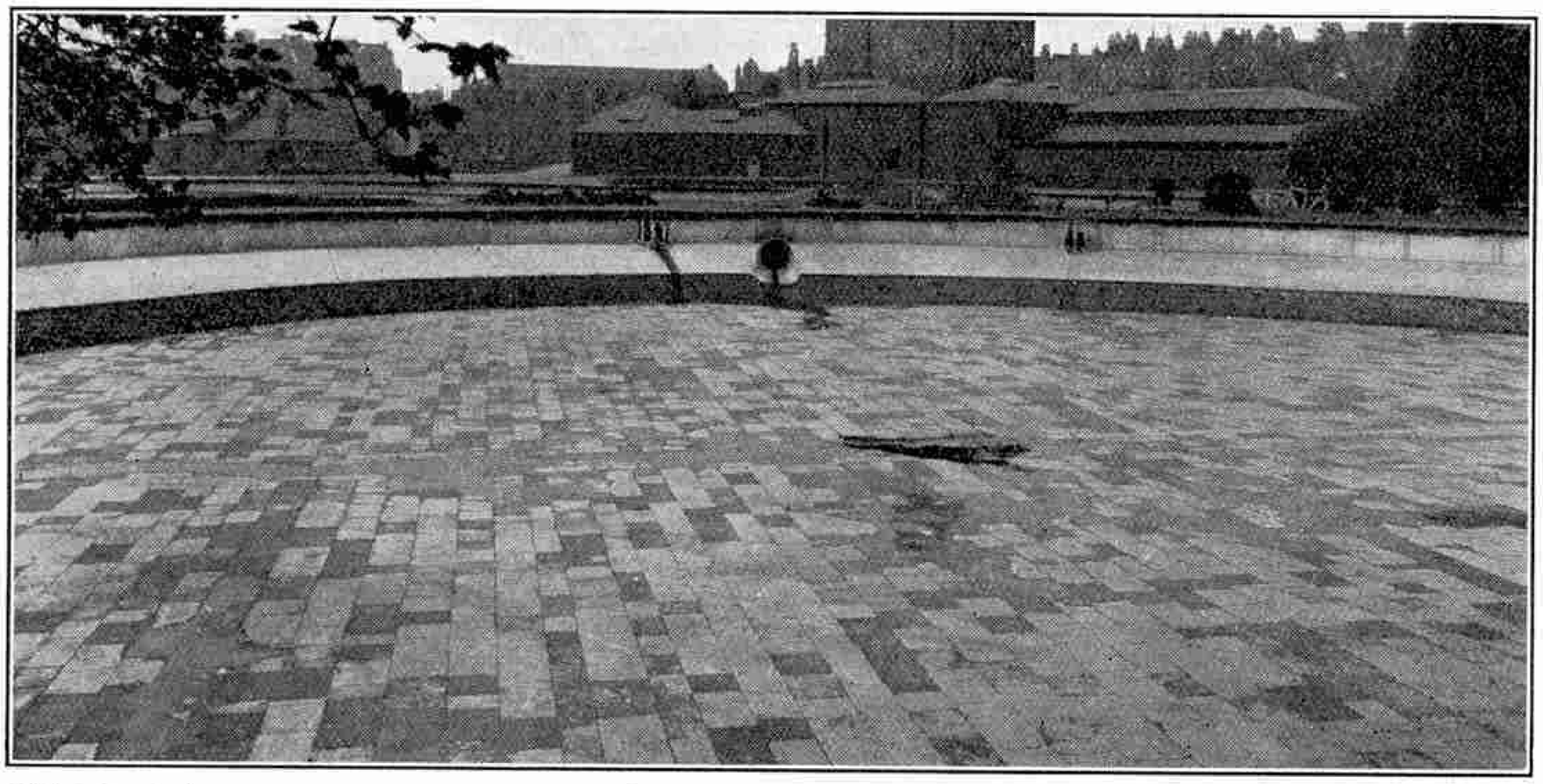


Round Pond constructed by Sir Hugh Myddelton in 1613. The Metropolitan Water Board offices now stand on part of the site

The prospect of the citizens of London continuing to suffer indefinitely from a shortage of pure water greatly troubled Myddelton and finally, losing patience at the repeated delays, he declared boldly: "If no one else will undertake this work, I will do so, and execute it at my own cost."

Myddelton's Offer Accepted

On learning that Myddelton was prepared to stand the expense himself the Corporation ignored the fact that he was not an engineer, an architect or even a builder, but simply a goldsmith, and readily authorised him to proceed. They were, in fact, only too glad to hear of someone venturesome enough to take on the job. An agreement was signed by Myddelton and the Corporation in April 1609, and shortly afterwards excavations were begun at the Chaldwell Spring near Ware.



Photos Courtesy] [Metropolitan Water Board

Stone paved floor of the above pond

An unexpected trouble now arose. The occupiers of land to be entered upon by the "New River" strenuously opposed the work, declaring that their meadows would be turned into marshes, that their farms would be "mangled" and their fields cut up into small pieces. They also argued that heavy rains would most certainly cause the New River to overflow and flood their lands. Parliament proved unable to settle this determined opposition and the trouble increased to such an extent that by 1612 the whole scheme was threatened with disaster.

In desperation Myddelton appealed to James I. for support. The route of the New River lay through the Royal Park at Theobalds, where probably the King had seen the men at work. At any rate Myddelton was favourably received and after some discussion the King resolved to support the project. A long agreement was duly drawn up and signed in which the King undertook to share half the cost of the whole scheme, and also granted Myddelton a right of way through any of the Royal Estates upon which it might be found necessary to encroach in carrying out the works.

The "New River"

The distance from Ware to London is only about 20 miles, but the New River when finished was nearly 40 miles long. This additional length was the result of the attempt to maintain the river as much as possible at the level of the Chaldwell Spring and at the same time to avoid deep cuttings and large embankments. In order to do this it was necessary to follow a winding course around the hills, crossing each valley at the most favourable point.

The embankments and valley crossings were from 8 ft. to 10 ft. in height, the earth excavated on the higher side of the cutting being used to build up the bank on the lower side. In some cases these

earthworks intercepted the passage of surface water to the river Lea, the natural drain of the district. Where this occurred the drainage water was conveyed under the New River in culverts or over it by what were called "flashes." The flashes consisted of wooden troughs about 12 ft. in width and 3 ft. in depth extending across the river.

An important item in the scheme was the building of the Bush Hill Aqueduct near Edmonton. There the New River was carried over a stream flowing from Enfield Chase by means of a brick arch that carried a strongly timbered lead-lined trough. This trough was 660 ft. in length and 5 ft. in depth and contained 80 brick piers 2½ ft. in height, upon which were erected stout timber posts 6 ft. in height. Cross timbers were laid and strengthened by intermediate uprights. A similar aqueduct was erected on the embankment near Islington. This was 460 ft. in length and 17 ft. in height and was nicknamed "Myddelton's Boarded River."

At Islington the New River passed through a tunnel of considerable length and emerged at the reservoir named the "New River Head." Previously this had been an unused pool known as the "Ducking Pond" and Myddelton enlarged it and made a proper embankment.

The New River was constructed with an average width of 10 ft. and was crossed by more than 150 bridges. The fall of the stream averaged about 2 in. per mile. Where this proved to be inconveniently rapid a stop-gate, from 3 ft. to 4 ft. in height, was erected across the stream, the water passing over this to the lower level.

Opening the Flood-gates

The opening of the flood-gates at the Islington Reservoir was carried out on 29th September, 1613, with great ceremony. The inrush of the pure water was greeted by the cheers of thousands of enthusiastic spectators, mingled with the firing of guns, the pealing of bells and the sound of trumpets and drums. In appreciation of the completion of this valuable work the King conferred upon Myddelton the honour of knighthood.

The New River Company distributed the fresh water by means of some 400 miles of wooden piping laid through the London streets. These pipes were seriously affected by weather conditions, however, and leakage took place to such an alarming extent that ultimately they were replaced by cast iron pipes. For a long time people remained prejudiced against water that had been brought through pipes of any kind. The water carriers, realising that they were in danger of losing their trade, naturally made the most of this public fear, and hawked their fresh water with cries of: "Fresh and fair New River water. None of your pipe sludge!"

King thrown into the River

The part played by the King in the making of the New River was brought back to him a few years later in a rather unpleasant manner. While he was out riding one winter day at Theobalds, accompanied by his son Prince Charles, his horse stumbled and fell, throwing him headlong into the New River which was thinly frozen over at the time. The King disappeared under the ice until only his boots remained visible. He was promptly hauled out and was able to ride back to the palace, three miles away, where he quickly retired to bed. Although he was none the worse for the mishap, the King regarded it as due to negligence on the part of Myddelton and the Corporation of London in not properly fencing off the river.

Silver Mining in Wales

An enterprise of a widely different nature engaged the attention of Sir Hugh Myddelton a few years later. During his visits to Denbigh from time to time he had heard of various mining enterprises in Wales, including those of the Company of Mines Royal in Cardiganshire. This Company had been formed in 1604 to re-open and work the old Roman lead and silver mines of that county. Mining machinery was at that time crude and inefficient, and although the mines were rich in ore the company found themselves without the means of successfully getting rid of the water that continually flooded the workings.

Myddelton determined to rent these mines, and on account of the company's trouble had little difficulty in doing so. The prospect of fighting the persistent influx of water and of getting at the valuable ore appealed strongly to his love of adventure. Moreover he felt confident that his engineering ability would enable him to master the situation. Rigging up better pumping machinery of his own design, he gradually gained upon the water. At length sufficient ore was raised to enable it to be tested, when it was found to be very rich in silver.

The news that silver had been discovered in the Welsh mountains created a great sensation, and so numerous were the attempts of lawless persons to encroach upon Myddelton's property that a Royal Proclamation was issued warning such trespassers of the consequences awaiting them.

Myddelton took in as partner Sir Bevis Thelwall, and by them the mines were worked with increasing profit for close upon 16 years, during which time very considerable quantities of silver were sent to the Royal Mint to be coined. The King was greatly pleased by this fresh evidence of Myddelton's skill and enterprise and further honoured him, in October 1622, by raising him to the rank of baronet.

"Drowned" Land in Isle of Wight

From creating rivers and re-starting silver mines, Myddelton turned his attention to a scheme to re-claim from the sea a tract of some 800 acres of "drowned" land near the village of Brading in the east of the Isle of Wight. Proposals to re-claim this land had been revived through the interest taken by James I. in other similar projects. A grant of the drowned area at Brading was made by the King in 1616 to a John Gibbs for an annual rental of £20. Gibbs sold his grant to Sir Bevis Thelwall who, however, declined to pay him anything until it had been found possible to restore the land to a dry and useful condition. Myddelton accepted Thelwall's invitation to participate in the task of re-claiming the land and work was commenced in December 1620.

At Bembridge Point the inundated area narrowed down to a "bottle neck" from which it widened out again to the coast. Across this narrowed channel Myddelton constructed a strong embankment on a foundation of wooden piles driven deep into the bed. Sluice-gates were erected in the embankment, which was finally completed and the water drained away in the summer of 1622. The laying bare of the hitherto submerged area revealed a well, strongly encased with stone, which was an interesting indication that at some earlier period the land had been dry and inhabited.

Reclaimed and Lost

The reclaimed ground proved disappointing, the seaward half consisting mainly of a light running sand. The adjoining mainland was the property of Sir John Oglander, whose remarks regarding the rescued area are worth quoting: "The total of the haven was 706 acres. Sir Hugh Myddelton, before he sold, tried all experiments in it; he sowed wheat, barley, oats, cabbage seed, and last of all rape seed, which proved best; but all the others came to nothing. The only inconvenience in it was that the sea brought in so much sand and ooze and seaweed that choked up the passage of the water to go out."

After vainly endeavouring for two years to cultivate a portion of the land Myddelton sold his holding to Sir Bevis Thelwall.

The frequent silting-up of the channel on the seaward side of the sluice-gates blocked the natural outlet of streams accustomed to drain away through the haven and resulted sometimes in flooding of the latter. During such a flood in March 1630, a high tide brought disaster to the embankment, for the two waters met in the quicksand beneath and a partial subsidence followed. This mishap was observed by Andrew Ripley, a man engaged by Thelwall to safeguard his interests. Ripley hastened to inform Sir John Oglander that the sea had made a breach and Sir John gives the following account of the interview:—

"I demanded of him what the charge might be to stop it out; he told me he thought 40 shillings, whereupon I bid him go thither and get workmen against the next day morning, and some carts, and I would pay them their wages; but the sea the next day came so forcibly in that there was no meddling of it, for Ripley went up presently to London to Sir Bevis Thelwall himself, to have him come down and take some further course; but within four days after the sea had won so much on the haven, and made the breach so wide and deep, that on the 15th March when I came thither to see it I knew not well what to judge of it, for whereas at the first £5 would have stopped it out, now I think £200 will not do it, and what will be the event of it time will tell."

Myddelton's work was undone by reason of his failure to deal satisfactorily with the shifting sand in which he drove his pile foundation.

By means of his various undertakings Myddelton became a very prosperous man and he spent his later years between his London house in Basinghall Street and his country house at Bush Hill, near Edmonton, the latter having been his residence during the strenuous days of the New River scheme. In the autumn of 1631 his health began to fail and on 10th December of the same year he died at the age of 76.

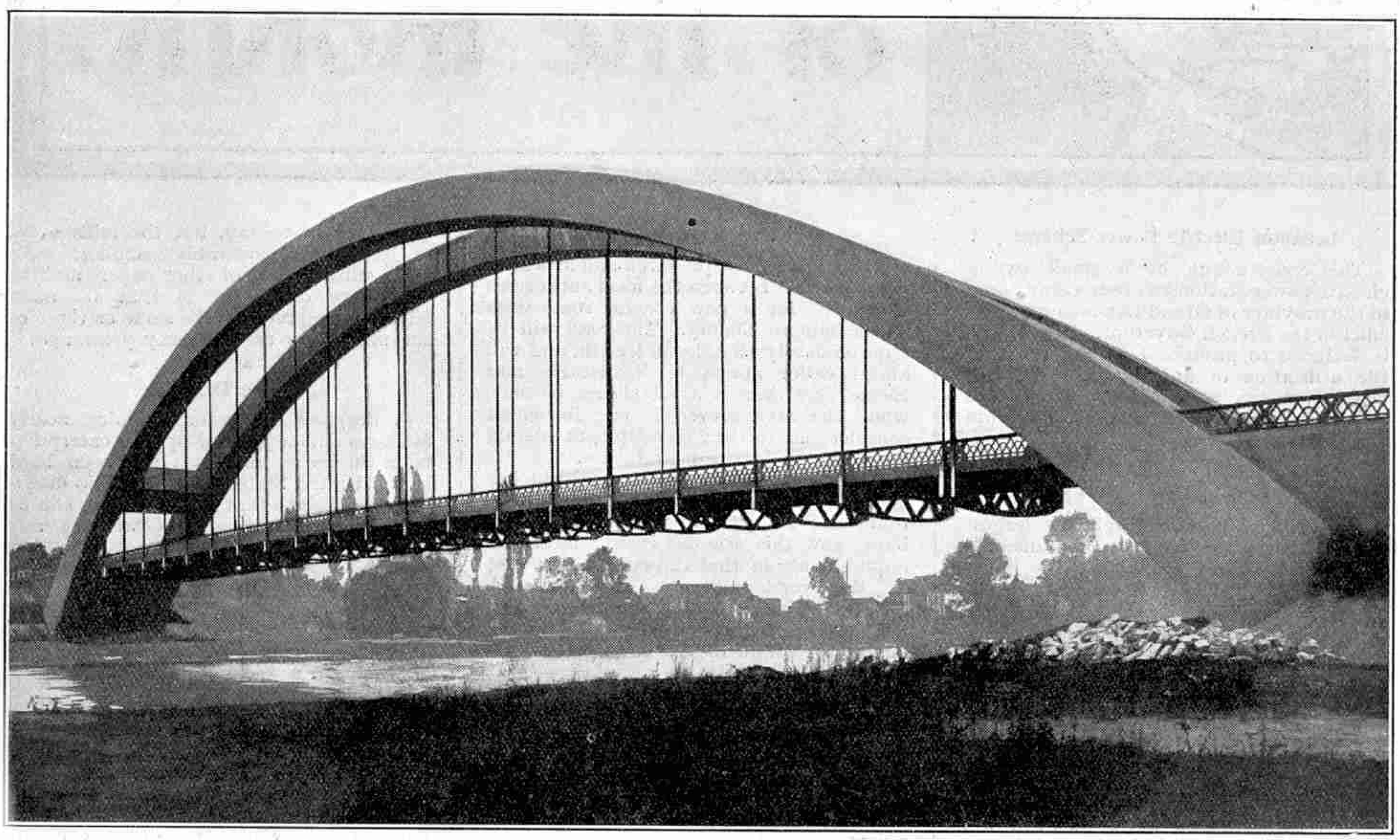
The attempt to reclaim Brading Haven was the forerunner of more ambitious undertakings of a like character, in which James I. showed himself equally interested.

One of the most enterprising of these was the reclaiming of the vast inundated area of the Fen district on the east coast. This considerable undertaking was entrusted to Sir Cornelius Vermuyden, a Dutch engineer skilled in coast defence works. Next month the story of these further schemes for reclaiming the "drowned" lands and the part played by Vermuyden in their execution, will be told.

FAMOUS BRIDGES—No. IX.

World's Largest Single-Span

The Concrete Bridge at St. Pierre du Vauvray



DURING the past few years ferro-concrete has become increasingly popular for bridge building. Concrete bridges have many advantages. They do not rust or rot, they need no painting and no periodical tightening of bolts or rivets. In most cases they can be built cheaply and their maintenance costs are low. In addition the fact that concrete is easily moulded makes it possible to carry out schemes of decoration of the highest artistic value.

In the "*M.M.*" for July we described two great American railway viaducts built of concrete and this month we give a description of the largest single-span concrete bridge in the world, that of St. Pierre du Vauvray. This famous bridge stretches across the river Seine and carries the road from St. Pierre to Andé. Previously there was a metal bridge at this point but it had to be removed on account of being badly damaged as the result of a steamer's collision with it while the river was in flood.

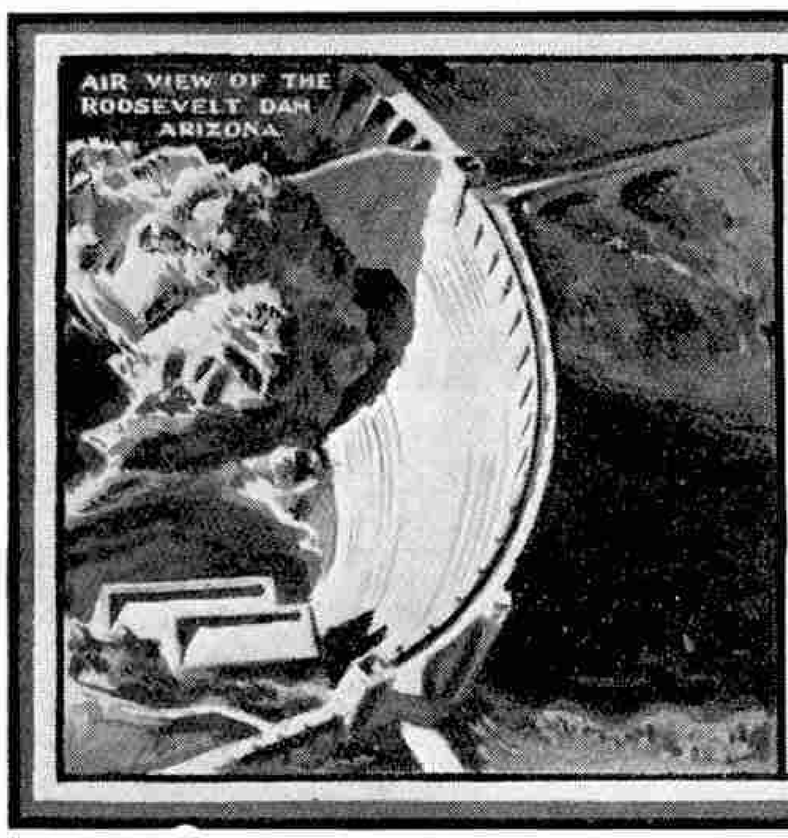
In order to guard against similar accidents it was decided that the bottom of the new bridge should be at least 20 ft. above high water level. In addition to this, the authorities insisted that the bridge should have no point of support in the river bed, so that the water should be left entirely clear of any obstruction caused by piers enabling ships of all kinds to pass freely beneath.

Laying the Foundations

Eventually a reinforced concrete bridge was proposed and a French architect named Freycinet submitted plans for an arched bridge with a span of 432 ft. between the abutments. This design was accepted and work was commenced immediately, but as all the operations had to be carried on without interfering with passing shipping, progress was necessarily slow.

Only a few temporary points of support on the river bed were allowed. Two series of supporting piles, each consisting of four sections, were driven into the bed, while two more groups were placed near each bank. These piles are known to French engineers as "Ducs d'Albe."

The foundations of the bridge are set on a bed of chalk and caissons of reinforced concrete were employed to lay them. These caissons, driven to the required depth by means of compressed air, had to penetrate a thick bed of clay and then a bed of gravel and sand before finally resting upon the chalk. (*Continued on p. 581*)



Engineering News of the month.

Lebanon Electric Power Scheme

The construction of a small hydro-electric power station has been commenced in the province of Grand Lebanon under an edict of the French Governor. The station is designed to produce 1,500 h.p., but by the utilisation of another waterfall this production can be doubled. Power will be supplied to Tripoli, Charré, Masroum and Edho.

* * * *

Nottingham a Port

Nottingham, one of England's largest inland cities, will shortly become officially a port, as a scheme for making the River Trent navigable for 120-ton barges up to the city from the sea is being carried out by the Nottingham Corporation.

The cost of the scheme, which includes the construction of four locks and a large amount of dredging, is approximately £500,000, but the trading advantage gained by the ability to pass goods direct from Hull to Nottingham and vice versa, without intermediate handling, will recoup the outlay in a very short time. The improvement in the water facilities will prove of great benefit also to adjacent towns and to the agricultural areas through which the river passes.

* * * *

Colombian Dock Scheme

Up to the present very little progress has been made with the building of the new docks at Buena Ventura, Colombia, but the disastrous stoppage of traffic on the Magdalena River, due to the recent prolonged drought, has forced the authorities to realise the importance of the docks and to push ahead with their completion.

At present there is only one pier, and vessels drawing over 22 ft. of water approach at their own risk. As the majority of the vessels calling at the port draw not less than 27 ft., it has been necessary to discharge into and load from lighters alongside the ship. To facilitate this process as a temporary expedient, several new cranes of big capacity have been ordered, and a platform will be constructed alongside the pierhead against which the lighters can be moored.

It is further intended to reclaim a large tract of land on the northern side of the island, and on this it is proposed to build a series of up-to-date warehouses and docks.

New Kent Road

Plans have been prepared and an agreement reached between the local authorities concerned for a new coastal road from Faversham to Thanet. The road will be approximately 19 miles in length, and will afford easier access to Whitstable and Herne Bay than is available at present, while the area served is one in which considerable further development should be witnessed in the near future.

The activity of the Kent coalfield has necessitated the provision of an alternative route into Thanet that will avoid Canterbury, and this scheme should meet the requirements in that direction. The cost of the road will be approximately £1,000,000, but it is not intended to proceed with the work immediately owing to the financial position of the county.

* * * *

The Iceland Cable

After protracted negotiations the agreement expiring this year between the Great Northern Telegraph Company and the Danish and Icelandic Governments for the working of the Iceland cable has been renewed until 1934, but the company have had to make several big concessions in the way of tariff reductions to retain the working agreement. The total telegraphic traffic passing in and out of Iceland is insufficient to render both cable and wireless telegraphy commercially profitable, and it has been agreed that all telegraphic messages, with the exception of news and meteorological reports, shall pass over the cable.

* * * *

America's Tallest Chimney

The tallest reinforced concrete chimney in the whole of the American continent has recently been completed at Trail, British Columbia. It is 400 ft. in height and 21 ft. in diameter inside at the top, while its walls are 2 ft. 6 in. in thickness at the bottom and 6 in. at the top.

* * * *

English Paper Output

England has nearly 260 mills still actively engaged in the paper-making industry and the output is approximately 1,250,000 tons per annum. An interesting comparison is afforded with early-Victorian days, for in 1859 there were 694 paper mills in England, 79 in Scotland and 27 in Ireland. Their combined output was much lower than that of to-day, but the mills were, of course, considerably smaller. An interesting point of the paper making machinery of to-day is that its main features are precisely the same as those of the machinery used seventy years ago.

* * * *

Huge Dragline

A dragline excavator weighing nearly 500 tons and supported by four caterpillar belts 36 inches in width has been built in the United States. The belts so distribute the weight that the excavator can be worked over soft ground without any difficulty.

* * * *

A Ship with 325 'Phones

In the "*Malolo*," a new 22,000-ton liner now being built in America, 325 telephones are to be installed, and in the matter of internal communications it is claimed that she will be the most completely equipped vessel ever built.

Two loud-speaking telephone systems are also included. One is for communication between the bridge, the after-docking bridge, the crow's nest, and the main engine-room, while the other connects the chief engineer's room and the main engine room. The "*Malolo*," which name is a Hawaian word meaning "flying fish," is being built in a Delaware River shipyard for the Natson Navigation Co., and will be launched early in 1927.

* * * *

New Steel Alloy

Hadfields Ltd., the Sheffield steelmakers, announce the discovery of a remarkable new steel alloy. This alloy will withstand so high a temperature that a gas turbine has been constructed to run at the colossal speed of 55,000 revolutions a minute, at a working temperature of 1,650 deg. Fah.

It is stated that machines made of this steel can be worked even at a bright red heat. It is expected that the discovery will be of great importance in the application of high-temperature gases.

* * * *

Large Contract for Barrow

Orders for eighteen large ships, ranging from 3,000 to 6,000 tons capacity, have been placed with Messrs. Vickers by the Lloyd Hellenic Navigation Company of Greece. The vessels are intended for trading between Greece, Egypt, Italy and the Black Sea.

World's Largest Entrance Lock

The North Sea canal entrance lock under construction at Ymuiden will be the largest in the world when completed, and will measure 1,300 ft. in length and 162 ft. in width, with a depth of over 50 ft. This will be 160 ft. longer and more than 50 ft. wider than the entrance lock of the Panama Canal, which is the world's largest at present.

* * * *

Bath Bridge To Go

A scheme is now under consideration by the City Council of Bath to replace the present bridge over the River Avon by a wider bridge of modern design. The existing five-arch bridge was built in 1362 and at one time a small chapel stood on it. It was widened in 1754 and side-walks for foot passengers were provided. The considerable increase of traffic has necessitated the introduction of the scheme for a new bridge.

* * * *

Oil in France

A considerable amount of experimental work has been carried out in France during recent years with a view to discovering whether oil exists in commercially workable quantities. Only one area, Gabian in the Herault Department, has yet produced satisfactory results, and in all ten borings have been made. Owing to the presence of water four of these had to be abandoned; three are producing oil and the others have not yet been completed.

Of the productive wells, the first produced 222 cubic metres in 1924 and 697 cubic metres in the following year. The second well produced 1,400 cubic metres in 1925, and this year, up to 1st April, 1,255 cubic metres had been drawn. It is impossible to state whether this oil-field has any real commercial value until the results of the remaining three borings have been ascertained.

* * * *

Canal Tunnel Under Mountains

The largest shipping tunnel in the world has been completed. It is five miles in length and runs beneath the mountains linking Marseilles with the great sea-water inland lake, known as Etang de Berre. The tunnel has a bar of 60 ft.—the widest in the world—and creates a direct route between Marseilles and Central Europe. It travels by way of the Rhone Canal and the great inland waterways of the Continent with which the Rhone-to-Rhine Canal is connected. Barges up to 1,200 tons burden are able to pass through the tunnel and even to pass one another in it.

The amount of earth removed in the process of excavation far exceeds the quantity removed from the longest tunnels in the world, being nearly three times that of the St. Gothard Tunnel, and more than half as much again as the quantity excavated in the building of the Simplon.

A Large Water-wheel

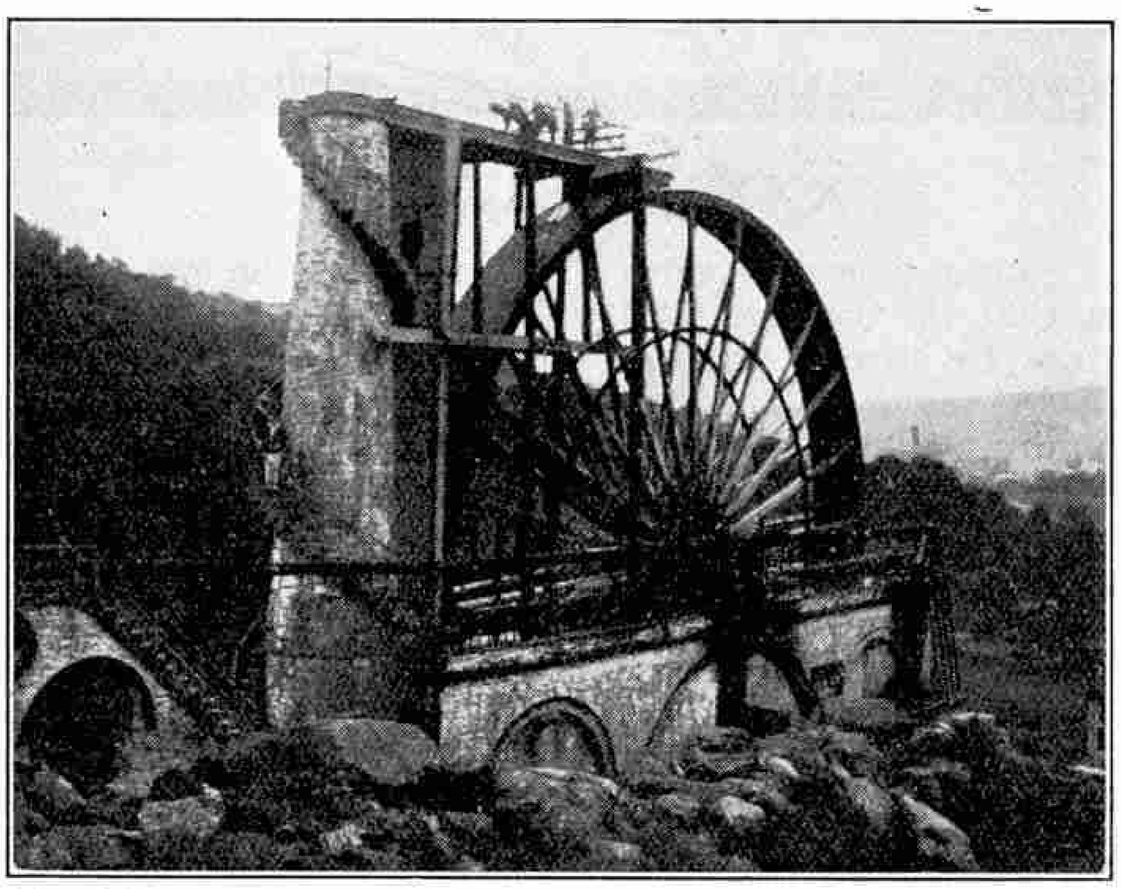


Photo by] [*H. Wolstenholme*

The Laxey Wheel was constructed in 1854 to pump water out of the neighbouring lead mines. The circumference of the wheel is 227 ft., its diameter 72½ ft. and its breadth 6 ft. The platform is 75 ft. in height and is reached by a spiral staircase of 95 steps.

Niger Valley Irrigation Problem

Considerable anxiety is felt in various French circles interested in the development of the Niger Valley, where large tracts of land are being reclaimed under the present irrigation programme prior to the establishment of what is intended to be an extensive cotton-growing area. The present water supply is obtained from Lake Chad, which is supplied principally by the Lagone River, but the latter threatens to carry away its banks in the event of a serious flood and to link itself up with the Benone, a tributary of the Niger. French engineers who have investigated the area are of opinion tha if this occurred Lake Chad would speedily become dried up, with the consequence that 160,000 square miles of extremely fertile land would become a desert waste.

To counteract the danger which, it is stated, is becoming increasingly imminent, it is suggested that a barrage should be constructed near to the Gauthiot Falls. This would secure a continual flow to Lake Chad and would divert a small tributary of the Benone into the lake.

* * * *

Norwegian Power Scheme

A scheme has been placed before the Norwegian "Storthing"—the equivalent of our British House of Commons—under which water rights over the famous Glomfjord waterfall will be let to the British Aluminium Corporation, who will undertake to provide 36,000 kilowatts per annum during the currency of the lease. A portion of the Corporation's aluminium-producing activities will be diverted from North Wales to Norway, but it is anticipated that the eventual effect of the transfer will be to improve the Corporation's output in England by providing an increased supply of raw material.

Electric Excavators Replace Steam Shovels

Nine steam shovels used by the Utah Copper Company of America have been replaced by electric excavators and the company intend to substitute electrically-driven shovels for the remaining fourteen steam shovels at present in operation.

The electric excavator represents no gain in the way of output when compared with the steam shovel, but the maintenance costs are considerably lower. In addition, a saving in the cost of distributing coal and water to the various machines will be afforded—no small matter when it is stated that in 1924 the steam shovels consumed over 104,000 tons of coal and nearly 250,000,000 gallons of water. A 44,000-volt current will be delivered by transmission line to various sub-stations and there converted to 5,000 volts for distribution over lines of a total approximate length of five miles, extending over the whole mining area.

* * * *

Raising the "Hindenburg"

The salvage work at Scapa Flow (described in the "*M.M.*" for December 1925) on the scuttled German battleship "*Hindenburg*" is being pushed forward steadily by Messrs. Cox & Danks. Considerable assistance in locating the ship's sea-valves has been obtained from a steel plate, bearing etched plans of the battleship, found in the chart-room.

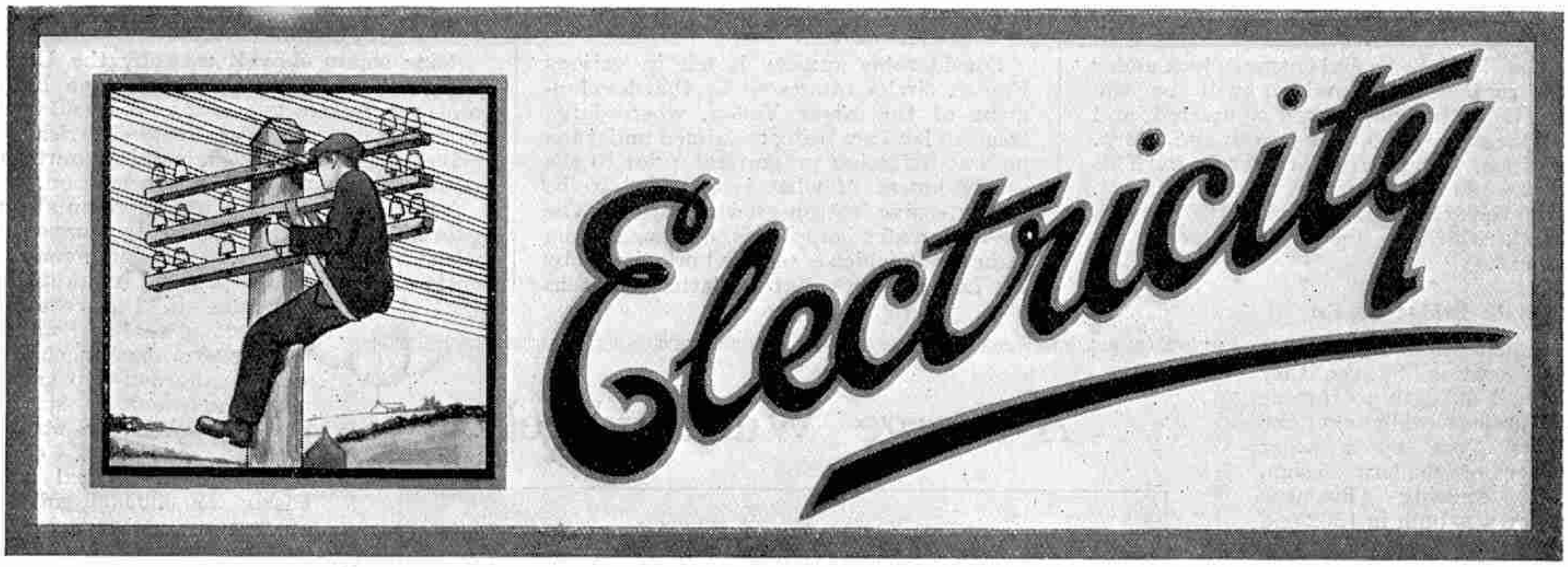
The stopping up of the holes and apertures in the ship has proved a huge task and altogether 700 patches have been placed in position by fourteen divers working in shifts. The gross tonnage of the "*Hindenburg*" is 27,000, and it is estimated that she is carrying over 60,000 tons of water. On this basis it will take the pumps over forty hours to clear her.

* * * *

Vancouver Harbour Bridge

The proposal to construct a bridge across the entrance to Vancouver Harbour, popularly known as the Lion's Gate, has been brought nearer realisation and negotiations are now going forward between two large engineering groups and the Canadian Federal Government. The groups concerned are Messrs. D. R. Robinson & Co., of New York, and Messrs. Armstrong Whitworth & Co., the famous British engineers. Both have submitted plans, and those of the latter firm provide for a bridge that would be one of the largest of its type in the world, involving an expenditure of from £600,000 to £750,000.

The bridge would be of the suspension type, approximately 1,200 ft. in length, and have a high water clearance of 160 ft., while the suspension cables would be supported on steel towers. The designs are only of a one-tier structure and no provision has been made for rail or tram traffic.



XXX. TELEVISION

IN our articles dealing with the transmission of pictures by telegraph we have seen that the average time taken to transmit one picture by wire or wireless is about 20 minutes, although by some systems the time is reduced to about 5 minutes. This is the time taken to transmit a single picture, but if we are to transmit the pictures sufficiently fast for them to produce the illusion of being one moving picture when superimposed we should require to send a complete picture in one-sixteenth part of a second.

It is now well known that the apparently moving picture seen on the screen at the cinema theatre is in reality a succession of stationary pictures, each slightly different from the last, following one another at the rate of sixteen a second. The eye continues to see an image of an object for about one-sixteenth of a second after the object has been moved from the field of vision, so that at the cinema, before the eye has realised that one picture on the screen has gone, the next has come. Thus the apparent continuity of the picture is obtained together with the desired movement.

It is obvious, therefore, that if the wireless moving picture is to make use of the principle of the present-day cinema by sending a succession of slightly different stationary pictures, it is necessary for at least sixteen complete pictures to be transmitted and received on the distant screen every second.

The "Natural" Method

The only other way in which a moving picture could be obtained is by copying the method employed by nature in the human eye. The eye is optically the same as a photographic camera. At the front there is the lens and behind is the screen on which is thrown the image formed by the lens. When a photograph is to be taken in a camera this screen is replaced by a plate of glass or a sheet of celluloid on which is a coating of a substance sensitive to light. In the camera the screen is flat, but in the eye it is curved, almost in the form of a hemisphere, and is called the retina. This retina really consists of the ends of a large number of nerve fibres, each of which sends a separate message to the brain informing it as to how much and what kind (that is, what colour) of light is falling upon it. The brain builds up the messages received from these nerves and "sees."

When the thing that is being observed moves, its image on the retina moves also, so that different nerves now receive the rays of light and the brain learns that the object has moved. The eye thus sees one continuous picture of the objects before it and this picture itself changes when the objects change.

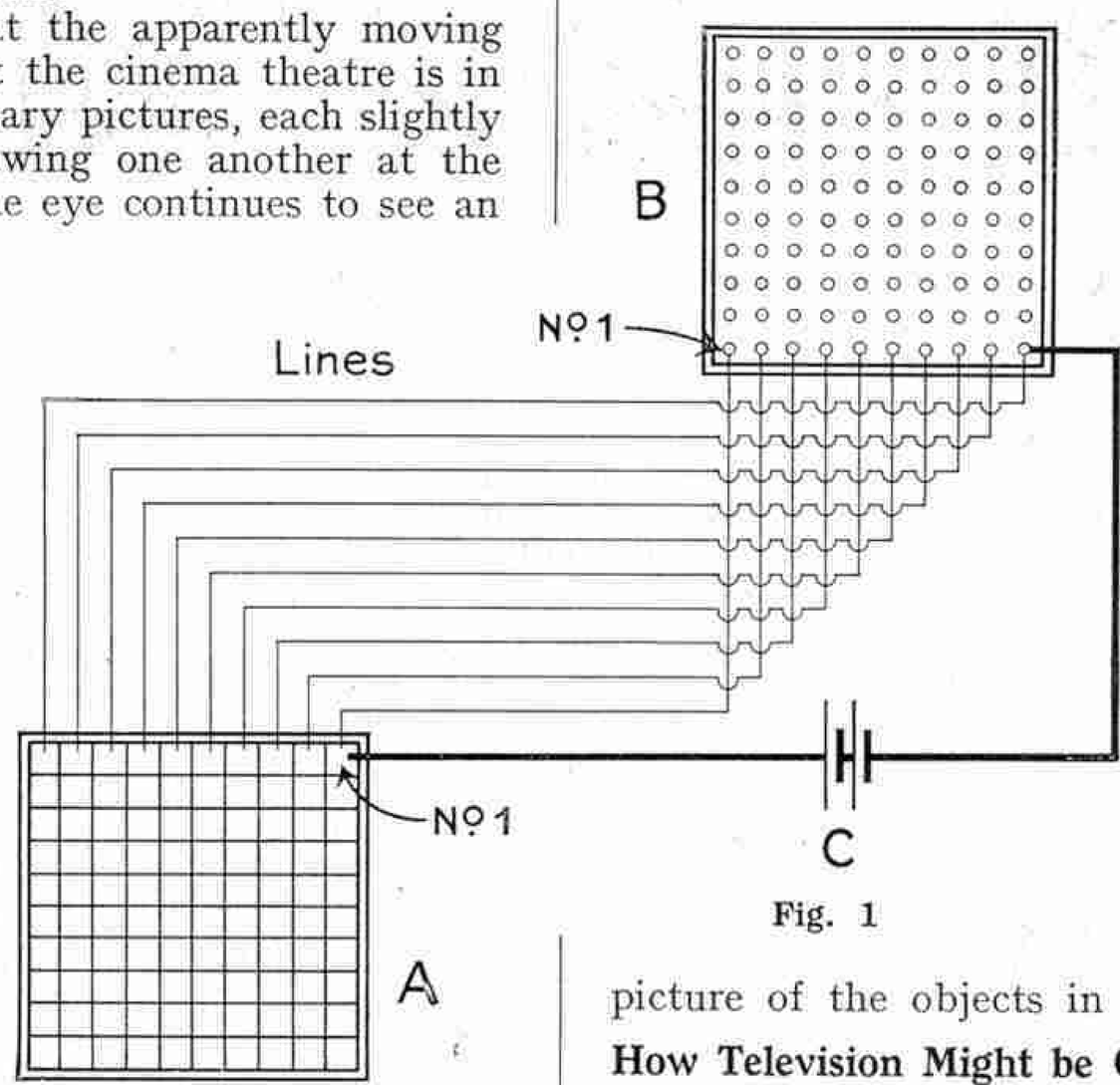


Fig. 1

This process could be imitated by electrical means so as to produce television by arranging matters so that objects in front of the transmitter — representing the eye—would influence it and cause it to send the necessary impressions along electric wires—the optic nerves—to the receiver—the brain—and thus enable the receiver to produce a light-picture of the objects in front of the transmitter.

How Television Might be Obtained

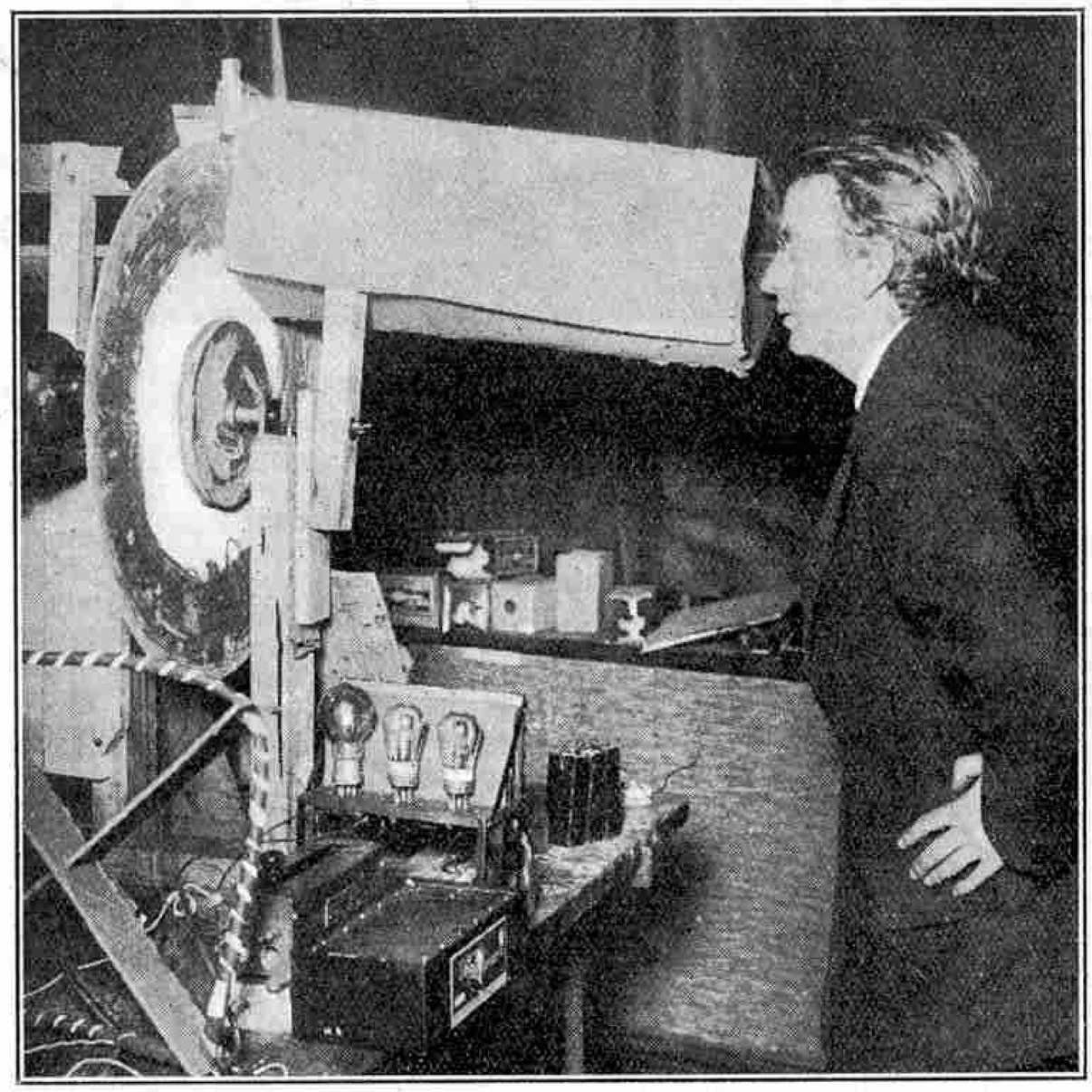
A system devised by Ernst Ruhmer was intended to operate in this manner. It was to consist of a camera of ordinary construction, except that there was to be no shutter, and a large number of independent selenium cells were to be put at the back in the place of the usual plate or film. The receiver was to consist of small electric bulbs, each connected by a separate wire to the selenium cell in the corresponding portion of the back of the transmitter.

This idea is shown in diagram form in Fig. 1, in which A is the back of the transmitter and consists of a batch of selenium cells (represented by small squares), and B the screen of the receiver, consisting of a similar batch

of electric bulbs. The connections are shown for the ten selenium cells of the top row of the transmitter which, since the image in a camera is inverted, corresponds to the bottom row of the receiver. Accordingly these ten selenium cells are joined to the ten lamps by the wires as shown. The second terminals of the cells are joined together, taken to a battery C and thence to the second terminals of the lamps.

If now the image of a picture falls on the batch of cells A and a bright part falls on cell number 1, its resistance will be lowered, as explained in the June issue of the "*M.M.*" (page 358), causing lamp number 1 to glow brilliantly. If, however, number 1 cell is only duly lit by the image, number 1 lamp will remain dull. The same applies to all the lamps and it is thus seen that the batch of lamps forms, in terms of bright and dull light, a picture of the original image falling on the cells A.

So far the scheme is quite practicable, but there is one point that seems as though it would make success impossible. In the figure only a hundred cells and lamps are shown. This is, of course, much too small a number to give any idea of a picture. This will be obvious when it is pointed out that it is necessary to make about 10,000 black dots per square inch to obtain the reproductions of photographs published in this magazine. These are, of course, of much better quality than we need in television, at least to begin with, but even a small fraction of this number is totally out of the question, especially when it is remembered that this only covers one square inch!



Mr. J. L. Baird "Looking in" at the receiver of his apparatus for transmission of a moving picture

A Mechanical Switching Device

It has been calculated that between 30,000 and 40,000 cells and lamps would be required to give even a poor picture of a human face. Apart altogether from the number of cells and lamps required, however, there is the difficulty of providing a sufficient number of connecting wires between the two stations. Some such switching device as is shown in Fig. 2 might be used to ease this problem. This has two rings A and B, consisting of a large number (32 in the figure) of insulated metal segments, each of which, in the case of A, is connected to a cell and in the case of B to a lamp.

The two wipers C and D rotate in the direction shown by the arrows, in synchronisation with one another, and brush in turn against each of the segments in A and B respectively. When C is on E, D is on F, so that the cell connected to E is joined momentarily to the lamp connected to F, and so on for each pair of segments. This system is similar to that employed on a smaller scale for multiplex telegraphy (see the "*M.M.*" for May 1925, page 241), but even this would not greatly relieve matters, for there is now the new difficulty of maintaining the wipers C and D in exact synchronisation.

In addition, the lights on the receiver B (Fig. 1) now flash instead of glowing continuously, so that, to produce an apparently continuous picture, each must be lit at least sixteen times a second. This means that the wipers E and F (Fig. 2) must rotate at the rate of at least sixteen times a second and thus, with the high speed, the difficulties of synchronisation increase once more. To operate a screen containing only 40,000 flashing lamps it would be necessary to produce 640,000 flashes every *second*.

This is only one of the many systems that have been suggested for securing television by means of transmitting the whole picture at one time. One of the other schemes was identical with that just described except that instead of variable lamps at the receiving end, variable shutters were to be employed.

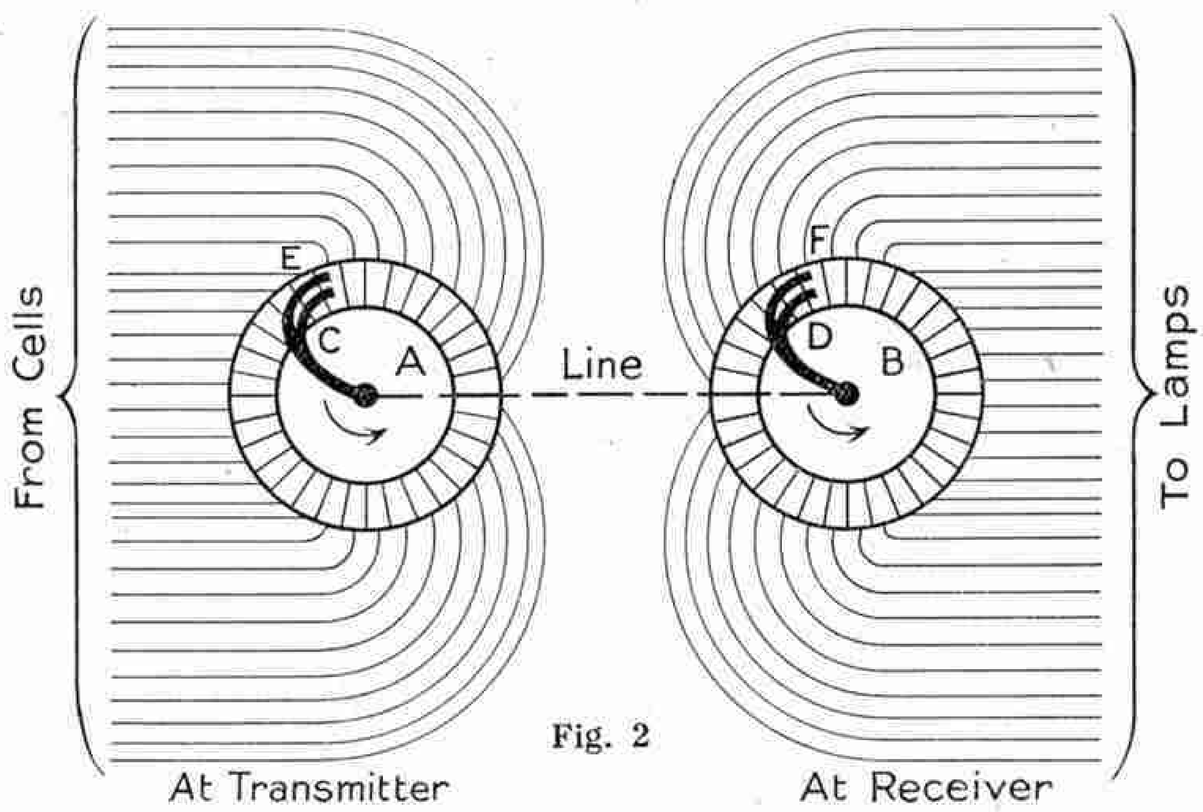


Fig. 2

While all these ideas are quite possible in theory it is not actually practicable to build transmitters and receivers of this kind. The chief difficulty is the excessive number of lamps required. In addition there is the problem of transmitting the signals from the selenium cells to the receiving lamps, and also the difficulty of making extremely small selenium cells.

For these reasons none of these schemes has ever passed the stage of being a drawing on paper, but although there are the immense difficulties just described, it would seem that the method should not be finally abandoned, for it is the only one so far suggested by means of which the whole of (Continued on page 572)

Railway News OF THE MONTH

New Shed to Accommodate 134 Locos

The extensive developments in the district of Llanelly and the re-arrangement resulting from the grouping of the railways rendered the local locomotive accommodation inadequate. A new loco shed has been built, 431 ft. in length and 255 ft. in width, providing accommodation for 134 locos. The shed includes two 65 ft. turntables each of which has 28 radiating approaches. In addition an up-to-date repair shop 85 ft. in length by 60 ft. in width has been constructed.

* * * *

To improve the transit to and from the L.C.C. housing estate at Becontree, the L.M.S.R. have built a station at Gale Street, between Barking and Dagenham.

* * * *

A Correction

In reference to the notes under the photograph on page 422 (July "*M.M.*") Mr. J. Millar Craig of Edinburgh, points out that "no Pacific has ever been run on the Aberdeen road, i.e. between here and Aberdeen, and probably won't for some time to come—certainly not on the Dundee-Aberdeen section, owing to the curves. N.B.R. Atlantics and Scotts are mainly in evidence on the latter section, along with some of the new 'Directors,' although those shedded at Dundee (five in all) work mainly to Edinburgh and Glasgow. Also Pacifics work to Glasgow only when they are fresh from the shops and are in consequence 'running hot.'

"Most of our engines painted at Cowlairs have red shading under the L.N.E.R. letters and numerals on the tender. This is contrary to the procedure in England where black shading is the regular colour."

In view of our reader's remarks we took up with the L.N.E.R. the question of "*William Whitelaw*" (No. 2563) running "between London, Edinburgh, Glasgow and Aberdeen," as our statement was made on information supplied by them. The L.N.E.R. now advise us that the words "and Aberdeen" were included in error in their information, a point that will satisfy many other enthusiastic railway readers, who have also written to us on the matter.

* * * *

80 m.p.h. Darlington-York

"I might also mention another point in connection with No. 2563," continues Mr. Craig, "The other morning she came into Waverley on 26.8 wheelers and the driver told me that it was one of the proudest achievements of his life in bringing 800 tons from Newcastle, over Cockburnspath back into Edinburgh unaided. In olden times (before 'grouping') this would have been worked as two trains, each with a N.E.R. 'Z' Atlantic, and pilot assistance would have been essential over Cockburnspath.

"The 'Z's are magnificent on the level road, of course, and many of them have touched 80 m.p.h. between Darlington and York, which is where—for a time—a distance of 44.1 miles had to be run in 43 mins. The record for the 'course,' however, is held by No. 1672, a 4-4-0, which ran it one night in 39 mins. with 200 tons, keeping 80 m.p.h. steadily for 15 miles.

"There are three 'Z's stationed at Haymarket Shed, Edinburgh just now, viz. Nos. 714, 2193 and 2194. No. 2194 is 'spare' for the South road (Newcastle and Berwick). No. 2193 is at Cowlairs shop for overhaul and No. 714 on a Glasgow turn. Although the Glasgow road is dead level, except for Cowlairs bank, these engines have the greatest difficulty keeping time, although schedules are exceedingly slack—the fastest train takes 61 mins. for the 47 miles instead of 50 mins. The 'Z's are not as favoured as the 'Directors' and 'Scotts,' which are very popular with the men and exceedingly steady runners."

* * * *

Single Line Working

We are informed that the L.N.E.R. 4-4-2 Nos. 9868–9872 inclusive, and also No. 9509, are stationed at Dundee and work mainly to Aberdeen except for one Edinburgh turn every day. They are fitted with tablet snatchers as part of the line—at Inverkeillor, near Montrose—is a single track and therefore all engines on that section require tablet-changing apparatus.

* * * *

Soviet Prizes for Locos

The Soviet Government are offering three prizes of a total value of £12,500 for designs of internal combustion locos suitable for the Russian gauge of 1·524 metres (5 ft.). The tractive power for goods locos must be not less than 15,000 kilograms (33,150 lb.) when running at 10 miles per hour, and for passenger locos not less than 12,000 kilograms (26,520 lb.) at 19 miles per hour. The maximum speeds for the two types of loco must be not less than 31 and 56 miles per hour, respectively. The awards will be passed mainly upon the cost of construction and maintainance, fuel consumption, reliability, weight and simplicity of operation.

Chepstow Station Improvements

The opening of the new racecourse at Chepstow, Mon., on the Great Western Railway, has necessitated extensive improvements to the accommodation at Chepstow station in order to cater adequately for the volume of traffic. The improvements include the provision of a new race-traffic platform, 600 ft. in length by 24 ft. in width, and the lengthening of one of the existing platforms to 600 ft.

* * * *

Electricity Replaces Steam

Several steam locos on the Virginian Railway have been replaced by electric locos. In a recent test a train having a total weight of approximately 5,000 tons was handled by two articulated electric locos, one hauling and the other pushing. Radio was utilised to transmit signals from one loco to the other when stopping and starting.

* * * *

Railway that Climbs a Live Volcano

One of the most interesting of recent railways is the one up Mt. Vesuvius, for it has the distinction of being the only railway in the world that actually climbs the slopes of a live volcano. This railway is essentially a tourist line and it is owned by the well-known caterers for tourists, Messrs. Thos. Cook & Sons. The first portion of the journey occupies 40 minutes and is accomplished by an electric cog-wheel railway. The second portion is made by funicular railway, and it takes the tourist to a point roughly 260 ft. below the mouth of the crater and 3,600 ft. above sea level. During the latter portion of the trip the mountain slopes are so steep that at times the funicular car seems to be suspended in mid-air.

* * * *

News from Scotland

The 35 new engines built at Darlington and classed "J38" are all at work in Scotland.

Named Pacifics at work on the N.E.R. Section are Nos. 2562, 2568–2577, Gateshead Shed, Nos. 2563–2567, Haymarket Shed, Nos. 2578–2581, Heaton Shed (Gresley Pacifics), Nos. 2400–2404, Gateshead Shed (Raven Pacifics).

* * * *

On the American Great Northern Railway in Montana, a wind-driven turbine in conjunction with a generator is supplying the power to operate colour-light signalling apparatus over a stretch of 26 miles.

Improving Communications in Central Europe

Railway communication between the principal towns of Central Europe will be improved considerably when the proposed railway tunnel through the Stelvio, recently approved by the Italian Government, is brought to completion. This tunnel will afford direct communication between Milan and Munich. The route for the new line, which is to be electrified throughout, is from Milan to Tirano and Bormio, from which point the tunnel will be constructed, to Prad-Rexia on the Austrian frontier. The line will then run to Landeck and Lermos, at which point another tunnel will be made. A line already exists from Lermos to Munich.

The total distance between Milan and Munich by this new route will be 486 km. (304 miles), as compared with the existing journeys of 620 km. (388 miles) via St. Gothard and 606 km. (379 miles) via Brennero. Of these 486 km., 181 will be entirely new track.

Both Austria and Germany are strongly in favour of the scheme and have offered financial assistance. These countries stand to gain considerably by the improved facilities, for the line will provide a quick route from the Mediterranean ports of Genoa, Venice and Trieste, not only with Munich, Vienna and Prague, but also with Frankfurt, Cologne and Amsterdam.

* * * *

New L.M.S. Loops

In order to relieve the prevailing congestion and to simplify the side-tracking of minor trains on the important Preston-Carlisle section of the L.M.S., 12 new loops have been provided at various points. These are principally on the stretch north of Lancaster, where the nature of the ground is such that it is not possible to provide third and fourth tracks.

The line carries traffic of a very mixed nature, and in order to permit the working of the Scottish express traffic it has been necessary to shunt local traffic into sidings while the expresses are passed. Under the new scheme, five of the sidings have been converted into running loops, each approximately 500 yds. in length and with electrically protected inlet and outlet points controlled from the same box. These five are the up and down loops at Southwaite, the down loops at Grayrigg and Tebay, and the up loop at Shap Summit. The last is of special importance because previously a shunted train had to travel its own length backward from the trailing points into the siding and then pull out against a gradient of 1 in 75.

* * * *

New Locos for India

In connection with their electrification scheme the Great Indian Peninsular Railway have ordered 41 electric freight locos from the Metropolitan-Vickers Electric Company of Manchester. These locos are to be used on the main line between Bombay, Poona and Igatpuri, on which sections gradients as severe as 1 in 38 are frequently encountered.

The locos are of the articulated type and consist of two trucks each having three axles, upon which the loco body is mounted. The total horse power of each loco is 2,600 and it is anticipated that they will attain an average speed of 20 m.p.h. on the up gradients, while their maximum speed will be 45 m.p.h.

* * * *

L.M.S.R. Loco Notes (Scotland)

Ten of the new C.R. Pickersgill 4-6-0 "60" class have been completed. They are identical almost with the originals except for lowered cab roof and slightly altered motion.

No. 1139, one of the Deeley 4-4-0's working in Scotland, is oil-burning and has two rectangular oil tanks on the tender. It seems very difficult to regulate the firing and she is perpetually "blowing off." As the furnace roars all the time, conversation between the two men in the cab is almost an impossibility.

A new M.R. Tank No. 16408, built by the North British Loco Co., has come to Dairy Road, Edinburgh, and is similar in all respects to the 7128 class.

One of the few C.R. engines, seen in Edinburgh during the strike, was No. 14346, a non-superheated "*Dunalastair III.*" (old No. 902) on the Edinburgh-Glasgow run.

* * * *

L.N.E.R. Notes (Scotland)

One of the engines seen working throughout the recent strike at Edinburgh was No. 9428 "*Adam Woodcock,*" which ran two trains to Glasgow and back almost every day. This engine handled the "Lothian Coast Express" all last year and is at present working Dundee slows. Since she was last in the shops (Dec. 1924) she has done excellent work and is practically the only "Scott" left to take turns on "Director's" shifts.

Pacific Nos. 2562 and 2582 have changed sections, the former now working on the new N.E.R. Section from Gateshead Shed and the latter on the G.N.R. Section into London.

Experiments are at present being made with No. 2562 in connection with the superheater tubes, but very little change in the running has been noted although steam is being generated at 700°.

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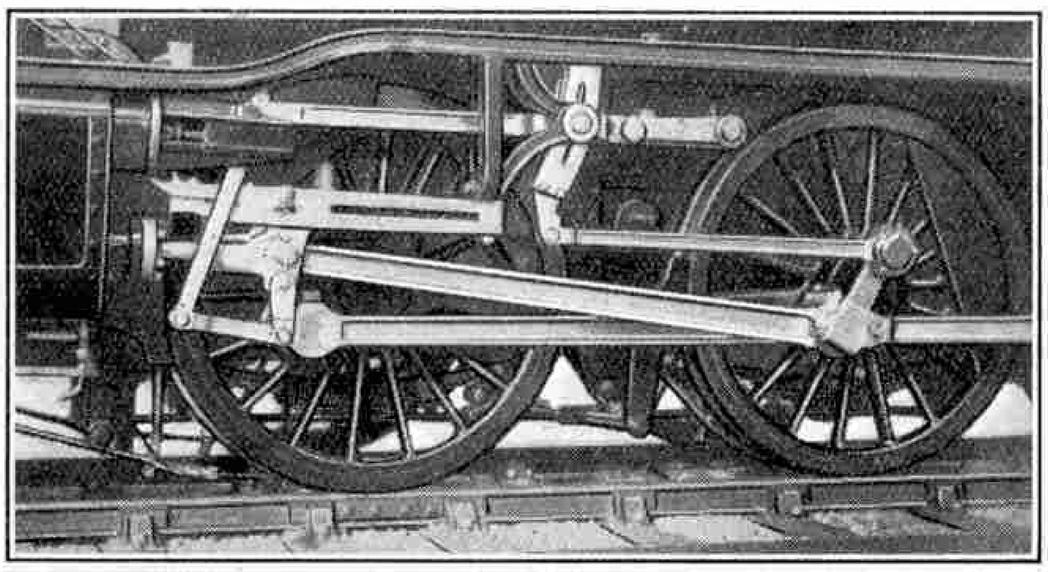
A new passenger halt and goods yard has been built by the S.R. between Ringwood and West Moors stations on the Dorchester-Southampton line and will be known as Ashley Heath Halt.



Motion of "*Flying Scotsman,*" showing Walschaerts' Valve Gear

(This Valve Gear may be reproduced accurately in Meccano)

A Veteran Loco

One of the most interesting locos working to-day is No. 663 of the G.W.R. A 14 Class. This loco was built in 1868 by the Worcester Engine Company for the Metropolitan Railway. It was then a 0-6-0 double condensing side-tank loco, equipped with 4 ft. 3 in. wheels and 20 in. by 24 in. cylinders. In 1873 it passed into the service of the Sirhowy Railway and was renumbered 9. Three years later, on the absorption of this line by the old L.N.W.R., it was renumbered 1891. Again it changed ownership, being acquired in 1877 by the Alexandra (Newport and S. Wales) Docks and Railway Co. With this company the loco was first renumbered 9 and later 26.

The loco was not allowed to rest, and after nearly 50 years of service was fitted up with a new boiler and cylinders, and in 1921 was re-built and emerged from the works of Hawthorn Leslie & Co., Newcastle-on-Tyne, as a 0-6-2 tank. In 1922 the G.W.R. took over the Alexandra Docks line and classified the veteran as A 14 and gave it its present number 663.

Sirhowy is about six miles from Merthyr Tydvil, and originally there ran from it a tram road to the Monmouthshire Canal, a distance of nearly 30 miles. In 1829, that is a year before the opening of the Liverpool and Manchester Railway, the sixteenth loco built by the Stephensons was placed upon this Sirhowy line. No. 663 has now the distinction of being the only Sirhowy loco still running.

* * * *

Edinburgh-London Running Times

It is interesting to note the difference in the two trains leaving Edinburgh for London. No. 14439, a C.R. superheated "*Dunalastair IV.,*" takes 9½ coaches on the West Coast and has to manage this load of 300 tons over Cobbinshaw and Beattock unassisted. In normal times, when coal is not such an important factor, the engine is assisted by a pilot through to Beattock summit when the load exceeds 300 tons.

The East Coast train has No. 2562 "*Isinglass,*" on eight bogies and the articulated Restaurant Car, the net load being 340 tons. Although she goes through to York, as against Carlisle for the West Coast, and each train has the same booked time throughout, the L.N.W.R. engines are hopeless time-keepers and a punctual arrival at Euston is unusual.

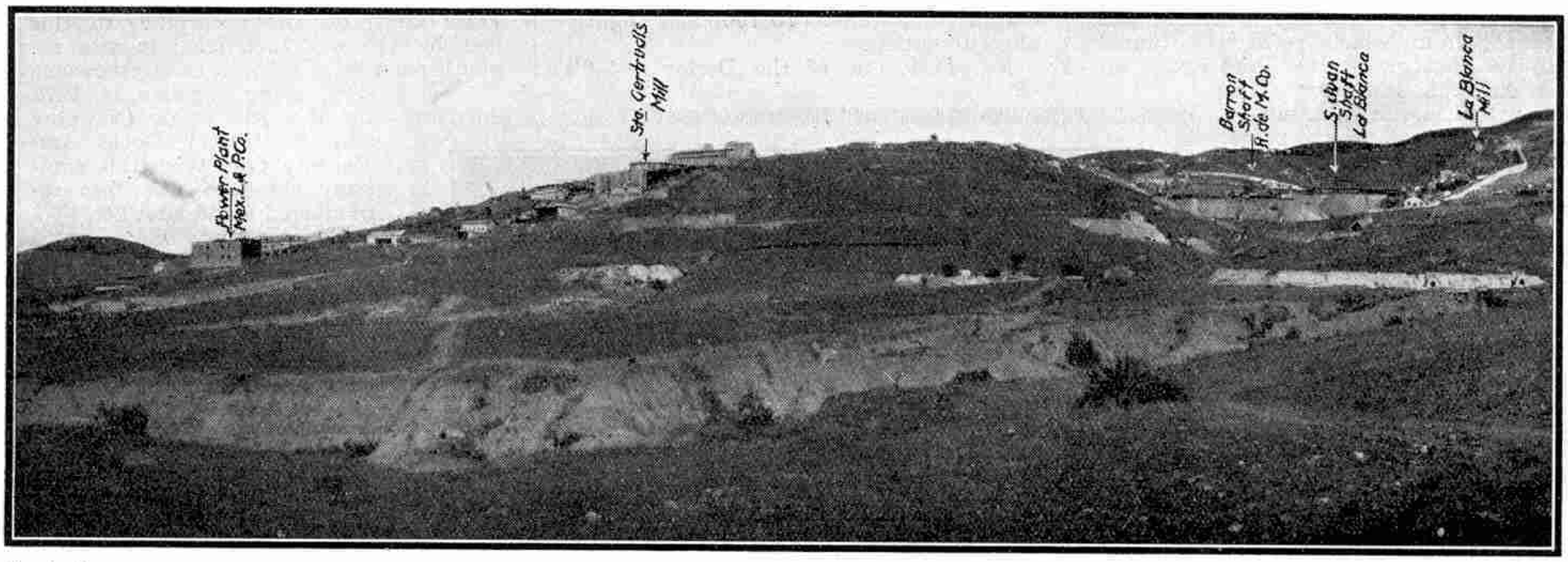
* * * *

The Smallest British Station?

Ufford Bridge, on the Stamford to Wansford branch of the L.N.E.R., possesses what is probably the smallest standard gauge railway station in the British Isles. The station consists of a single platform 166 ft. in length and is operated by a staff of one, the guard of the train working the branch line, who performs the duties of stationmaster, booking clerk, ticket collector and porter! The station buildings consist of a wooden shed built beneath the arch of a bridge that crosses the line. The booking office is carried in the guard's van of the train, which makes four calls each day in each direction.

The Story of Metals

XIII. SILVER: EXTRACTING AND REFINING



Courtesy] [*H. S. Denny*

General view of Santa Gertrudis La Blanca Mills

IN our last two issues we have dealt with the history and romance of silver mining. This month we come to the methods employed in the extraction of the precious metal.

The primitive method employed by the Romans was to subject the silver and lead ore to a preliminary crushing by hand mortar, after which it was placed in a sieve and water directed upon it to wash away loose earthy matter. The residue was then removed from the sieve and returned to the hand-mortar, the two operations of crushing and filtering being repeated usually five times. At the end of the fifth washing the remains in the sieve were transferred to a crude earth furnace and melted down. The molten lead floated on the top and was skimmed off, enabling the pure silver to be run out afterwards.

Dry crushing by hand-mortar was the prevailing method up to the sixteenth century. In 1519 Paul Gromstetter, a native of Schwarz, in Austria, evolved the idea of utilising water as an aid to the original crushing of the lumps of ore, and shortly afterwards established a "wet-stamping" plant at Joachimsthal. Gromstetter's "sifting and wet-stamping" process was improved upon in 1557 by Bartholome Medina, a native of the Mexican mining town of Pachuca. Medina's method, known as the "Patio" amalgamation process, continues to be used even to-day in many of the more remote mining districts of Northern Mexico.

The following instalments of this series of articles, "The Story of Metals," have already appeared. A few Copies of these Magazines are still available.

Copper	**(February, March and April 1925)**
Lead	**(June and August „)**
Aluminium	**(October and November „)**
Tin	**(January 1926)**
Gold	**(March, April, May and June „)**
Silver	**(July and August „)**

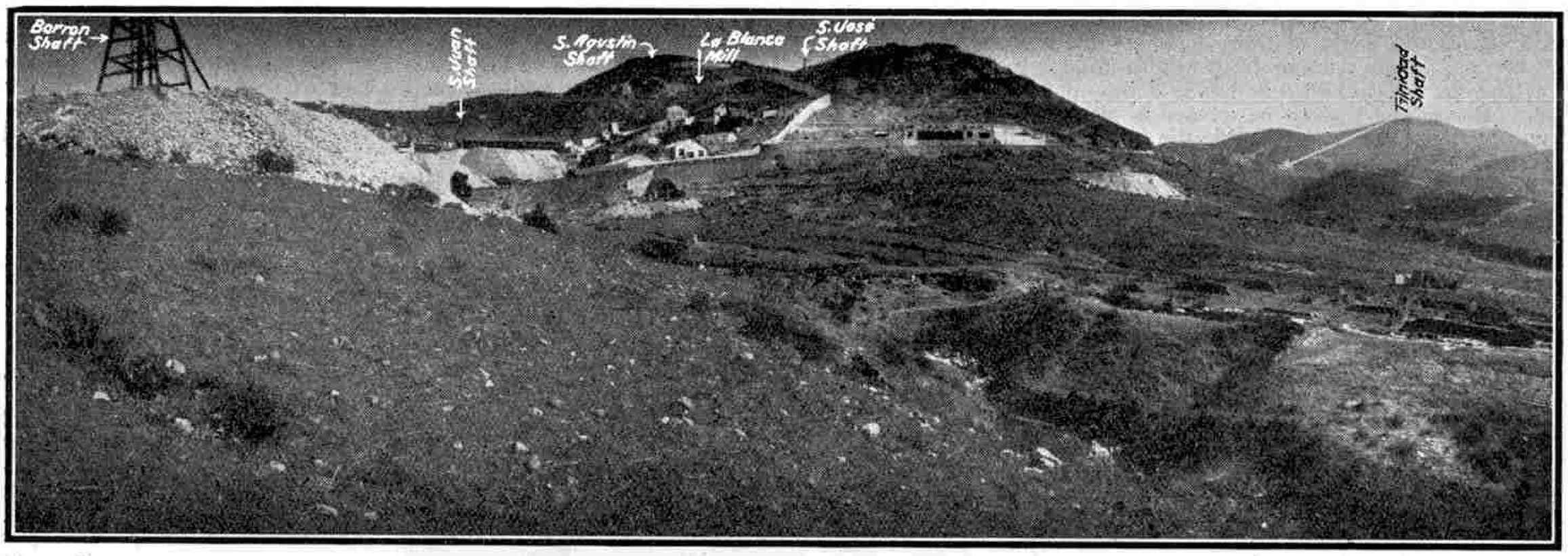
"Patio" Process

In the "Patio" process the ore is conveyed to the reduction works where, in a large yard, a gang of native women and boys armed with hammers break the ore-masses into smaller lumps. In the subsequent sorting all recognised rubbish is picked out and thrown aside.

The "accepted" ore is thrown into a large circular trough called a "molino," in which it is crushed by huge stone rollers drawn slowly around by mules. A further crushing is administered in a large cement-lined basin known as an "arrastra," usually about 10 ft. in diameter. In the arrastra the ore is ground by passing over it heavy stone blocks hauled by mules. Water is slowly poured on to the powdering ore, converting it into a thick slime. A large area of adjacent flooring, paved with either wood or stone, is surrounded by a low wall and into this confined space the slime is run. After several days' drying the ore paste has salt added to it and this is well mixed with the ore by allowing mules to trample it for two or three days.

Copper sulphate, common salt and mercury are now added and the trampling of the mules to mix up these ingredients is continued daily for some weeks. The mixture is tested periodically during the later stages of mixing, and when the official tester is satisfied that amalgamation of the mercury with the silver is complete, the mass is conducted to a large hydraulic washing tank. Here all the dross is separated from the mixture and drawn off. The amalgam that remains is collected and strained through filter bags to free it from excess of mercury. It is then placed in a retort and heated up. The mercury vaporises and is led off and condensed, while the silver is run off and cast into bars.

The "Patio" process extracts about 80 per cent. of the silver in the ore, but it wastes a good deal of mercury. The general slowness of the process is a



Courtesy] [*H. S. Denny*

La Blanca Silver Mine and Trinidad and Nevada Shaft, Pachuca Camp

further disadvantage. These drawbacks have been largely overcome in the more modern method of amalgamation termed the "Washoe" process.

"Washoe" Amalgamation Process

The "Washoe" process employs cast iron amalgamation pans approximately 5 ft. in diameter and 2 ft. in depth. A revolving shaft passes vertically through the centre of each pan and carries horizontal iron arms called "mullers." The mullers can be raised to a certain distance from the tank bottom by means of a handwheel governing a threaded inner shaft, and rotary movement is conveyed to them through worm gearing communicating with the shaft end beneath the pan.

Generally the pans are worked in series. The mullers of the first three pans crush the ore to fine powder. In a further tank water is added and the mullers convert the powdered ore to a muddy paste. When the contents are satisfactorily "slimed" they are passed to the next pan, where mercury is added and the mixture thoroughly stirred.

Common salt and sulphate of copper are added to quicken the rate of amalgamation, which is further speeded up by the heat from steam jackets enclosing the bottom of the pans. At the end of about four hours amalgamation is generally complete and the rotation of the mullers is reduced from 60 or 80 revolutions per minute to half speed. The pan is then filled up with water and after the amalgam has collected at the bottom it is drawn off into a smaller receptacle to await further treatment.

The pulp that remains is drained off through various plug holes into a settling tank, where it is further diluted with water and slowly stirred. The amalgam separates and sinks to a groove in the bottom of the tank from which it is collected and added to that taken from the amalgamating pan.

From an] [*Old Engraving*

Removing ore, showing box carried on sledge and dogs with pack saddles

The two lots of amalgam are now transferred to a large rotating cylinder. Further mercury is added and the whole is stirred for several hours, during which process the impurities are carried off. The amalgam is strained in canvas filter bags through which the excess mercury passes and the remaining amalgam is smelted in cylindrical iron retorts in the ordinary way. The silver thus obtained contains approximately one per cent. of mercury.

Silver is also extracted by smelting methods. Most lead ores contain sufficient silver to make its recovery profitable and the process of removing the silver from the ore is known as "desilverisation."

This may be carried out by what is known as the "Parkes" process. After treatment in a reverberatory furnace in order to get rid of such impurities as arsenic and antimony, the lead is run off into cast iron vessels known as "kettles." Small quantities of zinc are stirred thoroughly into the molten lead, the exact amount of zinc added being determined by the amount of silver in the lead. The zinc unites with the silver, and also with any gold present, to form an alloy which is lighter than the lead and therefore rises to the surface. The temperature of the whole mass is then gradually lowered, and as the alloy solidifies before the lead it is easily removed. Practically all the silver is contained in this alloy, along with a certain amount of gold and copper and some of the zinc, and the alloy is subjected to further treatment in order to isolate the silver.

Another method of desilverization, known as the "Pattinson" process, is worth describing on account of its interesting nature, although it has been superseded by the "Parkes" process.

In its original form the Pattinson process is

carried out in a set of from eight to fifteen cast iron spherical "kettles," each holding from six to fifteen tons of lead. The kettles are built close together in a row and each has a separate fire-place. The lead to be treated is placed in the central kettle and melted down, and then the fire below is withdrawn and transferred to a neighbouring kettle, the molten mass being continuously stirred while it slowly cools. Crystals separate out and are removed by means of a long-handled skimmer and transferred to the next kettle on the *right*. This process is continued until two-thirds of the whole contents of the central kettle have been removed in the form of crystals. The liquid remainder is then ladled into the next kettle on the *left*.

The kettle on the right is now two-thirds full of crystals, and to it is added one-third of lead containing the same proportion of silver. The kettle on the left is one-third full of molten lead, and to it is added two-thirds of lead containing a corresponding amount of silver. These two kettles are now heated, and then cooling, crystallizing and ladling out are carried on just as in the case of the original kettle. The latter thus receives crystals from the kettle on the left and liquid lead from the kettle on the right.

The process is continued, with the final result that the amount of silver decreases in the kettles to the right up to the last one, while it increases correspondingly in the kettles to the left. In this manner a large amount of lead low in silver is produced, together with a small amount of lead very rich in silver. The latter is again smelted in order to get rid of the lead.

Froth Flotation Process

At the Broken Hill Mines in Australia the modern froth flotation process has been employed for many years with marked success. The efficiency of this method was demonstrated clearly in the results obtained by means of it in the treatment of the huge dumps of so-called worked-out ore at these mines.

In the froth flotation process the ore is crushed down to the necessary fineness and in a subsequent washing is converted to pulp. The mass of pulp is then conveyed through a number of compartments leading off from one another and containing a series of revolving agitators working at high speed. In this manner intense aeration is set up in the mass. The result is that heavy mineral particles are carried to the surface as a sort of scum or froth, while the lighter and valueless materials remain below. The froth is raked off over a kind of lip and the liquid remainder is passed into the next compartment. By means of repeated agitations and frothings practically the whole of the mineral contents are recovered and the remaining liquid is run off. The mineral-bearing froth is subsequently filtered, treated in retorts for final separation of the silver and the metal is then moulded into ingots in the usual manner.

Assaying

One of the most important processes of extracting silver from the ore is that of Assaying. Fig. 1 illustrates the layout of an assaying plant. In the foreground are coke-fired wind furnaces for the reduction in crucibles, with the aid of suitable fluxes and reagents, of material carrying silver or gold and silver, with or without other metals. In the middle distance are gas-fired muffle furnaces, or "muffles" as they are briefly termed, and in the background—housed in the arched chambers—is the apparatus for "parting" gold and silver, to which we shall refer later.

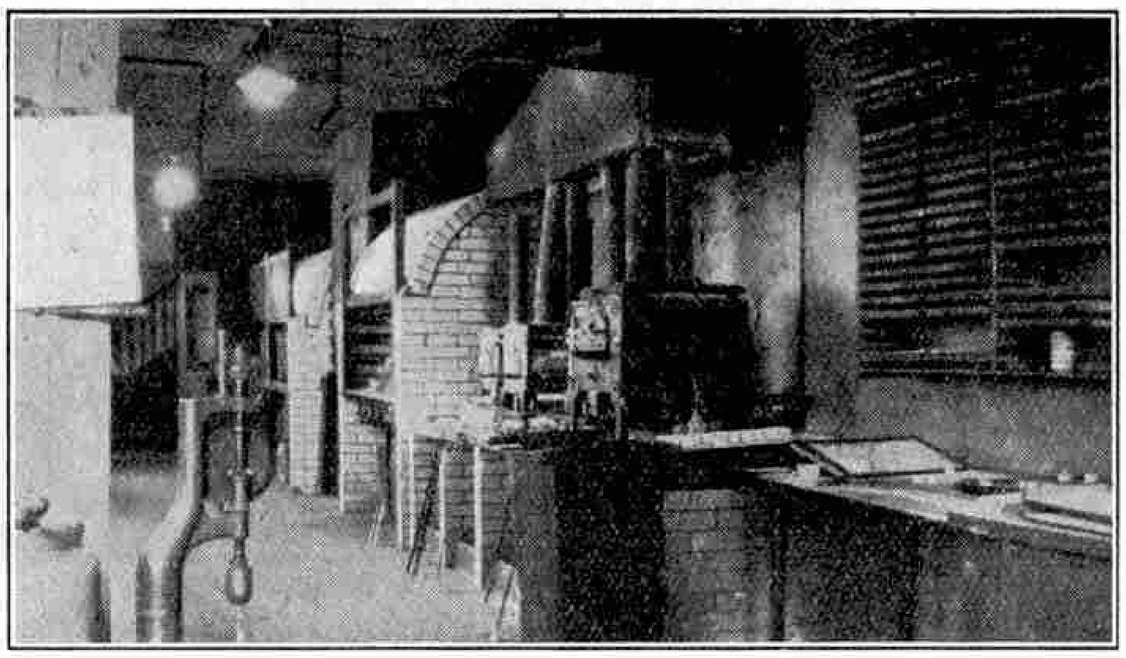


Photo courtesy] [*Daniel C. Griffith & Co.*

Fig. 1. Layout of an Assaying Plant

In Fig. 2 the above plant is shown in reverse order. The operator is engaged in removing a "pot" (as a crucible is often called) containing a molten charge.

Fig. 3 illustrates the wind furnaces (note their heavy covers) with the assayer pouring a charge into a mould, while the heavy flatting machine, of special design, is being used to flatten out pieces of metal in order that a larger surface may thus be exposed to the attack by acid.

We are indebted for the following description of the work of assaying to Messrs. Daniel C. Griffith & Co., who have also kindly lent us the three photographs on this page.

A definite weight of material is taken and carefully mixed with suitable fluxes and reagents, the number of these and the proportions of each being varied in accordance with the nature of the sample and the experience of the assayer. Placed in a crucible and suitably heated for the requisite length of time the contents become liquid, being then poured into a mould. When cool, the "melt" is broken up and the button of metal detached and cleaned from the slag.

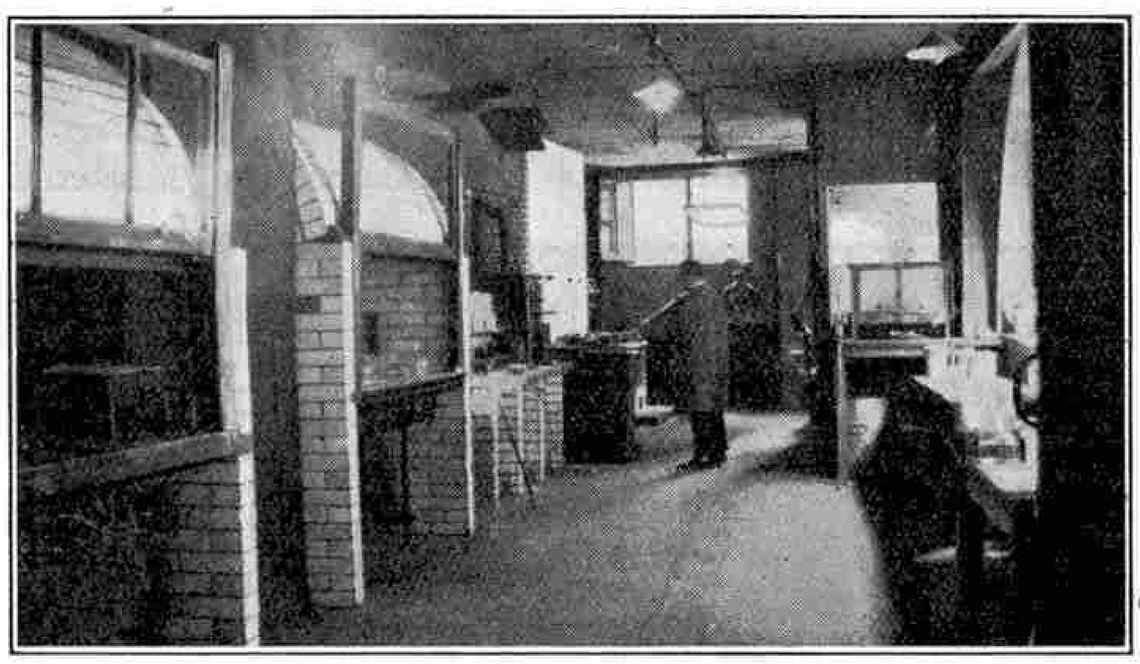


Photo courtesy] [*Daniel C. Griffith & Co.*

Fig. 2. View of Plant in reverse order

At this stage the small cupels—seen in their trays in Fig. 3—are brought into use. Without attempting to enter into details of what is a very delicate and elaborate operation, we may explain that their function is to carry the button of leady silver metal through the process of cupellation, in the gas-fired muffles (shown with their flues in Fig. 1). By this method the lead is eliminated leaving the silver ready for its final purification.

In actual practice there is very little silver that does not carry some gold, and vice versa, so that the lead will require to be what is called "parted." This operation is based upon the solubility of silver in nitric acid, in which gold is insoluble, and is carried out in "parting glasses" of various shapes and capacities. These are suitably arranged so that the acid may be heated and the silver dissolved, the gold then being recovered and weighed.

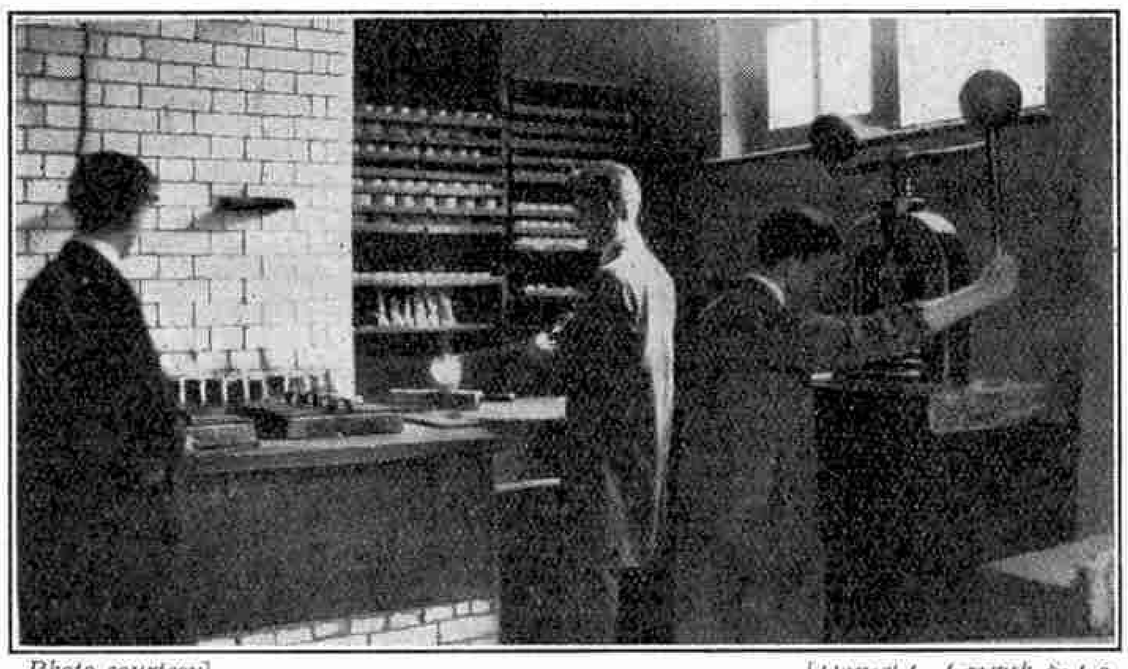


Photo courtesy] [*Daniel C. Griffith & Co.*

Fig. 3. Pouring a Charge into a Mould

The above is a bare outline of the very ancient art of assaying silver still widely practised to-day.

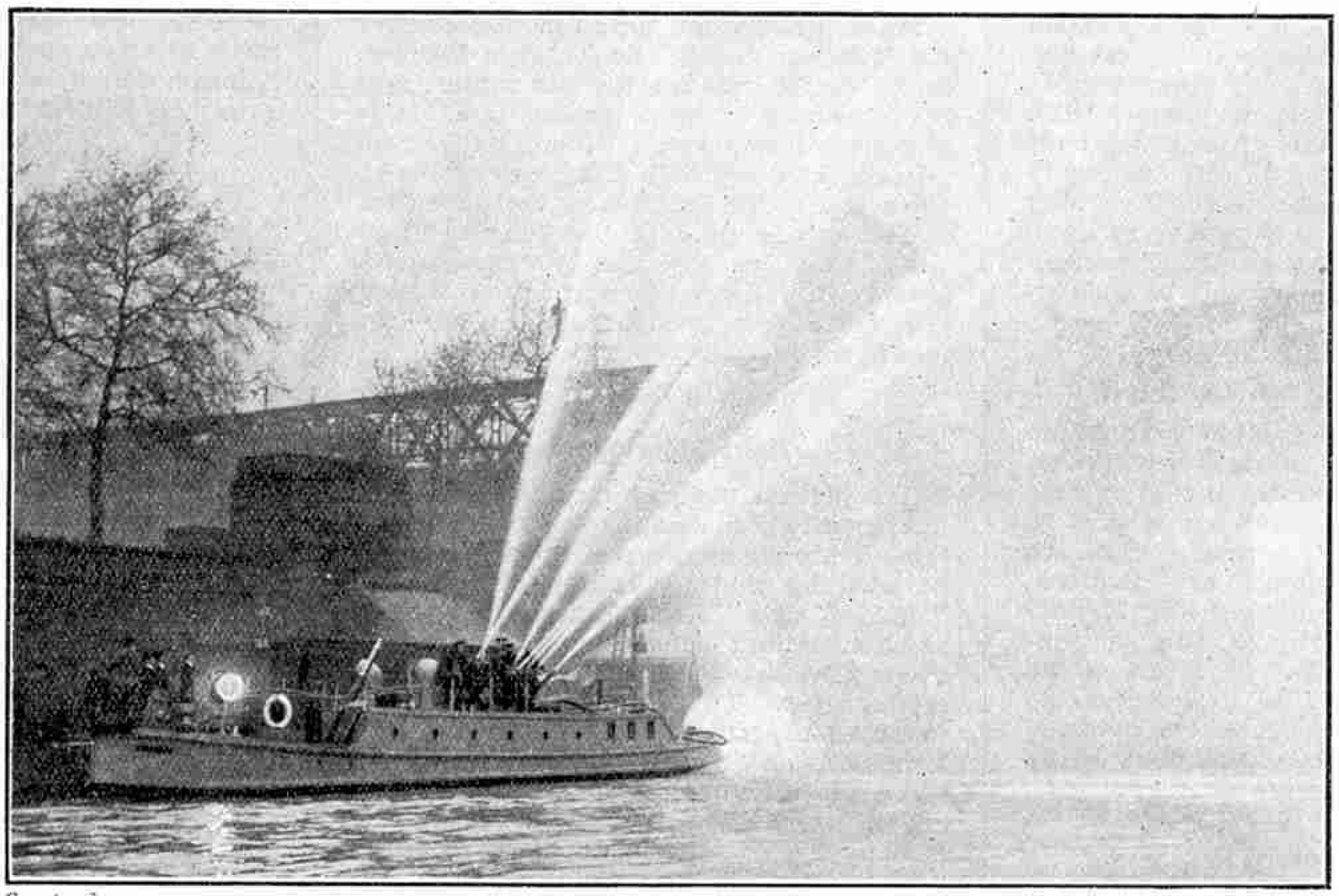
The uses of silver are many and varied. It ranks with gold in being widely adopted as a basic metal for coinage purposes, and we hope to relate in an early issue the history of coinage, in which these two metals have played so romantic a part. Many cathedrals are richly adorned with silver ornaments, notably that of Notre Dame, Paris. Silver has for many centuries been extensively employed for plating articles of baser metals. It is also an important factor in the making of photographic plates, films and papers.

New Fire-float for London Fire Brigade

Pumps Thousands of Gallons of Water Each Minute

A NEW fire-float, "*Beta III.*" has been built by Messrs. Merryweather & Sons, the famous Greenwich firm of fire engineers, to suit the special requirements of the London Fire Brigade. The float is a twin screw vessel, 70 ft. in length, 13 ft. 6 in. in breadth and 3 ft. 9 in. in extreme draft. The vessel, which has been built throughout under Lloyd's special survey, Class 100 A.1. for fire-floats, and also to Board of Trade requirements, has a hull of steel and a deck of teak.

The main engines consist of two separate internal combustion type, petrol - paraffin six - cylinder engines. They start-up instantly on petrol and run on it for the first five minutes after starting. They are then turned over to paraffin, on which latter fuel they develop and maintain their full power without difficulty.



Courtesy] [Merryweather & Sons Ltd.

"*Beta III.*," the new Fire-float of the London Fire Brigade

Consuming three quarters of a pint of paraffin per B.H.P. per hour, each engine is capable of developing 110 B.H.P. at 500 revs. per minute. The engines are arranged so that, by means of special clutches, their power may be used either for propelling the vessel or for driving the gun-metal turbine pumps.

The Powerful Pumps

Each of these pumps, of which there are two, is nominally rated to deliver 1,000 gallons per minute at a pressure of 90 lbs. per square inch. Actually, under test, each pump discharged 1,350 gallons per minute at this pressure. They were well up to specification, for even when delivering 1,000 gallons per minute the pumps exceeded the contract pressure by about thirty per cent. At a pressure of 50 lbs. per square inch each pump delivered over 2,400 gallons per minute.

A special arrangement of valves and piping permits the pumps to be driven either in parallel (for large quantities at ordinary pressure) or in series (for very high pressures up to 170 lbs. per square inch) as required. The contract figures have been considerably exceeded throughout, a result that is principally attributable to the very high efficiency of the pumps, which are of a new design.

Details of Pumping Arrangements

The auxiliary machinery includes two combined dynamo and air compressor sets, driven by internal combustion engines. These compressors are employed for charging cylinders containing the compressed air used for effecting an instantaneous start with the main engines. The dynamos furnish the current for lighting the vessel, and also for operating a 20 in. Admiralty type searchlight, fixed on deck.

The suction arrangements include the ordinary suction feed to the pumps, through strainer boxes fitted on either side of the vessel. There are also four special salvage suction inlets on deck (two port and two starboard), arranged to take standard London Fire Brigade 4 in. suction hoses.

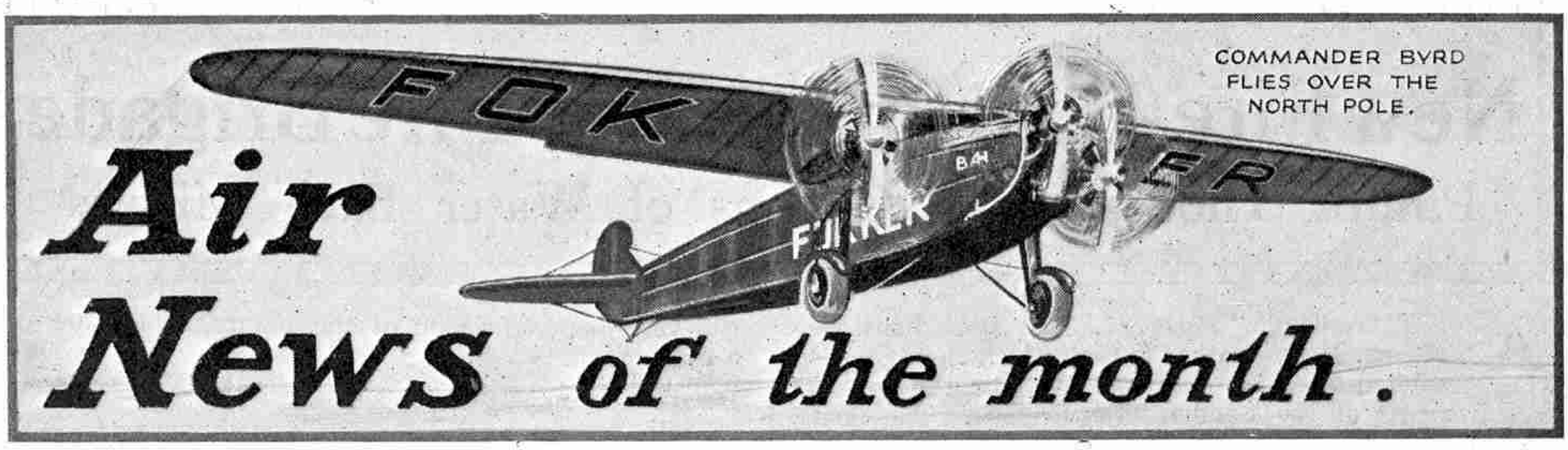
The delivery arrangements comprise a special delivery monitor arranged to take nozzles from $1\frac{1}{2}$ to $3\frac{1}{2}$ in. diameter, and two deck discharge boxes each fitted with four valves and connections for delivery hose. The discharge pipes from the pumps are so arranged that either or both pumps may serve either the monitor and the deck boxes simultaneously, or the monitor alone, or either of the deck boxes separately, or both together.

The vessel has been specially designed for easy manipulation in a restricted space, and is capable of turning in twice its own length under normal conditions. The speed, which is nominally 10 knots, was exceeded on an average of six runs over the measured mile.

The New Float Placed in Commission

The official trial of the vessel—apart from the speed test over the measured mile, which had taken place previously—was held under the supervision of Mr. A. R. Dyer, Chief Officer, assisted by Major Morris, Divisional Officer, and Captain Jackson, of the London Fire Brigade. Messrs. Merryweather & Sons Ltd.,

(Continued on page 586)



Air News of the month.

Dr. Nansen to Attempt a Polar Flight

Dr. Nansen, the famous explorer, has decided to make his next attack upon the North Pole from Haporanda, Sweden, which is only 20 hours' air journey from the Pole, and will start at Easter, 1928.

A giant Zeppelin airship is being built for the expedition and will be ready in the autumn of next year. This ship will have a greater gas capacity, by some 35,000 cubic metres, than the American "*ZR.3*" and if necessary will be able to remain in the air for six days.

* * * *

Aviation Instruction for Boys

Ten of the principal public schools are shortly to be given a course of instruction in aviation, and officers of the Royal Air Force will attend the selected schools to deliver lectures and arrange visits to aerodromes. The schools are Bedford, Charterhouse, Cheltenham, Eton, Haileybury, Harrow, Marlborough, Rugby, Winchester and Wellington. A feature of the scheme that should be a considerable factor in ensuring its success is that the officers selected will be old scholars of the schools to which they are detailed.

* * * *

Air Survey

The first English municipality to enter into a contract for a photographic survey of its district is the Doncaster Rural Council, who have instructed Aero-Films Ltd., to carry out a survey which, when complete, will be used to correct the ordnance maps of the area. The surveyor to the Council estimates that the task would take four years and cost £300 if carried out by his own staff, whereas under the contract the work will be completed in three or four months at a cost of just under £200.

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Monoplane to Carry 130 Passengers

The keen competition for pride of possession of the "largest ship afloat," which spurred the rival trans-Atlantic companies to build large and still larger vessels in the years preceding the war, has spread apparently to the aviation world.

Following the announcement of the huge Junkers machine comes the news that a German designer contemplates the creation of a huge monoplane that will provide accommodation for 130 passengers and carry them 3,000 miles in 27 hours! The designer is Dr. Rumpler, famous for his aeronautical work in the early days of flying.

The design of this mammoth calls for four flying boat hulls to carry between them three tails and four rudders, and 10 engines each developing 1,000 h.p.

Persian Mail Service

The Junkers Company have been granted a five years' aerial monopoly over the Teheran-Enzeli, the Teheran-Bushire, and the Teheran-Saratov air routes, and operations have been commenced. It is anticipated that one of these routes will be connected up with European traffic in the course of the next two or three months.

The agreement with the Junkers Company provides for the payment of a subsidy of 1/6 per kilometre flown during the first eight months, plus £500 per month for carrying mails.

* * * *

Huge Mooring Mast

The highest mooring mast in the world has recently been completed at the Cardington airship sheds, near Bedford, and will be used by the two commercial airships "*R.100*" and "*R.101*" now being built at that station. The mast is constructed of steel trellis work and has a base 60 ft. in diameter. Two circular platforms are mounted near the top, one of which will be used as an observation post for guiding the airship during mooring operations at night, while the other will serve as a balcony for passengers, who will be conveyed to the top by an electric lift.

A feature of special interest in connection with this mast is that it will be equipped with a pump capable of lifting 2,000 gallons of fuel oil per hour to the airships moored at the top. The oil will be stored in an underground tank holding approximately 10,000 gallons.

* * * *

Great Aeroplane Flight

The four R.A.F. aeroplanes that flew from Cairo to the Cape arrived at Southampton on their return home, having completed the 14,000 miles journey in 180 hours flying time.

The flight was undertaken purely as a service exercise, but it has been completed exactly to programme and without any untoward incident or change of engine. Valuable experience in long-distance flying over unknown country has been gained, and an extremely strong illustration afforded of the rapidity with which reinforcements could be despatched to distant parts of the Empire.

* * * *

Our Huge Airships

The re-construction of the Cardington airship shed was recently completed. The shed now measures 812 ft. in length and 180 ft. in height, but despite these gigantic dimensions it will accommodate only one airship of the "*R.101*" type.

An Alpine Flight

Lieut. Thoret, one of the French gliding pioneers, has succeeded in crossing the Swiss Alps in a machine fitted with a 40 h.p. Salmson radial air-cooled engine, despite extremely unfavourable weather.

* * * *

Attack on the South Pole

Lieutenant Byrd, the American airman who recently flew over the North Pole, is stated to be contemplating another expedition in the near future with the South Pole as his objective.

* * * *

The Saunders "*Valkyrie*"

Considerable interest attaches to the big Saunders seaplane "*Valkyrie*" that has passed its early tests so satisfactorily, because it is the first machine of the type to be turned out from this well-known works in the Isle of Wight.

The "*Valkyrie*" is fitted with three Rolls-Royce Condor engines, and Mr. Courtney, the test pilot, has been very enthusiastic in his reports. A three-engined flying boat fitted with Bristol Jupiter engines is also under construction for Imperial Airways at the Saunders works.

* * * *

Two-Storey Fokker

In our May issue we gave a brief advance note concerning the huge Fokker machine that is being constructed under conditions of close secrecy at the Fokker Company's Amsterdam factory. The principal details still remain a close secret, but it is known that the machine has been designed specially for long-distance passenger work in America, and it may be used on a projected trans-Continental service between New York and San Francisco. The machine will be fitted with at least three motors so that it will be navigable even though one engine be entirely out of commission, and it is expected that it will be capable of flying the distance between the two cities mentioned in less than 30 hours.

* * * *

Licenses for Women

At a recent meeting of the International Air Navigation Commission it was decided to allow women air pilots to qualify for passenger licenses. Thus the ban on women pilots that has existed during the past year has been removed.

* * * *

Air Mail Services Re-opened

The letter air mail services from London to Hanover and Berlin, and London to Hamburg, Copenhagen, and Malmo, have been re-opened.

500 Vacancies as Aircraft Apprentices

The Air Ministry announce that 500 aircraft apprentices, between the ages of 15 and 17, are required by the Royal Air Force. They will be enlisted as the result of an open competition and of a limited competition held by the Civil Service Commissioners and the Air Ministry respectively, and successful candidates will be required to complete a period of 12 years' regular Air Force service from the age of 18, in addition to the training period. At the age of 30 they may return to civil life or may be allowed to re-engage to complete time for pension.

The principal trades open to boys are carpenter-rigger, aero engine fitter and wireless operator mechanic. The apprentices are given a thorough training in their trade by highly qualified technical instructors and their general education is also carried on simultaneously by civilian schoolmasters. In addition, a few apprentices of special promise proceed to the Royal Air Force Cadet College for training as commissioned officers. For the remainder, opportunities arise later to volunteer to qualify in flying and become sergeant pilots, from among whom a few are periodically selected for commissioned rank.

Full information regarding the scheme may be obtained on application to the Secretary, Air Ministry, Kingsway, London, W.C. 2.

* * * *

Service Station for Private Owners

The de Havilland Company have recently opened at their Stag Lane aerodrome a service station for the use of private aeroplane owners, of whom there are now approximately twenty in England. Six private lock-up hangars have already been provided at a rental of £4 per month, and an occupier has been found for each. This is the first private air "garage" and represents one of the most interesting developments of air transport.

* * * *

Empire Air Service

Sir Samuel Hoare, Secretary for Air, emphasised in a recent speech the need for close co-operation between the various countries comprising our Empire in order to secure rapid and full development of the various air services established or projected. Already there are some 1,500 miles at home and 3,000 miles in Australia over which regular air services are being operated, and considerable progress could be achieved very quickly by using those services as the basis upon which to build further services.

Three principal lines of progress are already foreshadowed. These are the airship route to India, taking four days; the route to Cape Town, occupying six days, and those to Australia and New Zealand occupying ten and twelve days respectively. Probably a fourth Imperial link will be provided with a trans-Atlantic service to Canada, taking two-and-a-half days. From these main lines various subsidiary routes would radiate, thus creating lines of communication with other parts of the Empire.

Sir Samuel made a special appeal to the Dominions to build airship mooring masts to which the huge commercial airships now being built in England could attach themselves when calling.

Especially interesting was the statement referring to the inauguration of the Cairo-Karachi aeroplane service in January next. Already officers on the North-West frontier and officials of the various Indian services are booking passages by this route, which will save them from ten days to a fortnight on their journey home to England.

* * * *

Spanish Trans-Atlantic Flight

Three Spanish airmen, Captain Martinez, Gonzoles and Loriga, are proposing to emulate Commandant Franco's recent trans-Atlantic flight and will start from Madrid early next spring in an attempt to fly from Spain to the Philippine Islands.

Three Breguet machines fitted with 450 h.p. Lorraine engines are to be used, and each machine will be able to carry sufficient petrol for a twelve hours' flight at a speed of nearly 140 miles per hour. It is hoped to complete the journey within 25 days.

* * * *

A Grant from "Oil"

Several of the prominent petrol distributing companies have combined together in making a gift of £1,000 to the Royal Aero Club for the assistance of light aeroplane clubs, to enable them to purchase new machines. It is a condition of the gift that the clubs receiving a grant must already have raised a considerable portion of the necessary money from other sources.

A Safe Return

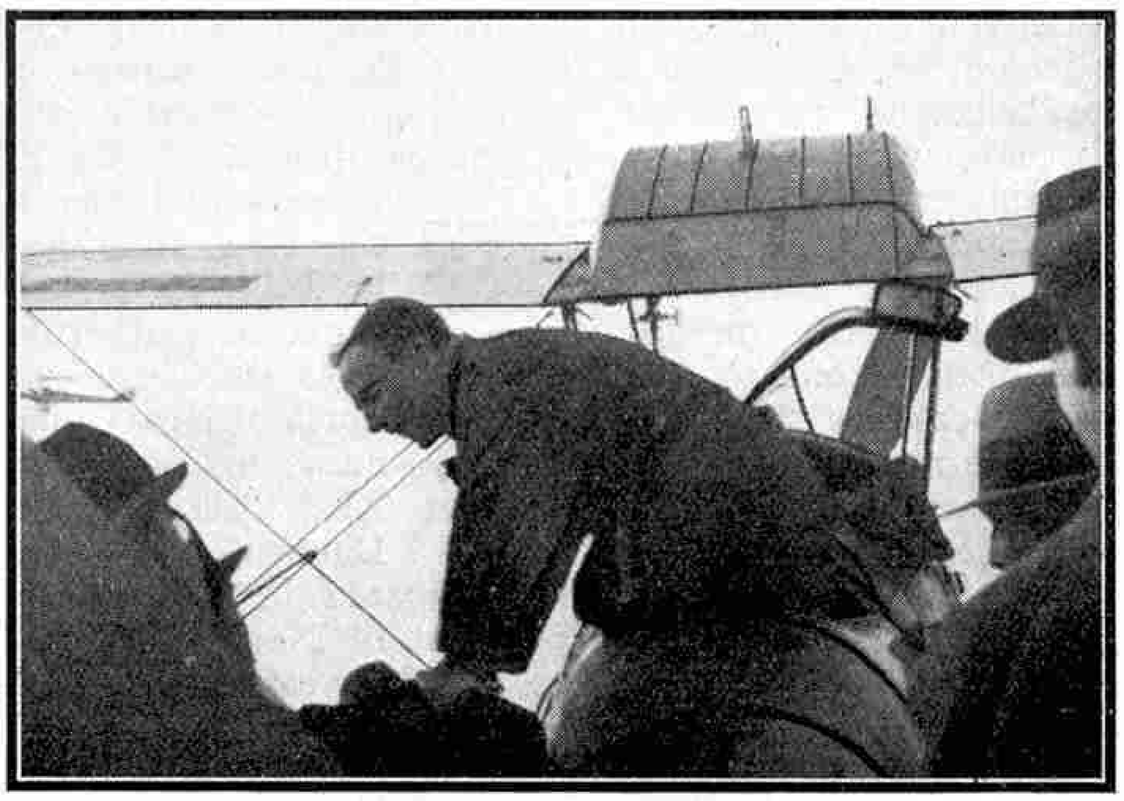


Photo by] [*R. H. Nuxlow*

A Reader's snap of Mr. Alan Cobham leaving his machine on his arrival at Croydon at the conclusion of his Cape to Cairo flight

Longest Non-Stop Flight

Captain Arrachart, the French airman, accompanied by his brother, recently set out from Paris in an attempt to break the world's record for a non-stop flight, 2,000 miles, that had been set up by himself in February 1925. In this new attempt Capt. Arrachart landed at Bassora, north of the Persian Gulf, having flown 2,735 miles in 26 hours 30 minutes.

This record had only been created a few days when Captain Girier and Lieutenant Wordilly succeeded in setting up new figures by flying from Le Bourget, Paris, to Omsk, Siberia, a distance of 2,940 miles, in 29 hours.

* * * *

Italian Air Contests

Two important aeronautical competitions will be held in Italy during the autumn and will be open to all machines entered by flying clubs affiliated to the International Aeronautical Federation. The first of these competitions will be held in October for the "Coppa del Mare" which is a seaplane event. The second competition, to be held in November, is for the "Coppa d'Italia" and is open to touring and training machines. In each case the first prize will be 150,000 lire and the second 50,000 lire.

* * * *

Australian Air Services

In previous notes we have commented upon the rapid extension of aerial transport in Australia. Among the companies operating in that continent the Queensland and Northern Territory Aerial Service, known colloquially as "Quantas," is the most successful and enterprising. Established just over five years ago, the company have covered over 300,000 flying miles, and during the past three years their freight traffic has increased 130 per cent. Regular services are maintained from the headquarters at Longreach to various parts of Queensland with a fleet of nine machines. Other subsidiary depots have been established at the southern terminals of their routes, Charleville and Cloncurry.

Wood-working and engine repair plants have been established recently and thus the company are able to handle aircraft construction work in addition to all ordinary repairs. The company hold a Government subsidy and during the first three years' working of their contract the number of passengers increased by over 400 per cent. A gratifying feature has been the steady maintainance of schedule trips, coupled with freedom from accidents.

* * * *

Chilian Air Service

The first air service to be operated in Chili is shortly to be inaugurated between Iquique, Valparaiso and Santiago. The machines will be of French construction and will be flown by South American pilots. This is the second commercial air route opened in South America.

MAKERS OF THE BRITISH EMPIRE: 2. OUR PACIFIC POSSESSIONS

By R. Kay Gresswell

AFTER America had been discovered and explored, and while it was being colonised, the seamen and scientists of Europe began to turn their attention towards the Pacific Ocean, which was then comparatively unexplored. Much of the Asiatic mainland had been known to Europeans for many hundreds of years but little or nothing was known of the islands to the east and south-east of this great continent, and on maps of the world the space between Eastern Asia and the *east* side of America was a blank.

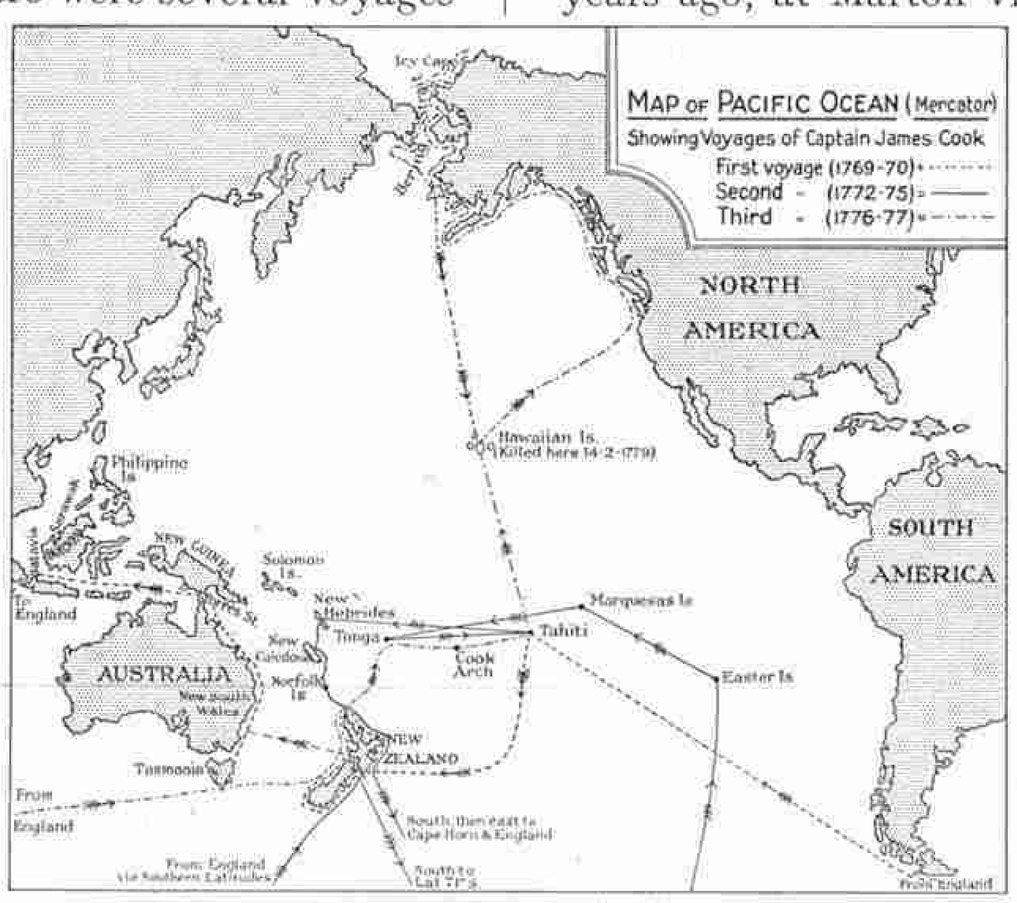
Early Explorers in the Pacific

In 1513 Vasco Nuñez de Balboa, a Spaniard, whose portrait is shown on the one cent value of the 1906 issue of Panama, was the first white man to cross the American continent to the west coast and to see the Pacific Ocean stretching to the horizon. Six years later Magellan, whose name is more correctly rendered as Fernao de Magalhaes, sailed southward down the east coast of South America, through the straits now named after him into the western ocean, which he found so calm that he named it El Mar Pacifico. Unfortunately Magellan was killed by some natives of the Philippine Islands but his ship completed its voyage and was the first to sail completely round the world.

During the following years there were several voyages of exploration up the west coast of the Americas and many ships crossed the ocean from the Magellan Straits to the Philippines off the south-east corner of Asia, but this route did not take the sailors through the great archipelagoes, being far northward of New Guinea, Australia and New Zealand, so that these places remained undiscovered. Among the men to cross the Pacific in this way was Sir Francis Drake during his famous voyages round the world.

Numerous voyagers discovered various of the small islands. A theory began to form in men's minds that there was a great southern continent stretching from near the south-eastern part of Asia to near the southernmost point of South America. The Portuguese sighted New Guinea. Pedro Fernandez de Quiros discovered the Caroline Islands, the Society Islands and the main island of the New Hebrides (1607), which he believed to be a part of the expected southern continent. Luis Vaes de Torres sailed along the south of New Guinea and gave his name to Torres Strait. In 1642 Abel Tasman discovered Van Diemen's Land, now known as Tasmania, in the south of Australia, and also the west coast of New Zealand.

Fifty years later William Dampier discovered Australia and explored the coasts of New Guinea. In 1767 Tahiti and Pitcairn were discovered and Santa Cruz, Solomon Islands and New Pomerania were visited, followed in the next year by the exploration of the Society Islands, Samoa, northern New Hebrides and parts of the Bismarck archipelago.



Captain James Cook

The exploration of the Pacific Ocean had now begun in earnest and it is now that we hear of that famous Yorkshire sailor, Captain James Cook, who at the same time as discovering many of the islands in that ocean made them parts of the growing British Empire.

Born on the 28th October 1728, nearly two hundred years ago, at Marton village in north Yorkshire, James Cook was the son of a poor man connected with agriculture. At the age of twelve James became employed by a haberdasher in a village near Whitby, but apparently this business did not appeal to the boy, for shortly afterwards we learn that he was apprenticed to a firm of shipowners in the same place.

Cook made a success at this occupation and after sailing in the North and Baltic Seas for a number of years, and having risen to the position of mate, he joined the Royal Navy. This was when he was twenty-seven years of age, and when he was thirty-one he was promoted to the position of master

of a sloop called "*Grampus*" from which he was transferred to be master of the "*Garland*" and later of the "*Solebay*."

In the last named vessel he went up the River St. Lawrence, which he sounded and surveyed from Quebec to the sea, producing an excellent chart of the channel.

Cook was thus more or less carrying on the work of Cabot and Cartier (whose achievements we described in the July "*M.M.*"), but after a time he extended his surveying to the Newfoundland coast, being appointed the official marine surveyor. In 1766 he became known to the world of scientists as a capable mathematician and an astronomer of no mean order on account of his observation and report of a solar eclipse that occurred in August of that year.

His Pacific Explorations

Twelve months later he left this post as surveyor and was appointed to conduct an expedition to the South Pacific Ocean. The object of this expedition was to explore this part of the ocean from a geographical point of view and also to observe the transit of Venus that was shortly to take place. (A transit of Venus is the passage of the planet across the disc of the Sun apparent to an observer on the Earth).

Cook, with his crew of sailors and scientists, left England in the "*Endeavour*" on the 25th August 1768, and on the 13th April in the following year he reached Tahiti, one of the Society Islands (Lat. 17½° S., Long. 151° W.) Having observed the transit of Venus from here he sailed southwards in search of the believed southern continent to which we have already referred.

This continent was, of course, not found, for it did not exist, but Cook arrived at New Zealand and spent six months charting the coasts of both islands. The strait dividing the two islands, to which he paid particular attention, is now called Cook Strait in his memory. He then sailed westwards to Australia, or New Holland as it was then termed, surveying the whole of the east coast of that continent, and naming New South Wales, on account of its resemblance in his opinion to Glamorganshire. The allotted time for his voyage was now over, however, and on the 12th June he arrived back at England having come by way of the Cape of Good Hope.

Cook was now made a commander and shortly afterwards sent on another expedition to the same regions to determine definitely whether or not the southern continent did actually exist. He was able to show that it did not by sailing far into the southern latitudes many times. Having settled this point he continued his exploration of the ocean by calculating the exact position of Easter Island, the Marquesas Islands and the Tonga or Friendly Islands, after which he sailed to Tahiti to rest and refit.

He next turned west to the New Hebrides and discovered New Caledonia and Norfolk Island. From here he sailed further south, crossed the Pacific to Cape Horn and sailed home via the west coast of Africa, returning to England on the 25th July 1775.

Cook's Last Voyage

This was Cook's second voyage and his third and last was now begun, this time with the object of exploring from the Pacific side the possibility of a practicable sea passage north of Canada, a subject that was engaging so much attention from sailors at this time.

Leaving England in July 1776, Cook sailed by way of the Cape of Good Hope to Tasmania, New Zealand and the Tonga and Society Islands. Between the Tonga and Society Islands he discovered the islands now known as the Cook Archipelago, amongst which are Rarotonga and Aitutaki. This was in the first few days of April 1777, and sailing north he rediscovered the Hawaiian Islands, that great group of islands, that, it is believed, had been visited two hundred years before but subsequently forgotten. Cook named them Sandwich Islands, in honour of his chief, the Earl of Sandwich, then head of the British Admiralty.

The explorer struck the coast of Alaska in due course and surveyed it until any further progress was prevented by a solid wall of ice 12 ft. in height extending to the horizon. Finding that the north passage was impossible he returned to Hawaii, where the story of his life comes to an abrupt end.

One of the ship's boats had been stolen by some natives and, following his usual custom in such cases, Cook seized the native king with the intention of holding him until the boat was returned. When he landed on the following day, however, several natives attacked him and the sailors who were with him, and during the fight the sailors were overcome and Cook was killed.

The natives, who of course were heathens at that time, had worshipped Cook as being a kind of god and after his unfortunate death his remains were preserved by the priests and worshipped until the time when idolatry was finally abolished.

Scenes from the life of Captain Cook and views of the archipelago named after him are shown in the series of six stamps issued in 1920 by the Cook Islands Federation under the name of Rarotonga and in the identical series, except for title and colours, issued by Aitutaki at the same time.

We illustrate five of these stamps, the scenes depicted being as follows: ½d., the landing of Captain Cook on one of the islands; 1d. (not illustrated), the wharf at Aitutaki; 1½d., a fine portrait of Captain Cook; 3d., a palm tree, the typical vegetation of the islands; 6d., some huts at Mitiaro with villagers standing in front of them; and 1/–, Avarua Harbour. We also illustrate the 1d. value of the 1907 issue of Papua. This view, as well as showing a lakatoi, the native type of canoe with sails, shows the village of Hanuabada in the background. (Cont. on page 567)

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Stamp Collecting—(*continued from page* 565)

with the hills of the interior stretching out behind.

The White Raja of Sarawak

Turning now from a sailor and explorer to a totally different type of Empire-builder, we find in Sir James Brooke, in his nephew, Sir Charles Brooke, and in the son of the latter, Sir Charles Vyner Brooke, three unique figures in the history of the British Empire.

Their portraits have appeared on all the stamps of Sarawak and we illustrate three stamps of this country. The six cents stamp illustrated is one of the series issued in January 1895. It was engraved and printed by Messrs. Perkins, Bacon and Co. of London, and shows a portrait of Sir Charles Brooke. He also is shown on the one cent stamp illustrated here, this being one value of the series issued between 1899 and 1908. The 2c. stamp shows Sir Charles Vyner Brooke, this being one of a series issued in 1918.

James Brooke was born near Bath, England, on the 29th April 1803, his father being a member of the East India Company and long resident in Bengal. Brooke entered the service of the East India Company when he was of the right age and went to India when he was about twenty-two. Five years later he made a voyage to China and was so impressed on the way by the magnificence of the East Indies and by their natural fertility, that he thought what a pity it was that these islands should be occupied only by barbarous savages who were constantly at war with one another, and who could not make use of the immense possibilities of the lands.

He did not, as many would have done, think how admirable it would be to oust the natives from their homes and to fill the islands with white men. Instead he conceived the great idea of civilising the natives so that they could appreciate and make use of their possessions.

His father died about this time and he became a wealthy man so that he was able to put his scheme to the test, for he resolved to try to civilise the natives himself. He bought a yacht and having tested it and trained its crew for three years in the Mediterranean he sailed for the East Indies on his grand adventure.

Ridding the Seas of Pirates

He reached Borneo and found Raja Muda Hassim, the uncle of the Sultan of Borneo, occupied in putting down a revolt of some natives in Sarawak, then a province of Borneo. He went to the assistance of the Raja and together they succeeded in overcoming the rebels. As a reward Muda Hassim gave him the title of Raja of Sarawak, having deposed the previous holder of this title for that purpose. Thus James Brooke became Raja Brooke, and absolute ruler of the district, or country of Sarawak.

Raja Brooke made a set of rules for his people and sought to carry out his scheme of civilising them. Feeling that commerce would assist greatly in this, and that this could not become successful to any great extent unless piracy, which at that time was rife, was stopped, he set about attacking the pirates in their bases. He was eventually successful in ridding the seas of these pests, although only after commanders of various British warships had assisted him and after immense slaughter. (*Continued oot of next column*)

FIRST STAMP COMPETITION

First Prize ... ... Stamps to the value of 10/6
Second Prize ... ... Stamps to the value of 5/-
Third Prize ... ... Stamps to the value of 2/6 (to be chosen from advertisements in this issue)

Owing to the great popularity of the stamp competitions we held some time ago, and to satisfy continued requests for their renewal, we begin this month a new series of competitions specially relating to stamp collecting.

For our first contest, readers have to state the country of issue of each of the stamps illustrated above. This is a good test of observation and competitors are required to describe, as shortly as possible, how they traced the nationality of each stamp.

Arrange your solutions for each stamp as follows. First, give the number of the stamp; second, the name of the country to which you think it belongs; and third, how you found out that it belongs to this country. For example, you might write (although you would be wrong if you did!): "No. 5, Peru. I know that this is a Peruvian stamp because it shows a view of the suspension bridge at Paucartambo." Add your name and address and state the stamps you choose if you win the prize and post to us before 30th September.

Stamp catalogues may be used but outside assistance must not be obtained, and we trust to the honour of competitors that this condition is observed.

Sarawak was until that time not a British possession but with Labuan it was purchased from the Sultan of Borneo and Brooke was allowed to retain his unique position. Sir James died in 1868 and his nephew, Sir Charles Brooke, succeeded him as Raja. In 1917 Sir Charles died, after ruling for forty-nine years, and he was succeeded by his eldest son, Sir Charles Vyner Brooke, who was born in 1874.

The Raja is absolute ruler although he is assisted by a supreme council consisting of three Europeans and four Malay magistrates. As will have been noticed the succession to the office of Raja is hereditary.

NEW ZEALAND
Map Stamp

To commemorate the return to inland penny postage on 1st October 1923, New Zealand issued a special stamp having a map of the islands as its central design. This stamp, which is illustrated here, was printed in New Zealand to the design of Mr. W. R. Bock, who also engraved the Christchurch Exhibition stamps issued in 1906. There was only the one value and the perforation gauges 14 × 15.

MECCANO

EXAMPLES OF MODEL CONSTRUCTION:

3.—Transport by Rail

THE present-day railway system is one of the greatest triumphs of engineering. For one hundred years a vast network of steel rails has gradually been extending all over the country. Means of locomotion have grown more and more efficient, until to-day we are able to travel for almost any distance at a great speed and with every comfort. It is almost impossible to imagine the everyday life of the public before the introduction of railways. Because of the difficulties of travel the ordinary individual a century ago seldom travelled far from his native town or village, with the result that the countryside beyond a certain radius was as remote to him as a foreign land.

Railway Transport is represented by a number of fine Meccano models, as will be seen from the examples shown on this page. Meccano locos are not only realistic in appearance but they may be driven by the Electric or Clockwork Motors and employed in building up complete working model railways.

Meccano Outfits range in price from 3/6 to 370/–, and may be obtained from all leading toy stores. Ask to see them.

MECCANO LTD., Binns Rd., LIVERPOOL

In Reply

In these columns we reply to suggestions regarding improvements or additions to the Meccano and Hornby Train systems. We receive many hundreds of such suggestions every week, and consequently we are able to publish only ideas that show particular interest or ingenuity. Every idea, however, whether acknowledged in these columns or not, is carefully examined and considered. Practical suggestions that prove to be in popular demand are marked down for adoption at the first available opportunity. It would be of great assistance if readers, when submitting suggestions for consideration, would write them on separate sheets of paper and include their name and address on each sheet used.

Suggested Meccano Improvements

MECCANO ANNUAL.—Your suggestion is a good one. We have several schemes of a similar nature already in hand concerning a special Meccano publication, but we fear time will not permit its introduction this year. (*Reply to M. McCarthy, Newtown Shandrum, Co. Cork*).

MECCANO BOY'S DIARY.—We certainly believe that a pocket note-book or diary specially compiled for the use of Meccano boys would prove interesting and useful, and we shall consider your suggestions carefully. (*Reply to S. Edwards, Welling; E. Fewster, York; and J. W. Scott, Westbury-on-Tyne*).

MINIATURE RAILWAY ARTICLES.—We intend to devote a considerable amount of space in future issues of the "*M.M.*" to articles dealing with model railways, etc. Meanwhile we cordially invite readers to send in contributions on this subject, for we feel sure that many Hornby Train enthusiasts would be able to put forward ideas and suggestions concerning layouts and model train operation that would prove extremely interesting to our readers. (*Reply to R. Plumb, Ruislip, and others*).

MECCANO BOY'S POCKET - KNIFE.—Your suggestion concerning the manufacture of a pocket-knife equipped with spanner, screw-driver, Clockwork Motor and Loco Keys and other items likely to prove useful to the Meccano boy is certainly novel, and will be borne in mind. (*Reply to J. E. Boxley, Leyton, E.10*).

Suggested New Meccano Parts

PERFORATION IN CRANK HANDLE.—We do not think it wise to revert to the practice of punching a hole in the shaft of the Crank Handle, since it is seldom found to fall in the exact position required. Cord may be secured by tying to a Spring Clip, or to the set-screw of a Collar or other part, nipped in place on the Crank Handle. (*Reply to H. Walmesley, Aberystwyth, and S. M. Spoor, Newcastle-on-Tyne*).

COMPRESSION SPRINGS.—See our reply under this heading in the April "*M.M.*" (*Reply to H. Walmesley, Aberystwyth; K. R. Mathews, Eastbourne; and C. H. Barratt, Southampton*).

WIRE WHEELS FOR CARS.—Your proposed miniature wire wheels for motor cars would prove very expensive to manufacture. Moreover, they would not be adaptable to other types of models. The 3" Pulley Wheel with Rubber Ring serves as a neat road wheel for the majority of Meccano motors, and its appearance may be improved if desired by adding a disc fashioned from a piece of tin. (*Reply to R. C. F. Catterall, Eastbourne*).

MINIATURE INSULATORS.—Your suggestion will be examined carefully. (*Reply to L. Pugh, Southend-on-Sea*).

HELICAL GEARS.—See our reply on this subject in the "*M.M.*" for March 1926. (*Reply to F. Pearce, East London, S.A.*)

FLANGED TRIANGULAR PLATE.—Your suggestion concerning the addition of a flange to the existing 2½" Triangular Plate will receive careful consideration. (*Reply to F. Pearce, East London, S.A.*

CIRCULAR SAWS.—We note your suggestion concerning the introduction of small circular saws as special parts, but we fear the demand for same would be insufficient to warrant their inclusion in the system. (*Reply to E. C. Vitel, St. Helier, Jersey*).

THREADED STRIPS.—We doubt whether the introduction of your proposed strips with threads cut in the holes is practicable. The usual form of "screw" bearing consists of a Threaded Crank or Coupling, as you remark; a neater method, however, makes use of a nut, rigidly clasped between two Strips placed face to face, through which the Screwed Rod may be journalled. (*Reply to L. P. Storey, Bristol*).

CURVED GIRDERS.—The manufacture of curved Braced and Angle Girders presents several difficulties; moreover, the adaptability of these parts would be extremely limited. (*Reply to G. Hardy, Niton, I.O.W.; F. Fawcett, York; and J. McManus, Bridge-End, Derry*).

ELECTRIC MAGNET.—Your suggestion concerning the addition of an electro-magnet for use in connection with model cranes, etc., will be considered carefully. (*Reply to J. Fowler, Mossley, Nr. Manchester*).

SMALL FLANGED WHEELS.—See our reply under this heading in the "*M.M.*" for March 1926. (*Reply to F. Aston, Palmerston, N.Z.*)

FLAT ANGLE BRACKET.—We are unable to discover any special advantages that might be derived from your suggested part, for its functions appear to be already covered by the Corner Bracket and similar pieces. With reference to your proposal for bent shafting, see our reply in the March issue. (*Reply to F. Pearce, East London, S.A.*)

6" FLYWHEEL.—A heavy flywheel of this size would prove somewhat expensive and would be suitable for use in only a few models. When such a part is required, it may be built up from existing pieces. Part Nos. 118, 143, 145, 146, etc., all lend themselves to this kind of construction. (*Reply to S. A. Shepherd, Hamilton, N.Z.*)

TUBULAR PLATES, BOILERS, Etc.—We experience considerable difficulty in standardising curved elements of this description with the existing system, but the question of their introduction is receiving attention. (*Reply to A. E. Clarke, Leicester; D. Munro, Dulwich Hill, Australia; B. Boddy, London, S.W.12; N. A. Bannatyne, Auckland, N.Z.; and S. A. Shepherd, Hamilton, N.Z.*)

1" WORM WHEEL.—We do not think this part would perform any particularly useful functions. (*Reply to S. A. Shepherd, Hamilton, N.Z.*)

Suggested Hornby Improvements

CLASSIFICATION NUMBERS ON LOCOS.—The numerals at present appearing on the sides of Hornby tank locos, indicating the wheel arrangement, will be substituted by ordinary serial numbers as early as possible. (*Reply to B. Y. Williams, Devonport; R. Beal, Leeds; D. Mumby, London, E.10; E. Crilley, Kenilworth; D. Ely, Epsom, N.Z.; J. T. Dolby, Keighley; M. Beach, Rownhams; F. C. Newton, Bristol; and others*).

NEW LOCOS.—We note your suggestions regarding the addition of 4-6-0 locos, 0-6-0 goods engines, and other six-coupled types. In this connection we would refer you to our remarks under the heading "4-6-0 locos" in the "*M.M.*" for April last. (*Reply to A. S. Maultby, Lincoln; J. A. Ratcliffe, Erith; K. Harrison, Bradford; J. Treadgold, Hunt End, Nr. Redditch; J. T. Dolby, Keighley; R. Plumb, Ruislip; E. Vivian, Parkstone; J. E. Jenkins, Terowie, S. Australia; J. Studd, Halifax; C. Dawe, London, S.E.17; H. C. H. Kerr, London, N.3; J. A. P. S. Wood, London, S.W.4; J. Hobson, Newcastle-on-Tyne; and others*).

No. 2 TANK PULLMAN SET.—See our reply under this heading in the May "*M.M.*" (*Reply to R. Coverdale, Hornsea*).

LETTERING ON WAGONS.—We are arranging to remove the descriptive lettering—such as "No. 1 Cattle Van," etc.—from the sides of certain wagons in the Hornby System. The addition of serial numbers on all goods rolling stock presents several difficulties, but we shall bear the suggestions in mind. (*Reply to B. Y. Williams, Devonport, and others*).

COUPLED WHEELS IN No. 1 LOCOS.—As previously announced we intend to go into this question carefully when opportunity occurs. (*Reply to J. Broadhurst, Swansea; G. F. Mellor, Dewsbury; P. Petty, Westcliff-on-Sea; A. Fletcher, Leeds; D. Percy, Carlisle; A. Jacobs, London, S.W.12; J. S. Smith, York; A. Jardine, Edinburgh; E. Baker, Frinton-on-Sea; and R. Clark, Dorking*).

No. 1 TANK PASSENGER SET.—See our reply under this heading in the July "*M.M.*" (*Reply to C. E. V. Awdry, Box, Wilts., and S. Colman, Cardiff*).

LARGER TURNTABLE.—We shall consider the possibility of introducing a larger turntable to suit No. 2 Tender Locos. (*Reply to L. Anderson, Glasgow; G. Miller, London, N.W.2; T. G. McDowall, Gloucester; and A. J. Blanchet, London, N.W.11*).

CAST WHEELS.—See remarks concerning these in the May "*M.M.*" (*Reply to A. Ley, Welwyn Garden City; D. F. E. Nash, Sutton; C. G. Draffery, Musselburgh; and A. J. Blanchet, London, N.W.11*).

DOUBLE RAIL JUNCTION.—Your proposed junction for double track working will receive further consideration. (*Reply to E. Vivian, Parkstone*).

SIGNAL GANTRY.—See our reply concerning this suggestion in the March "*M.M.*" (*Reply to J. E. Jenkins, Terowie, S. Australia*).

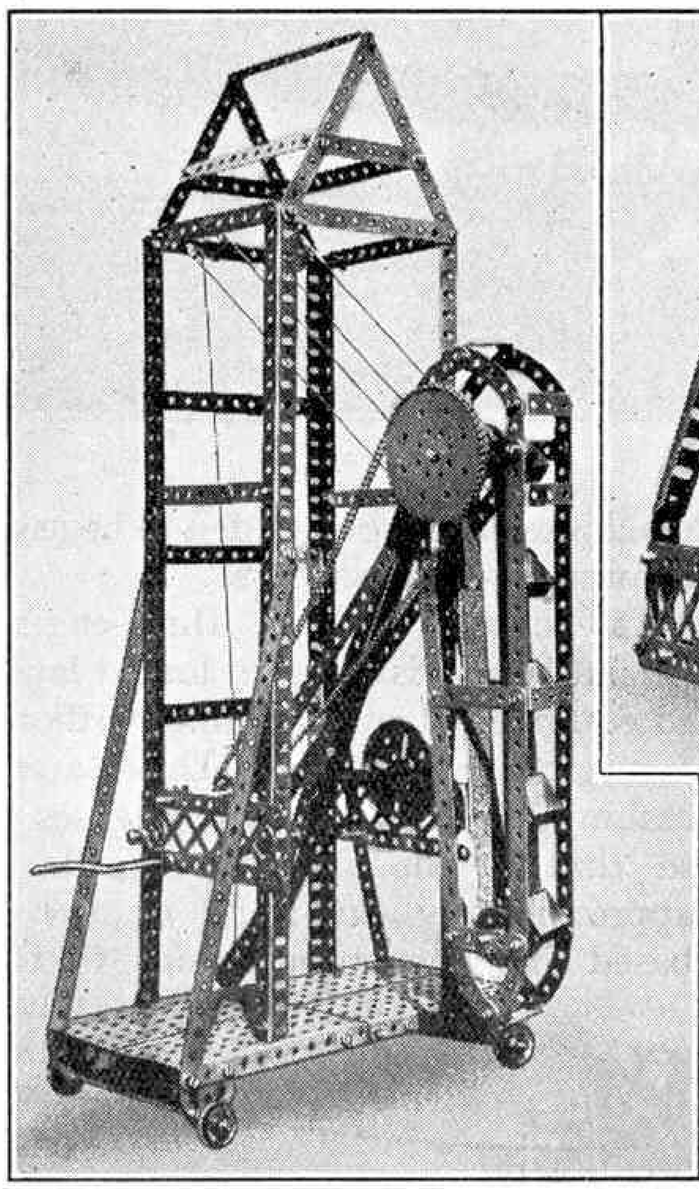
SEATS IN PULLMAN CARS.—We do not think the advantages to be obtained from the addition of seats and tables in the Pullman and restaurant cars would justify the necessary increase in cost. (*Reply to J. A. Hamilton, Harlesden, N.W.10*).

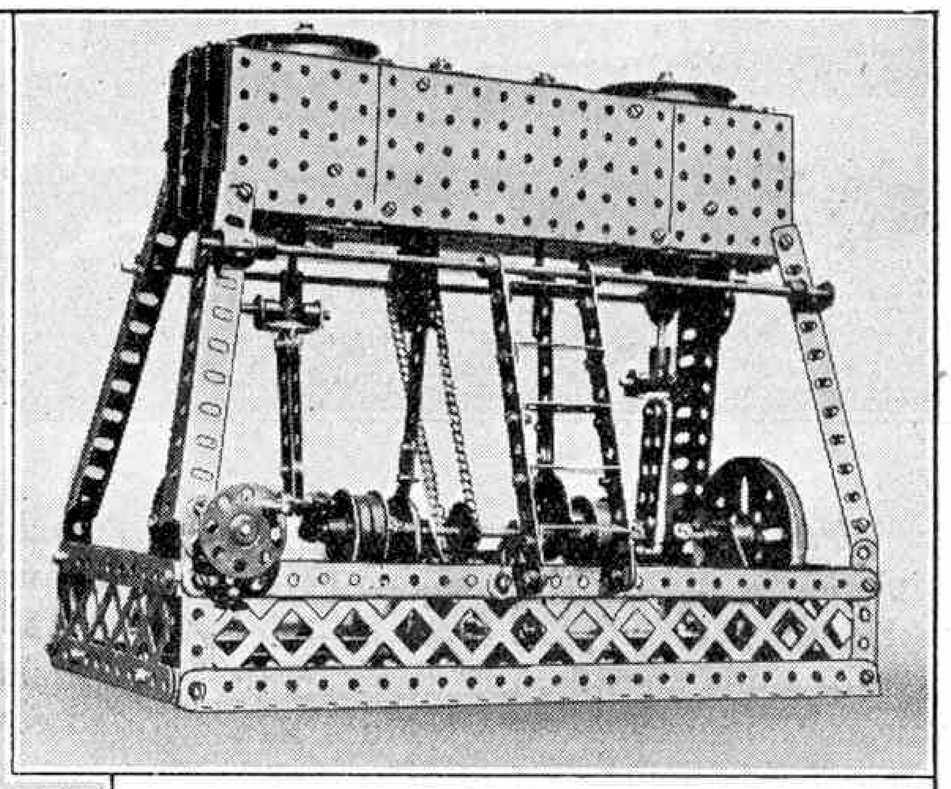
"KITCHEN" CARS AND BRAKE CONNECTIONS.—There is little demand for "kitchen" cars in the Hornby System. Regarding vacuum brake connections on locos, see our remarks on this subject in the "*M.M.*" for January 1926. (*Reply to Derek Peel, Norbury, S.W.16*).

LOW POWER METROPOLITAN TRAINS.—New Hornby Metropolitan trains, adapted to run from an accumulator and from clockwork mechanism, are in course of construction. (*Reply to E. W. White, Islington, N.1*).

THREE-WAY POINT.—We have experienced very little demand for a three-way point, but your suggestions have been noted. (*Reply to O. P. Dinnick, London, and A. Prince, Point Grey, Vancouver, B.C.*)

Two Prize-Winning Models

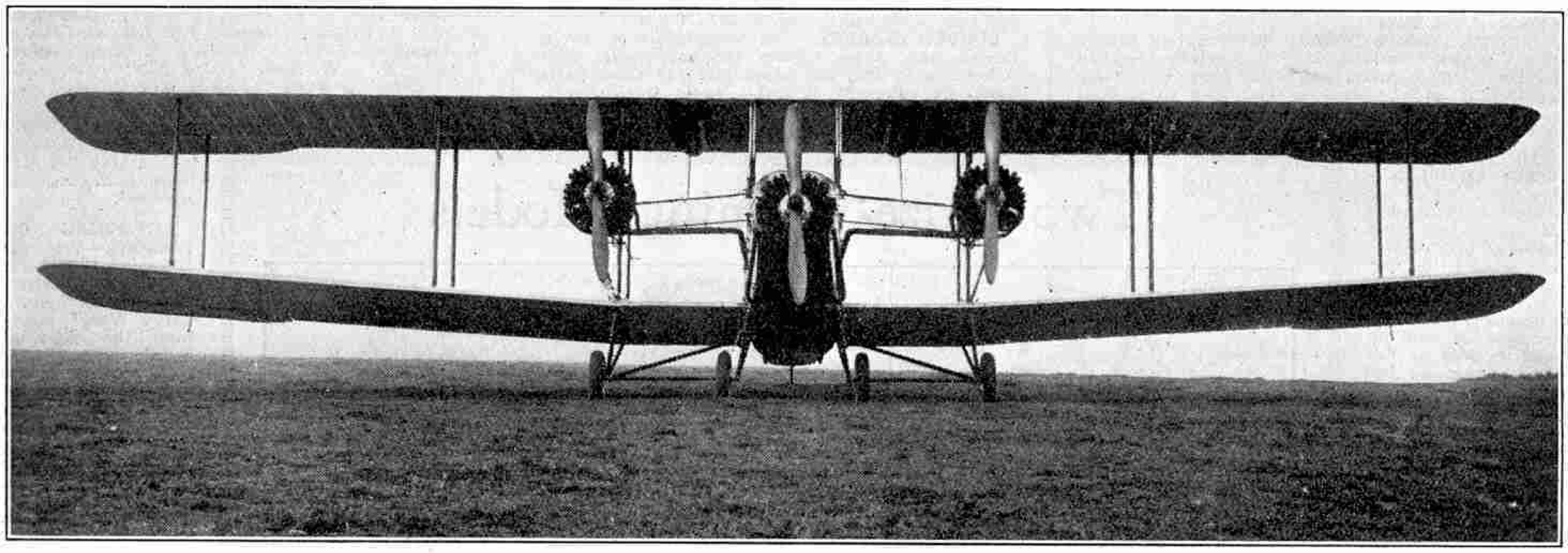




We reproduce two very interesting models that gained prizes for their designers in the recent model-building competition organised by Mr. J. Woodhall, the well-known Meccano dealer of Grange Road, Birkenhead. The left-hand illustration shows a Travelling Grain Elevator built by W. Blythe, who secured First Prize. This model was copied from the original in the Birkenhead Docks, and the piece of braid carrying the buckets is the only part used in its construction that is not included in the Meccano system. The second illustration shows a Marine Engine, for which I. Mullins was awarded Second Prize.

The Conquest of the Air

XVII. The Handley Page "Hampstead"

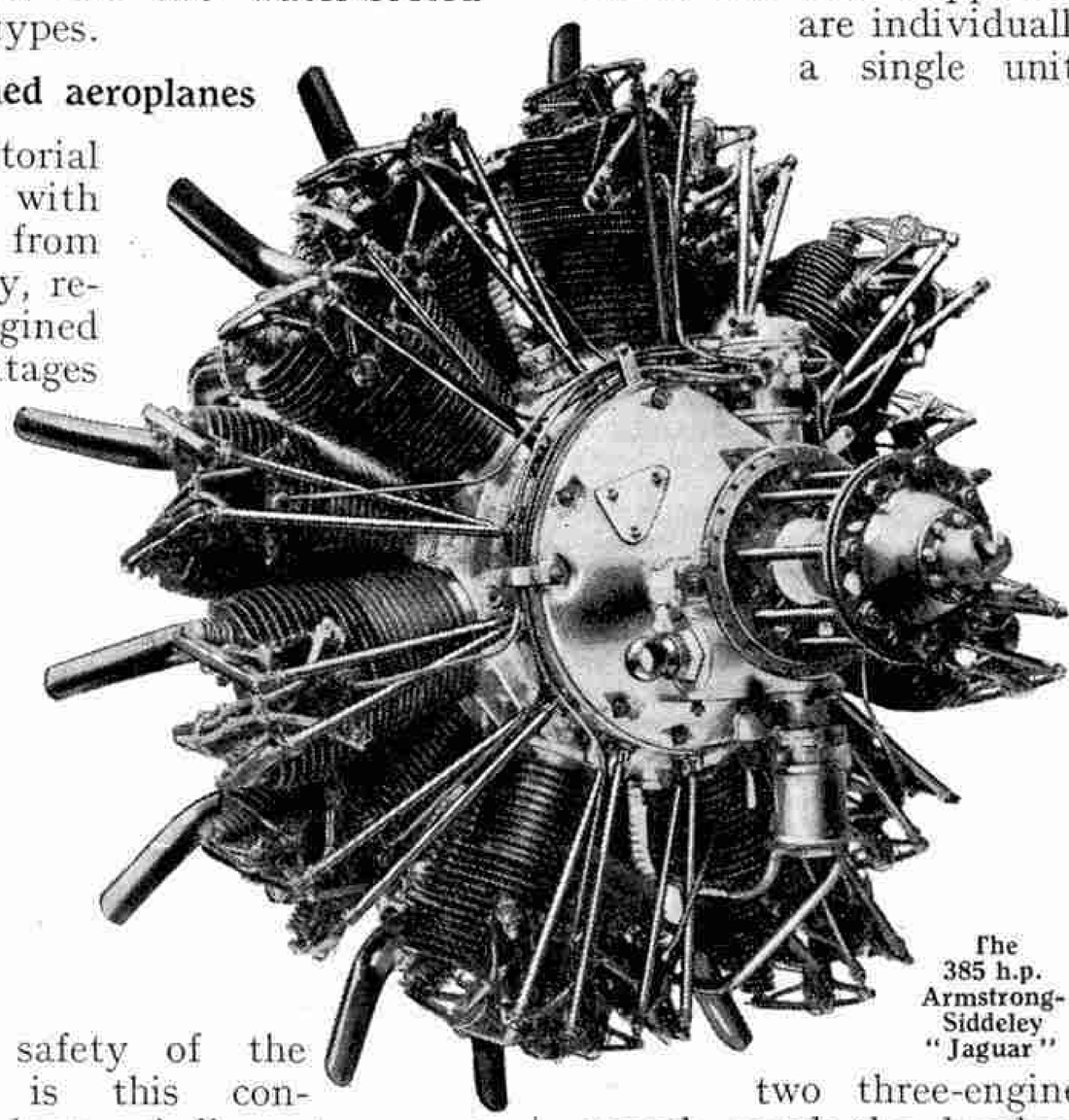


THE Handley Page "Hampstead" three-engined aeroplane is a development of the twin-engined Handley Page W.8 type air-liners that have been flying for some considerable time on the London-Paris air route. Some of these machines have now flown more than 3,000 hours—or approximately 300,000 miles—and have carried many thousands of passengers. The later "Hampsteads" are equipped with three air-cooled Armstrong-Siddeley "Jaguar" engines, however, in place of the two water-cooled engines fitted in the earlier types.

The Advantage of three-engined aeroplanes

As we explained on our Editorial page last month, in dealing with the new D.H. 66 air-liners, from the point of view of regularity, reliability and safety, a multi-engined machine offers great advantages over the single-engined type. Theoretically, the three-engined aeroplane is capable of flying satisfactorily when only two of its engines are at work, and experience has shown that the possibility of two engines giving out at the same time is exceedingly remote, so that the chance that all three engines would simultaneously give out is practically negligible.

The primary idea behind the introduction of three engines, of course, is the safety of the machine. More especially is this consideration necessary in the large air-liner types of machines that are intended to be used largely for carrying a number of passengers.



The 385 h.p. Armstrong-Siddeley "Jaguar"

In theory, with a three-engined aeroplane there should be no risk due to forced landings, and a machine so equipped should be able, without difficulty, to reach a suitable destination. This statement is based on the assumption that all three engines are of equal power, so that if one should stop, the power lost is only approximately one-third of the total. It is also based on the supposition that the three engines are individually as reliable as the engine of a single unit, but should this not be the case, then the chances of a forced landing are, of course, actually greater than in the case of a single-engined aeroplane, and the advantage of the three-engined machine is lost.

First to Climb on Two Engines

So far, the three-engined aeroplane is to a large extent in the experimental stage, and no doubt there will have to be considerable developments before it gives full satisfaction. Even the present type of machine may have to be radically altered in design, but whether this will be so or not, only the future can determine. In the meantime the Handley Page "Hampstead," and the other two three-engined machines mentioned last month, mark the development of this type.

Photograph Courtesy of] [*Handley Page Ltd.*

Side view of the Handley Page "Hampstead"

The "Hampstead," which was the first three-engined machine to fly, is easily able to fly on any two of its three engines, and can even fly for quite a long distance on one engine only. During the official trials of the first "Hampstead" it was found that any of the engines could be switched off at will and started again in flight by slightly diving the machine. All three engines were stopped in succession and re-started in the air, the aeroplane being flown with only two engines in the first case, and only one engine in the last case, the other engines being completely stopped. It is claimed that this is the first three-engined machine that has actually climbed on any two engines, and with two engines only running the aeroplane has a rate of climb at 2,000 ft. of 200 ft. per minute. With one engine only running, the aeroplane descends at a rate of 200 ft. per minute and at a gliding angle of approximately 1 in 20. The machine will also take off with only two engines running.

The trials, which were conducted with a full load on board, conclusively prove the ability of the "Hampstead" to fly to its destination fully laden and with one engine stopped. This is in accordance with the plans of the designers, the machine having been intended to provide a margin of safety, rather than to give a high paying load per horse-power for the three engines installed.

Principal Dimensions of the "Hampstead"

As mentioned last month, the three British machines of the multi-engine type are all biplanes, although abroad the monoplane is the type favoured for three-engined machines. Commander Byrd, for instance, flew to the North Pole and back on a "Fokker" monoplane, and the Junkers machines used on the German air lines are also cantilever monoplanes. Evidently there is a battle looming ahead between the biplane and the monoplane in this class, and it remains to be seen which type will survive.

The Handley Page "Hampstead" is of huge dimensions, the span of the wings being 79 ft.; chord, 10 ft.; and the height from the chassis wheels to the highest part of the upper wing is 16 ft. 9 in. The total length is 60 ft. 4 in.

The wing construction follows the Handley Page standard practice, the outer wings for the "Hampstead" machine, in fact, being interchangeable with those of the W.8 machines. The only difference is that the inner wings, i.e., the bays between the engine struts and the fuselage on both sides of the latter, have been made wider to prevent the overlapping of the propeller slip streams and consequent propeller blade flutter. The spars are of spruce, built up to form a box section and the ribs are of the Warren-girder type. The total area of the wings is 1,563.5 sq. ft., giving a wing loading of 9.28 lb. per square foot with the machine fully loaded, and the ailerons, which are balanced by setting the hinges at some distance behind the leading edge, have a total area of 149.6 sq. ft.

The pilot and navigator are accommodated in the cockpit in the nose of the fuselage, behind the front engine, and the view from the pilot's seat—behind the central engine and in front of the wings—is uninterrupted. A special ladder at the side of the fuselage gives access to this cockpit, whilst behind the pilot's seat is a trap door that communicates with the passengers' saloon.

This saloon is a compartment 17 ft. 5 in. in length, 4 ft. 5 in. in width and 5 ft. 10 in. in height, with lavatory accommodation at the rear. Fourteen cane seats are provided for passengers, and a luggage rack runs the whole length of the saloon on either side. An air-speed indicator and an altimeter are fitted so that the passengers may inspect them at will.

The Ventilating System

The cabin is heated by hot air obtained from the exhaust manifolds of the front engine, and the heat may be turned on or off by the passengers as required.

Special attention has been paid to ventilation and half the windows in the saloon are made to be opened with a very neat sliding window device, all windows being of Triplex glass.

Apart from the ventilation obtained through the opening of the windows, the air in the cabin is specially ventilated by air scoops fitted on the outside of the fuselage. These communicate with a hollow tube forming part of the luggage rack, air vents giving direct passage from the air outside into the saloon. Flowing through the cabin, the air is exhausted at the back

through suitable outlets so that no draughts are caused.

Baggage and freight is carried in a large separate compartment immediately aft of the saloon, with a capacity of 146 cu. ft. A separate door to this compartment, provided with special locks for sealing, is of sufficient size to admit bulky parcels.

The 425 h.p. "Jaguar" Engines

The "Hampstead" is fitted with three Armstrong-Siddeley "Jaguar" engines, the bore and stroke of which are 127 mm. and 140 mm. respectively. These engines, which have been the subject of searching tests both in actual flight and on the test-bench, each have 14 cylinders of the radial air-cooled type, rotating in a left-hand tractor direction. The engines are mounted one each between the port and starboard wing in the inter-plane struts and one in the nose of the fuselage.

The rated horse-power of each engine is 385/425, and 410 brake horse-power at the minimum revolutions of 1,700 per minute. Although normally rated at 385 h.p. the engine actually develops 435 brake horse-power at maximum speed.

The cylinders are arranged in two planes around a central crank-case, the seven cylinders of each group having their pistons connected to one of the crank pins of a two-throw crankshaft. The propeller is mounted on the forward end of this crankshaft without any reduction gearing. The Zenith carburetter, two B.T.H. 14-cylinder magnetos, and the distributors are located at the rear of the crank-case.

We have mentioned above that the "Jaguar" has been subjected to searching tests, and in this connection it may be mentioned that it was this type of engine that took Mr. Cobham from London to Cape Town and back, a distance of 17,000 miles. This was the first occasion on which a radial air-cooled engine was used on a flight of this nature, and the "Jaguar" accomplished all that any aero engine, of whatever type, could be expected to do. On his return Mr. Cobham stated that never at any time had there been the slightest suggestion of engine trouble. Although the extreme temperatures met with must have been trying to the engine, and although more than once, flying in sandstorms caused the air intakes to be smothered in sand, the engine ran as well as ever.

Aluminium Cylinder-Heads

The success of the Jaguar engine is in a great part due to the type of cylinder-construction employed, and in particular to the method of attaching the hemispherically-shaped heads of cast aluminium alloy to the steel cylinders. The cylinders, turned from steel forgings, are screwed into the heads and secured by locking rings. At the other extremity the cylinders are attached to the crank case by steel adapter sleeves, which are screwed on to the lower ends of the cylinder-barrels, fitting into corresponding recesses inside the crank-case casting.

The pistons, 5 in. in diameter, are of cast aluminium alloy. They have four rings, two of which are gas rings, the others being oil-scraper rings. The gudgeon pins are hollow and float in both the pistons and the connecting rods, lateral movement being prevented by split pins.

Each group of pistons is connected to the crankshaft by a master connection-rod of "H" section, and six tubular auxiliary rods. The crankshaft is made up in one piece and has two throws 180° apart, with gun-metal balance weights bolted to the extension of the webs.

The cylinders have one inlet and one exhaust valve of the overhead type, the valves being seated on aluminium bronze rings and worked by rocking levers and hollow push rods. The exhaust pipes are short steel bends, cut off at about 45° and slightly flattened at the ends.

A special throttle control device is incorporated and operates all engines as required.

The induction system is particularly interesting, its special feature being the employment of a fan to draw the mixture from the carburetter and to supply it uniformally to the cylinders and at a pressure above that of the atmosphere. This fan resembles the supercharger fitted to "Ladybird," the Sunbeam racing car described in our issue of June last, and is quite an interesting feature.

The lubricating oil circulates around the heater box, and this not only has the advantage of cooling the oil, but also of warming the mixture before it reaches the cylinders.

The petrol tanks are fitted in the upper planes and are well away from the fuselage, so that there is no question of petrol fumes or vapour making the cabin uncomfortable for passengers. All-metal couplings are used so as to eliminate rubber joints from the system.

The London-Paris Speed Record

No cowling is required for the engines, and the bottom planes are provided with ample platform accommodation to facilitate easy overhaul or removal. The propellers are two-bladed tractor screws, 9 ft. 6 in. in diameter, with a pitch of 6.53 ft. The special hand-starting gear, fitted to each engine, has proved most effective, and removes any element of risk to the ground staff.

The climb at "taking off" and with full load, is exceptionally good, while the landing speed is exceedingly low—45 miles per hour. A new design of under-carriage—rubber in compression—entirely absorbs all shocks so that the landing is quite free from bumping.

The weight of the "Hampstead" unladen is 8,364 lbs. and the total weight laden (14,500 lbs.) includes the following :—Weight of equipment (instruments, wireless, electric lighting and cabin equipment, etc.) 476 lbs. Weight of crew (pilot and navigator) 360 lbs. Weight of fuel (petrol—220 gals. sufficient for a flight of 4/5 hours) 1,670 lbs.

The weight of the paying load is estimated at :—Passengers (14 at 160 lbs.) 2,240 lbs. ; Luggage and Freight, 1,150 lbs., total 3,390 lbs.

The particular machine illustrated on pages 570 and 571 is in use on the London-Paris service of Imperial Airways Limited, and has already covered a total distance of considerably over 3,000 miles, carrying 102 passengers and 10,500 lb. of freight, exclusive of luggage. Its maximum speed, at a height of 1,000 ft., is 116 miles per hour, and the cruising speed at that height, with full load, is about 100 miles per hour. The machine now holds the record for the fastest flight between Croydon and Le Bourget, having on the 10th March last, accomplished the journey of 205 miles in 86 minutes, carrying 10 passengers.

The normal landing speed is 45 miles per hour, and the run required to pull up is about 200 yards ; in getting off, the run is about 280 yards. The rate of climb near the ground level is 900 ft. per minute, and the service ceiling is 13,500 ft.

Previous articles in the "Conquest of the Air" series have appeared as under :—

1.	The Lympne Trial for Light Monoplanes ...	March	1925
2.	Beardmore "Wee Bee I."	April	"
3.	Super-Seaplanes for U.S. Navy	May	"
4.	Argentine Airman's Attempt to Circle the Earth	June	"
5.	Parnall "Pixie III."	July	"
6.	De Havilland "Moth"	August	"
7.	Beardmore-Rohrbach All-Metal Flying Boat ...	October	"
8.	Fokker C.V. Scout	November	"
9.	Vickers "Vimy" Ambulance	December	"
10.	The Cierva Auto-Giro Flying Machine	January	1926
11.	Boulton "Bugle"	February	"
12.	The Flight from London to the Cape	March	"
13.	Light Aeroplane Clubs	April	"
14.	D.H. 54 (de Havilland "Highclere")	May	"
15.	Vickers (Rolls-Royce) "Vanguard"	June	"
16.	De Havilland "Hercules"	August	"

Electricity—(*continued from page* 555)

the picture would be transmitted all the time.

Methods of Telegraphing Pictures Impracticable for Television

The rotating cylinder methods of transmitting and receiving photographs and drawings as described in the series on "Telegraphing Pictures" are quite useless so far as television is concerned. At present to transmit by means of a cylinder merely a simple picture takes at least several minutes. Even if this time could be shortened to the 1/16th part of a second that, as we have seen, is the maximum time allowable, there is the difficulty of changing cylinders on the transmitter at this rate. The fact that the receiver is of a cylinder type also makes it impossible for the pictures to be immediately visible. Incidentally there is also the expense of making the necessary large number of cylinders, each to contain a picture slightly different from that in the previous one.

Two Definitions of Television

The word Television may be interpreted in two ways. First, it may be considered as the transmission of an electrical interpretation of a succession of previously prepared pictures, in such a manner that they will be received and rendered visible one after the other, so as to form an apparently moving picture. This amounts to the ordinary cinema with electric instead of light transmission between the projecting camera and the screen.

On the other hand, television may be regarded as the making visible at one place of actual scenes and events occuring at another place, at the same time.

Many schemes for the accomplishment of both these conceptions of television have been devised and next month some of them will be described.

Competition Page

Doublet Word Puzzles

Lewis Carroll, the famous author of "Alice in Wonderland" and "Alice Through a Looking-Glass," was very popular and had a large circle of friends. Some of these friends complained that the day's social round was not sufficient to occupy their minds and that time hung heavily on their hands. In order to relieve their tedium Carroll invented the word game known as "Doublets." His friends received this game with so much enthusiasm that after a while he was persuaded to introduce it to the public. It "caught on" immediately and became quite a rage.

We are confident that our readers will find this form of puzzle very fascinating and at the same time amusing. The rules are very simple. Two words, each containing the same number of letters, are given and are termed the Doublet. It is required to change the first word into the second by placing connecting words between them, each new word differing from its predecessor only by the alteration of one letter. These connecting words are termed "links." It is obvious, of course, that only words of exactly the same length as those comprising the Doublet may be used.

It is important to note that only well-known English words are admissible and names of persons or places are not allowed.

To guide our readers in solving the Doublets given below, the following examples are given :—

Fit	HOOK	to	BOLT.	2 links wanted
	HOOK–book–boot–BOLT.			
Change	PIG	to	RAT.	2 links wanted
	PIG – pit – pat – RAT.			

It will be seen that the changing of only one letter occurs in each link and that there is no reshuffling of the letters.

Below we give a list of Doublets to be solved and by their side the number of links required to complete the chain.

Change	BOY	to	MAN	2 links wanted
Burn	COAL	to	COKE	6 links wanted
Change	PLUM	to	PEAR	4 links wanted
Kick	BALL	with	FOOT	5 links wanted
Sting	LAD	with	BEE	2 links wanted
Complete	HOME	with	ROOF	4 links wanted
Fit	LOCK	on	DOOR	3 links wanted
Lift	BLOCK	with	CRANE	4 links wanted
Build	MODEL	with	PARTS	5 links wanted
Waft	SHIP	with	WIND	

In the case of the last Doublet, we leave the correct number of links to our readers' ingenuity—the lower the number, the better the solution.

Prizes of Meccano or Hornby Trains to the value of £1-1s.-0d., 15/–, 10/6, and 5/– respectively will be awarded to the senders of the best four sets of solutions. Entries should be addressed to Doublets, Meccano Magazine, Binns Road, Liverpool, and sent to reach this office not later than September 30th.

Overseas closing date: December 31st.

September Essay

It is not an easy task to provide month after month fresh subjects for our Essay Contests that will appeal to the majority of our readers, but if we may take the recent Sports Voting Contest as a guide, this month's subject, "Test Match Conditions—How to Improve Them," should be of general interest.

The last of this season's Test Matches has been played and the "Ashes" have been won and lost. Behind the recollection of this great fight to a finish there is, however, the unpleasant memory of four uncompleted games. Obviously conditions that produce so unsatisfactory a result call for drastic revision and we want as many readers as possible to enter for this contest and let us know their opinions. Many suggestions have been made—the return to natural turf wickets, changes in the size of the wickets, the bat or the ball, alteration from three days to four, etc. All that competitors have to do is to state clearly and briefly which of these or any other changes would, in their opinion, help to do away with the aggravating and disappointing succession of unfinished matches.

Prizes of £1-1s.-0d. and 10/6 respectively will be awarded to the best and second best entries in Section A for those of 16 and over and Section B for those under 16. Entries should be marked "Test Matches" and should reach this office not later than 30th September. Overseas Closing date, 31st December.

Results

Summer Pastimes Voting

While not constituting a record, the number of entries for this contest was heavy. The voting was extremely close after the overwhelming choice of cricket for the premier position, and the eventual order was cricket, tennis, motoring, cycling, swimming, photography.

The awards were as follows: 1st, D. Haigh (Huddersfield); 2nd, F. Oldham (London, E.16); 3rd, R. Holmes (Huddersfield); 4th, W. J. Oliver (Dartford); Consolation Prizes were awarded to: D. F. Draper (Thatcham, Berks.); G. Brockie (Wakefield).

16th Drawing Contest

The awards were as follows: First Prizes: Section A, N. Edgar (Blaydon-on-Tyne); Section B, R. Forrester (Carlisle). Second Prizes: Section A, D. A. Stewart (Portsmouth); Section B, R. M. Macdonald (Belvedere, Kent).

July Essay

Opinion on the respective merits and demerits of League and County cricket appears to be very evenly divided among our readers and a specially gratifying feature of the contest was the reliance of the protagonists upon an exposition of the strong points of their own style of cricket rather than upon a re-iterated denunciation of the weaker points of their opponents' game. Thus was the spirit of "cricket" maintained even in this contest.

It was perhaps to be expected that the Northern counties should be strongly represented among the entries submitted, for Lancashire and Yorkshire may be said to be the natural home of League cricket. But, strangely enough, nearly 75 per cent. of the entrants from those two counties voted in favour of County cricket, and gave reasons typical of the North-Countryman.

The awards are as follows:—First prizes: Section A, G. H. Adamson (Surrey); Section B, L. Smith (London, N.W.10). Second Prizes: G. F. Marsh (Blackpool); Section B, F. Ripley (St. Helens, Lancs).

Overseas Results

March Essay

It has been truly said that the happiest man is he who can find something to excite his interest even in his apparently wasted time. That may well be termed the keynote of this essay, the subject of which was "A half hour on a Railway Station Platform." With only one exception every entrant found himself obliged to wait those thirty minutes owing to the lateness of a train, and every moment was one of pleasurable excitement. He must be a very superior person who does not experience some thrill or another on entering a great station, and to students of locomotion, engineering, organisation or human nature there can hardly be a dull moment on a station platform.

The awards were as follows:—First prizes: Section A, J. T. West (Ceylon); Section B, A. Conson (Jamaica). Second Prizes: Section A, P. V. Ramachandra (Bangalore); Section B, H. W. Turner (Hastings, N.Z.) Consolation Prize, N. Eustis (Alberton, S. Australia).

14th Drawing Contest

The awards are as follows:—First Prizes: Section A, H. V. Reynolds (Georgetown, British Guiana); Section B, F. S. Brown (Sydney, N.S.W.) Second Prizes: Section A, F. Scheer (Holland); Section B, B. Whyte (Hastings, N.Z.)

March Sharp Eyes

Evidently our readers found this picture of special interest and rather more difficult than the February picture, for the number of entries was bigger while the average number of mistakes found was considerably lower.

A point that struck us particularly in this connection is that the great majority of the entrants adopted a systematic method of registering the errors found, classifying certain areas of the picture, and placing all errors from that area together.

The awards are as follows:—1st, A. Grosvenor (Sydney, N.S.W.); 2nd, A. G. Reid (Auckland, N.Z.); 3rd, G. Griffin (Chatswood, N.S.W.); 4th, J. Welch (Johannesburg, S.A.)

Books to Read

Long ago, even in the early days of civilization, the man who could weave tales of mystery and imagination was always in great demand. In those far-off days people depended on the story-teller for their amusements, as well as for their knowledge of countries other than their own.

All through history we hear of men of wonderful imagination and descriptive powers, travelling over the country, and in return for food and shelter telling stories long into the night, while their audience listened with rapt attention.

In the Days of the Vikings

These men were known by various names, and were to be met with all over the world, wherever there was civilization. Our Viking ancestors knew them as the "*sagamen*" and there were few bands of Viking warriors that did not include at least one story-teller who could tell many a tale of prowess and adventure.

The *sagaman* wielded a wonderful power. One minute his audience would be silent and thoughtful and the next, when some gallant deed was recounted, they would rise up from their seats in honour of the hero, and the rafters would ring with the sound of their cheers. Thus could the *sagaman* influence the minds and moods of his comrades. On the eve of any battle he would inspire them to deeds of daring by his tales of bravery and heroism.

"When Knights were Bold"

In the Age of Chivalry the story-teller was called the "*jongeleur*." He wandered from castle to castle telling the knights and their ladies marvellous tales of bravery and romance. At this time the monks were the only people who possessed the knowledge of writing and, although the knights were often the highest people in the land, only a few were able to read! Books were rare and seldom seen, and messages were carried by word of mouth.

To-day it is the exception to find anyone unable to read or write, and every Meccano boy is, in this respect, better equipped even than the knights of old! We cannot ride out to the joust and engage in mortal combat, but we can read and write!

The Joys of Reading

We are not dependent on the *sagaman* or the *jongeleur*, but are free to choose our stories from an almost limitless treasure-house of books. At any time we wish, and in the comfort of our own homes, we may be transported far back into the age of adventure without difficulty. Then we can glory in the deeds of brave men whose names are famous in our country's history. We can journey "in the twinkling of an eye" into far distant lands, where strange men and weird customs hold sway. We can read of the tragedies and the triumphs of those who have lived in by-gone times or in distant countries, and we can find entertainment in thousands of other subjects too numerous to mention.

Reading makes all this possible, just as writing has preserved for us the works of the greatest story-tellers that have ever lived. Here men of wonderful imagination have created brave and beautiful characters that will live for ever in the minds of men. As long as men retain their love of story-telling, the names of men like Dickens, Thackeray, Scott and a host of other great authors, will ever remain famous and beloved.

Nor has the present century allowed the precious heritage of romance to pass by unheeded and unenriched. To the works of those past masters have been added the genius of men like Sir J. M. Barrie, the creator of "*Peter Pan*," the wonderful stories of imagination of H. G. Wells, Sir Rider Haggard's great tales of adventure in distant lands, and above all, the immortal writings of Rudyard Kipling.

Books of Every Kind Available

It is impossible to read the works of all the great writers, for the love of story-telling has borne fruit in countries other than our own. Tolstoy, the great Russian reformer and idealist—famous for his courage, power and sincerity—has also added to the classics of literature, as have many other men of genius in other countries. Names such as Voltaire, Rabelais, Victor Hugo and Alexandre Dumas, stand out as sure proof that the art of the story-teller is world-wide and undying.

There is no subject on which some book has not been written. No matter about what we may wish to read—whether it be of past ages, romance of history, our work, our hobbies, or even our dreams—there is always some book that holds the knowledge we seek. We read for our living and we read for pleasure, and it is impossible for us to imagine a world without books.

* * * *

Readers frequently write to me asking if I can recommend books that are both of interest and of use. On this page I review books that specially appeal to Meccano boys. I do not actually supply these books, which may be obtained either through any bookseller or direct from the publishers.—EDITOR.

"The Future"

By Prof. A. M. Low

(Geo. Routledge & Sons Ltd. 5/-)

Looking into the future is always a fascinating pastime, but those who enjoy allowing their imagination to run riot have in recent years almost given up the game, for modern science is making it very difficult to visualise, even a few years ahead! Professor Low is not afraid to plunge deeply into the vistas of the time to come, however, and as he is a scientist of distinction we must respect his opinions, although at first sight some of them appear highly improbable!

His ideas embrace almost everything from trousers and trains to television! Everywhere he sees a great speeding up. The man of the future will be catapulted out of his bed in the morning, will jump into a one-piece suit, and as he descends by lift into his aerocar, will "eat" his bacon and eggs and toast and marmalade in tabloid form. Passengers who fall asleep for a few moments in the train, and so over-ride their station, may wake up in Ceylon though their tickets indicated Piccadilly Circus! The question of traffic congestion in large towns and cities will be solved by the ingenious method of fitting motor cars with air-screws. Telescopic 'planes will enable anyone to either take off from the road or ascend in a lift to a roof landing-stage!

"The question is really what science will do for mankind in the future," says Professor Low. "It is not possible to separate science from life, for it is to technical studies, in however simple a form, that mankind owes its clothing, amusement, rapid communication and general comfort. . . . The future will see immense changes in the mode of life of the world. The next century will mark a greater advancement than any in the world's history. The last 100 years has seen the greatest advance in the history of the human race, and it is not easy to conceive what progress will be made in the next, and succeeding centuries. Life in the future will in many ways be a more wonderful, comfortable and pleasant experience than can at the present be conceived."

The book, which is illustrated with some interesting drawings that vividly depict the changes mentioned, cannot be read without one feeling that we who live to-day are missing many pleasures that the Meccano boys of the future, and their descendants, will enjoy.

* * * *

"Railway Wonders"

By C. J. Allen, A.M.Inst.T.

(J. F. Shaw & Co. 2/6)

This is a companion volume to "Railway Marvels," being written in the same simple and interesting manner, and containing 96 pages, 139 photographs and 7 coloured plates. Chapters are devoted to railway grouping; electric railways; Swiss mountain railways; the building of a locomotive; signals and signalling; how railways are planned and made; and many other items too numerous to mention. Our younger readers will derive many pleasurable and profitable hours from this interesting volume, and they will gain a great deal of very useful information that will certainly make them the envy of their school-fellows.

"Experiences of a New Guinea Magistrate"
By Capt. C. A. W. Monckton, F.R.G.S., F.Z.S., F.R.A.I.
(The Bodley Head. Price 8/6)

I have read scores of tales of adventure, of pirates and cannibals, and tales of exploration, but never have I read a book that contains so many thrilling stories of daring adventures and hair-breadth escapes.

The title might for the moment suggest the atmosphere of a police court, until we learn of New Guinea as it was when Capt. Monckton first landed there. The story begins in the year 1895 with an account of the author's voyage in "*Myrtle*," a schooner of 150 tons, and we are quickly taken right into the midst of adventures that will delight the heart of any boy. From a crew that eats their cabin-boy because the more usual rations have run out, we pass on to the goldfields, to pearl-fishing cruises, salvaging sunken vessels and countless other expeditions, until at last Capt. Monckton takes up the position of Resident Magistrate.

Contrary to expectation, the excitement of the earlier episodes becomes commonplace and humdrum by comparison with what is in store! Capt. Monckton plays in turn the parts of doctor, sorcerer and explorer, in addition to his official role as Magistrate and commanding officer of the armed constabulary.

We meet crocodiles and impassable country in practically every chapter, and the natives regard every stranger as fair game for their cooking-pots, to be speared or clubbed and then roasted alive! Some of the tribes, we are told, have a pleasant custom of building in the centre of their villages square platforms on which they heap the skulls of their victims!

Not content with these terrestrial adventures, the author proceeds to dispute possession of a house with a ghost, but in this instance the ghost wins. "It's either the spirit of a dead man or a devil," said his men. "Spirit of dead man or devil, it's all one to me," remarks the author, "If it's taken a fancy to prance through my room, it can do so alone; shift my things off to the Government boat for the night." Capt. Monckton makes no attempt to explain why he and his sergeant, who had mounted guard to watch, should see doors open and hear heavy footsteps pass and another door open, without any visible explanation—he merely recounts a true story for others to puzzle out.

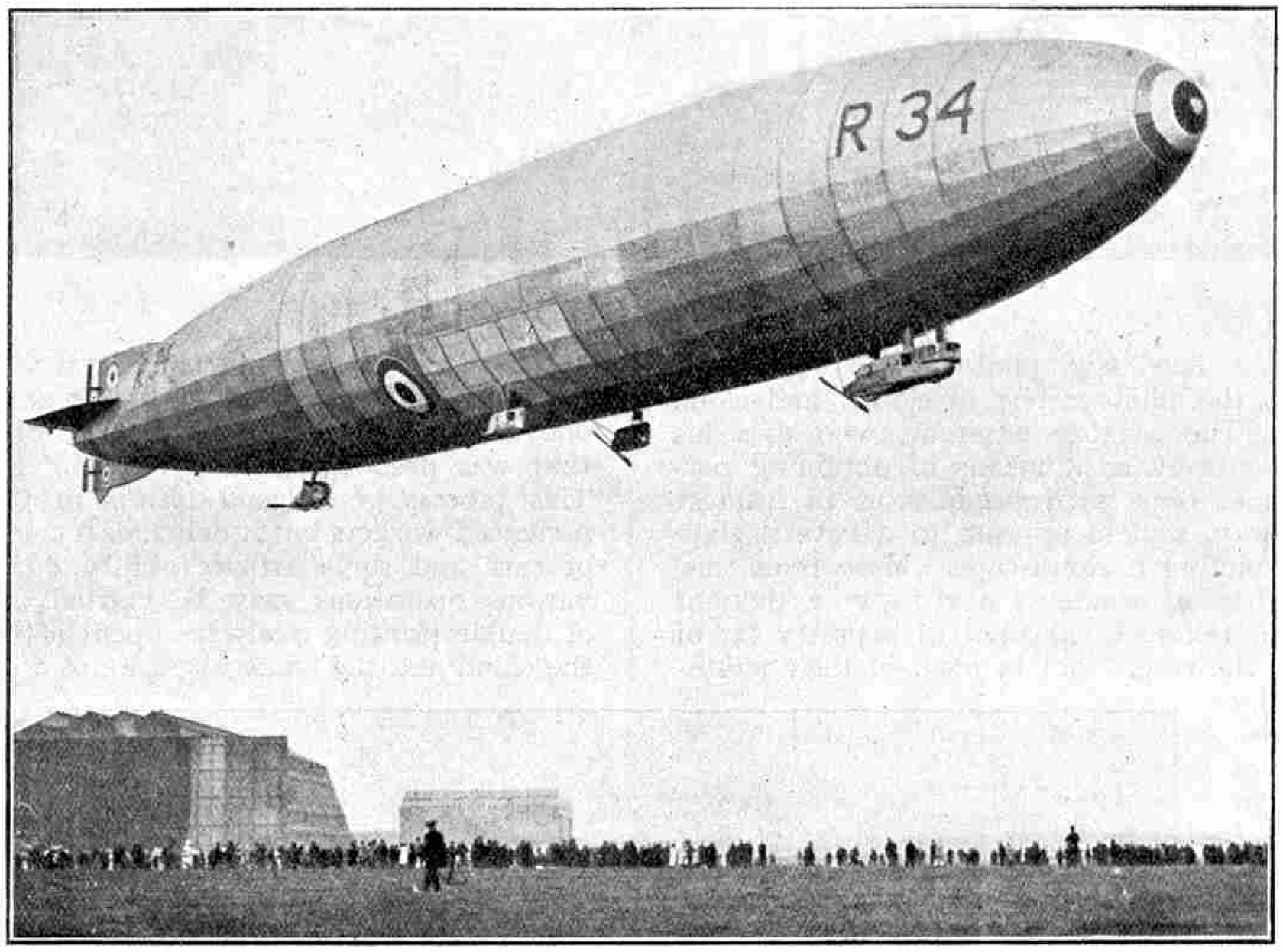
We are glad to know that Captain Monckton came safely through his explorations, his crocodiles, cannibals and ghosts, and look forward to many more thrilling stories from his capable pen.

Broadcast Reception in Theory and Practice
By J. L. Pritchard
(Published by Chapman & Hall. Price 8/6)

This book, consisting of 259 pages and illustrated by a large number of photographs and diagrams, is intended for those wireless enthusiasts who wish to do more than construct wireless sets in a mechanical manner by following given instructions. As the author points out in his preface, there are many excellent books that cater fully for those who wish to construct a set, but the amateur is very little further forward when he has made a particular set, unless he knows the principles on which it works. On the other hand there are books published on the theory of wireless that involve a wide knowledge of the principles of electricity and a high standard of mathematical knowledge. Mr. Pritchard's book is intended to fill a gap between these two types of book.

The author explains the principles of wireless reception in so comprehensive a manner that the experimenter not only makes the set he requires, but is able to adjust it or even alter it, knowing full well what he is doing. He knows exactly what will result from each alteration that he makes over and above the building instructions.

The book contains chapters on choice of materials used in the construction of sets, condensers, inductance coils, resistance, aerials, batteries, rectification and amplification, circuits, valves and fault-finding. As far as possible the book is self-contained and the reader will find in its pages all the practical information he is likely to require for ordinary purposes.



The R.34 Takes the Air (From "The Science of Flight and its Practical Application," to be reviewed next month)

"Elementary Guide to Reinforced Concrete"
By A. Fakeman
(Published by Concrete Publications Ltd. Price 2/-)

This elementary guide to reinforced concrete will be found most serviceable to those who are studying the subject and more particularly to those who wish to obtain a clear understanding of the principles of designing. Every effort has been made to keep the explanations as simple as possible, so that they may be understood by the student who is commencing a study of modern construction and the diagrams have been prepared with the same object.

The author impresses upon us the necessity for careful supervision and for the care in accurate placing of reinforcing piers, the correct proportioning and thorough mixing of concrete aggregates. He deals with the many principles involved in the design of reinforced concrete structures, and shows the nature of tension, compression and shearing stresses. He describes also the several types of beams and shows the effects produced by the different methods of using different types. Reinforced columns, the design of simple walls, are also dealt with and some attention is given to the question of foundations.

The importance of concrete in engineering is now well known, but in the opinion of many the subject is as yet only in its infancy and everyone interested in engineering, or intending to become an engineer, should study the subject very thoroughly. While the present book is more particularly adapted to the requirements of those engaged in practical work, there is a vast amount of information in it that will well repay the study.

Books Received

We have received copies of the undermentioned books during the past month, and these will be reviewed in a future issue.

"ERECTION OF ENGINEERING STRUCTURES AND PLANT" *by* Atkin Price (Chapman & Hall), 9/6

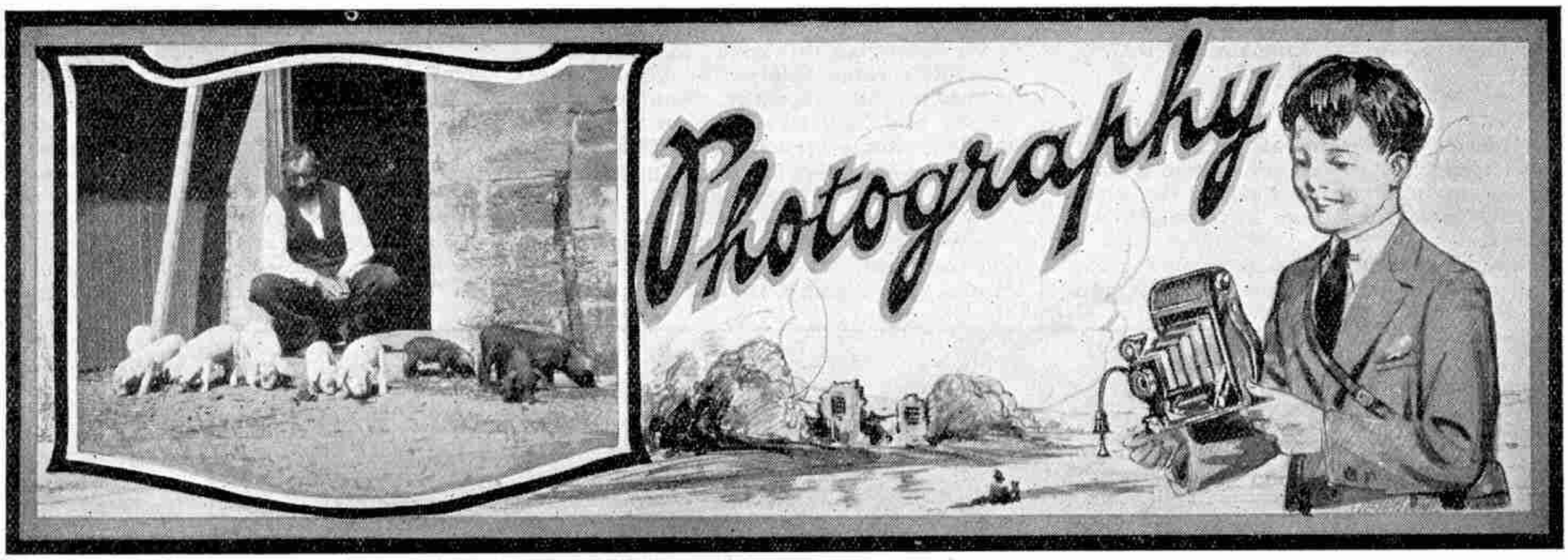
"THE SCIENCE OF FLIGHT AND ITS PRACTICAL APPLICATION" *by* Capt. H. Sumner (Crosby, Lockwood & Son), 16/-

"ELEMENTARY ELECTRICAL TECHNOLOGY" *by* A. M. Parkinson (Oxford University Press), 6/-

"FLAGS AND FUNNELS" *by* Wedge (James Brown & Son, Glasgow), 6/6 net

"THE HISTORY OF PROTOZOOLOGY" *by* F. J. Cole (University of London Press Ltd.) 3/- net

"FURTHER ADVENTURES OF ROBINSON CRUSOE" *by* Daniel Defoe (Boy's Own Paper Publishers), 2/6 net



XVIII. CLOUD PHOTOGRAPHY

IT is surprising how few photographers pay any attention to the photography of clouds and cloud formations. The average amateur, who uses his camera almost entirely as a means of obtaining permanent records of objects or occurrences of interest that come his way, seldom appears to devote a plate or a film to depicting a cloudscape. More than this, very large numbers of amateurs never give a thought to the sky when taking a snapshot of a pretty bit of landscape, with the result that in most of their photographs the sky portion appears as a blank piece of paper. It might be said: "What about a cloudless sky?" Even when absolutely cloudless the sky appears to us to be blue and therefore it should appear grey, not white, in the print. This neglect of the sky is unfortunate for it results in the production of photographs that are deprived of a great deal of the beauty and interest that they would otherwise possess.

In the early days of photography there were many difficulties in the way of obtaining successful reproductions of sky and cloud but to-day this is no longer the case.

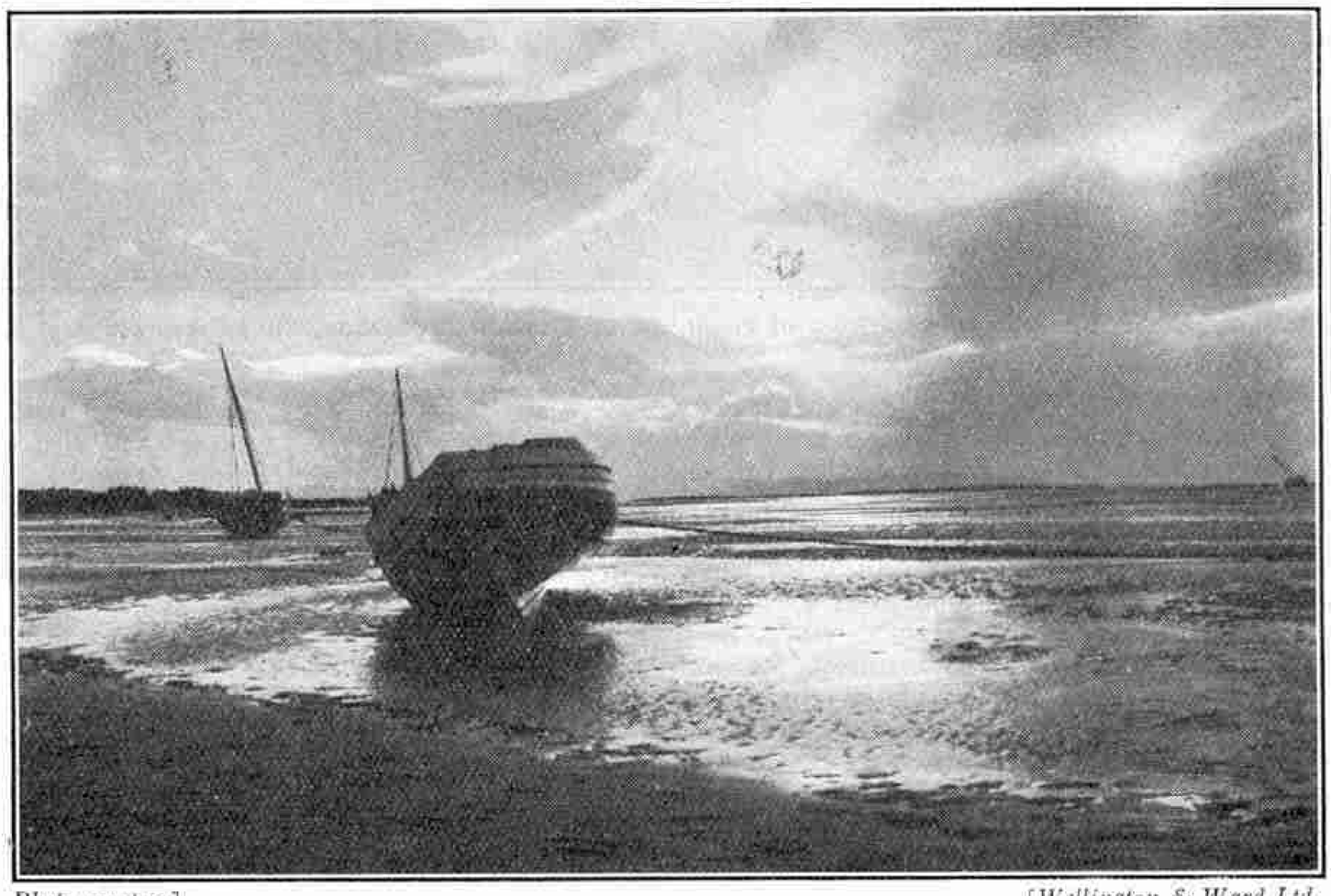


Photo courtesy] [*Wellington & Ward Ltd.*

On the Shore at Sunset

Two Different Standpoints

Cloud photography may be approached from two entirely different standpoints—pictorial and scientific. We may regard the sky as part of the landscape and be satisfied when we have succeeded in producing prints in which both sky and landscape are rendered in correct proportion; or on the other hand we may look upon the clouds as objects to be photographed for their own sake, without any regard to the landscape.

If our object is entirely pictorial we may prepare a series of negatives of clouds alone and add a suitable one to a landscape by the process of double printing that was described in the "*M.M.*" for August 1925. This process gives good results in the hands of experienced workers but it demands a considerable amount of care and some artistic ability. However well the various operations may be carried out, this method of double printing is always open to the objection that the cloud and the landscape are not a single unit. The lights and shades of any landscape at any moment are determined by the nature of the sky, and although an added sky may be selected with the greatest care in regard to its suitability, it cannot blend with the landscape as did the sky actually existing at the moment. The alternative method is to obtain both cloud and landscape on the same plate and fortunately there is little difficulty in doing this.

Cloud and Landscape

The chief difficulty in securing cloud and landscape together is that under normal conditions the correct exposure for the sky is somewhere about one-tenth of that required for an ordinary landscape. If therefore we expose correctly for the clouds the landscape is seriously under-exposed. On the other hand, if we give the correct exposure for the landscape, the clouds are so greatly over-exposed that, unless they are of a heavy type, they are lost during development and are practically invisible in the finished print.

Generally speaking, in order to secure cloud and

landscape together, it is necessary to use "orthochromatic" plates or films. What are known as "ordinary" plates are very defective as regards their colour sensitiveness. They are sensitive to blue and violet light to such an extent that an object of an intense blue colour photographs almost the same as white while a true violet also photographs much too light. On the other hand green appears much too dark, and pure yellow, and even more pure red, photograph almost as though they were absolutely black. Orthochromatic plates are treated with certain dyes which render them more or less sensitive to yellow and green, and these colours therefore are rendered much more nearly as the eye sees them. Practically all films made to-day are orthochromatic and every plate-maker produces one or two blends of orthochromatic plates of different speeds.

Colour Filters

Although the orthochromatic plate is a great improvement on the ordinary plate, it still has the latter's defect of being far too sensitive to blue and violet. This defect is serious, but fortunately it may be overcome by placing in front or behind the lens a colour screen or light filter which holds back some of the light to which the plate or film is too sensitive, while passing all the light to which it is not sufficiently sensitive.

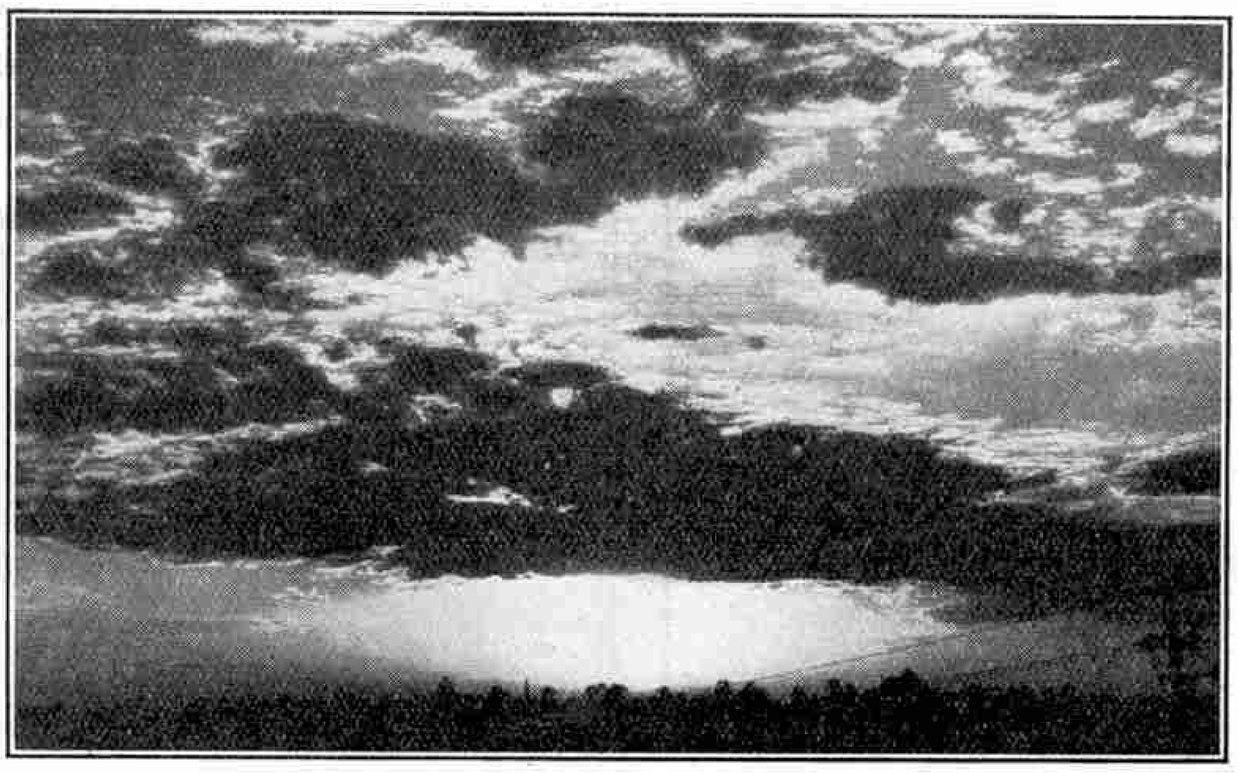
The fact that a colour screen holds back some of the light makes a longer exposure necessary, the increase depending upon the amount of light cut out by the screen. We thus have what are described as "three times," "four times," "six times" screens, etc., according to the increase of exposure they require. For general photography with a hand camera a screen that requires an exposure three times the normal is as deep as can be used.

There is no possible doubt about the improved results that are obtained when orthochromatic plates or films are used in conjunction with a light filter. This is particularly the case with the lighter forms of clouds, which usually are utterly lost when using an ordinary plate.

As an alternative to the orthochromatic plate and colour screen, we may use one of the modern plates that incorporate in the film a yellow dye which acts in much the same manner as a pale colour screen. The nature of these plates is indicated by their names, such as the Wellington and Ward "Anti-Screen;" Gevaert "Filtered Ortho;" Imperial "Ortho Non-Filter," Ilford "Auto-Filter," etc.

Still another method of securing a similar result is by the use of a graduated light filter. Unlike the ordinary filter, which is the same depth throughout, a graduated filter commences with clear glass and gradually increases in depth up to a fairly deep yellow. This screen is placed in front of the lens in such a manner that the light from the sky passes through the deep yellow portion while the light from the landscape passes through the lighter yellow and colourless portions. The result is that the light from the sky is held back and some approach to equality of exposure for clouds and landscape is obtained.

Some of the most strikingly beautiful cloud and landscape photographs are obtained towards sunset. At this period of the day the cloud formations are often very fine and "silver lining" effects are then seen that do not appear at any other time. Perhaps the most successful sunset photographs are those in which the foreground consists of an expanse of water or wet sand.



Sunrise: Clouds taken from an Aeroplane in Egypt

We are all more or less familiar with the so-called "moonlight" views. Almost all these are "fakes" in the sense that they were not taken by moonlight, but in daylight. As a matter of fact it is almost impossible to obtain a satisfactory result by taking a photograph by the light of the moon, the effect being almost invariably that of a photograph taken by weak daylight. The best moonlight pictures are obtained towards the close of the day by taking an ordinary sunset picture but giving it very much less than the normal exposure. The plate or film is then developed in the usual manner but is very considerably overprinted. The result is to produce a sky effect strongly suggesting moonlight, while the landscape part of the picture has the heavy shadows that are necessary to complete the illusion.

The photography of clouds for their own sake is quite a different matter and usually is connected more or less directly with the study of meteorology. For this work orthochromatic plates are useful up to a certain point but in order to obtain the best results we must use what are known as "panchromatic" plates, which have a much wider range of colour sensitiveness. By using a panchromatic plate along with a red light filter the utmost possible contrast is obtained.

The photograph, On the Shore at Sunset, for permission to reproduce which we are indebted to Messrs. Wellington & Ward, upon whose Anti-Screen plate it was taken, is an excellent example of pictorial photography in which a cloudscape is combined with a foreground of wet sand. The second illustration, Sunrise: Clouds taken from an Aeroplane in Egypt, was taken purely for purposes of scientific record and shows clearly the intense contrast produced by the use of a panchromatic plate and a deep screen. Incidentally, a very interesting comparison is afforded between the delicately soft gradation of tones in the purely pictorial cloudscape and the almost harsh contrast of the record.

30th Photo Contest

September is probably the best month of the year for securing cloud photographs and it is for that reason that this month's photographic article is based upon that special subject. Our contest, therefore, is to give readers an opportunity of profitably employing the teaching embodied in that article and the subject will be "A Cloud Photograph" or "A 'Moonlight' Scene."

The subject has been dealt with very fully in our article and no additional comment is necessary here. The usual two sections will be held, A for readers of 16 and over, B for those under, and prizes of photographic material (or Meccano products) to be chosen by the winners, to the value of £1-1s.-0d. and 10/6 respectively, will be awarded to the first and second prize-winners in each section.

Closing date: September 30th. Overseas, December 31st.

Result of 28th Photo Contest

It is doubtful whether any photographic contest of recent months has given competitors so wide a scope as this, for it will be remembered that the chosen title was "Happiness." So many qualities of contentment and peace with the world are conveyed by that single word that it is not surprising to find that the pictures submitted show a wide range of interpretation. Thus we are carried from the uproarious merriment of a party of school children playing in a hay field to the mellow contentment of a Chelsea pensioner, pipe in mouth and child on knee, in the evening of his days but supremely happy in his hours of ease.

The awards were as follows:—First Prizes: Section A, J. R. Toller (Ipswich); Section B, R. Norman (Chesham, Bucks.) Second Prizes: Section A, F. G. Brook (Ipswich); Section B, A. Bromley (Liverpool).

Overseas Result 23rd Photo Contest

The awards were as follows:—First Prizes: Section A, A. W. Davies (Cairo); Section B, T. S. Richards (Bombay). Second Prizes: Section A, G. Thomas (Auckland, N.Z.); Section B, J. B. Gregory (Johannesburg).

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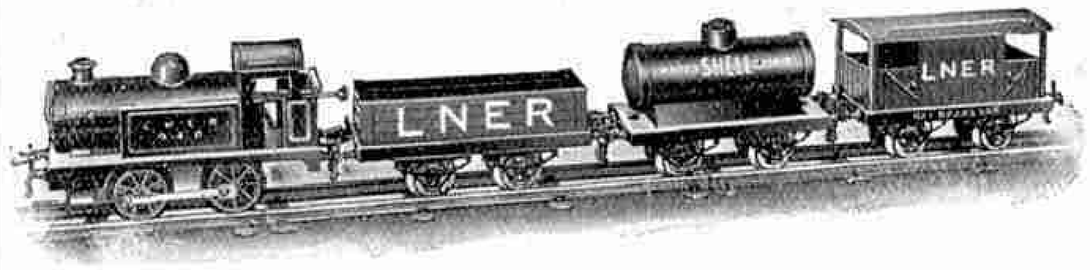

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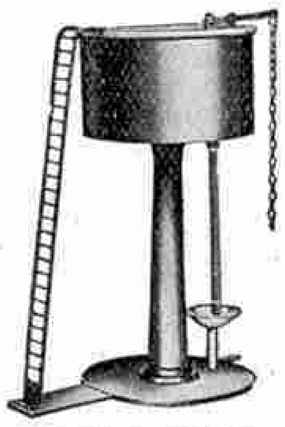

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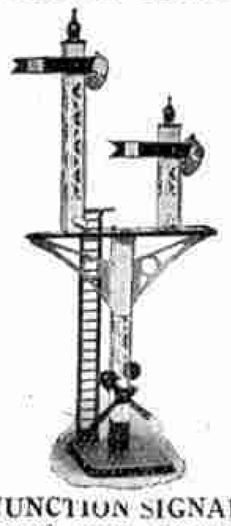

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A Famous Dolphin

"Pelorous Jack"—The Pilot of the Southern Seas

Many strange tales have been told about fish and of creatures of the deep, but no more amazing story was ever told than that concerning "Pelorous Jack," a dolphin that achieved fame, and about which at least two books have been written. By the courtesy of the Editor of "*The Ocean Ferry*," the official magazine of the International Mercantile Marine Company, we are able to reproduce the accompanying photograph and to give the following particulars of this remarkable inhabitant of the southern seas.

"Pelorous Jack"

The photograph on this page is a faithful representation of the general appearance of this celebrated denizen of the deep, as seen from the bows of a ship. He was known to sailors the world over as "Pelorous Jack," a name, by the way, that does not refer to his species but to his habitat—Pelorous Sound. He won world wide fame through his remarkable habit, pursued for many years, of piloting steamers through the waters of the French Pass, Cook Strait, off New Zealand.

Captains in the New Zealand trade for more than three decades knew Pelorous Jack by sight, and watched for him as they entered what were known as his home waters. Fourteen years ago he disappeared and it is now believed that he is no more—but he lives in the memory of thousands and his fame has multiplied with the repeated telling of his story.

The photograph of the pilot dolphin here reproduced was presented to Captain V. W. Hickson, commander of the White Star liner "*Cedric*," four years ago by Captain Post of the New Zealand Government steamer Tutanekai. The photograph was taken by a press photographer, who was accompanying Captain Post on an official trip, and was one of the best of many taken at various times.

Although Pelorous Jack was classed as *Grampus griseus*, or Risso's dolphin, he was unusual in the fact that a Risso's dolphin of his colour and habits has not hitherto been known. From 14 to 16 ft. in length, he had a blunt nose, humped forehead, scythe-shaped dorsal fin, and horizontal two-fluked tail. His body was bluish white in colour, tinged with purple and yellow, with irregular brown-edged marks running in all directions, and his flippers were blackish, mottled with grey.

Pelorous Jack is said to have been known to sea-faring men in Cook Strait for about thirty-six years. Even the Maoris claimed to have traditions concerning him, but their existence is very doubtful.

Although Jack was shot at many times, he was an object of such interest that on 26th September 1904, he was protected for five years by a special Order in Council of the New Zealand Government. On 23rd May 1906, he was again protected by clause 36 of the fisheries regulations, for another five years.

During the time he was known he met practically every steamer, by day and by night, on the Nelson-Wellington run, and escorted each one, leaping and gambolling under the bows, for about twenty minutes. The distance he escorted the steamers was something over five miles, and lay off Clay Point, from midway across Admiralty Bay off D'Urville Island to midway across Pelorous Sound off Chetwode Island.

The strange creature would sometimes disappear for a few weeks or even months, and then reappear in his old haunts. In April 1912, he disappeared finally, however, and no trace of him has since been seen. Foreign whalers visiting the locality about this time are considered to be responsible for his death, but nothing definite has been learned.

The story of Pelorous Jack has always been regarded as one of the "tallest" of sea stories but the strangest part of the story is that it is true.

It is a very interesting fact that dolphins have attracted the interest and attention of sailors from the earliest times. Their appearance was invariably regarded as being a good omen for it was believed that they gave warning of the approach of a storm. Ancient writers tell many fabulous stories of dolphins saving the lives of famous heroes.

OUR MAIL BAG

In this column the Editor replies to letters from his readers, from whom he is always pleased to hear. He receives hundreds of letters each day, but only those that deal with matters of general interest can be dealt with here.

Correspondents will help the Editor if they will write neatly in ink and on one side of the paper only.

R. Purcia (Trinidad).—

"What thing is this"? I asked myself,
To answer which a smiling elf
Trod lightly on my toe.
"Without those gleaming strips," he said,
"A million boys would nigh be dead;
They call it Meccano."

Your poem is very good, Ralph, and we are sorry we can print only one verse. We shall certainly deal with Steamships in the "*M.M.*" soon.

R. McCreath (Burton-on-Trent).—We were very pleased to hear from you again and to know that you are progressing so well in your work. You say that continually working on casks is not at all monotonous and after reading the interesting details in your letter we can quite believe that you like it. Why not send a short article for the "Reader's Page?"

D. Welsh (New York).—You are a lucky boy to be spending a holiday in New York, and your journey also appears to have been very interesting. We entirely agree that the sunset on the St. Lawrence justifies all the extravagant things that people say and write about it. Your letter was not the least tiring and we liked every line of it.

J. Candler (London).—"If you go to Folkestone, go to the zig-zag path at twilight with the band playing, but I shouldn't take your best girl or any of them for that matter. What with the swish of the sea and one thing and another even old Euclid would get romantic!" Really, John, you become more incorrigible with every letter. Who said we had a best girl, anyway?

M. Krautchenko (Rome).—Thanks for your story, which we hope to publish. We are always pleased to receive stories and articles written by Meccano boys, and any other contributions that you may send along will receive careful consideration. We hope that you have now settled down in your new home and that we shall have another interesting letter from you very soon.

L. Lacey (St. Leonards-on-Sea).—"The one thing I hope for now is the time when the '*M.M.*' will be enlarged to at least three times its present size." Excuse us while we mop our heated brows, L.L.! We are glad to know that you and your chums have all joined the Guild. If there is not a Meccano Club in the neighbourhood, we advise you to form one yourselves. That is how all our clubs were first started, you know.

V. J. Ruxton (Kirkcaldy).—Congratulations on your success in gaining a second class certificate in your Building Construction examination. We hope that you will win the first class one next year. The coincidence you related was very curious and we read of it with interest. We are glad that you like our "Suggestions Page" so well, and note that you would like to see a complete story featured each month. This is a matter on which there has been much difference of opinion amongst our readers and we shall be glad to hear from others on the point.

W. L. Carroll (Transvaal, S.A.)—"You cannot please everybody, and the '*M M.*' is the best magazine that can be purchased." We are in entire agreement with you Leslie, and although we know well that we cannot please everyone, we are out to have a good try!

E. Sykes (Johannesburg).—We read of your "Mock Trial" with interest. Many clubs include this form of activity and we consider it unrivalled for developing the debating powers of the members and for providing wholesome fun. Your club is one of which we are particularly proud.

Fred. G. Harper (Christchurch, N.Z.)—Your form of address ("Dear Meccano Man") calls up a vision of an up-to-date model sitting in an office moving jerkily all day and being packed away in a box at night! Is this your conception of our august person, Fred? We were sorry to learn about the chicken pox, which seems to have affected everyone, and hope your sister made a speedy recovery. Congratulations on winning so many prizes for school work. We have yet to meet a Meccano boy who is slow at his studies.

Boris Goumeniouk (Tientsin, China).—"I like the '*M.M.'s*' very much. They are the only books that I may read at school." That is because they contain only improving and instructive matter, Boris. You must write again as we always are glad to hear from you and from your brother.

"M.M." Readers Fly in "Moths"

Prize-Winners Take Their Flights at Stag Lane

IN connection with our recent competition, in which readers of the "*M.M.*" were invited to suggest names for the new D.H.66 aeroplanes, some of the prize-winners attended at Stag Lane Aerodrome on Saturday, 7th August, to take their prize-winning flights.

As our readers will remember, the judges finally selected the name "Hercules" for the new air-liners, and as this name was suggested by seven readers the prizes were awarded in the order of date that the entries were received. The first post card bearing the name "Hercules" reached us from E. F. Hope-Jones of Common Lane House, Eton College, Windsor, whose good fortune was no doubt envied by every one of our 60,000 readers.

In view of the fact that some of the winners of the consolation prizes, who were entitled to ten minutes' joy rides in the neighbourhood of the Aerodrome, live a considerable distance from London, it was not convenient for them all to be present on 7th August. V. R. Billings and C. J. Phillips took their flights on that day, however, at the same time as E. F. Hope-Jones.

Prize-winners get Pilot's Autograph before the Start

E. F. Hope-Jones is the second figure from the left and on his left is Capt. White. The other two boys are C. J. Phillips and V. R. Billings

The Prize-Winner's Experiences

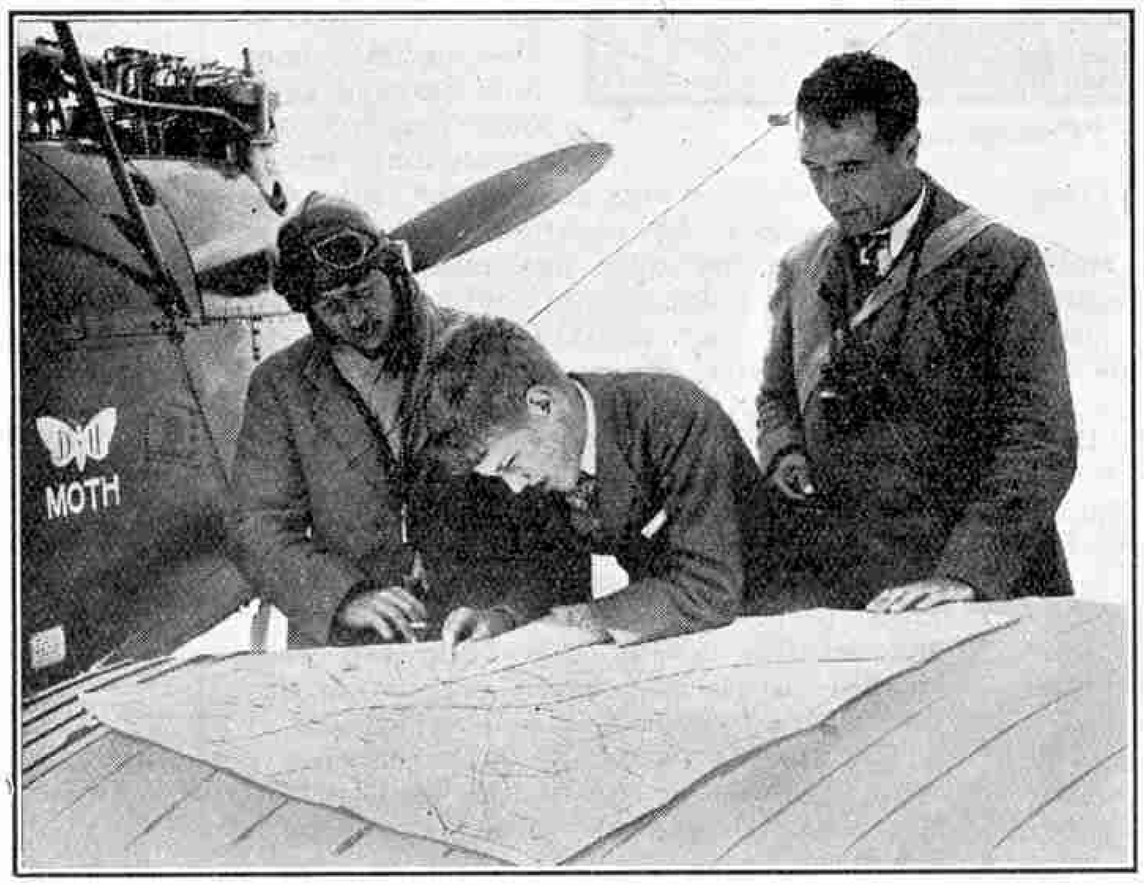
The winner of the First Prize, a 50-mile out and home flight in any desired direction, chose to fly by way of Harrow and over his own college, Eton, then up the Thames to beyond Henley, returning by an alternative route. It was his first experience in the air and he has kindly sent this account of his flight:

"I arrived at Stag Lane Aerodrome and after a short wait, was conducted to a large field. All the 'Moths' were in the air but shortly a 'Moth' (G-EBOT) came down and I was told that Captain White was going to take me up. We had our photographs taken whilst we were discussing the route and again when we were seated in the aeroplane ready to make the flight.

"We were both equipped with helmets, so that we could speak to one another, but I could only hear about a quarter of the things Captain White said (although I pretended that I could hear the rest!) owing to the noise of the engine being so great. Unfortunately at Windsor I was not feeling very well, owing to the air being rather bumpy, but we continued past Henley (about forty miles from Edgware) where we turned and commenced our homeward journey back to Stag Lane."

The Haze of London

V. R. Billings, one of the consolation prize-winners, came up from Folkestone specially for the flight and considered it an honour that he had Major de Havilland as his pilot, which fact, in his opinion, certainly added to the enjoyment of his flight. Here is his account of his experience:—



Capt. White and E. F. Hope-Jones, who is selecting the route to Eton and Henley, to which places he chose to fly for his prize-winning flight
On the right is Mr. Hope-Jones, who is Maths. Master at Eton

"After arriving at the aerodrome I found that I should have to wait a little while for my flight. I took advantage of this wait to look around, I saw many interesting things, such as aeroplanes continually landing and taking off; a very large air-liner; and groups of would-be pilots undergoing their course.

"When the time for my flight arrived, I found that my pilot was to be Major de Havilland himself. I climbed into the little 'Moth' and saw just in front of my seat a joy-stick, which I was told not to touch, it being a dual-controlled machine on which pilots learn; On a small dashboard there was an altimeter, and an air-speedometer and by looking over the windscreen I could see a rev. meter and an oil pressure gauge.

"Major de Havilland behind me called out: 'Contact on,' and the propeller was swung once, twice, three times, and the engine broke into a roar. Slowly we climbed up, and up. Looking over the side, the aerodrome seemed to be growing smaller and smaller, and over the other side I could see the haze of London on the horizon, and not quite so far away, a sheet of water, which I found later was Welsh Harp. I could see also a tiny electric train that seemed to creep along the track. Everything seemed like a map in relief and on looking at the altimeter I found that we were 4,000 ft. above sea-level. The speedometer registered our maximum speed as about 77 m.p.h., and the little engine was buzzing round at 4,800 r.p.m.

"All of a sudden Major de Havilland switched off the engine, and we glided down and met the ground with a slight bump, taxied up the field and stopped, after having been in the air about a quarter of an hour, and flown about 12 or 13 miles.

"I should like to add that my Mother who accompanied me was very kindly given a flight in a similar machine by Capt. White; so I regard this as a double flight for my prize."

A Glorious Sensation

C. J. Phillips also took the air with Major de Havilland as pilot, on a flight that extended for about 13 miles. Although Phillips' home is at Hendon, and he has therefore seen many different aeroplanes, in his estimation there was never a more splendid machine than the gallant little "Moth" that took him up in the air that Saturday morning! He thoroughly enjoyed every moment of

his trip, and says that he hopes some day to join the Royal Air Force. This is his account of his experiences :—

" Imagine my surprise on the morning of the 7th of August when I received the Editor's letter telling me that I had won a joy-ride in an aeroplane at the Stag Lane Aerodrome. Within two hours I had entered the gates, as fortunately, I had not far to go. The gate-keeper seemed interested in the Editor's letter and let me through to the waiting room, from which they soon released me to go on to the 'drome.

" Here were several machines, both on the ground and flying above, including an Imperial Airways 'plane with accommodation for about ten people, and it was very interesting to watch this huge bird come to ground. One of the ' Moths ' flying overhead also landed, and into this I was soon told to climb. It was a glorious sensation to realise that I was actually in the cockpit of a real aeroplane ready for my first flight. The pilot, Major H. de Havilland, had already taken his place at the " helm," the engine was switched on and the propeller was given a swing. " Stand clear ! " was given—the blocks from under the wheels were pulled away by rope attachments, and things began to move away from us on the ground.

" While wondering when we were going to get up a bit, I looked over the side and, to my astonishment, found that we had already reached quite a considerable height. It was difficult to realise that what I took to be a small model train was *really* a train, and the little beetles of various colours crawling along a white streak were actually motors and vehicles skimming along a wide road. After rising about 1,000 ft. the ' Moth ' had got into her stride with a motion like a switch-back over regular undulations, and we were over Wembley Exhibition grounds in far less time than it has taken to write all this.

" The pilot now turned with what seemed to me a very steep bank, making me look quickly for something to hold on to. After making a circuit, about 13 miles in all, we headed for the aerodrome. Suddenly the engine was shut off and we planed down. The ground appeared to be rushing up to meet us at a far greater speed than we were travelling. Eventually we " bumped," and after a little taxi-ing along the grass, we fetched up just where we started from. It was hardly possible to imagine that I had been up ten minutes and had flown thirteen miles, and I only wish I had won the first prize ! "

Capt. White and E. F. Hope-Jones about to take the air

Famous Bridges—(*continued from page* 551)

Constructing the Arches

As our illustration shows, the bridge consists of two parallel arches having a span of 432 ft. and a curve of 82 ft. from the foundations. These arches, which are hollow, are spaced 28 ft. apart from axis to axis and are rectangular in shape. The outside breadth of each arch is 8 ft., the depth varying from 13 ft. at the base to about 8 ft. at the top. What is known to engineers as " a high moment of inertia " has been given to these sections on account of the hollow construction of the arches. This means that greater rigidity is assured for the structure without a corresponding increase in width.

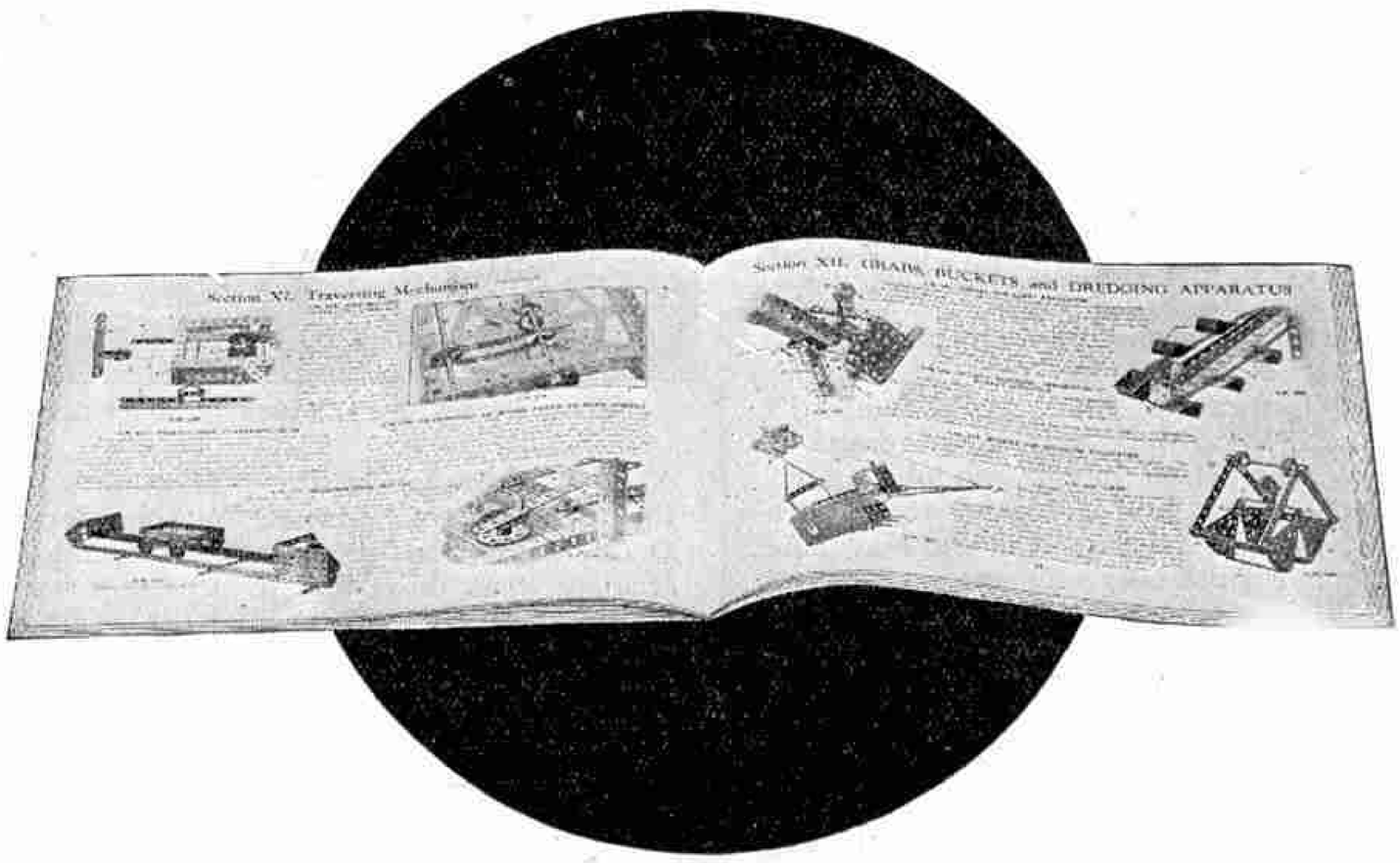
Reliability Tests

The platform, which is 29 ft. in breadth, carries a roadway of 17 ft. 6 in. and also two footpaths of about 4 ft. 6 in. each. The whole is supported by girders spaced 17 ft. apart and suspended from each arch by means of ties formed of steel rods sheathed in concrete.

Before the bridge was opened to the public it had to undergo two searching trials for constructional flaws, one under the stress of dead weight and the other under the effect of moving loads. In the latter test two streams of vehicles proceeding in opposite directions were employed. One stream consisted of two 7-ton lorries drawing trucks of 7 tons and 12 tons, and in the other stream were two 7-ton lorries followed by a 16-ton steam-roller and an 8-ton lorry. At the same time the footpaths also were uniformally loaded with a weight of 1,000 lb. per square yard.

Under these exhaustive tests the structure showed not the slightest sign of weakening and on 14th October 1924, the Bridge of St. Pierre du Vauvray, the largest of its kind in the world, was opened as a public thoroughfare.

"Meccano Standard Mechanisms"



There are a large number of Meccano movements that may be applied to more than one model—in most cases without any alteration, but in some few instances with only slight alterations to the original movement. These have been collected and classified, and a selection has been published in each issue of the "*M.M.*" for the last few months as "Standard Mechanisms."

The entire collection may now be obtained in the form of a new Manual entitled " Meccano Standard Mechanisms." All the movements are described in this book in a clear and detailed manner, and the publication should be of special value in assisting inventive boys to embody correct engineering principles in their new structures. The various devices have been arranged so that immediate reference may be made to any particular motion that it is desired to incorporate in a model. No keen Meccano boy will consider his equipment complete without a copy of the " Standard Mechanisms " Manual.

The price of " Meccano Standard Mechanisms " is 1/1½ post free. Overseas, price 1/7½ post free. It may be obtained from any Meccano dealer, from our Overseas agents (addresses on page 600), or direct from Meccano Ltd., Binns Road, Liverpool.

Results of Meccano Model-Building Contests

By Frank Hornby

"Crane" Competition

THE crane has always been regarded by model-builders as one of the most favourable subjects for reproduction in Meccano, and my expectations concerning both the quantity and quality of the entries in the competition for this class of model have been more than fulfilled.

The results in Section A are given below. The Overseas section closes at the end of the present month, and I am confident that our readers abroad will ensure the complete success of the competition by an equally fine response.

First Prize (cheque for £3-3s.): A. M. Sanford, High Street, Barnet, Herts. Second Prize (cheque for £2-2s.): R. A. Pervanoglu, 78, Wiverton Road, Sydenham, S.E.26. Third Prize (cheque for £1-1s.): L. W. Grey, 131, Kempton Road, East Ham, E.6.

Prizes of 10/6 each:—

G. W. Younger, Stockport; W. O. Sharp, Haywards Heath; G. Boedeker, Croydon; A. G. Thomas, Chadwell Heath; J. Wilson, Aberdeen; S. G. Aver, Wolverhampton.

The following competitors, who are amongst those gaining Certificates of Merit, have been selected as deserving special mention:—

G. H. Graves, Bootle; Kenneth Smith, Gravesend; T. R. Thompson, Bath; A. J. Smith, Newchurch, I.O.W.; L. Deall, Croydon; J. Alves, Glastonbury; R. Witty, Hull; G. H. Lyon, Skipton; C. P. Plantin, Westcliff-on-Sea; R. Webber, London, S.E.15; V. J. Ruxton, Kirkcaldy; A. Hill, South Shields; R. Viney, Manchester; L. Hollyoak, Coventry; B. S. Braithwaite, Bell Busk, Leeds; H. Topham, Burnley; J. E. Lockett, Manchester.

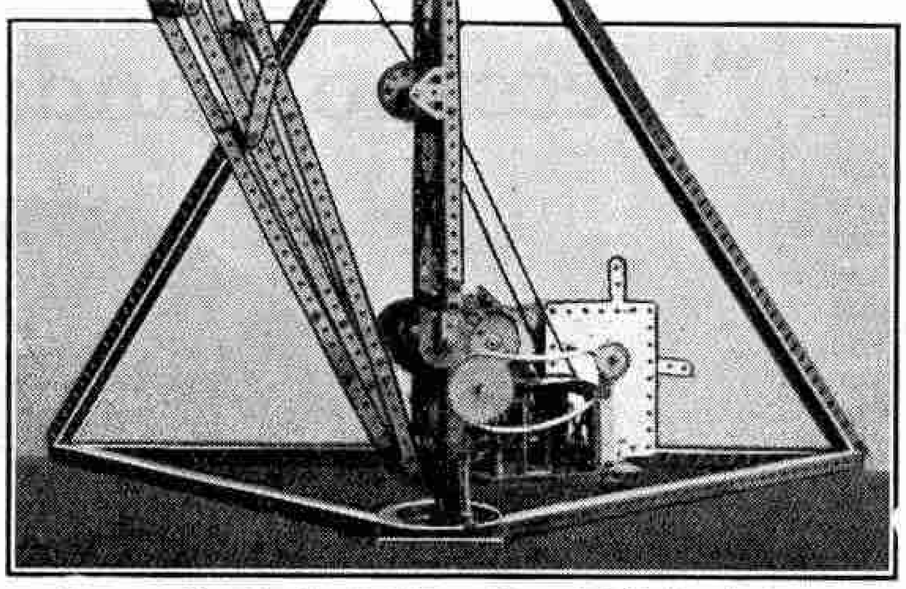
Unfortunately the photographs of the principal prize-winning models are unsuitable for reproduction. A. M. Sanford's model of a railway breakdown crane is under construction in our Model Department, however, and I intend to publish a detailed description of it in the Magazine shortly. Incidentally I may mention that the same issue of the Magazine in which it appears will contain a special article dealing with railway accidents and breakdown cranes in general.

Meccano Crane 5 ft. in height

The second prize-winning model, sent in by R. Pervanoglu, represents a radial crane of the type used in loading giant ships. The model rests on a four-legged foundation measuring 12½" × 12½" × 12½", from the top of which the main column tapers for 18½" of its length until it joins the perpendicular stem, which is 5½" square and 24½" in height. The framework is cleverly reinforced by a series of ties and struts, with the result that the complete structure will support the weight of its designer without the slightest sign of strain.

The horizontal boom of the crane is mounted on roller bearings, similar to Standard Mechanism No. 106, secured at the top of the tower. It is 35" in length and is rotated about its central axis by a Meccano Motor mounted at the end of its shortest arm. The pulley block is suspended from a trolley running along the length of the boom, and the hoisting mechanism is controlled by a screw-operated hand brake. The overall height of the model exceeds five feet.

The third prize was secured by a model of a giant floating crane of a type similar to the "Mammoth"—the "200-tonner" owned by the Mersey Docks & Harbour Board which, it may be recalled, was described in an early issue of the "*M.M.*" It is a most realistic model and the jib-elevating mechanism is particularly effective. The crane swivels upon a rolling base built up from Hub Discs and Flanged Wheels.



Meccano Derrick, by J. Wilson (Awarded Cash prize)

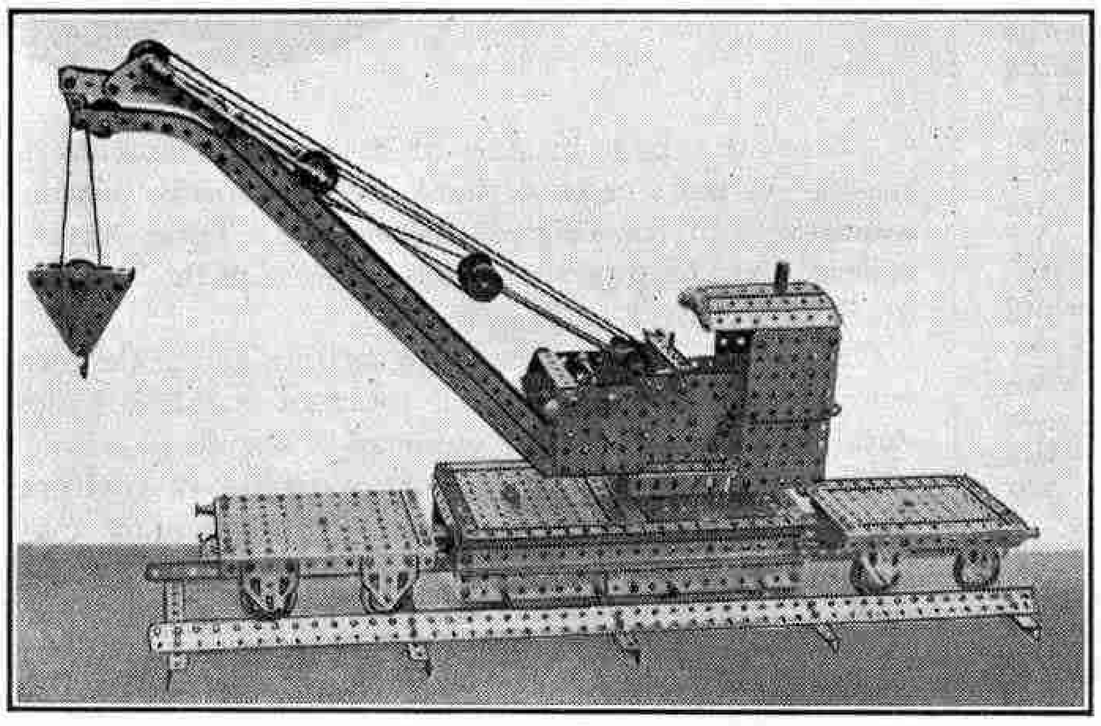
Stokes' Patent Crane Improvement

Some very interesting models are included amongst those gaining the six remaining cash prizes. That submitted by G. W. Younger represents a 36-ton breakdown crane built by Ransomes & Rapier Ltd. This model is reproduced herewith and its excellent appearance will be appreciated from the illustration. It embodies Stokes' Patent, which consists of two four-wheeled bogies connected to either end of a longitudinal girder passing beneath the main crane chassis. The object of Stokes' Patent is to temporarily increase the length of the wheelbase, so relieving the weight on the principal driving axles and reducing the stresses set up in bridges over which the crane may have to pass. The bogies can be dismantled and removed altogether when not required. A Meccano Electric Motor is accommodated in the cab and operates the three motions of the Crane—namely, hoisting, derricking, and rotating, all of which may be thrown in or out of gear on operation of suitable levers.

W. O. Sharp sent in an interesting model of a large derrick of the type commonly used in steel constructional work, etc. It consists principally of a vertical built-up girder, 3½" square and 7 ft. in height, to the top of which is fitted a short lever supporting the three-sheaved pulley block. The model is very powerful and one of the photographs submitted shows it in the act of hoisting a stout piece of timber. The brake on the winch is released by means of an electro-magnet, and should the current be shut off, either by intention or accident, the brake is applied immediately by means of a spring.

The upper illustration on this page shows a derrick submitted by J. Wilson. As will be seen, this model is well-built and the various movements are easily controlled. A novel feature that should be noted consists of a small pulley attached to the jib pulley block and used as a guide for the hoisting cord; this effectively obviates any possibility of fouling the hoisting cord. Motive power is supplied by a Meccano Clockwork Motor.

G. Boedeker and A. G. Thomas both submitted models of cantilever cranes of the type common to most ship-building yards, while S. G. Aver's model is an interesting and very compact example of a railway travelling crane. All the motions in the latter are controlled by one lever and may be brought into engagement with a single driving axle.



Breakdown Crane, with Stokes' Patent Bogies, by G. W. Younger (Cash prize)

Overseas "Ship" and "No. 3 Outfit" Contests

The results of the Overseas Sections of the "Ship" and "No. 3 Outfit" Model-building Competitions are as follows :—

Overseas "Ship" Contest

First Prize (cheque for £3-3s.): George W. Healy, Case Mont Blanc, Geneva, Switzerland. Second Prize (cheque for £2-2s.): Robert O. Jukes, Cricklewood, South Canterbury, N.Z. Third Prize (cheque for £1-1s.): P. Stoddart, Buenos Ayres, Argentina. Prizes of 10/6 each: I. Mackenzie, Johannesburg, S.A.; C. C. Irvine-Smith, Johannesburg, S.A.; G. Fyfe, South Canterbury, N.Z.; P. Renault, Paris; M. Salisbury, Cape Town, S.A.; J. Robinson, Melbourne, Australia.

Special Commendation (Certificate of Merit):

E. R. Morgan, Gundagai, N.S.W.; R. Turner, Kellerberrin, West Australia; C. Robinson, Clarksville, Otago, N.Z.; K. Vickery, Kaiapoi, N.Z.; M. A. Morgan, Homebush, N.S.W.; K. Langsdorf, Nobby, Queensland; R. Brown, Montreal, Canada.

Overseas "No. 3 Outfit" Contest

First Prize (Meccano products to the value of £2-2s.): E. Saunders, 22, William Street, Melbourne, Australia; Second Prize (Meccano products to the value of £1-1s.): Kevin Langsdorf, Box 7, Nobby, Queensland, Australia; Third Prize (Meccano products to the value of 10/6): Billy Swift, 642, Belmont Avenue, Westmount, Montreal, Canada.

Special Commendation (Certificate of Merit):

W. Welsh, Ottawa, Canada; D. A. Walker, Temuka, South Island, N.Z.; E. Harkness, Albert Park, S. Australia; S. Thomas, Kogarah, N.S.W.; K. Robertson, Wellington, N. Zealand; G. W. Sexton, Moonee Ponds, Australia; B. Pippy, Springhill, N.S., Canada.

The first prize-winning model in the "Ship" Competition represents a Destroyer. It is built on carefully planned lines and is complete with such details as searchlights, guns of various sizes, torpedo tubes, bridge and wireless aerial, etc. The hull, measuring about four feet in length, is mounted upon 1" Pulleys concealed near the "water-line," and the ship is fitted with four funnels.

R. O. Jukes submitted a model of the warship "*Nelson*." This has three propellers, all driven through suitable gearing from a Clockwork Motor mounted amidships. There are three swivelling turrets, each equipped with three guns, and six smaller guns are secured in various positions on the decks.

The third prize-winner entered a model coasting vessel, similar to that entered in Section A of the competition and described in the June Magazine. It is of excellent proportions and is complete with all the principal fittings.

Paddle-Wheel Steamer

Amongst the other prize-winners I should like to mention two ocean liners, the work of C. Irvine Smith and I. Mackenzie respectively. Each of these models is complete with gangways, derricks, anchors, lifeboats, wireless aerials, etc., and both present a pleasing and realistic appearance.

Another model, sent in by J. Robinson consists of a small passenger paddle-wheel steamer, the only vessel of this type to be received in the contest. It is exceedingly well built, and is complete with miniature engines mounted in a horizontal position and driving the transverse shaft which carries the paddle wheels. This type of boat, although somewhat old-fashioned, is still popular in connection with river excursions or for short passenger trips. Its principal advantage lies in the fact that it is capable of sailing in shallow waters, whilst it is extremely steady when in motion.

A number of Certificates of Merit will be presented to competitors who sent in other interesting efforts. One of the entries gaining this award is built in the form of a lightship, and I should imagine much fun may be obtained with this model by fitting some kind of light in the lantern, which may be rotated by operating a shaft fitted in the deck of the boat and attached to the vertical lantern shaft by means of a cord and pulleys.

"No. 3 Outfit" Competition

We continue to receive some excellent models in connection with the "Outfit" competitions, and some of those entered for the "No. 3" Contest are certainly striking examples of what can be done with the contents of that Outfit.

A model derrick of a somewhat similar type to Model No. 709 in the Complete Instruction Manual secured First Prize for E. Saunders. There are three separate motions in this model—swivelling, luffing, and hoisting, each being operated from suitable handles journalled in the gear box at the base of the jib. A screw brake, similar to Suggestion No. 24, controls the jib-raising gear, whilst a pawl and ratchet gear is fitted to the hoisting shaft.

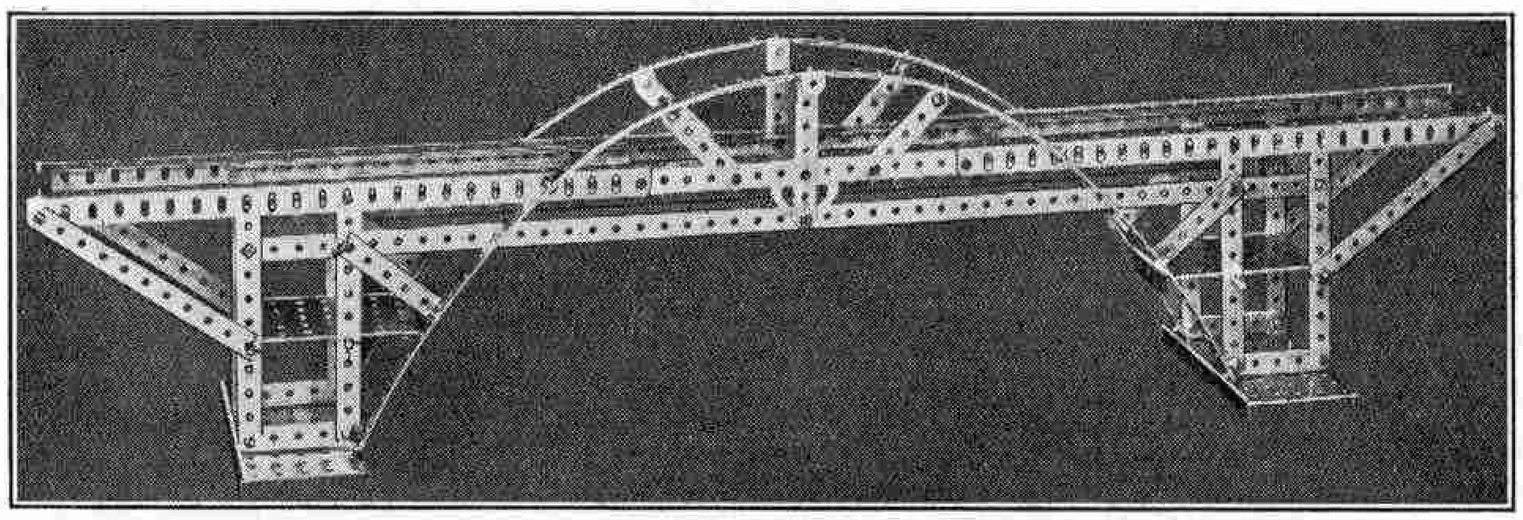
K. Langsdorf sent in a miniature Saw Bench, equipped with a table sliding on four 1" Pulley Wheels. When the machine is in motion the table is pushed forward for the cutting stroke, but is returned immediately on release by means of a suspended weight connected to it by a piece of cord. The amount of travel of the table is governed by Angle Brackets, bolted to its underside, which are caused to strike against a Rod as the table reaches the end of its stroke. The saw is cut from a sheet of galvanised iron and bolted to a Bush Wheel. The drive is led by belt transmission to the shaft of the saw wheel and is controlled by a belt clutch similar to Standard Mechanism No. 18a.

A Meccano Safe

The third prize-winning model in this section takes the novel form of a Combination-lock Safe. The lock in this ingenious model consists of an Axle Rod arranged transversely behind the door and engaging with a socket in the side of the safe. Before the door can be opened, this Rod must pass through one of the holes in a 57-teeth Gear Wheel. The latter is mounted on another Rod and may be rotated by means of a worm gear from a hand-wheel fitted to the outside of the door. The safe can be made more "burglar-proof" by screwing nuts and bolts in all the holes in the Gear Wheel except one; the hand-wheel must then be given a certain number of turns, according to its position when the safe is locked, before the vacant hole is in the correct position to allow the movement of the lock. The construction of this type of model should prove most fascinating and I hope other Meccano boys will endeavour to devise some new and interesting locking mechanisms that may be used in connection with it.

Amongst the models specially commended I wish to mention a vertical compound marine engine submitted by K. Robertson, a light cruiser by Stanley Thomas, and a fine hammer-head crane by D. A. Walker. The latter model comprises four movements—i.e., travelling, rotating, traversing movement of the crane trolley, and hoisting. The pulley block is equipped with a very simple but efficient pair of friction grip-tongs for use in block-setting operations.

RAILWAY BRIDGE BUILT FROM OUTFIT No. 3



We illustrate an excellent model of a railway bridge built from Outfit No. 3 by D. R. Haggis of Muswell Hill, London, for the recent "Outfit" Competition, in which it was specially commended by the judges and awarded a well-deserved Certificate of Merit. Its construction is simple and straightforward, and is based upon correct principles, with the result that the bridge is strong and of good appearance. It is over 2½ ft. in length, and should form a useful addition to any Hornby model railway.

New Meccano Parts

The following new sizes in Braced Girders have been added to the series of Accessory Parts :—

No. 97a	Braced Girders,	3" long	½ doz.	8d.
,, 99b	,,	,,	7½"	,,	,, 1/3
,, 100a	,,	,,	4½"	,,	,, 10d.

All sizes of Braced Girders may be obtained either with the usual nickelled finish or enamelled in green.

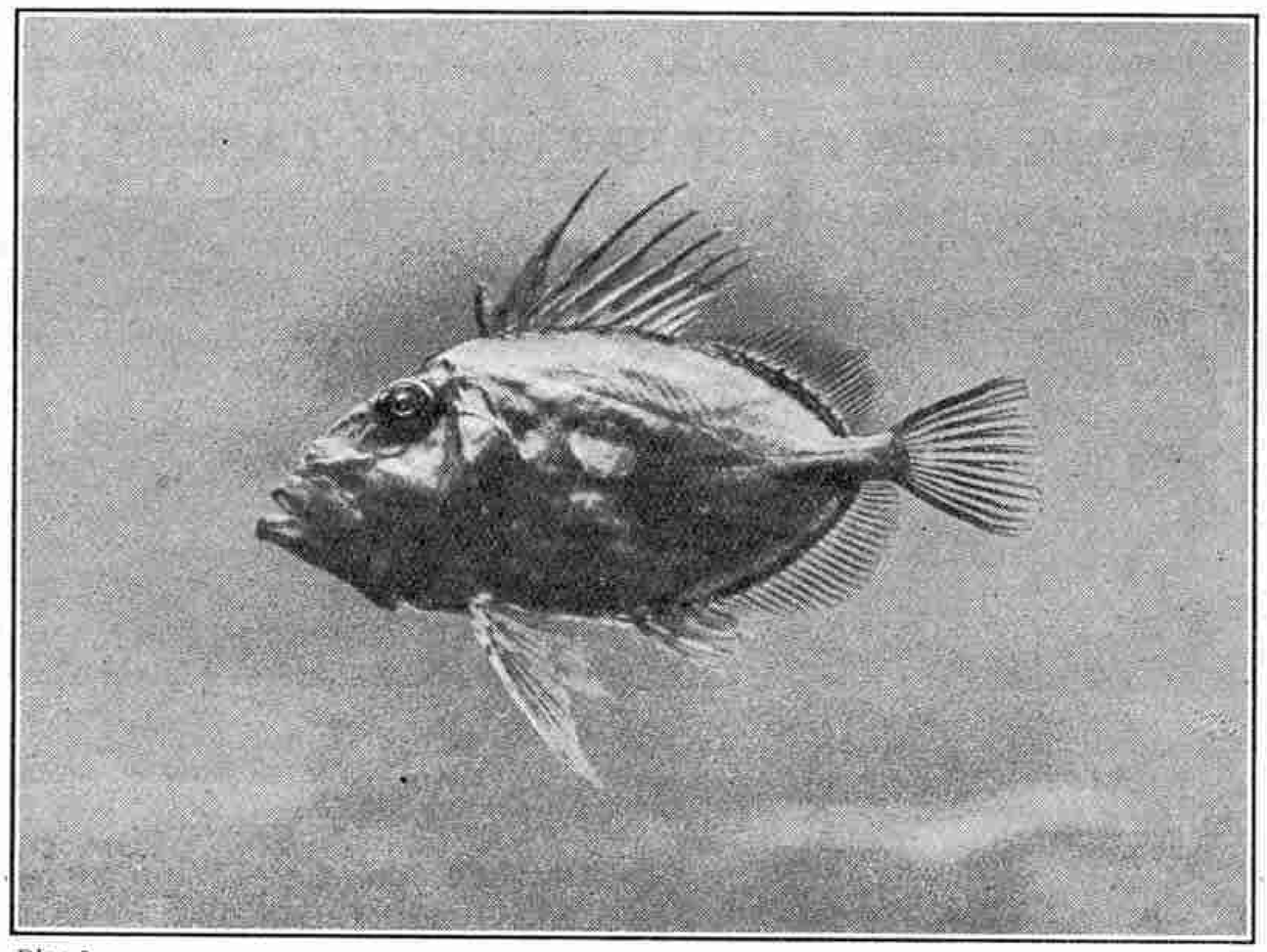
No. 111c Bolts, ⅜" ... ... doz. 4d.

This part will be found particularly useful in a number of models where the 7/32" Bolt (No. 37b) would prove too short. Six of these new Bolts will be included in every complete Outfit in future.

How to Start an Aquarium

by W. Coles-Finch

IN the articles under this heading that appeared last year in our June-August, October and November issues, and which were re-commenced this year in the March number, I have endeavoured to give some idea of the great fascination of aquarium-keeping and to show how simple a matter it is to achieve success. In response to many requests I am devoting the present article—the last of this year's series—to a brief consideration of large aquariums with particular reference to the magnificent aquarium of the Zoological Society of London.



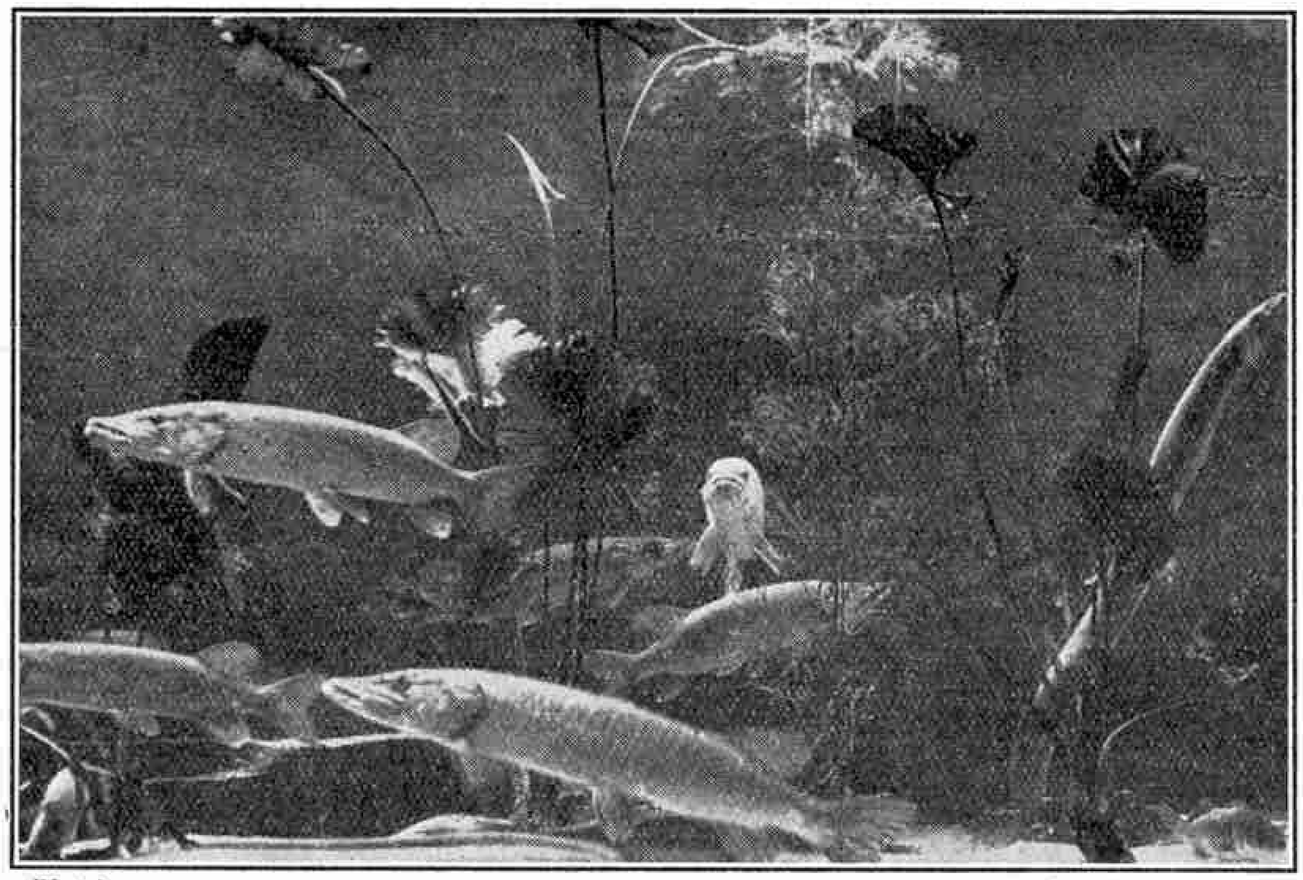
Photo] [*Neville Kingston*

John Dory, with back fin erect, in the Aquarium at the London Zoo

Early Aquariums

The earliest aquariums as used by the ancient Egyptians and by the Greeks and Romans were merely ponds in which fish were kept and fed until they reached a size suitable for the table. In the case of the Romans these ponds were constructed on an extremely costly scale in order to provide the fashionable banquets of fish. In later ages every abbey and monastery had its "fish-stew." Frequently these were of large size, capable of containing as many as 20,000 eels. In these "fish-stews" carp in particular were fed until they reached an enormous size.

It is impossible to trace the beginning of the aquarium as a means of studying aquatic life. It is probable, however, that marine animals were kept in confinement for the purpose of study and observation as far back as three centuries ago. Sir John Graham Dalyell of Edinburgh, the author of "Rare and Remarkable Animals of Scotland," 1847-48, and other works, utilised a simple form of aquarium for the study of marine animals and it is known that some of the creatures lived in his tanks for a very long period. We are told, for instance, that one sea anemone placed in a tank in 1828 was alive and flourishing in 1873.



Photo] [*Neville Kingston*

Pike and Eel, in the Aquarium at the London Zoo

Growing Popularity of the Aquarium

About the year 1840 a good deal of attention commenced to be given to the construction and maintenance of aquariums, but the movement did not achieve any great popularity on account of the difficulty of keeping the water fresh. A year or two later came the great discovery that the fact that plants absorbed the carbon-dioxide generated by animals and in turn liberated the oxygen required by animals, could be utilised in aquariums in such a manner as to maintain the aeration and freshness of the water. Experimental work was carried on by various London investigators in order to ascertain the best means of balancing vegetable and animal life, and the publications of some of these investigators, particularly those of Mr. P. H. Gosse, were enthusiastically received by the public. Aquarium-keeping very rapidly increased in popularity and became almost a mania after the construction in 1853, by the Zoological Society of London, of the first public aquarium. This marine aquarium was faulty in construction and had only a short life. It is interesting to know that the building is still in existence and is now known as the "Diving Birds' House."

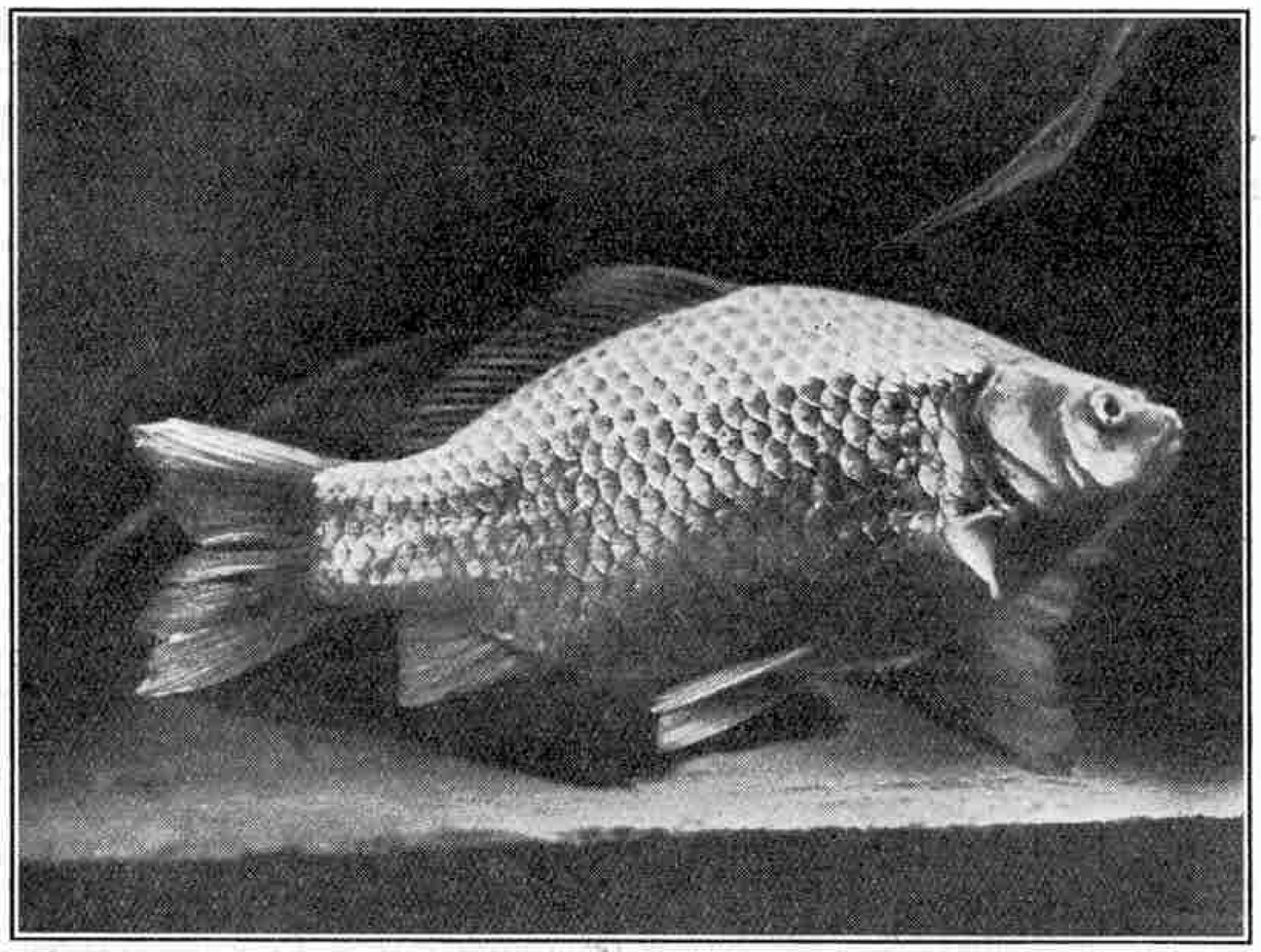
In the late 'seventies large aquariums were constructed in London and various provincial towns, notably at Brighton, but for various reasons the popularity of these institutions waned and to-day

few of them are in existence. At the present time the aquarium of the Zoological Society of London, in Regent's Park, is the only British inland public aquarium of any importance. Abroad there are magnificent and popular aquariums in New York, and in Berlin, Amsterdam, Naples and other Continental cities.

The Regent's Park Aquarium

The want of a first-class aquarium in Regent's Park had been felt for many years by the Council of the Zoological Society and in 1922 it became possible to fill the gap. The aquarium which then came into being is the most up-to-date of its kind. It cost nearly £55,000 and took over a year to build.

The aquarium is situated underneath the Mappin Terraces, by the hills of which it is protected, and its exposure is to the north-west. The building takes the form of a crescent-shaped gallery with tanks on each side. The tanks on the outer side of the crescent are illuminated by daylight and those on the inner side by electric light from special lamps that give a light almost identical with daylight. The building has a total length of nearly 450 ft. and it is divided into three principal parts. The Fresh-water Hall has 25 tanks varying in length from 6 ft. to 30 ft.; the Marine Hall has 25 tanks, two of which are more than 30 ft. in length; and the Tropical Hall for fresh-water fish has 40 tanks, most of which are small.



Photo] [*Neville Kingston*

Carp, in the Aquarium at the London Zoo

Aeration of Large Aquariums

As we have already seen, the aeration of the water in a small aquarium can be carried out by means of water plants, which provide the necessary oxygen. It is not possible to aerate a large aquarium on these lines, however, and constant circulation of the water must be maintained.

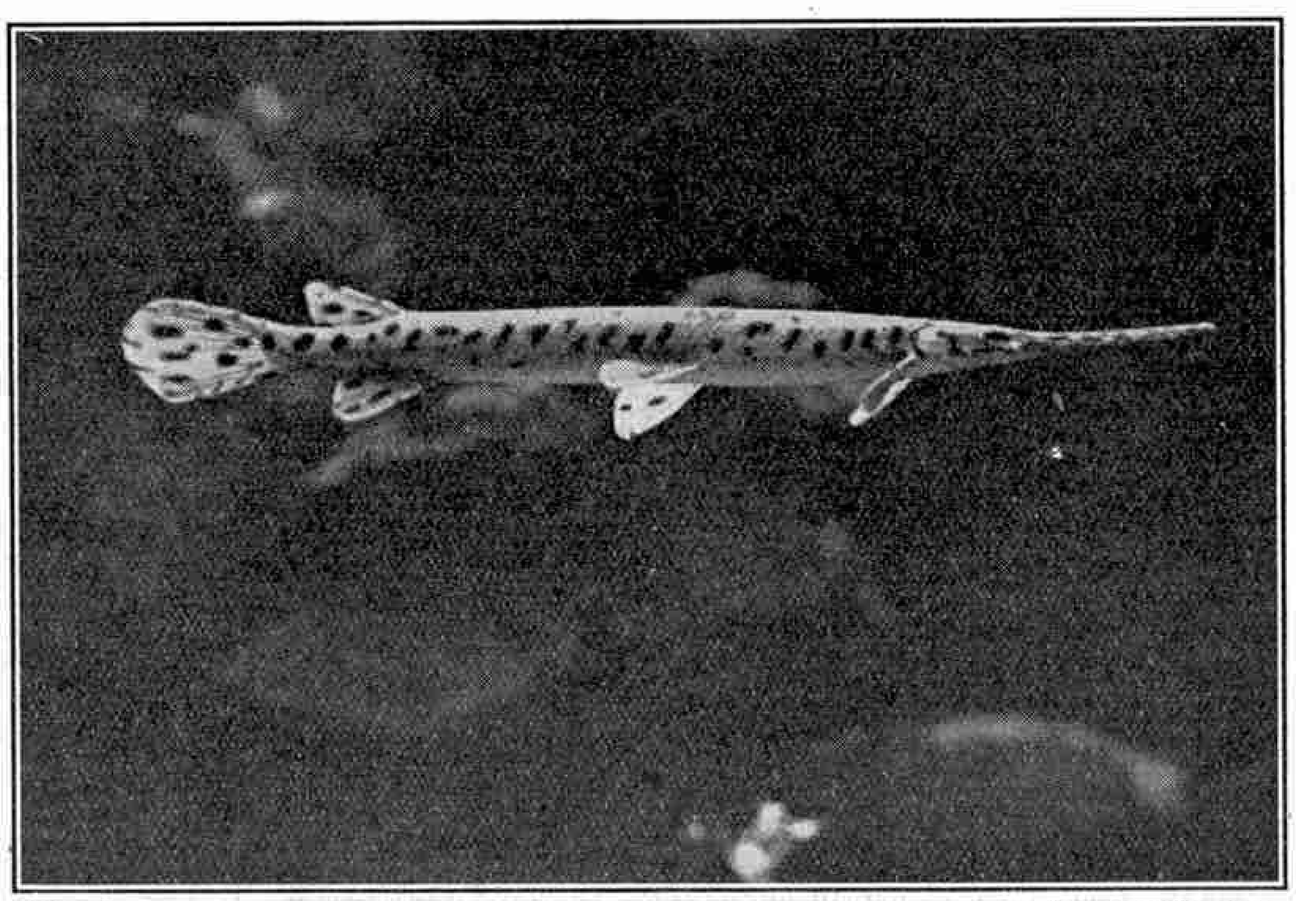
In the Regent's Park aquarium there are provided underground reservoirs of 120,000 gallons capacity for sea water and 60,000 gallons capacity for fresh water. From these reservoirs the water is pumped to storage tanks situated in the peaks of the Mappin Terrace mountains, from which it falls by gravity into the show tanks. The overflow from the show tanks passes through a series of sand filters and returns to the underground reservoirs. Further oxygenation of the water is obtained by passing compressed air directly into the tanks.

The amount of sea water in the show tanks is roughly one-fifth of that in the reservoirs and filters, and one-third in the case of the fresh water. Iron supply and drainage pipes in the marine section have an enamel lining to prevent rust.

It is interesting to know that the sea water was obtained from the Bay of Biscay. It was brought to the London docks in the ballast tanks of the General Steam Navigation Co.'s vessels that run between Bordeaux and London. On arrival at the docks the water was transported to barges, which travelled up the Regent's Canal to the Zoological Society's Gardens, and was then pumped into the underground reservoirs through a hose 605 ft. in length. This sea water will not need to be renewed for many years.

The Show Tanks

The show tanks are constructed of slate or concrete and are decorated with rockwork arranged to suit the requirements of the inhabitants. The rocks are of various kinds and have been obtained from the moors of Westmoreland and Yorkshire and the coasts of Devonshire and Cornwall. The glass that forms the front of the tanks is naturally one of the most important items and it is also one of the most expensive. In the case of the larger tanks the glass is $1\frac{1}{4}$ in. in thickness. For feeding and cleaning purposes a large service passage is provided behind the rows of tanks. This passage is not open to visitors.



Photo] [*Neville Kingston*

Gar Pike, in the Aquarium at the London Zoo

The aquarium is fitted with an elaborate system of hot-water pipes and of air circulation by which the Fresh-water and Marine Halls and tanks are maintained throughout the year at a temperature of about 55°F. while the Tropical Halls and tanks are maintained at about 78°.

Connected with the aquarium is a well-equipped laboratory where important work of a zoological and economic nature is carried out. Any of our readers who are able to do so should not fail to visit this wonderful Aquarium.

Famous Australian Cricketers

During the visit of the Australians, to play the Lancashire County XI. on the Liverpool C.C. ground at Aigburth, we had the pleasure of welcoming Messrs. M. A. Noble and Charles Kelleway at our Head Office. Although not actual members of the touring party both happen to be in the country on business, and are naturally taking the opportunity of according their moral support to their comrades in sport. It will be recalled, perhaps, that Mr. Noble retired from the game in 1920 and also that Mr. Kelleway's omission from the selected party caused considerable discussion in New South Wales cricket circles during the recent election of delegates to the Australian Board of Control.

Our visitors had heard of Meccano, of course (in fact, Mr. Kelleway is an enthusiastic Meccano "boy!") and took the first opportunity of visiting the factory to see how Meccano and Hornby Trains are made. It was with considerable difficulty that our visitors were persuaded to speak of cricket—they were far more interested in their inspection of the Meccano factory and its wonderful machinery—but later on we learned several details of their respective careers during the course of a chat.

Mr. Noble is perhaps the more famous as a cricketer, although Mr. Kelleway's name will be more familiar to our readers by virtue of his exploits in 1919, with the Australian Imperial Forces team of which he was captain.

Mr. Noble's record is imposing, as befits so great a personality in Australian cricket. He first played for New South Wales in 1894 at the age of 21, and in the course of an eventful career (which, as previously stated, only ended in 1920 when he appeared by special request of the Queensland Cricket Association in the Queensland—New South Wales match at Brisbane) he visited England as a member of an Australian team on four occasions, 1899, 1902, 1905, 1909, on the last occasion of which he was captain. During each visit he made over 1,000 runs, and his total "bag" in first class cricket amounts to over 14,000 runs, with an average of 39.8 per innings, and 654 wickets which cost 23.9 runs each. His biggest score was against the Essex County team in 1904 when he made 284 runs and altogether he has made thirty-seven scores of 100 or more.

Among Mr. Noble's individual performances, probably the best feat was that of scoring four successive centuries in the inter-State Sheffield Shield competition, during the seasons 1898/9 and 1899/1900. Another performance of which he is proud was that of scoring a century in each of the two innings in the New South Wales–Victoria match at Sydney during the season 1907/8. His scores were 176 and 123. Sydney seems to have been Mr. Noble's happy hunting ground for he took part in the memorable match on that ground against South Australia, in season 1900/1, when five of the New South Wales batsmen reached their century in the first innings. Mr. Noble's contribution was 153.

Mr. Kelleway is still a young man as cricketers go, for he was born in 1889 and first played for New South Wales in the inter-State competition in 1907, when he was only eighteen years of age. His first experience of English cricket was as a member of the Australian touring team which visited this country and subsequently the U.S.A. in 1912. The intervention of the War prevented further participation in "big" cricket until the formation of the A.I.F. team mentioned above, during whose tour, it is interesting to note, Mr. Kelleway had the satisfaction of registering his biggest score, 168 v. Cambridge. Regarded as Australia's best medium pace bowler, he is an all rounder, as his figures show. Altogether he has collected over 3,000 runs, including twelve centuries three of which have been made in Test Matches, two versus South Africa and the other against England and taken nearly 300 wickets in first class cricket.

Mr. Kelleway, it may be recalled, shared in the famous partnership at Sydney against South Australia in the season 1920-21, when New South Wales added 397 for the fifth wicket. This figure still holds as the record for a fifth wicket stand.

Readers' Page—(*continued from page* 587)

may use such a paradoxical word—of red-hot metal stretching from the furnace floor to the door. Everywhere we went there seemed to be pools of molten metal, conveniently placed for us to step into!

Very reluctantly I followed my guide out of this "Meccano boys' paradise," and we entered a room which, by contrast, seemed almost strangely quiet. This was the Assembly Shop, where the various machines were put together and tested. Here we saw scales to weigh everything from an ounce of sweets to a railway locomotive. One machine, designed to weigh 1,250 tons, was being made for Australia. I was particularly interested in three large overhead gantry cranes that were lifting huge steel girders as easily as we should lift a cardboard box. Wonderful machines for testing the strength of metals were also being assembled and tested with the minutest care.

I have only mentioned a few of the interesting things I saw in this works, but my advice to all "*M.M.*" readers is—If ever you get a chance of visiting an engineering works and foundry, seize the opportunity with both hands!

R. Blake (Coventry).

"Wireless World"

The "Wireless World" appears to be able to find new and interesting topics without difficulty. The most recent issue to hand, No. 359, is notable for a particularly well-written account of the demonstration of the use of radio-telephony during the Royal Air Force display at Hendon. The description of the apparatus employed is greatly assisted by a number of excellent photographs. Mr. F. H. Haynes contributes a description of a Portable Superheterodyne suitable for outdoor wireless, and the permanent features of the paper dealing with events of the week and hints for beginners are well up to their usual standard of interest.

Fire Fighting from the Thames—

(*Continued from page* 561)

the builders were represented by Mr. John H. Osborne, Managing Director, and Mr. C. H. Bown, Works Manager.

Promptly to time a start was made from Greenwich Pier where the float had been lying overnight. Charing Cross floating fire station was reached according to schedule, the speed and general handiness of the boat being well demonstrated on the short voyage. A remarkable display of pumping was then witnessed by a large crowd assembled on the Embankment. At one time eight powerful jets were in the air together, but perhaps an even more impressive sight was the single 3½ in. jet that rose to an enormous height and appeared to reach half way across the river. The pumping tests continued for four hours without a hitch of any kind, after which the fireboat was approved and formally taken over by the London Fire Brigade and placed in commission forthwith.

The illustration of the Float on page 561 shows eight jets in operation during the official trials at Charing Cross Pier. To the left of the jets may be seen the Monitor, and the 20 in. diameter searchlight.

"MECCANO MAGAZINE" BINDERS

There is no better way of keeping your Magazines clean and tidy than by binding them in one of the special binders we supply.

These binders have strong stiff backs, covered with black imitation leather, tastefully tooled, and are lettered in gold. The large binder holds 12 Magazines—price 3/6 post free. The small binder holds 6 or 8 Magazines—price 3/- post free. Meccano Ltd., Binns Road, Liverpool.

This page is reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for this page are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

The Wonders of Delhi

Delhi, the chief town of the District and Division of the same name, is situated on the right bank of the River Jumna. The immediate neighbourhood of Delhi has been the site of a capital city from the very earliest periods of Indian history. From some time about the 15th century B.C., city after city has risen and fallen, and their remains cover an area of from 40 to 50 square miles. The present city was founded in the 17th century by the Emperor Shah Jahan, who surrounded it by a high wall of stone some 5½ miles in circumference and having ten gates.

At one time Delhi was the centre of Buddhist religious life, but in the 12th century it became the capital of the Mogul Empire and the centre of Mohammedan power.

The city played a prominent part in the Indian Mutiny of 1857. It became the headquarters of the rebel troops, who massacred all the Europeans within their reach. After a siege of nearly four months, a British army of not more than 8,000 men forced an entrance into the city, whose rebel defenders numbered between 30,000 and 40,000. Six days' heavy fighting from street to street followed before the city was completely conquered.

Delhi was chosen as the scene of the great Durbar on 1st January 1877, at which Queen Victoria was proclaimed Empress of India, and there, too, was held the magnificent Coronation Durbar of 1st January, 1903.

One of the greatest glories of Delhi is the Jama Masjid, the largest cathedral mosque in India. This magnificent structure was commenced by Shah Jahan in the fourth year of his reign and completed in the tenth. The great courtyard in front is 450 ft. square and is paved with granite inlaid with marble. The mosque itself forms an oblong 261 ft. in length, and from its roof rise three great domes of white marble.

Outside the city walls are many striking memorials, among which is the tomb of the Emperor Humayun. This handsome building is of granite inlaid with marble. Above a central platform about 20 ft. high and 200 ft. square rises the mausoleum, which is surmounted in the centre by a white marble dome.

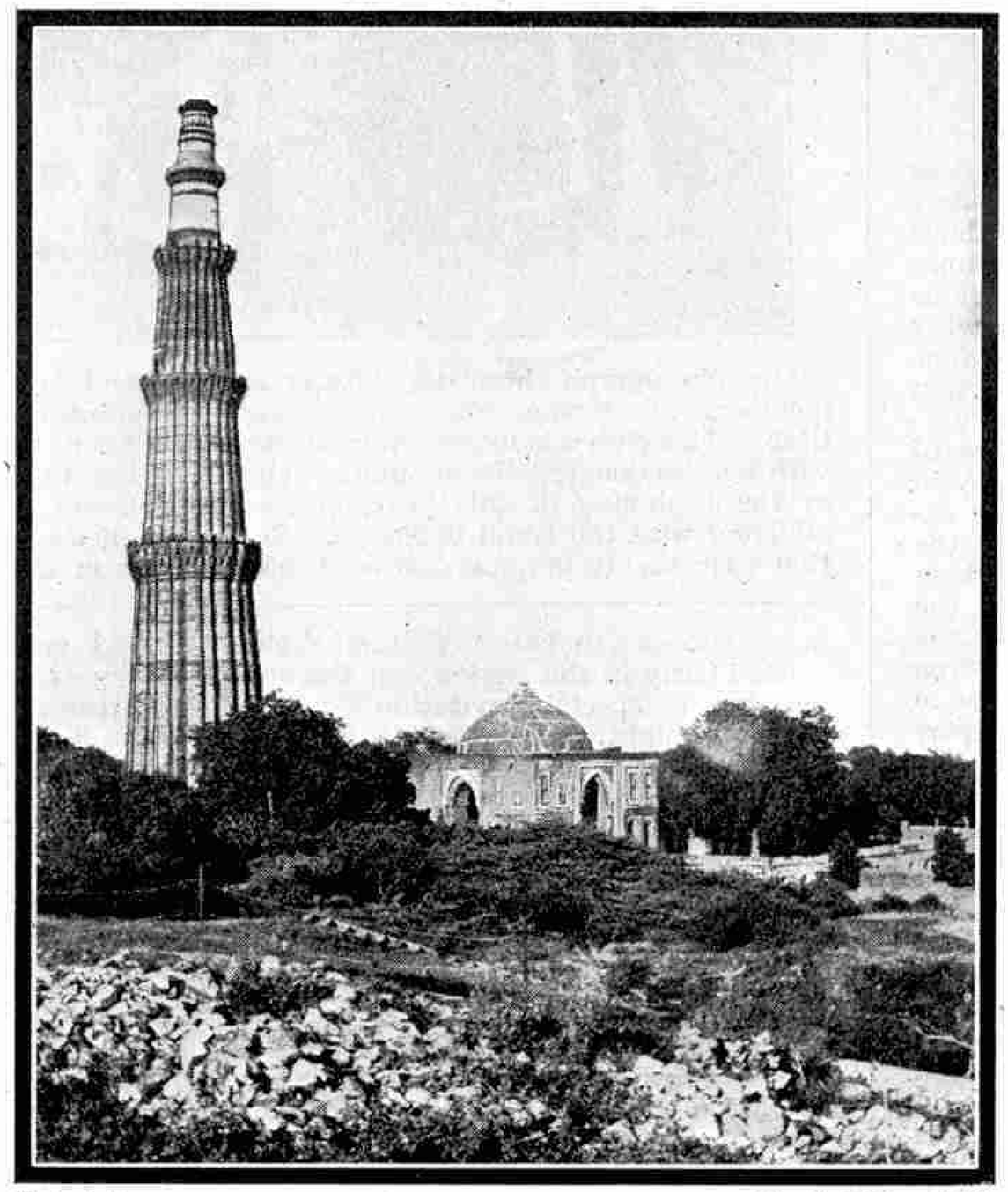


Photo by] [*A. P. Mittra, Delhi*

Kutab Minar, the famous tower near Delhi

Some nine miles south of the city is the remarkable Kutab Minar. This wonderful pillar is built of red stone, beautifully carved. It is about 238 ft. in height and is 47 ft. 3 in. in diameter at the base, its upper diameter being 9 ft. It is built in five storeys and the summit is reached by a flight of about 370 steps. The pillar was commenced by Kutab-uddin, a Mohammedan ruler of Delhi, about the year 1200 A.D., and was completed after twenty years by his successor Altamash. The whole structure is inscribed with quotations from various religious books of the Mohammedans.

(W. Henry, Delhi).

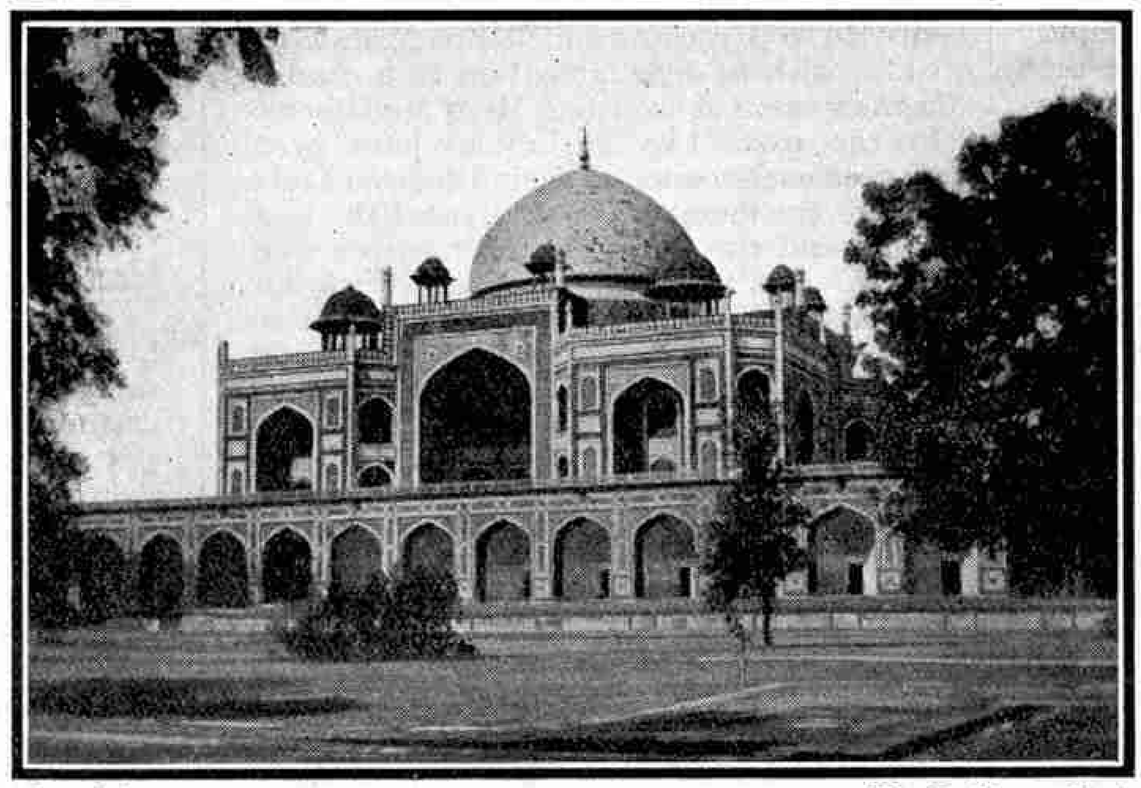


Photo by] [*K. J. Bhore, Simla*

Mausoleum of King Humayun

A Visit to an Engineering Works

I had the pleasure recently of visiting a large engineering works in Birmingham at which weighing machines and many other kinds of machinery are made.

Accompanied by an official guide, I was first taken to the Machine Shop, where large numbers of huge machines were at work drilling, shaping and performing many other operations. One machine that interested me particularly kept continually reversing, the method of reversing being almost the same as that in Meccano Standard Mechanism No. 18.

I was glad to leave this shop for the noise was fearful, but it was a case of "out of the frying pan into the fire," for the next place we visited was the foundry. This, to my mind, was the most interesting part of the whole works. Trudging through the sooty sand that formed the "floor," we came to the huge blast furnaces. Every now and then a workman opened a furnace door and the molten contents came pouring out in a dazzling, white-hot stream, sending out showers of sparks on all sides, like a huge firework display. Even at a distance of twenty yards from the furnace the heat was terrific. The molten metal was received in large cylindrical tanks, not unlike dustbins on wheels, and was quickly wheeled away by the workmen to be ladled into the moulds. When the furnace was again closed there remained a sort of huge "icicle"—if one

(*Continued on previous page*)

The Secretary's Notes

Planning Winter Programmes

Although the first winter session does not commence until next month, Leaders and secretaries are already thinking about their winter programmes and considering various plans for improving upon their previous year's syllabus. Certain features—Meccano Model-building in particular—form part of the programme of every club, but there is great diversity in what may be called the secondary activities. To a considerable extent the nature of the more important of these secondary activities is influenced by the Leader. For instance, a Leader who is enthusiastic about Miniature Rifle Shooting will introduce this fascinating pastime to his club; another Leader who is an expert at Ambulance Work will initiate his members into its mysteries, and so on. Such activities cannot provide a complete winter programme, however, and in order to ensure sufficient variety to meet the tastes of all members it is necessary to include in the syllabus a number of less ambitious but equally interesting pursuits. It is in regard to these smaller items that the newer clubs frequently find most difficulty, as they have little experience upon which to fall back, and therefore I am constantly asked for advice upon the matter. In order to assist me in helping such clubs I should like secretaries of well-established clubs to let me know during the next few weeks the new items that they propose to introduce during the winter. However trivial an innovation may appear to be, I shall be very interested to hear of it, because it may provide me with just the idea I need to help some small club that is in difficulties. I hope secretaries will bear this point in mind and send me the necessary particulars as soon as possible.

Increasing Local Interest

Most clubs now realise the value of publicity and of gaining the support of local residents who take a practical interest in the hobbies and amusements of boys. A practice that has been adopted with success by many clubs is that of preparing a circular letter giving a short account of the club's history and activities, and outlining its plans for the coming session. This letter is printed if possible, or duplicated in some manner, and a copy sent to local residents who are likely to be interested, inviting them to visit the club and see members actually at work. In some cases a definite "Visitors' Night" is fixed early in the session and the letter contains a special invitation for that particular night. This plan involves some small expense, but in most cases it brings the club excellent results, financial and otherwise. If desired, the letter might invite gentlemen to become "Honorary" or "Associate" members at a small yearly subscription of say 2/6, such membership carrying the right to visit the club at any time during the session.

Merit Medallions

I receive very few recommendations for the award of Special Merit Medallions for the Summer Session and apparently an impression exists that these awards are made only for work during the Winter Sessions. This is quite wrong, and a member who does good work for his club during the Summer is fully entitled to be recommended for a Medallion. I also wish to draw attention to a change in the system of awarding Merit Medallions. In the past, two Medallions have been allotted each session to each Affiliated Club, one for the member who delivered the best paper and the other for the member who carried out the best all-round work for the club during the session. In response to requests from several Leaders, the Guild President has decided that in future there shall be no restrictions in regard to the awarding of these Medallions. Two will be allotted every session to each club as before, but a Leader will be fully at liberty to award them to any two members whom he considers deserving of them, without reference to the delivery of a paper. When Medallions are required for presentation on special occasions, it is necessary for Leaders to apply for them about a week before they are actually required, as they are sent away for engraving.

To Club Secretaries

I am glad to say that monthly club reports are now arriving with much greater regularity than was the case last year, and they are also more detailed and interesting. There are two little points I should like to mention in this connection. The first is that nothing but the club report should be written on the report form. Any other matter, such as requests for the loan of models or lectures, or for Guild literature of any kind, should be contained in a separate letter. The second point is that in referring to gentlemen who have delivered lectures or assisted the club in any other way, the initials should always be given in addition to the surname. I take this opportunity also of reminding secretaries that the club subscription cards of which I wrote in last month's notes are now ready.

Models from Headquarters

In my notes in the June "*M.M.*" I referred to models loaned from headquarters for the purpose of Club Exhibitions or special study and I pointed out that at least three weeks' notice must be given in order to ensure the building and despatch of a model by the required date. Since writing this note certain models have failed to reach their destination in time owing to transport delays, due no doubt to difficulties arising out of the coal dispute. It is very disappointing, both to me and to the club concerned, when a model arrives too late, and in order to avoid further trouble in this direction I have decided that in future *a minimum of five weeks' notice must be given in every case.* This notice will allow a margin of time for the building and despatch of the model and should obviate any danger of disappointment through delay.

Beccles (Suffolk) M.C.

Our photograph shows the Leader and members of Beccles Excelsior Meccano Club. This club was formed in connection with Beccles Congregational Sunday School at the beginning of this year, and was affiliated with the Guild in March. Since that time steady progress has been made, and last month a highly successful Exhibition was incorporated in the Flower Show held at Beccles. Mr. W. C. Watts, the Leader, is shown at the back of the group, and Master Watts, aged five, who is affectionately regarded as the Club Mascot, is in the centre of the front row.

CLUB NOTES

Reading M.C.—Recent activities included an outing to the Corporation Waterworks, when three pumping stations were visited. Other excursions were an inspection of the G.W.R. Sheds, arranged by the kindness of Mr. C. B. Collett, Chief Mechanical Engineer, G.W.R., and a visit to two neighbouring churches where the Vicars conducted the party. An interested patron of the club is the Rev. G. Fleming, M.A., Governor of Emanuel College, Reading. Club roll: 47. *Secretary*: F. G. M. Wheeler, 72, Peel Street, Reading.

Southport M.C.—On fine days meetings are held on the sands, where games and sports are organised. A visit to the Formby Power House for the L.M.S. Electric Line is contemplated, but has been held up on account of the coal strike. Club roll: 18. *Secretary*: W. E. Williamson, "Deva," 10, Delamere Road, Ainsdale, Southport.

Liverpool M.C.—Has recently been affiliated under the Leadership of Mr. Walter H. Jones of Fazakerley, Liverpool, and is making excellent progress. A club room is lent by the courtesy of the Rev. Venn, of Orrell Park Baptist Church, and weekly meetings are well attended. Model-building is the chief interest, models being constructed at home and brought to the club room where they are examined and tested and the faults pointed out by the Leader. Marks are awarded in order of merit, the size of the outfit and the age of the member being taken into consideration. A club Library has been formed. Club roll: 22. *Secretary*: Leonard Hodkinson, 5, Cobham Avenue, Orrell Park, Liverpool.

Annan M.C.—A successful Exhibition was recently organised and a good display of Models was augmented by a Workshop Model loaned from Headquarters, and a fine Hornby Train layout. Various Competitions were held and were instrumental in increasing the funds substantially. Club roll: 15. *Secretary*: Oswald Gibbs, The Studio, Annan, N.B.

Nottingham Central Y.M.C.A. M.C.—Meetings are devoted chiefly to Model-building, and it is hoped that in a month's time a large railway layout will be installed in the club room, members being allowed to bring their own rolling stock in addition to that belonging to the club. A branch club has been formed at West Bridgford. Club roll: 12. *Secretary*: Mr. N. C. Whitehead, M.Inst.Met., City Boys' Secretary, Y.M.C.A., London Road, Nottingham.

Queen Elizabeth's School (Crediton) M.C.—Weekly meetings are held for Model-building and games alternately. At an enjoyable Social, Merit Medallions were presented to M. Phillips and R. Cross for good work during the last session. Two of the members gave pianoforte solos and vocal items respectively. Club roll: 9. *Secretary*: R. Cross, 117, High Street, Crediton, Devon.

Middlesbrough M.C.—A charabanc excursion to Stokesley was greatly enjoyed by all who attended. A promising club Magazine entitled "The Middlesbrough Meccano Monthly" is now published regularly. The first concert of the Club Concert Party proved highly successful, the programme of 17 items including three sketches, pianoforte solos and selections by the Jazz Band. Mr. O. Kay very kindly loaned curtains for the occasion and Mr. Scupham also took a kindly interest in the arrangements. A Temperance Demonstration and procession in the town will include a decorated car which is to represent the club, and a special Guild Week is being arranged to include Sports, Cricket Matches, an Exhibition and a Concert. Club roll: 44. *Secretary*: A. Bradley, 23, Laurel Street, Middlesbrough.

Pershore M.C.—Good progress is reported, and an Exhibition of Models incorporated in a local Flower Show proved very successful. Unfortunately Captain Elkington, the Leader, is leaving the town and consequently severing his connection with the Club. A cycling run to Bredon Hill proved very interesting. Club roll: 16. *Secretary*: Tom Pettifer, High Street, Pershore, Worcs.

Holy Trinity (London) M.C.—Has just completed a highly successful session, in which the activities included a talk on "Standard Mechanisms," Model-building Competitions, Fretwork, Model Railways, Cinema Shows, Lantern Lectures, Outings, a Concert, a Sale of Work, and the introduction of a "Club Bulletin," which is printed and distributed each month. This bulletin contains discussions of all current topics concerning the club and Meccano in general, and is both interesting and useful. *Secretary*: Robert Clark, 77, Richmond Road, Barnsbury, N.1.

Sparkhill M.C.—Outdoor excursions and Cricket Matches are the main activities. The club Magazine has been discontinued for the present, the printer having been obliged to leave the club. Club roll: 24. *Secretary*: E. Stewart, 44, Benton Road, Sparkhill, Birmingham.

St. Michael's (Teignmouth) M.C.—Recent activities have consisted mainly of Cricket Matches, Bathing Expeditions and Cycling excursions. The secretary has been in hospital with appendicitis, but has now made a complete recovery. Club roll: 12. *Secretary*: Frank Russell, 19, Bank Street, Teignmouth.

Bearwood (Birmingham) M.C.—A special Recruiting Month is to be held, three prizes being awarded to the boys who win the greatest number of recruits. Visitors' Nights are very popular, the parents of members taking a keen interest in the excellent models constructed and displayed. A "Games and Hornby Train" night was recently held, members who possessed Hornby Trains running them on a track at one side of the club room, while the rest of the members played games. Meccano Competitions are keenly contested, prizes being awarded. A Lecture on Meccano by K. Hadley proved very interesting. Club roll: 38. *Secretary*: C. G. White, 72, Katherine Road, Bearwood, Birmingham.

1st Herne Bay Meccano and Hobbies Club.—A recent picnic proved most enjoyable. After a ramble over the cliffs, followed by lunch, the afternoon was spent in playing cricket and other games, which were continued after tea well into the evening. Medallions were presented to G. Cador and F. Blogg for their good work during the last session. A visit was paid to the Waterworks, members being shown first the old-fashioned engines that were used 30 years ago and then the modern ones. Two huge covered reservoirs holding 25,000 and 75,000 gallons respectively were examined with interest. Club roll: 36. *Secretary*: C. W. Russell, 4, Clifton Villas, Herne Bay, Kent.

Meccano Club Leaders

No. 28. Mr. M. C. Hodder

Mr. M. C. Hodder is Leader of the Exeter Meccano Club. This club did not commence its career as a Meccano Club but as a Church lads' club. Various internal troubles arose and the club was threatened with dissolution, when Mr. Hodder came upon the scene, brought about a friendly settlement of all disputes, and in a very short time restored the club to healthy activity. Early in 1925, Mr. Hodder, with the unanimous consent of the members, transformed the club into a Meccano Club and shortly afterwards it became affiliated.

Immediately after affiliation a Recruiting Campaign was commenced in which Mr. Hodder urged every member to endeavour to recruit 20 others and thus bring the club total to 200. At the beginning of June of this year the membership reached the figure aimed at, every member being also a member of the Guild. The present membership is 204 and there is every sign that the club will develop still further.

Royal Grammar School (High Wycombe) M.C.—The end of the school term marked the end of a very successful club session, and the prize-giving included the presentation of two Merit Medallions and the President's prize. One Merit Medallion was awarded to H. R. Foden for good club work, and the other to A. C. Thewaneti for an excellent paper on Aeroplanes. The President's prize, a vest pocket Kodak, went to G. H. Stevens for the highest number of marks on the session's work. The syllabus included Lectures on "Photography for Beginners," "The Iron and Steel Industry," "Bees," "Life in Barracks," "Poultry-keeping," "Wild Flowers," "Pond Life," "Butterflies and Moths," "Building a Gramophone," "Lantern Slide Making" and "East Africa." Demonstrations of Gaslight Printing, Enlarging and Passe Partout were given by the Leader. Successful outings were organised to the Kodak Factory, the Zoo, and "His Master's Voice" Gramophone Factory. Club roll: 69. *Secretary*: H. R. Foden, Royal Grammar School, High Wycombe, Bucks.

Haslingden Secondary School M.C.—An eight miles' Ramble was recently held and was greatly enjoyed. A Cricket Match with the members of Accrington M.C. is being arranged. Club roll: 30. *Secretary*: Grenville D. Yarnold, Beech Villa, Haslingden, Manchester.

South Africa

Observatory M.C.—Recent activities included a Mock Trial in which the Leader and fifteen members took part. The case was one of "assault with intent to injure," and during the hearing of the case several fines were inflicted for "Contempt of Court!" A Silver Shield has been presented to the club as a floating trophy for the senior members, by Messrs. Bloch & Co. Dennis Hayes, the winner, was also presented by the President with a silver medal. Another floating trophy presented was for competitions by the junior members, the donor being Mr. H. G. Barker. Other trophies have been promised. *Secretary*: John Barrett, 6, Irwell Street, Observatory, Cape Province, S. Africa.

Sea Point M.C.—The syllabus includes Model-building, Model Racing, Inventions, Philately, Instruction evenings, Lectures, Essays and a visit to the "Cape Times" printing works. A joint debate on "Are Visits to Factories and Workshops Beneficial to Meccano Boys?" was held at the club room of Observatory M.C. The club has a number of associate members, who are mainly parents and friends of the regular members. Club roll: 22. *Secretary*: Eric Pilz, 114, Op de Bergen Street, Fairview, Johannesburg, S. Africa.

Australia

Katoomba M.C.—This recently affiliated club is making splendid headway. Already it has held a successful and profitable Meccano and Hornby Train Exhibition and its syllabus includes Model-building, Lectures, Socials and Impromptu Evenings. The club has printed membership cards in which its aims and objects are set out, together with a list of the dates of meetings and the subjects to which they are to be devoted, and the names and addresses of officials. It has been found necessary to close down for a brief spell on account of the extreme severity of the weather. Club roll: 25. Leader: Mr. R. Falconer, "Alloa," Station Street, Katoomba.

New Zealand

Wiseman's M.C.—The attendance at regular meetings continues to be good. Mr. Lovell, a patron of the club, delivered an interesting lecture on "Wireless" and afterwards offered a Wireless Set as a prize for the best essay on the subject written by a club member. Another interesting feature is a Lecture on "The Construction of a Locomotive" delivered by Mr. Mackley, Chief Locomotive Engineer of the North Island N.Z. Railway, whose support of the club has been very valuable and is greatly appreciated by members. Club roll: 800. *Secretary*: W. Shearer, 170, Queen Street, Auckland, N.Z.

Clubs not yet Affiliated

Takapuna (New Zealand) M.C.—A meeting held at the home of the secretary was devoted to a race in Model-building. Members were required to build the Step Ladder model in the shortest possible time. The winner, George Symes, constructed it in 12½ minutes, and a second race to disassemble the model in the shortest possible time was won by Thornton Walker. The story "Ten Minutes Slow" was read aloud from the "Meccano Magazine." *Secretary*: George Henwood, "Fernbank," Lake Road, Takapuna, Auckland, New Zealand.

West Bridgford (Nottingham) M.C.—A hut has been obtained on the Y.M.C.A. Athletic Ground as a temporary club room. A pavilion will be available shortly for regular meetings. It is proposed to instal electric current for driving electric trains and running Lanterns and Cinemas. An Exhibition to raise funds is to be held early in Spring, and support will be given by Nottingham Y.M.C.A. M.C., of which this club is a branch. *Secretary*: Mr. N. C. Whitehead, M.Inst.Met., City Boy's Secretary, Y.M.C.A., Nottingham.

Dublin No. 1 M.C.—A sound club has been established and it is hoped to secure affiliation at an early date. An inspiring opening address was given to the members by Mr. Cochrane, a patron of the club, who is endeavouring to arrange tours of various works and factories. New members will receive a hearty welcome. Club roll: 9. Leader: Mr. J. Seymour, 49, Eccles Street, Dublin.

Sutton Bridge (Lincs.) M.C.—Under the Leadership of Mr. Steeples, a second club has been formed at Sutton Bridge. A club room is already secured and regular meetings are held. *Secretary*: Wm. Hall, 18, King Street, Sutton Bridge, Lincs.

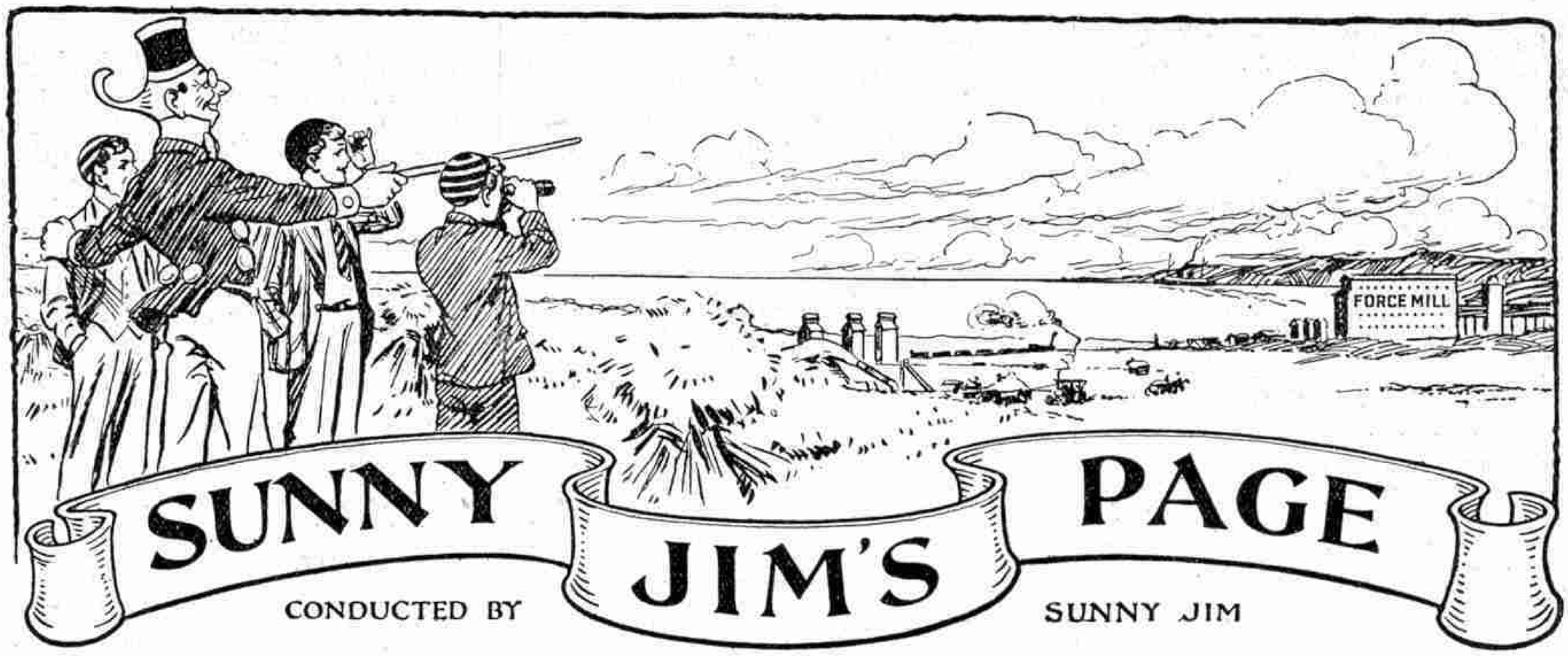
Eastham M.C.—During a recent visit to Eastham Locks all the machinery was explained to the members and the outing proved most interesting. Meetings are held out-of-doors in fine weather and members meet in the club room only when it is raining. Club roll: 9. *Secretary*: F. Taylor, School Lane, Eastham.

Proposed Clubs

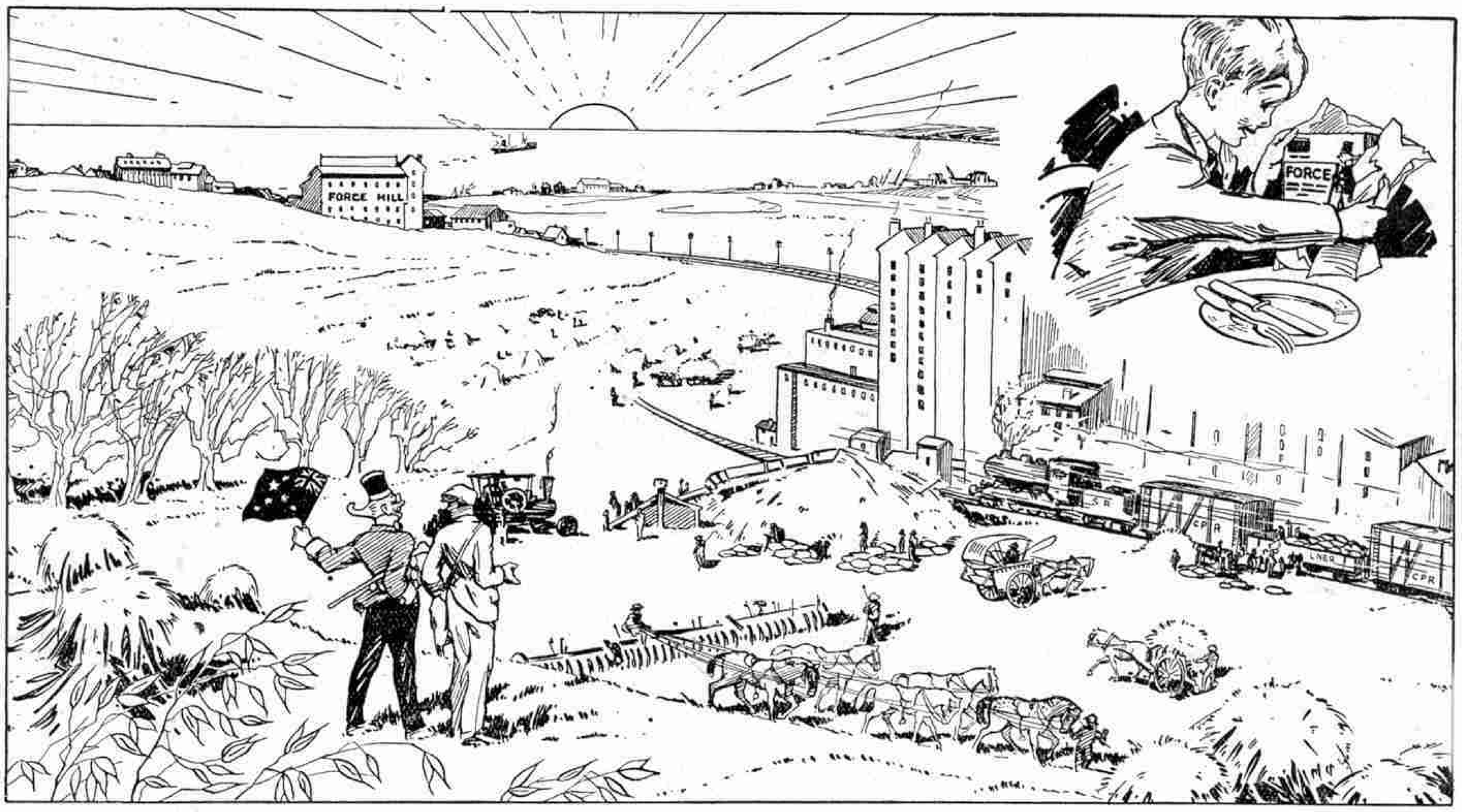
Montreal (Canada) M.C.—A club has been formed and a Leader has already been secured. Full particulars may be obtained from A. Lansdell of 5531, 8th Avenue, Rosemount, Montreal, Canada.

Chiswick (London) M.C.—Boys living in the district of Chiswick are invited to communicate with the promoter of a movement to form a Meccano Club, Walter Moss, 212, Goldhawk Road, London, W.12.

Manitoba Model-Builders' M.C.—A Meccano Club is being formed at Winnipeg by a number of engineering enthusiasts. It will include juniors, intermediates and seniors, and the opening meeting is arranged to take place early in October. President and Organiser: Mr. W. R. Newcomb, 194, Tache Avenue, Norwood, Winnipeg, Canada.



2/6 A WEEK POCKET MONEY FOR 8 WEEKS



If you find the 20 things "that would not happen"

Second Prize 2/6 a Week for Four Weeks

Third Prize 5/- Cash

And a host of Consolation Prizes

Every Saturday morning, for eight weeks, a postal order for 2/6 from Sunny Jim! That is what is in store for the lucky winner of this new "FORCE" competition. *You* may be that Meccano Boy! Even if not, there's a host of other prizes. Get a piece of paper now and see how many faults you can discover. What sort of mistakes are they? They are all things that just don't happen in real life. For instance, as you know, "FORCE" is whole WHEAT, yet if you look carefully at the picture you will see that *oats* are shown in the foreground. There's a big error! There are 19 more things happening in the picture all as wrong as that. Read up the pages about "FORCE" in back numbers of the "*Meccano Magazine*" it will refresh your memory and help you spot some more of the faults in the above picture. Find as many as you can—perhaps no-one will find them ALL—and write down your results on one side of a sheet of paper headed "'FORCE' PICTURE FAULTS."

Then tabulate the faults you have found as under :—

1. "FORCE" is WHEAT, *oats* are shown in foreground of picture.
2. . . . here you put the second fault you discover—and so on.

When you have finished, sign your name, write your address at the bottom and post *with the top from a packet of "FORCE"* to

"Sunny Jim,"
197, Gt. Portland St.,
London, W.1.

marking your envelope "'*FORCE*' *Picture Faults Competition*," in the top left hand corner.

Sunny Jim has the original list of errors in his possession and the first prize will be awarded to the Meccano Boy who submits the list that compares most closely with the original list of errors. The second and third prizes will be awarded in order of merit and also many consolation prizes.

The results will be announced on this page in a subsequent issue of the "*Meccano Magazine*," and "Sunny Jim's" decision in all matters appertaining to this competition will be final.

Send in your entry now.

WINNERS OF "MODEL" COMPETITION

In the July issue, 1926.

The first prize of £1, the second prize of 10/- and the third prize of 5/- have been awarded by Sunny Jim to the three Meccano Boys named below.

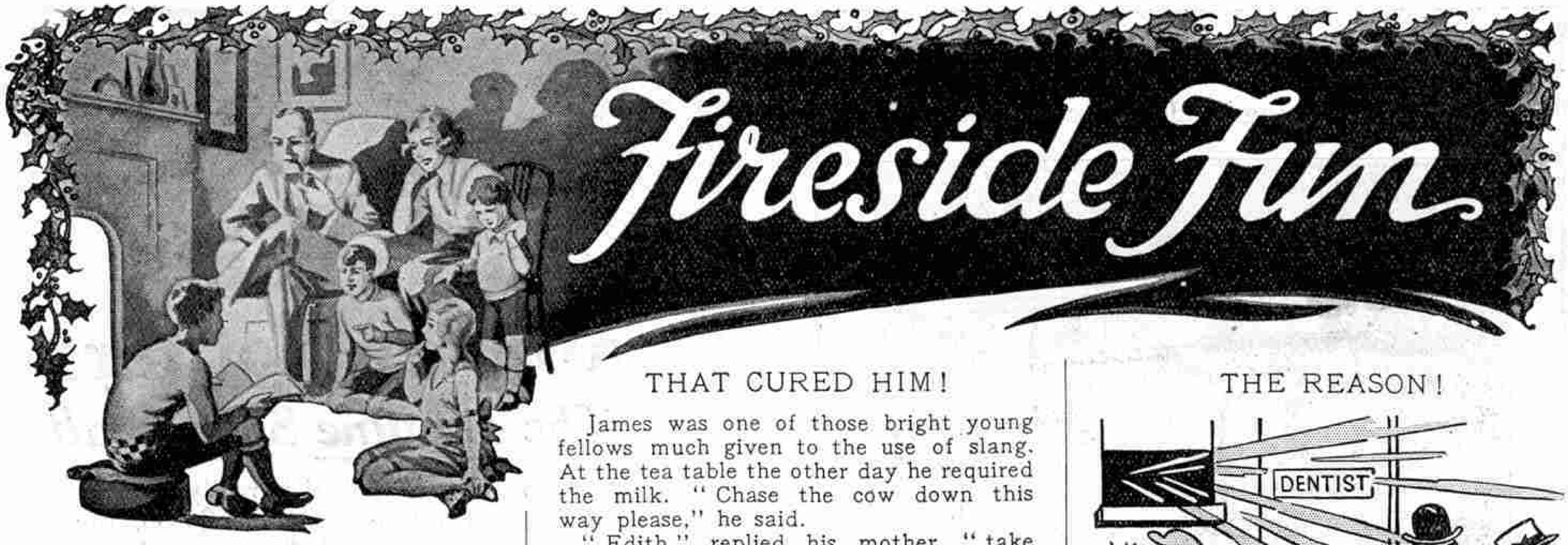
First Prize (£1).
S. W. Hardisty, Cockermouth, Cumberland.

Second Prize (10/-)
S. L. Hucken, Oxford.

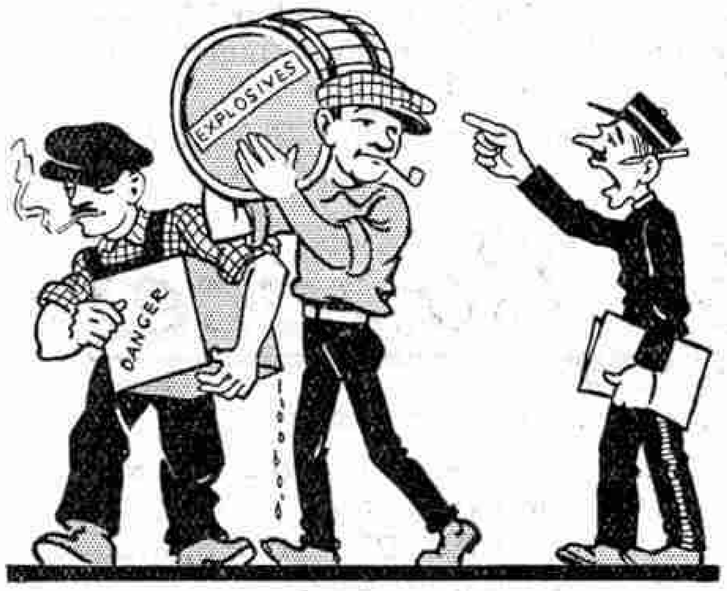
Third Prize (5/-)
Dereck Brough, Worcester Park, Surrey.

Consolation prizes have been sent to other competitors.

Sunny Jim



HIGHER MATHEMATICS!



"Hey, you two, handle that gunpowder carefully!"

"Why?" they asked.

"Don't you know that some of that same stuff exploded last month and killed seven men?"

"Well," one of the two replied, "that couldn't happen now, there are only two of us here."

* * * *

During the war one unfortunate Tommy had spent many months in hospital and had undergone so many operations that he was becoming tired of them.

"Will this be the last time?" he asked, as he was being prepared for his fifteenth visit to the operating room.

"I hope so," replied the surgeon, "but, of course, I cannot say until I know how this operation turns out."

"Oh, well, if that is so, I think you had better not sew me up again. Just put a few buttons on!"

* * * *

WAIT AND SEE!

Although the weather was not very rough, one passenger in the dining saloon showed unmistakable signs of being ill in the very near future. A steward endeavoured to persuade him to return to his cabin.

"Come, Sir," he said, "you really cannot be sick here."

The passenger regarded him with a glassy eye. "Can't I?" he said. "Wait and see!"

* * * *

Pat: "Moike, phwat are ye boring a hole in your boat for?"

Mike: "Begorra! There's one hole in it that lets the water in, and I am boring another one to let it out!"

THAT CURED HIM!

James was one of those bright young fellows much given to the use of slang. At the tea table the other day he required the milk. "Chase the cow down this way please," he said.

"Edith," replied his mother, "take the cow down to where the calf is bawling."

* * * *

Johnson: "Oh, I call my dog Sausage because he is only half bre(a)d."

Jackson: "That reminds me of a goat we used to call "Nearly" because he was all butt, and a chicken we used to call Robinson because he crew so!"

* * * *

Little girl (to brother): "Jimmy, what makes that whistle in our wireless set."

Brother (looking very puzzled): "I don't know. I heard father say that he had put up a cage aerial. Perhaps a bird has got caught in it!"

* * * *

STARTLING!

A guide, showing on old lady over the Zoo, took her to a cage occupied by a kangaroo.

"Here, madam," he said, "we have a native of Australia."

The visitor gaped at it in horrified astonishment.

"Good heavens!" she said. "An' to think my sister married one o' them things!"

* *

First Schoolboy: "Jack Smith's mother is ever so good to him."

Second Schoolboy: "What's she done?"

First Schoolboy: "Let him have measles the day the school opened!"

* * * *

MIXED HISTORY!

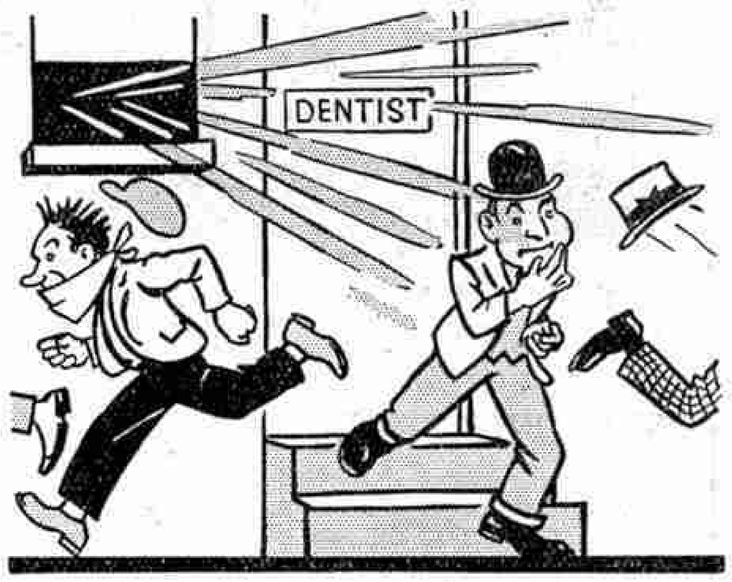
Teacher (during history lesson): "Who followed James?"

Tommy: "Mary."

Teacher: "That's right. Now who followed Mary?"

Tommy: "Please ma'am, her little lamb."

THE REASON!



Dentist: "I'll have to charge you 25/- for pulling that tooth."

Patient: "I thought your charge was only five shillings?"

Dentist: "Yes, but you howled so loudly you scared four other patients out of the place!"

* * * *

Traveller (to young boy): "Just hold my horse while I go in that shop."

Young Boy: "Will he kick?"

T.: "No!"

Y.B.: "Will he bite?"

T.: "No!"

Y.B.: "But will he run away though?"

T.: "No!"

Y.B.: "Then why do you want me to hold him?"

* * * *

Salesman (heatedly): "I take orders from no one."

Sales Manager (frigidly): "So I notice from your last month's report."

* * * *

FISHY!

A certain famous judge was with a party of American friends on a fishing trip in the Adirondacks, and around the camp fire one night the talk naturally ran to big fish. The stories became wilder and wilder as each endeavoured to out-do his predecessor. When it came to the judge's turn he felt rather uncertain as to how his story would compare with those that would follow, and as he related an incident he paused to think.

"We were fishing one day on the Grand Banks," he began, "for er—for—"

"Whales," somebody suggested.

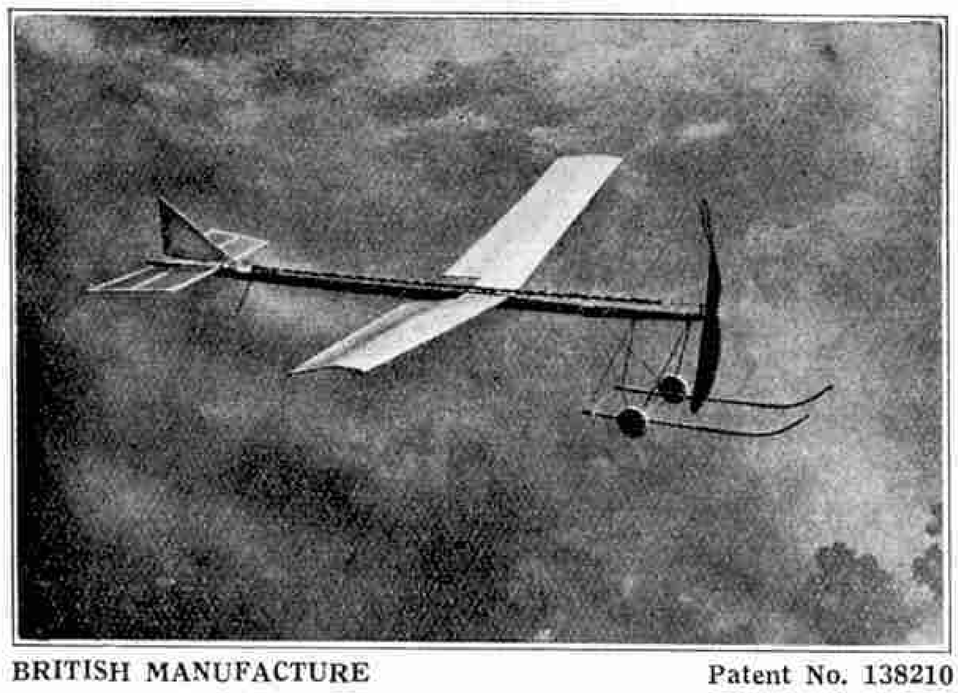
"Oh no!" said the judge, "we were baiting with whales."

* * * *

A schoolmaster had been telling his class something of the fearsome nature of the rhinoceros, and wound up by asking the boys to name something that was dangerous to approach and had a horn. As one man came the answer from the whole form—"A Motorcar!"

Hullo Boys!! Enjoy Flying:

The "Skisail" Flying Model Tractor Monoplane



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YOU want the ball that really bounces best—therefore insist on Sorbo, the original unburstable ball—not a flabby foreign imitation.

You can slash a Sorbo Bouncer and prick it—you could not burst it however much you tried—and it never loses its bounce.

Insist on a genuine Sorbo, the British ball that never "gives in."

Sorbo Bouncer

THE BALL YOU CAN'T BURST

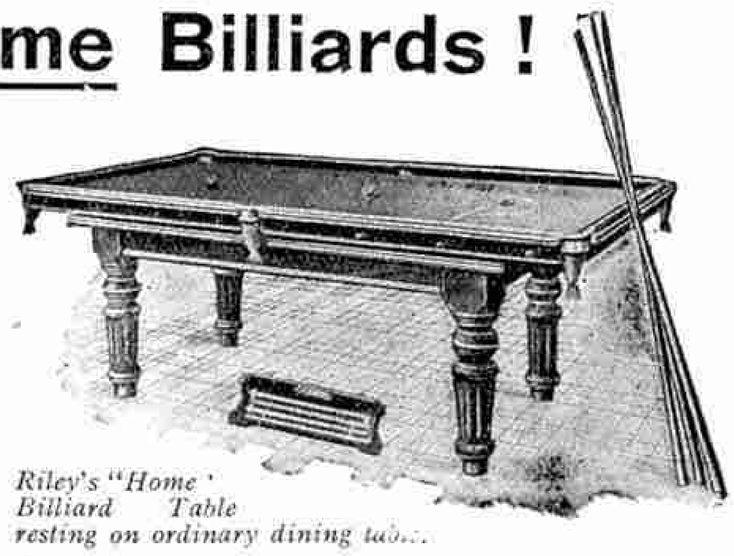
Of all dealers. Prices 2½d. to 1/6 each. In assorted colours.

SORBO RUBBER-SPONGE PRODUCTS, LTD.
Sorbo Works, Woking.

Riley Home Billiards!

There never was a jollier home-pastime for long Winter evenings.

Send 14/-, and a 6-ft. "Home" Billiard Table, complete with all accessories, will be delivered to your door, carriage paid in free packing case. Riley's take all risk in transit. The balance you pay easily while you play. If this size is not convenient, you may have any other delivered by sending the first payment.



Riley's "Home" Billiard Table resting on ordinary dining table.

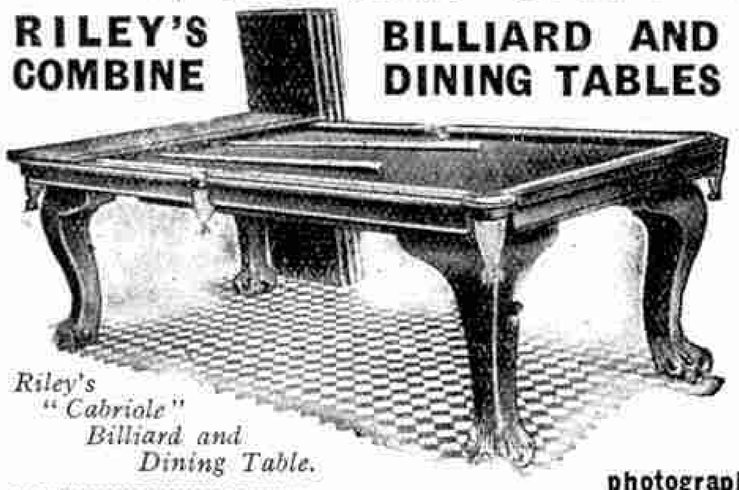
All tables for the home are sent on 7 days' free trial. This enables you to test the table before buying.

RILEY'S "HOME" BILLIARD TABLES

These tables are made by the same method and with the same precision as the famous Riley's Full-Size Billiard Tables, and give you a perfect game of billiards *in your own home.* Sizes and prices as follows:

4′ 4″ × 2′ 4″	£7 0 0	or in 8/6
5′ 4″ × 2′ 10″	£9 0 0	18 11/-
6′ 4″ × 3′ 4″	£11 15 0	monthly 14/-
7′ 4″ × 3′ 10″	£15 0 0	payments 18/-
8′ 4″ × 4′ 4″	£21 10 0	of 26/-

RILEY'S COMBINE BILLIARD AND DINING TABLES



Riley's "Cabriole" Billiard and Dining Table.

Beautiful and perfect pieces of furniture. Can be converted from dining tables to billiard tables, or vice versa, in ten seconds. Supplied in Oak or Mahogany—any shade. These prices are for Mahogany Round Leg Design. See price list for other designs.

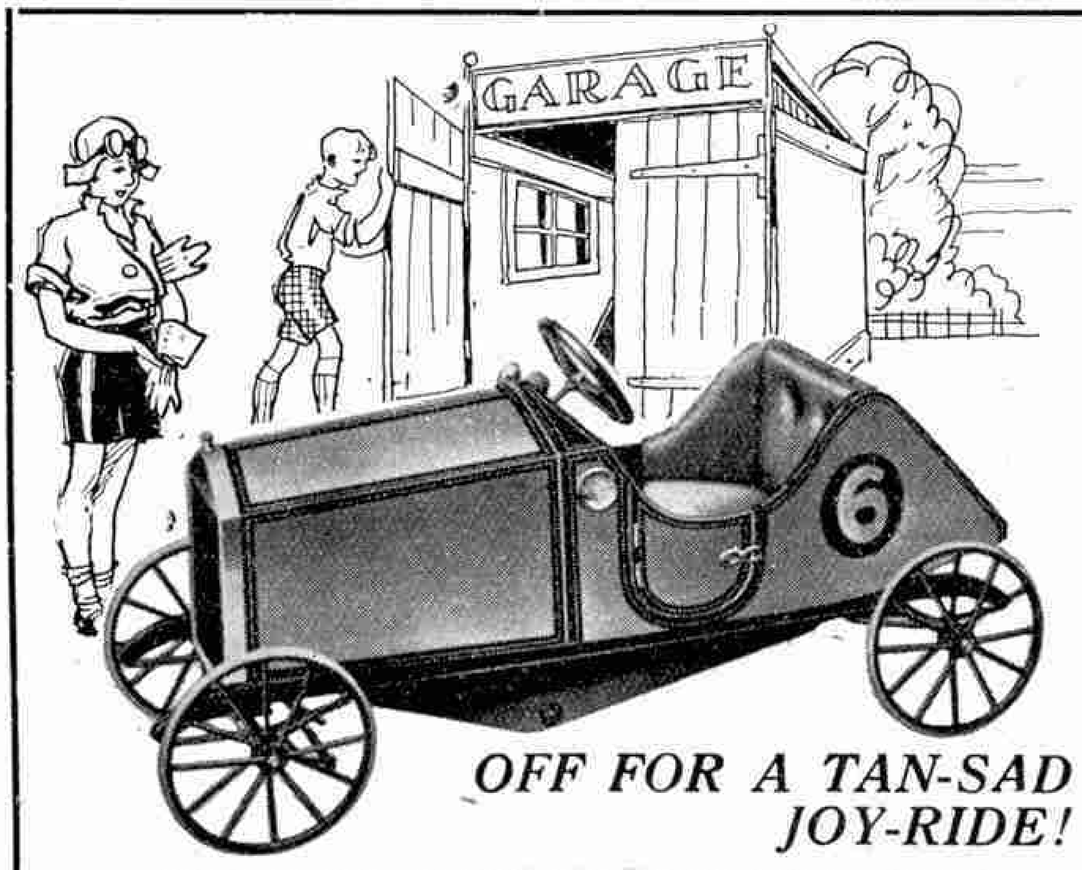
5′ 4″ × 2′ 10″ ...	£22 10 0
6′ 4″ × 3′ 4″ ...	£26 10 0
7′ 4″ × 3′ 10″ ...	£33 0 0
8′ 4″ × 4′ 4″ ...	£43 0 0

or in 13 or 20 monthly payments.

Riley's are the largest makers of **Full-size Billiard Tables** in Great Britain. Send for full particulars. Estimates given free for any kind of repairs or accessories

Write TO-NIGHT for FREE photographic list of tables of all sizes.

E. J. RILEY LTD.,
Deal Works, ACCRINGTON,
and Dept. U, 147, Aldersgate St., E.C.1



OFF FOR A TAN-SAD JOY-RIDE!

This is one of the new 1926 TAN-SAD Wheel Toys. For real fun—every day—there is nothing like a Tan-Sad motor. Look at the 'Sports Model' illustrated above. It is fitted with speedometer and clock on the dashboard, license holder, mirror and horn. The near side door opens whilst the door panels and bonnet are attractively beaded. Transmission is by double crank pedal movement. Colours:—orange, red and black lined gold with grey radiator - - - Price 65/-

Other models from 21/- to £5/15/-.

Illustrated list post free on request.

TAN-SAD WHEEL TOYS

TAN-SAD LTD., Drake Works, Albert St., BIRMINGHAM

LONDON: 8, Phœnix Place, Mount Pleasant, W.C.1.

JAEGER
Pure Wool

The New "Meccano" Jersey

This Jaeger "Meccano" Jersey is made in the special "Meccano" pattern. It wears splendidly and prevents chill when a boy gets hot, as every boy will sooner or later. The "Meccano" Jersey appeals to every boy at once as well as to the "grown-ups" who study the health, happiness and appearance of children.

22"	24"	26"	28"	30" Chest
7/-	7/9	8/6	9/3	10/-

Colours :—Navy body with Light and Dark Saxe dice effect.
Mid Grey body with Black and White "
Fawn body with Brown and Saxe "
Brown body with Fawn and Red "
Saxe body with Navy and Dark Saxe "
French Grey body with Lt. and Dk. Saxe "

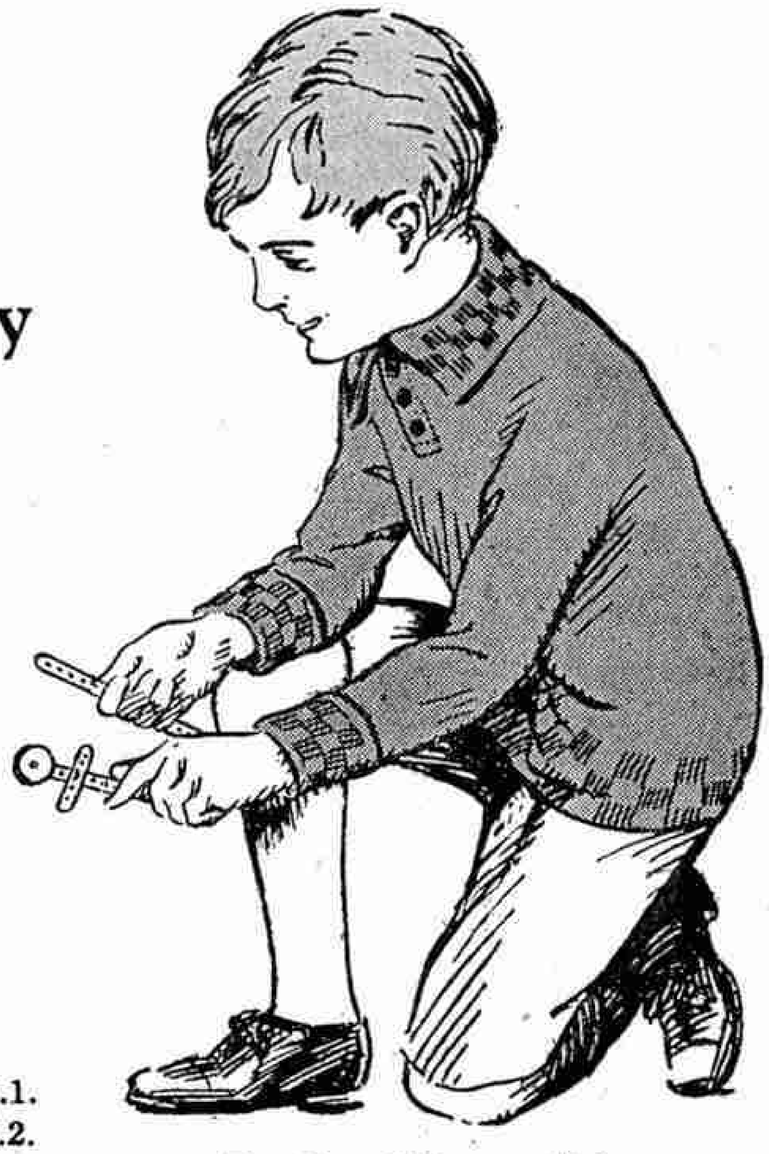
Three-quarter Hose, Turnover Tops to match

3, 4	5, 6, 7	8, 9, 10
2/9	3/3	3/9

Obtainable only from Jaeger Depots and Agents.
(Write for the address of your Local Agent).

JAEGER HEAD RETAIL DEPOT : 352/54, OXFORD ST., LONDON, W.1.
WHOLESALE & SHIPPING : 95, MILTON ST., LONDON, E.C.2.

BRANCHES : AUSTRALIA—Melbourne, 325, Flinders Lane. Sydney, 38/44, York Street.
CANADA—Montreal, 1187, Bleury Street.



The New "Meccano" Jersey

THE MECCANO BOY'S STAND-BY
THE TUBE OF

SECCOTINE

The World's Great Adhesive. Registered Trade Mark.

WITH it he can mend a thousand things—his bats, balls, boats, boxes, bags, books, &c. He can make numberless things that a boy likes. He can help his mother by mending breakages in house furniture, anything—everything.

NOTE. There is nothing messy about Seccotine. Use the spike or pin supplied to open a new tube—at top of cone—press gently at end of tube (at folded part) for as much adhesive as is needed—then replace spike or pin which acts as stopper. Keep folding tube end as contents are withdrawn. Give mended article adequate time for drying.

TUBES are 4½d. (vest pocket box), 6d. and 9d. each. Sold everywhere.

Mothers should know that cups, saucers, tumblers, etc. intended to hold liquids, hot or cold—should be mended with FIRMAS (Heat Seccotine). Tubes 6d. each.

McCAW, STEVENSON & ORR LTD.
The Linenhall Works BELFAST

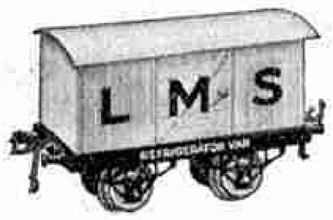
ROLLING STOCK AND ACCESSORIES

(HORNBY SERIES)

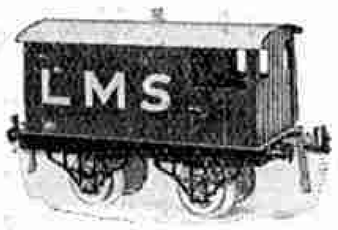
There are now 50 different train accessories—Stations, Signal-boxes, Lamps, Wagons, Level-Crossings, Foot-Bridges, Turntables, etc. Further accessories will be added to the system from time to time, and will be announced in the pages of the "*M.M.*"

All Hornby Rolling Stock and Accessories are built in correct proportion to the size, gauge, method of coupling, etc., of the Hornby Trains and all have the uniformly beautiful finish that is the great feature of these trains. With these accessories you can build up a most realistic railway system, and the splendid range of rails, points, and crossings make possible endless variety in rail layout. Ask your dealer to show you specimens of the new products that have recently been introduced.

BRAKE VAN
Finished in grey, with opening doors. Price **4/-**

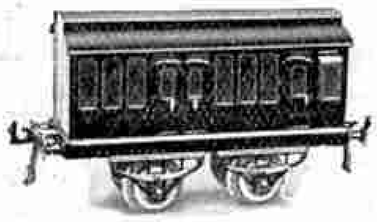


***REFRIGERATOR VAN**
Enamelled in white, with opening doors. Price **4/-**

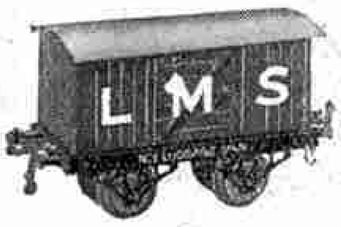


BRAKE VAN
Finished in grey, with opening doors. Price **4/-**

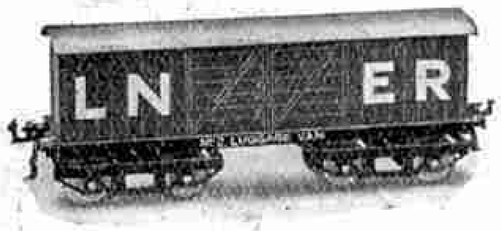
***SNOW PLOUGH**
With revolving plough driven from front axle. Price **5/6**



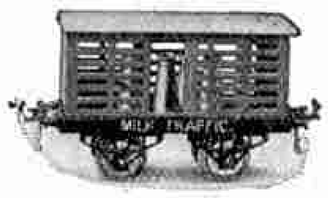
***GUARD'S VAN**
Realistic design, fitted each side with opening doors. Price **3/6**



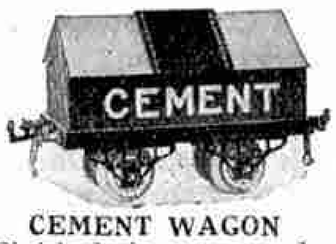
***No. 1 LUGGAGE VAN**
With opening doors. Price **4/-**



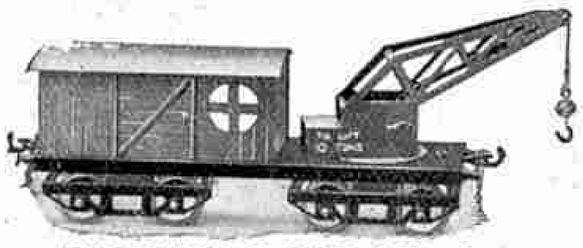
***No. 2 LUGGAGE VAN**
Finished in blue and green. Fitted with double doors. Suitable for 2-ft. radius rails only ... Price **6/6**



***MILK TRAFFIC VAN**
Fitted with sliding door, complete with milk cans. Price **4/6**

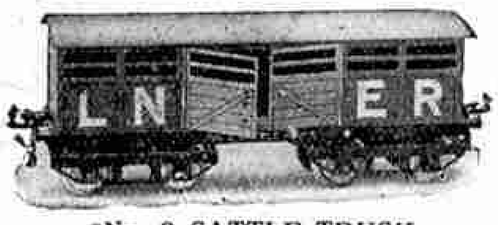


CEMENT WAGON
Finished in grey and black. Price **4/-**

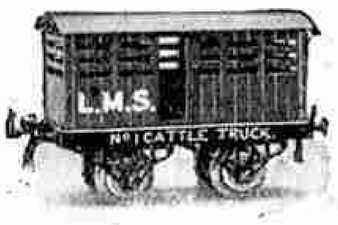


***BREAKDOWN VAN AND CRANE**
Beautifully coloured in grey and black, with opening doors. Suitable for 2-ft. radius rails only ... ... Price **7/-**

SECCOTINE WAGON
Beautifully finished in blue, with opening doors. Price **4/-**



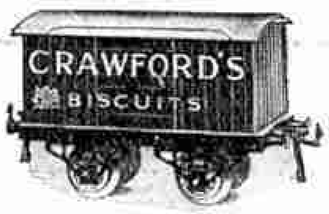
***No. 2 CATTLE TRUCK**
Splendid model fitted with double doors. Suitable for 2-ft. radius rails only ... ... Price **6/6**



***No. 1 CATTLE TRUCK**
Fitted with sliding door. Very realistic design. Price **4/-**

SIDE TIPPING WAGON
Excellent design and finish. Price **3/6**

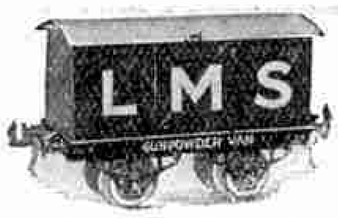
ROTARY TIPPING WAGON
Finished in grey and green. Price **4/-**



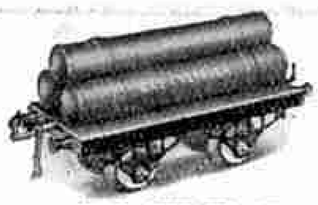
CRAWFORD'S BISCUIT-VAN
Finished in red, with opening doors ... Price **4/-**

CARR'S BISCUIT VAN
Finished in dark blue, with opening doors. Price **4/-**

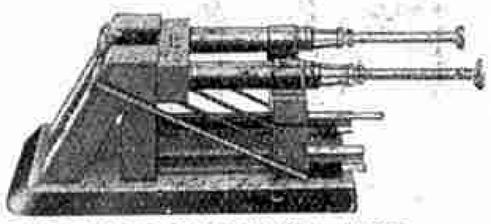
JACOB'S BISCUIT VAN
Finished in crimson lake, with opening doors. Price **4/-**



***GUNPOWDER VAN**
Finished in red, with opening doors. Price **4/-**

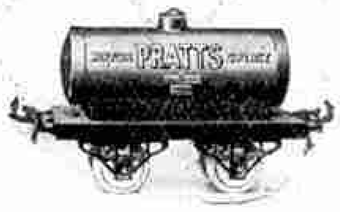


***GAS CYLINDER WAGON**
Finished in red, lettered gold. Price **3/-**

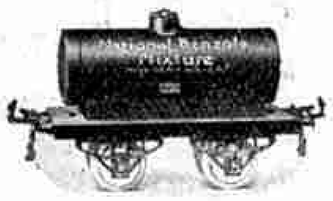


HYDRAULIC BUFFER STOP
Price **5/-**

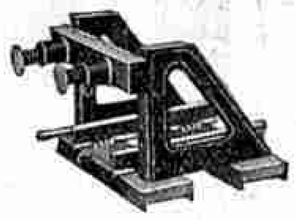
PETROL TANK WAGON "SHELL"
Finished in red. Price **3/-**



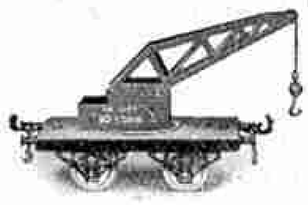
PETROL TANK WAGON "PRATTS"
Finished in green. Price **3/-**



MOTOR SPIRIT TANK WAGON "NATIONAL BENZOLE"
Price **3/-**



SPRING BUFFER STOP
Price **1/6**



***CRANE TRUCK**
Finished in grey and black ... Price **4/6**

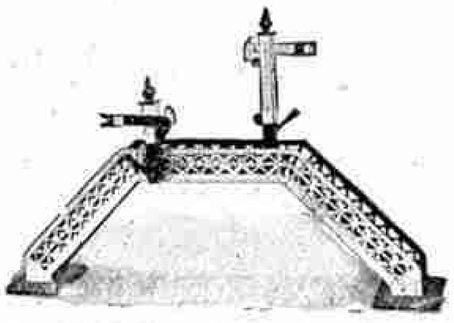
***HOPPER WAGON**
Mechanically unloaded. Finished in grey and black ... Price **4/-**

***TROLLEY WAGON**
Finished in grey and red. Suitable for 2 ft. radius rails only ... Price **6/-**

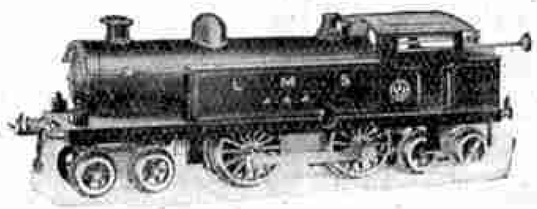
TURNTABLE
Price **5/-**

TUNNEL
Realistic and finished in colours ... Price **7/6**

HORNBY No. 1 TANK LOCO
Gauge 0, in colours to represent L.M.S., G.W. or L.N.E.R. Companies' locos. Price **12/6**



FOOTBRIDGE
No. 1. With detachable Signals Price **6/-**
No. 2. Without Signals ... „ **3/6**
Signals only ... ... per pair **2/9**



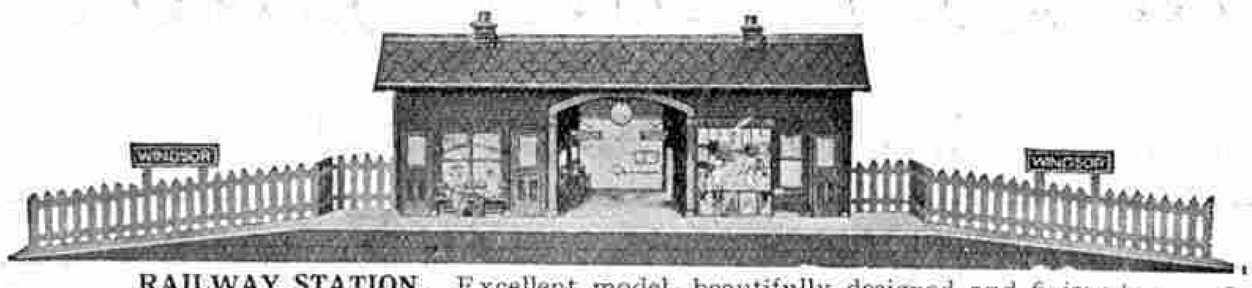
HORNBY No. 2 TANK LOCO
Beautifully finished in colours to represent L.M.S., G.W. or L.N.E.R. Companies' locos. Fitted with reversing gear and br.ke mechanism ... ... Price **30/-**

**Lettered L.M.S., G.W. or L.N.E.R.*

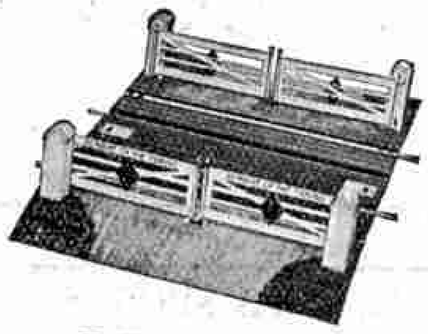
ROLLING STOCK AND ACCESSORIES

(HORNBY SERIES—*continued*)

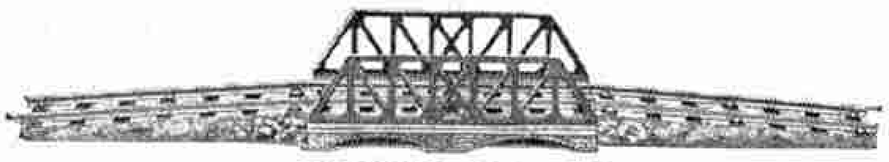
SIGNAL CABIN
Dimensions: Height 6½-in., Width 3½-in., Length 6½-in. Finished in colour and lettered "Windsor." Roof and back open to allow signal-levers to be fitted inside cabin if desired.
Price **6/6**



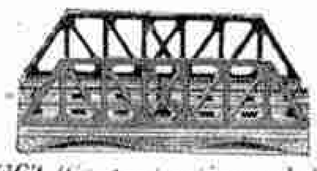
RAILWAY STATION. Excellent model, beautifully designed and finished. Dimensions: Length 2-ft. 9-in., breadth 6-in., height 7-in. Price **12/6**



LEVEL CROSSING
Beautifully designed in colour. Measures 11½ × 7¼-in. with Gauge 0 rails in position.
Price **6/6**

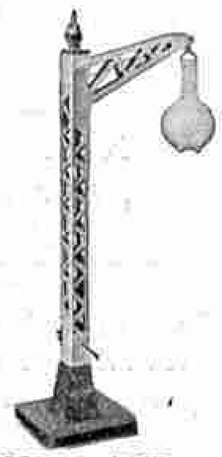


VIADUCT. Price **7/6**
ELECTRICAL VIADUCT. Price **8/-**

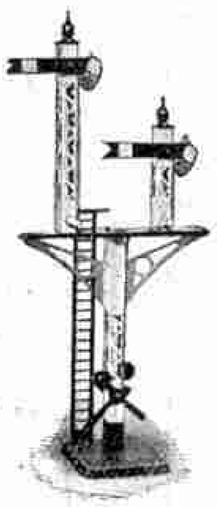


VIADUCT (Centre Section only) Price **4/6**
ELECTRICAL VIADUCT (Centre Section only) Price **5/-**

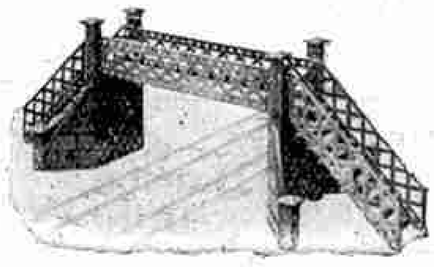
LOADING GAUGE
Price **1/9**



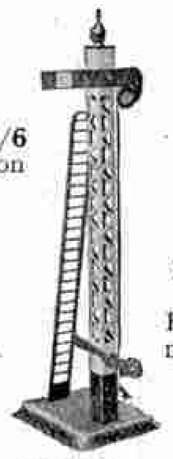
SINGLE LAMP STANDARD
A 4-volt bulb may be fitted into the globe. Price **3/-**



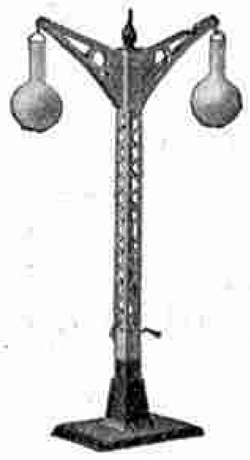
JUNCTION SIGNAL
Signal arms operated by levers at base. Very realistic model standing 14-in. in height.
Price **5/6**



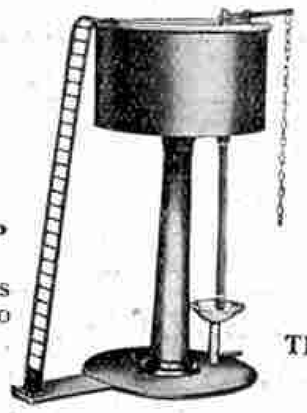
LATTICE GIRDER BRIDGE
Constructional type. Strong and well proportioned.
Price **10/6**



SIGNAL
Price **2/6**

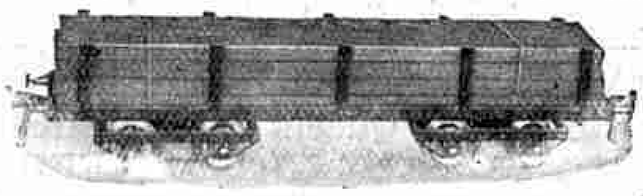


DOUBLE LAMP STANDARD
Four-volt bulbs may be fitted into the globes.
Price **4/-**



WATER TANK
Brightly coloured in red, yellow and black, 8½-in. in height, with flexible tube and pump lever.
Price **6/6**

TELEGRAPH POLE
Price **2/6**



***No. 2 TIMBER WAGON**
Beautifully enamelled in green. Suitable for 2-ft. radius rails only ... ... Price **4/6**

No. 1 TIMBER WAGON
Beautifully enamelled in green.
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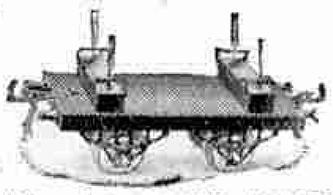
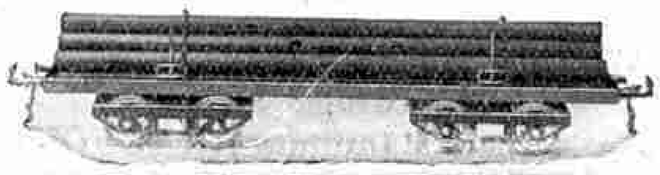


***No. 1 LUMBER WAGON**
Fitted with bolsters and stanchions for log transport.
Price **2/-**



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Fitted with bolsters and stanchions for log transport. Suitable for 2-ft. radius rails only.
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Price per set **1/6**

PLATFORM ACCESSORIES
No. 3. Platform Machines, etc.
Price per set **1/6**

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No. 2. Milk Cans and Truck.
Price per set **1/6**

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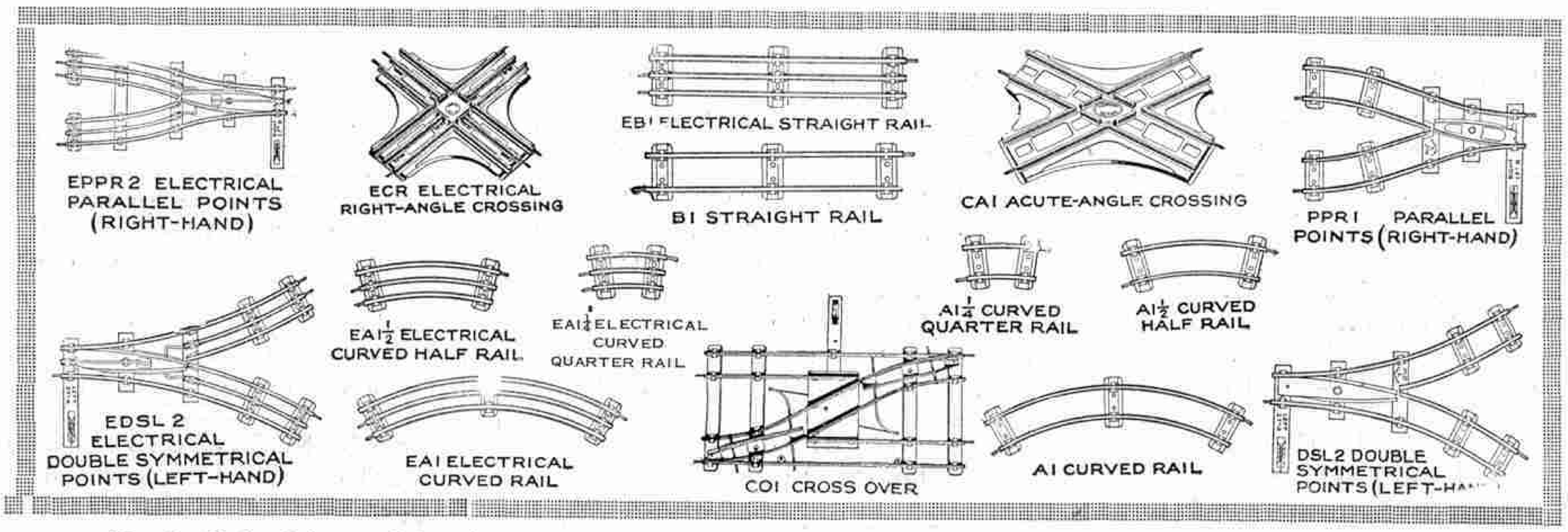

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ASK YOUR DEALER TO SHOW YOU SAMPLES

Meccano & Hornby Train Supplies

All the dealers whose advertisements appear on this page carry full stocks of Meccano Outfits, Accessory Outfits and Meccano parts, Hornby Trains and Hornby Train Accessories all the year round. The names are arranged in alphabetical order of town.

ACTON'S SPORTS SUPPLY CO.,
ACTON. EALING.
WIMBLEDON. HARLESDEN.

HARRY BROWN,
1, Moss Lane,
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256, Grange Road,
Phone : B'head 621 BIRKENHEAD.

MERCER'S DOLLS' HOSPITAL,
68, Darwen Street,
BLACKBURN.

SELLEN'S BAZAAR,
54, Waterloo Road,
BLACKPOOL, S.S.

BROWN, MUFF & CO. LTD.,
BRADFORD.

W. CARTER,
15, Bridge Street,
opp. Mechanics' Institute, BRADFORD.

JOHN TAYLOR,
28, Preston Street,
Tel. : Brighton 957 BRIGHTON.

GYLES BROS. LTD.,
Tel. 2888 24, Bridge Street, BRISTOL.
188, Whiteladies Road, Clifton, BRISTOL.
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SALANSON LTD.,
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HAROLD HUNT,
38, Spring Gardens,
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A. M. HARRIS,
"Wilces Toy Shop,"
14, High Street Arcade, CARDIFF.

H. W. GILL,
23 & 24, Pittville Street,
CHELTENHAM SPA.

R. H. JEPSON,
1, Cross Cheaping,
COVENTRY.

PURSEY & MOCKRIDGE,
The Sports Outfitters,
Tel. Dartford 173 DARTFORD.

HENRY WHALLEY,
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DARWEN.

RATCLIFFES TOYERIES,
19, Osmaston Road,
DERBY.

C. E. MELLER,
"Dolls' Hospital,"
DONCASTER.

JOHN ARCHIBALD,
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DIXON'S,
41, High Street,
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DRAFFEN & JARVIE LTD.,
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CARTER'S STORES,
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BASSETT-LOWKE LTD.,
1, Frederick Street,
EDINBURGH.

WRIGHT'S DOLLS' HOSPITAL,
14, High Street,
ERDINGTON.

UPTON BROS. LTD.,
Sandgate Rd. and Tontine St.,
FOLKESTONE.

HARRY HUBBARD,
8, High Street,
(Opposite the Cricketers) GILLINGHAM.

ROBERT BALLANTINE,
103½, St. Vincent Street,
GLASGOW.

CLYDE MODEL DOCKYARD,
22-23, Argyll Arcade, GLASGOW.
Model Makers to the Admiralty, the Railway Coys., etc.

The MARVEL MART (Wm. Ross & Co.),
110, West Nile Street,
GLASGOW.

POLLOCK & CO., 36, Bridge St. and
222 and 245, Argyle Street
and 39, Paisley Rd. West, GLASGOW.

WELTON & MESSENT,
5, Pond Street,
HAMPSTEAD, N.W.3.

FLETCHER'S TOYLAND,
77, Deardengate, HASLINGDEN.
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SMITH & DANIELS,
59, Westgate St., IPSWICH.
25, Market Place, GT. YARMOUTH

W. J. S. CARPENTER,
13 & 15, Queen Victoria Street,
LEEDS.

PEARSON & DENHAM (PHOTO)
LTD., 6, Bond Street,
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ROBOTHAM,
"Baby's Kingdom,"
Tel. 4809 LEICESTER.

LLOYD & SON,
2, Station Street,
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BYCROFTS EMPORIUM,
366, High Street,
LINCOLN.

C. LUCAS, Hobbies Depot,
35, Manchester Street,
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Reliance Cycle & Motor Co.,
29/31, Manchester St., Liverpool.
Argyle & Conway Sts., Birkenhead.

THE ARUNDEL CYCLE & MOTOR
STORE, 52, Church Road,
Upper Norwood, LONDON, S.E.19.

W. HUMPHRYS & SON,
Estab. in 1840 269/271, Rye Lane,
Peckham, LONDON.

Meccano & Hornby Train Supplies

The twenty-five dealers whose advertisements appear on this page carry full stocks of Meccano Outfits, Accessory Outfits and Meccano parts, Hornby Trains and Hornby Train Accessories all the year round. The names are arranged in alphabetical order of town.

F. R. POTTER & SON,
43, Market Place,
LOUGHBOROUGH.

H. G. PARTRIDGE & CO.,
10, Chapel Street,
Tel. 234 LUTON.

BARR'S CHILDREN'S PARADISE,
49, Deansgate,
Tel. City 165 MANCHESTER.

BAXENDALE & CO. LTD.,
Miller Street,
Tel. 5900 City (20 lines) MANCHESTER.

A. FRANKS LTD.,
95 & 97, Deansgate, MANCHESTER.
90, Bradshawgate, BOLTON.

A. INMAN,
Moorfield Arcade, 105, Lapwing Lane,
Didsbury, MANCHESTER.

JOHN NESBITT LTD.,
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H. WILES LTD.,
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SHAW'S BAZAARS,
30-36, High Street,
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R. SCUPHAM & SONS,
35, Linthorpe Road,
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DIBBS' DOLLIES' HOSPITAL,
NELSON, LANCS.

ALFREDS, TOY SHOP,
77, Northumberland Street,
NEWCASTLE-ON-TYNE.

WILLIAM OLLIFF,
13, Grainger Street West,
NEWCASTLE-ON-TYNE.

THE OXFORD SPORTS DEPOT,
117, St. Aldates',
OXFORD.

JANES & ADAMS,
13, The Promenade,
And Branches. PALMERS GREEN.

A. J. ROBERTSON,
39-41, Broad Bridge Street,
Tel. 374 PETERBOROUGH.

DEAN & HOLT,
78, Yorkshire Street,
ROCHDALE.

SHEFFIELD PHOTO COMPANY,
6, Norfolk Row (Fargate),
'Phone 3891 SHEFFIELD.

A. J. TINKER,
20, London Road,
SHEFFIELD.

WILSON, GUMPERT & CO. LTD.,
57, Fargate,
Tel. 489 SHEFFIELD.

BIRMINGHAM & COVENTRY
CYCLE CO., 140 & 151, Above Bar,
SOUTHAMPTON.

OSBORN & CO.,
9, High Street,
SOUTHAMPTON.

S. T. SIMPSON & SON,
589-595, Lord Street,
Tel. 999 SOUTHPORT.

TAYLOR BROS.,
Great Underbank,
Tel. 630 STOCKPORT.

SPORTS HOUSE WOKING & WEYBRIDGE.

MECCANO WRITING PADS are supplied in two sizes, each consisting of 50 printed sheets of tinted paper with cover. Prices—Large, 1/- each, and small, 6d. each (post free), from Meccano Ltd., Binns Road, Liverpool.

This Space is set to ½ inch s.c. and costs 5/- per month. The sum is the 64th of £16, the price of a whole page advertisement. Over 70,000 copies of the December number were distributed all over the world. You therefore reach this exclusive public for less than one penny a thousand.

Don't Do This!

Don't carry the milestones on your mind. Fit a

VEEDER CYCLOMETER

on your Bicycle and let it register the miles for you.

You can rely on its accuracy.

REGULAR 6/6

TRIP 15/-

Insist upon a genuine VEEDER

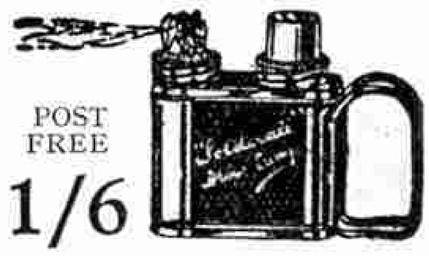
See our name thereon.

BEWARE OF GERMAN IMITATIONS.

SPECIAL OFFER OF BLOW-LAMPS.

Strongly made, size 4 × 3¾". Gives powerful flame, removes paint, etc., solders without iron. Simple, safe, economical. Worth 3/6. Satisfaction guaranteed or money back, **1/6** each, 3 for 4/-, post free.

WILKINSON & SON, 24, North Road, CLAPHAM, S.W.



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FORGET TYRE TROUBLE

and go care-free on your way. Tubes treated with our IMPERVO increase the joys of your Cycle.

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Write NOW for a copy.

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The frame is rust proofed, enamelled Black & Coach lined (or All Black if desired). Lady's or Gent's Model. Carriage Paid **£6:0:0**

Terms: 8/- with order, 8/- monthly.

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OPEN PRIZE COMPETITION

FOR THE BEST DESIGN OF

RAILWAY STATION OR TERMINUS BUILT WITH LOTT'S BRICKS

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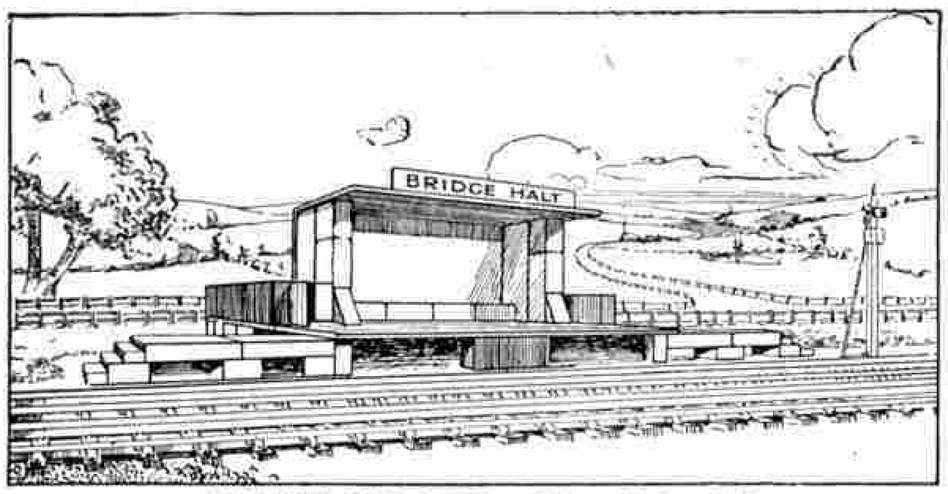
1st PRIZE, £3 3s. 2nd PRIZE, £2 2s. 3rd PRIZE, £1 1s. (In Goods)



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Box 3A	(Supplement)	25/-	
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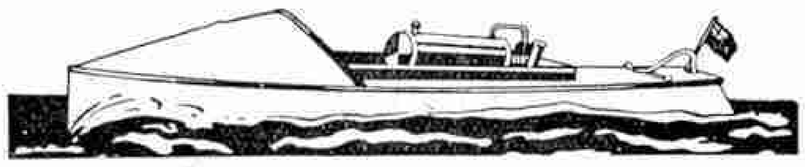

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Just like a real motor boat

This is the

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A beautiful little model 21 inches long. Made with either Clockwork or Steam Drive. Spray-hood and hull hand painted decking hand polished.

NEW SEASON'S PRICE

Carriage **21/-** Paid

IMMEDIATE DELIVERY FROM STOCK

Other Sailing Yachts and Power Boats, Ships' Fittings and everything for the model ship-builder are described in our new catalogue section S/17 now ready, post free 6d.

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A REAL FLYING MODEL

British Patents, G.B. 171,499—G.B. 188,523
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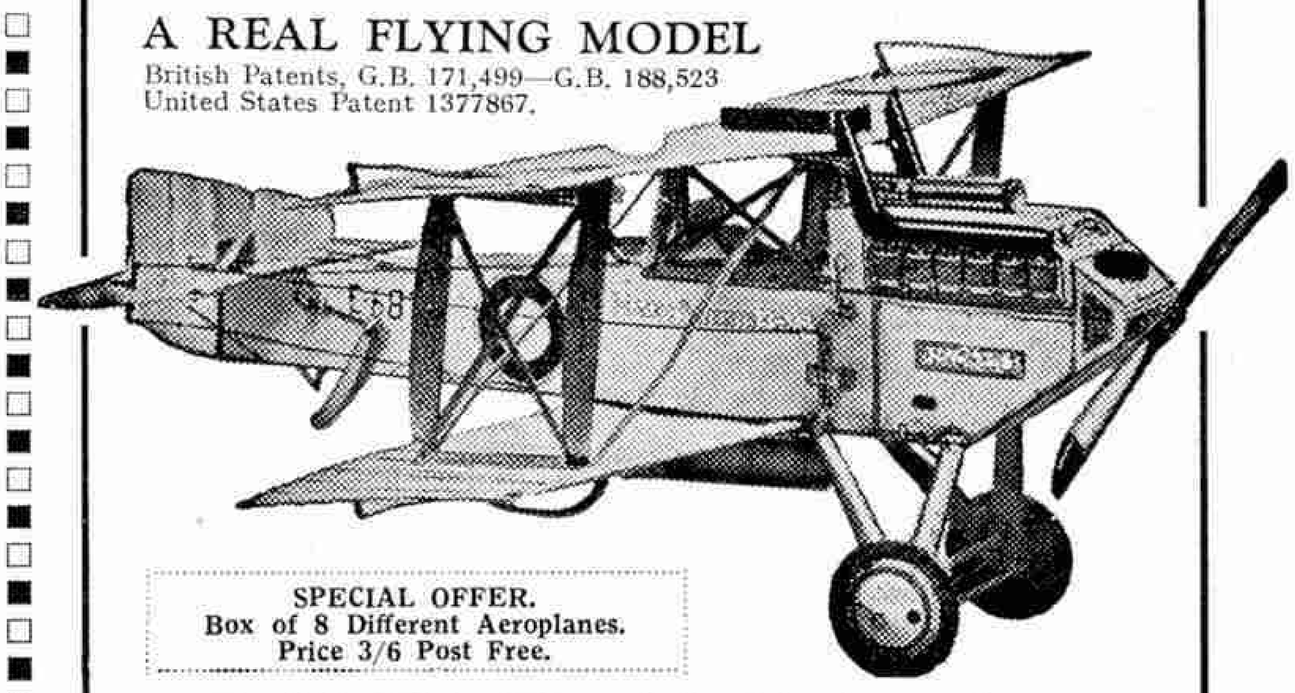

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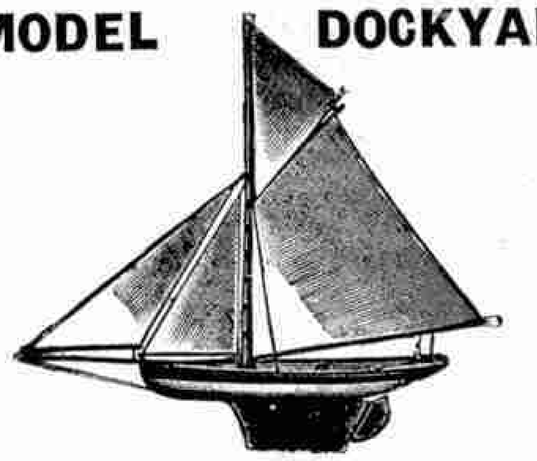

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Send 1½d. Stamp for List "M."

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Boys!—
build a working model railway, realistic in appearance and efficient in operation, by using

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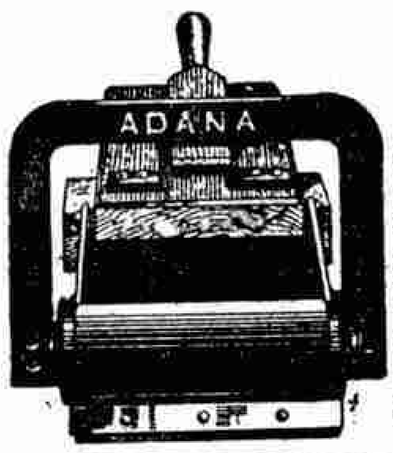

45/-
COMPLETE PLANT

This massively constructed Printing Machine is the most wonderful of its kind, being sold at a tenth the price of any other of the same size with similar advantages. It is capable of turning out every class of printed matter

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Printers should write for particulars of new system of supplying First-Class Founders' Type.

Good News
Hobbies 1927 Catalogue
is now ready.
1/6 Design included. 9d. post free.

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Post free 6d. each.

Lists for Wireless, Meccano, Model Railways, Motor Boats, Mouldings, now ready—Free.

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Let us develop your films. We will enlarge one of the best in each complete spool
FREE. FREE.

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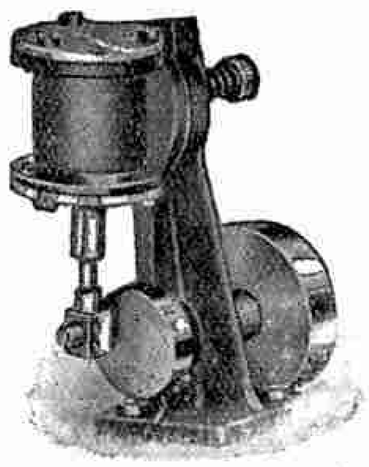
35, Manchester St., Liverpool
Hobbies Famous Depôt.
Agent for Messrs. Meccano Ltd., Messrs. Bassett-Lowke Ltd.



An Owner writes: *June, 1926.*
"To give you an idea of what an excellent little engine the S.T. is, I may say I have put her on a Meccano frame on wheels, an elastic band driving a pulley geared to the back wheels. She will pull a trailer with 2½ lbs. in it at a good speed. By itself it simply races."

This engine can be built with a screw-driver and we give full instructions. We *guarantee* the engine to work well.

S.T. Engine Parts ... 5/-
Finished Boiler 8/-
} *Post Free*

Send stamp for list 12M or 6d. for complete "Engine" catalogue (80 pages). All kinds of engines and boats.

Stuart Turner Ltd.
HENLEY-ON-THAMES

MAKE YOUR OWN ELECTRIC LIGHT

5/6

These wonderful Dynamos light brilliantly 4-6v. lamps, and are very easy to work. 5/6, post 6d. Will also work as Electric Motors.
GREENS (Dept. E.N.), 14, New Oxford Street, London.

JENNERS
PRINCES STREET, EDINBURGH
LIMITED
EDINBURGH
AGENTS
for MECCANO and
Hornby Trains

A complete stock of all Hornby Train Accessories and Meccano parts.

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THE AUTOMATIC PEA REPEATER

The most reliable pistol on the market. Takes 25 shots at one loading, best black finish, each in box with instructions and supply of ammunition, post free 2/3.
New model 17-shot Pea Repeater, black finish, post free 1/3.
R. DILNOT, 125, Chiswick High Rd., London, W.4.

ROLLER SKATES

Provide **healthy ideal** and **safe** exercise for **boys** and **girls.**
They have become almost as much a necessity as a **Meccano** or a **Hornby Train.**
Our **Sales** are **increasing** every day and **our prices** are still **THE LOWEST IN THE TRADE.**

No. 3 with Threaded Clamps and Case-hardened Steel Wheels are only 5/- pair
No. 5 with best Ball-bearing Wheels, as illustrated ... ... 10/- „
No. 6 with best Ball-bearing Wheels and Block Heels ... ... 11/- „
Postage and Packing 1/- per pair extra.

Send at once to
Bateson's Sports Depôt, Blackpool

Readers' Sales and Wants

If you have anything to sell or wish to buy anything take advantage of the service offered by a small advertisement in these columns.

The "*M.M.*" is read by approximately 100,000 people every month. It circulates in every country where the English language is spoken. If you wish to sell your duplicate stamps, your rabbits, or your tools, or to purchase a loud speaker, a steam engine, a model yacht, or a hundred-and-one other things, you will be able to do so through the columns of the "*M.M.*"

The rates are one penny per word, with a minimum of 1/- (cash with order).

Your advertisement must be received before the 10th of the month for insertion in the following month's issue.

If a Box Number is used, 4d. should be added to cover the cost of postage of the letters to the advertiser from this office. The letters will be posted one week after the advertisement appears, and a second batch a month after the advertisement appears. They will be sent more frequently if additional postage is included with the advertisement.

IMPORTANT.—Advertisements dealing with any article in the Meccano catalogue cannot be accepted.

READERS' SALES

(*Rate: 1d. per word, min. 1/-*).

Send 1½d. for list of Miscellaneous Toys.—William Johnstone, Stoneshiel, Reston, Berwickshire.

Sale. Duplicate Stamps, 100 a 1/- or 500 3/6.—R. Guthrie, Beechfield, Singleton Road, Kersal, Salford.

Free List of Slides, Tools, Cinematograph, Books, Camera, Miscellaneous Articles, for Postcard.—Box 901.

"Meccano Magazines" from August 1924—July 1926. Splendid condition, 6/-. 500 Cigarette Cards, 6d. per 100.—C. Strong, "Outspan," Lawrence Grove, Henleaze, Bristol.

2,000 Cigarette Cards, 1/- per 100.—Cole, 4, Springwells, Ross Road, Abergavenny.

For Sale. Air Gun. Bargain, 15/-.—Small, Upexe, Thorverton, Devon.

Nickel Keyless Watch, 6/-; also 30-hour Lever Movement Watch, 3¼" high, 3/10 post free, accurate timekeepers.—T. Clarke, 56, Back Street, Winlaton, Durham.

Wanted. Sunripe panels also Bryant and May Match Coupons. Best prices paid. Good cash offer for quantities.—Apply BM/GAFP, W.C.1.

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Stamps. Selling valuable collection, 1/- per 100. Enclose 1½d. postage.—E. Kearsley, 91, Seymour Road, Hornsey, London, N.8.

Wanted. Meccano Magazine, February issue, 1926.—J. McManus, Bridge End, Derry, Ireland.

For Sale. Radio Press Omni-Circuit Receiver. Good Components and Workmanship. £6 15s.—Sanderson, 36, Morningside Drive, Edinburgh.

Sale. Dixie Motor Boat, clockwork. Bassett-Lowke Model. Almost new, 14/-.—Smith, St. Lawrence House, Haddington.

To Stamp Collectors Abroad. Will exchange Roumanian, Jugoslavian, etc., against Colonials, Mexican, Danish.—Grimble, 57, Cambridge Road, King's Heath, Birmingham.

For Sale. 3,000 Cigarette Cards, 4d.; 100 Picture Post Cards (views) unused, 2d. doz.; also Stamps, 2d. 100. Postage 1½d. extra.—Jones, 18, Rudkin Street, Bradford, Manchester.

Young England, etc., Cigarette Cards, 10d. 100. Sets. Particulars—Johnson, Mile Oak, Portslade.

Album containing 700 Stamps. Offers ?—M. Cope-Proctor, 1, Webster Yds., Ealing.

For Sale. "Geco" 22 bore, bolt action, self-ejecting Shot Gun. Good condition, 15/-. Vertical Steam Engine fitted with water gauge, steam cock, etc. Good condition, 10/-.—Adcock, Nymet, Ringwood Road, Parkstone, Dorset.

800 Cigarette Cards, 2 Albums. All good condition. For particulars—Box 902.

Sale. Chums, September, 1925, August 1926, 6/-. 45 Scouts, 1925-6, 3/-. In good condition.—Box No. 903.

Cigarette Cards. All kinds. Lists free.—Thornton, 159, Grosvenor Road, Wavertree, Liverpool.

Cigarette Cards for sale. 9d. per 100. Also three Cigarette Card Albums, 9d. each.—G. Homewood, 6, Wentworth Road, Golders Green, N.W.

Cigarette Cards Purchased. Condition must be perfect. 2/- per thousand given and postage paid.—C. L. Bagnall, Wayside, Laleham Road, Cliftonville, Margate.

Sale. "M.M.'s" Dec. 1923–Dec. 1924. What offers. Cinematograph, 5/-.—Langmaid, 157, Newport Road, Cardiff.

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Cigarette Cards. Small—5 sets, 50, 2/6; 3 sets, 25, 9d.; 1,200 assorted, 50, 4d. Large—180 assorted, 1/6. Lot 12/6.—Box 905.

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CUT THIS OUT. 'Meccano' Pen Coupon Value **3d.**

Send 5 of these coupons with only 2/9 direct to the **Fleet Pen Co., Fleet Street, E.C.4.** You will receive by return a splendid British 14-ct. Gold Nibbed Fleet Fountain Pen value 10/6 (Fine, Medium, or Broad Nib). If only 1 coupon is sent the price is 3/9. 3d. less for each extra coupon up to 4 (Pocket Clip 4d.) Satisfaction guaranteed. Your own name gilt letters, either pen 1/- extra. **Lever Self-Filling Model with Safety Cap, 2/- extra.**

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CINEMATOGRAPH FILMS, cheap. British-made Machines and Cinema Accessories.—Filmeries, 57, Lancaster Road, Leytonstone, London.

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SHEETS OF PARTS DRAWN TO SCALE AND CORRECTLY COLOURED for making cardboard models of the "Flying Scotsman," the latest Pacific locomotive—"Locomotion" of 1825, the latest type sleeping car and "Experiment" coach of 1825. The parts for making these four models will be sent post free for 1/3. **The Locomotive Publishing Co. Ltd., 3, Amen Corner, London, E.C.4.**

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The Pea Pistol you have been looking for! 20-Shot Repeater. Perfect action; fires a pea 25 feet; bright nickel finish; each in box with Ammunition. A better Shooter than you have ever had before. Send **1/6** and don't miss our latest and best pistol. **Send postcard for 1926 Catalogue.** *Foreign and Colonial Postage 9d. extra.*
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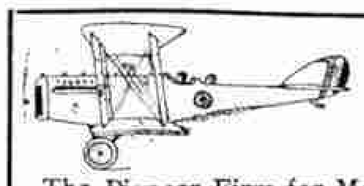

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EDITORIAL AND ADVERTISING OFFICES:—
BINNS ROAD, LIVERPOOL.
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To Contributors. The Editor will consider articles and photographs of general interest; payment will be made for those published. Whilst every care will be taken of those submitted, the Editor does not accept responsibility for any loss or damage. A stamped addressed envelope should be sent where the contribution is to be returned if unacceptable.

Binding Cases. Spring-back Binders to take a number of "*M.M.'s*" are supplied, covered with imitation leather and lettered in gold. Two sizes, price 3/- and 3/6 each (post free).

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

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Press Day, etc. Copy must be received not later than 10th of each month for publication in following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 4d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

Obtaining the "*M.M.*" Overseas

Readers Overseas and in foreign countries may order the *Meccano Magazine* from regular Meccano dealers, or direct from this office. The "*M.M.*" is sold Overseas at 6d. per copy, or mailed (post free) direct from Liverpool, 4/- for six issues, or 8/- for twelve issues.

IMPORTANT.

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the home market. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms.

CANADA: Meccano Ltd., 45, Colborne Street, Toronto.
AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.
NEW ZEALAND: Messrs. Browning, Ifwersen Ltd., P.O. Box 129, Auckland.
SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), Textile House, Von Brandis St., Johannesburg.

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The Fairycycle

REGD TRADE MARK

FAIRYCYCLE ASSOCIATION

This is an illustration of the "F.A." badge, which is now attached to every Fairycycle sent out. Anyone who buys a genuine Fairycycle now, can become a member FREE. If you've already bought yours without the badge, write for particulars of membership.

Look for the triangle on the toys you buy. It is the trade mark of British Toys made by :—

LINES BROS. LTD.
9, FORE STREET, LONDON, E.C.2
Works: Merton London, England

WHEN your friends go shopping for Mother—riding with Daddy on their Fairycycles—doesn't it make you wish that *you* had one?

They're ripping little things for running about on and they're beautifully made; like real 'bikes.' A folding stand and carrier is fitted to all models from AX. *Now*, you simply put down the stand, where before you had to lean the machine against a wall.

Ask your people to get *you* a Fairycycle to-day! Your local dealer has one, or can get one for you.

MODELS:

A.	Standard Fairycycle enamelled black, lined gold with ½" wired on tyres, no stand or carrier	**39/6**
AX.	As A, but with patent folding stand and parcel carrier; fitted to all models below	**42/-**
B.	De Luxe Fairycycle, with ⅞" Cushion tyres, rim brake, etc.	**59/6**
D.	Super Fairycycle, as illustrated, with ⅞" Cushion tyres, tangent spoke wheels, ball bearings throughout ...	**75/-**

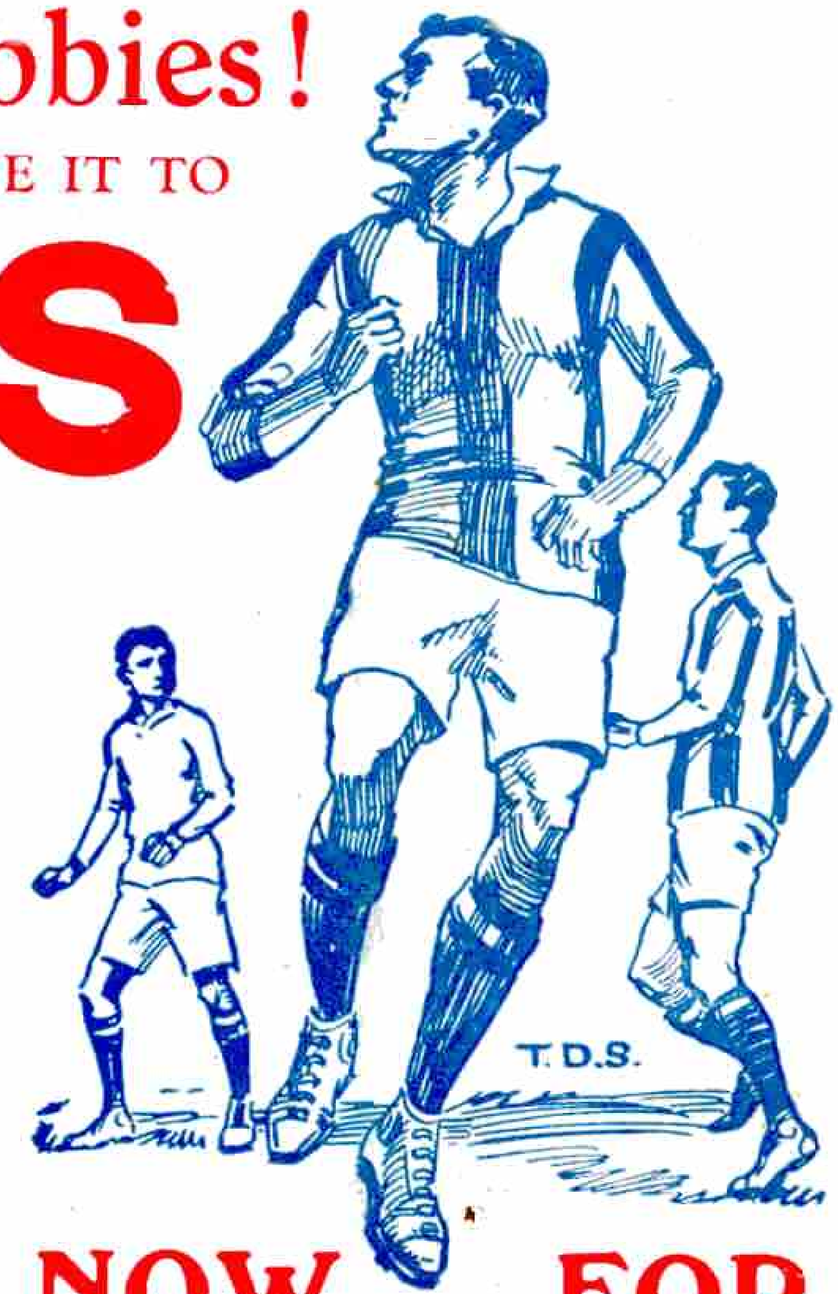
Lines Bros. Famous Toys

L. BROS. LTD. LONDON BROS. ENGLAND

September starts New Hobbies!

IF YOU'RE NOT QUITE SURE WHAT TO DO—LEAVE IT TO

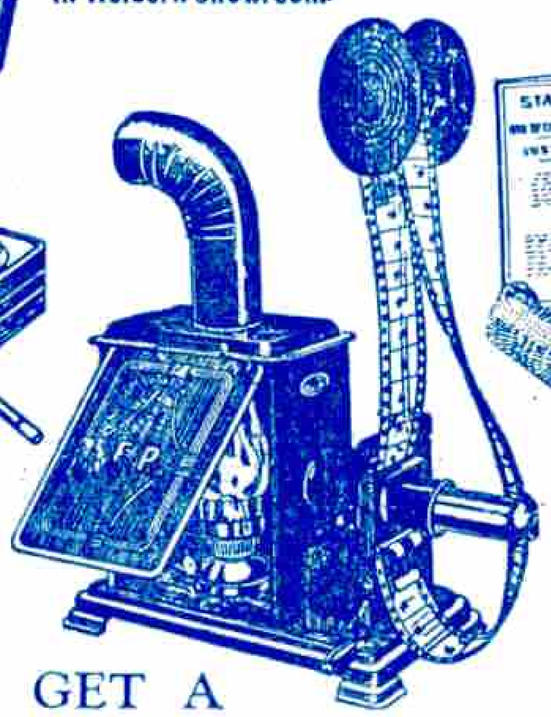
GAMAGES



FIRST of all of course, Football. But then you can't play Football all day. You MUST have something for the evenings. At Gamages, every Sport, Hobby and Pastime under the Sun is catered for in minutest detail. Just you come along and see. Meanwhile write and tell us about your favourite Hobby (mention "Meccano Mag.") and we will send you an illustrated Book about it—FREE!

Suggestions for Winter Hobbies!

Many more showing in Holborn Showrooms



CONJURING

—ever so easy with the right things and a little practice. Entertain your friends this Winter. All the apparatus and instructions for many mystifying tricks. Price **4/6** Post 4d.

Other Sets **3/-, 7/9, 10/9, 15/9**

CONJURING CATALOGUE FREE.

GET A CINEMATOGRAPH

Throws sharp clear pictures and takes standard size films. Can also be used as Magic Lantern. Complete with oil lamp, film and lantern slides. Post 9d. Price **7/6**

CINEMA CATALOGUE FREE.

Take up CHEMISTRY

Interesting and instructive. Jolly good fun too—not a bit like School "Chemy." Outfit, as illustrated, containing sufficient chemicals for 50 experiments. Complete with instructions. **5/6** Post 6d.

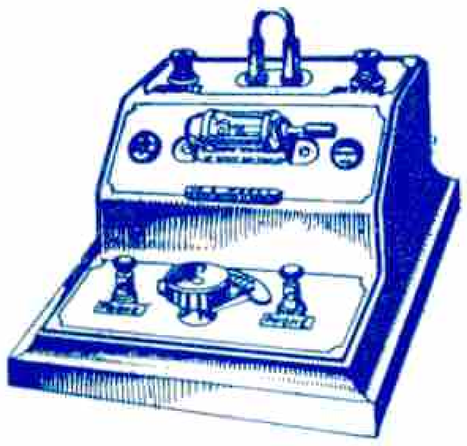
Other Sets **3/3** to **52/-**

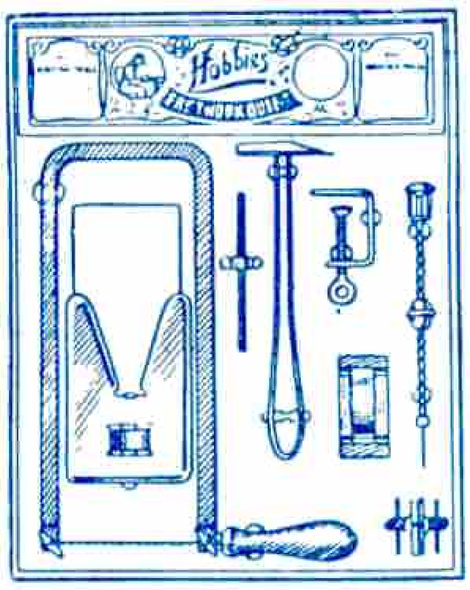
Scouting!

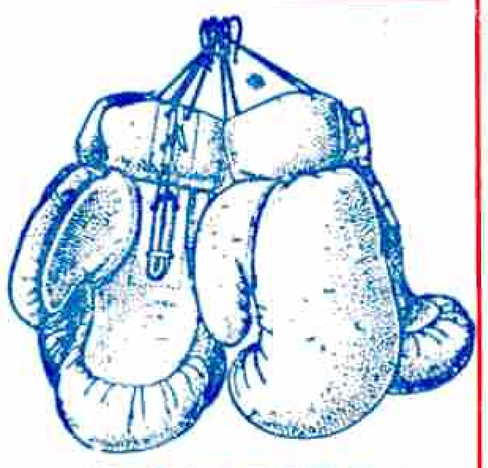
Largest Display of Scouting and Camping Kit in London. Scout Catalogue free on request to 'Meccano' Boys.

The Zoo!

Dogs, Cats, Monkeys, Parrots, White Mice, etc.—see them all in Gamages Zoo. They're all very cheap if you should want one.







WIRELESS!

A first-class concert always within your reach with this "Brownie" No. 2 Receiver. Fine quality fittings throughout Complete with semi-opal glass protected Detector, D.L.5 Crystal and Pallmadium Cat's Whisker. Wonderful results. Post free. Price **10/6**

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This is a hobby that you will enjoy this winter. Interesting and instructive. You can make many useful little novelties and such things as jig-saw puzzles. Outfit, containing 12 in. frame, sandpapering block, brad-awl and design. Other Outfits, **3/-, 4/6, 6/6, 7/6** and **10/-**. **5/6** Post 4d.

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Boys' Size per set **13/6** Post 6d.

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NOW FOR Football!

MAKE up your mind NOW to do better this season than you've *ever* done. Get ALL your Kit from Gamages and play WELL—safe in the knowledge that your Outfit will never let you down. . . it's the BEST that money can buy!

THE BEST BALL

in its class ever offered by a British Firm—the "Gamage Club!" Give it a trial in your opening match! The Price is but **15/9**

For practice there are fine full size Balls from **3/11** they're jolly good for the money.

Get this Book

FREE to 'MECCANO' BOYS!

All you budding internationals will get a wider knowledge of the game with this Football Catalogue in front of you—and you'll save money on every single article of Kit you buy from it.

POST FREE ON REQUEST

(But be sure and mention "Meccano Mag.")

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City Branch: BENETFINKS, CHEAPSIDE, E.C. 2.

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