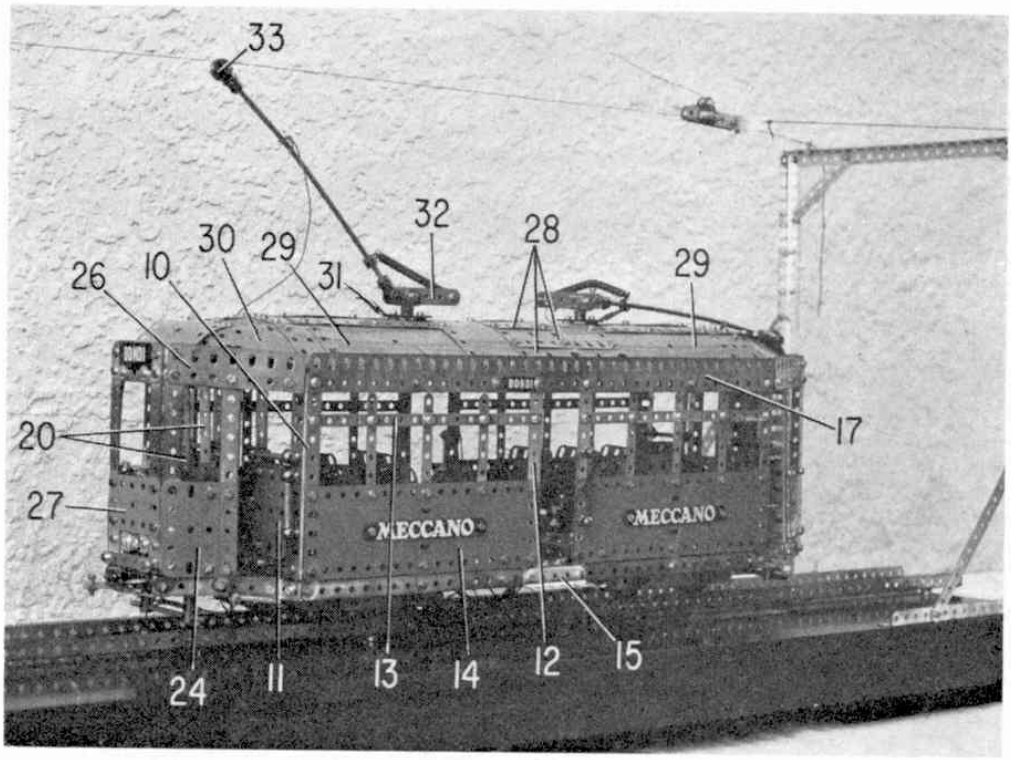
BONDI TRAM

A scale model built and described by Australian reader Colin Campbell

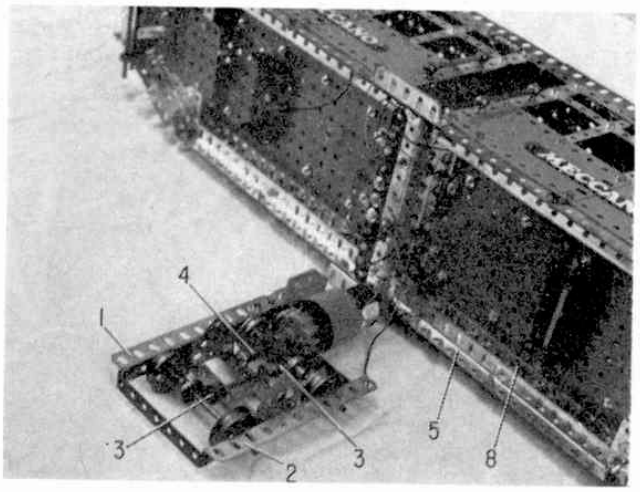


"HE SHOT THROUGH LIKE A BONDI TRAM." This was a common expression used in Sydney during the tram era which finally came to an end 10 years ago on 25th February, 1961. The Sydney Tram system was begun in 1879 as a substitute for the City railway and the Eastern Suburbs Railway, of which the latter is still under construction. Originally steam-driven, electrification was introduced to the system in 1890, full electrification being completed in 1909.

Featured here is a Meccano-built model based on the first type of tram to be constructed specially for the Sydney system, the R1 class, of which 155 cars were built, 55 in 1935 and the remainder between 1950 and 1953. The model was designed and built many years later, of course, actually being produced for display at the 1970 Sydney Toy Fair. As a display model, it is automatic in operation, powered by two 3-12 volt Motors with Gearbox and one of the now-withdrawn Emebo Motors. The Emebo Motor, however, can be replaced by any suitable contemporary motor.

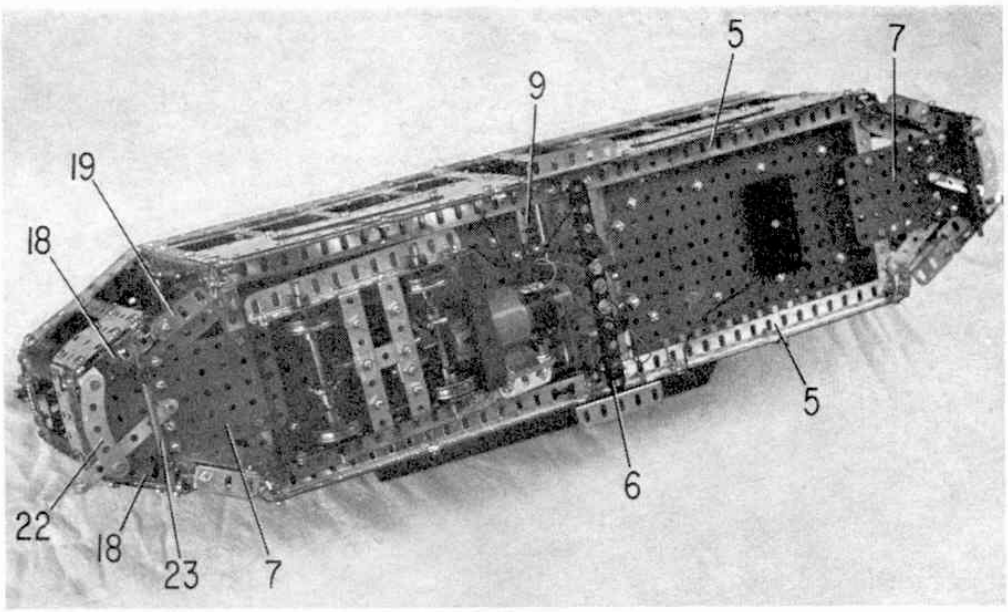
Bogies

Beginning construction with the bogies, both of which are identical, the frame is produced from two $5\frac{1}{2}$ in. Angle Girders 1 and 2, connected by four $3\frac{1}{2}$ in. Double Angle Strips. Girder 1 is extended by a $1\frac{1}{2}$ in. Angle Girder and two $2\frac{1}{2}$ in. Strips to hold a Motor with Gearbox, then the wheels, supplied by $1\frac{1}{8}$ in. Flanged Wheels, are set to the required gauge and mounted on two $4\frac{1}{2}$ in. Rods, held by Collars in the frame. Also mounted on each Rod is a $\frac{3}{4}$ in. Contrate Wheel which meshes with a $\frac{1}{2}$ in. Pinion 3 on one or the other end of a $2\frac{1}{2}$ in. Rod journalled in a $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip bolted between the two inner $3\frac{1}{2}$ in. Double Angle Strips. In mesh with one Pinion 3 is a $\frac{3}{4}$ in. Pinion fixed on the nearby motor output shaft, but note that the shaft is fitted only partway into the bore of the Pinion. Inserted in the remainder of the bore is an Adaptor for Screwed Rods 4 bolted to a Fishplate, which is, in turn, attached by an Angle Bracket to one of the $3\frac{1}{2}$ in. Double Angle Strips. Two Flat Trunnions are also attached to the inner $3\frac{1}{2}$ in. Double Angle Strips by Angle Brackets, a $3\frac{1}{2}$ in. Rod journalled in the apex holes of these Flat Trunnions later attaching the bogie to a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flanged Plate bolted to the underside of the trim.



Above, the automatically-operating model of an early Bondi Tram, designed and built by Mr. Colin Campbell of Beverly Hills, New South Wales, Australia for display at the 1970 Sydney Toy Fair.

Right, One of the two identical bogies as it appears removed from the Tram.



A general underside view of the Tram, with one of the bogies removed, showing construction of the main chassis framework.

The Tram Body

Coming to the tram body, the main chassis is made from two 18½ in. Angle Girders 5 connected at each end by a 5½ in. Strip and, in the centre, by three 5½ in. Strips. Suspended from the centre 5½ in. Strip by Double Brackets is a 5½ in. Insulating Strip 6, while a 4½ × 2½ in. Flat Plate 7 is bolted to each end 5½ in. Plate.

As can be seen from the illustrations, the saloon consists of two similar sections. The floor of each section is built up from three 5½ × 2½ in. Flat Plates butted together and bolted to two 7½ in. 8 Angle Girders, which are extended two holes by two 1½ in. Strips, then the floor is finished by a 5½ in. Strip at the outside end and a 5½ in. Angle Girder 9 at the inside end, both attached to the relevant Flat Plates by Fishplates. Attached vertically to the outside end of each Angle Girder 8 is a 5½ in. Angle Girder 10, extended downwards by a Fishplate for later bolting to the chassis. These Girders at each side are connected top and bottom by 5½ in. Strips, these Strips in turn being connected vertically by two further 5½ in. Strips, to each of which a 2½ × 1½ in. Flexible Plate 11 is bolted to complete the end wall of the saloon section.

Attached to the inside end of each Girder 8 is a 5½ in. Strip 12, this Strip being connected to Girder 11 by an 8½ in. compound narrow strip 13, built up from two 4½ in. Narrow Strips, and an 8½ × 1½ in. compound flexible plate 14, built up from two 4½ × 2½ in. Flexible Plates. Note that the ends and centre of the compound plate are also extended downwards by Fishplates for bolting to the chassis. Compound plate 14 is connected to compound narrow strip 13 by three 3 in. Narrow Strips, representing window frames. The handrails are supplied by 1½ in. Rods in Handrail Supports at the end doorways and from 2 in. Rods in Handrail Supports at the centre.

Each saloon section is fitted out with eight seats, each seat consisting of two 2½ × 1½ in. Flexible Plates, suitably formed and attached to two 1½ × ½ in. Double Angle Strips connected together by Fishplates to form a rectangular "box", the lower Double Angle Strip being bolted to the floor.

With the two saloon sections thus far completed, they are secured to the main chassis by the earlier-mentioned Fishplates, leaving a centre doorway with a width of three clear holes. A 2½ in. Angle Girder 15 is bolted to the chassis at this point to serve as a step. Inside the saloon an 18½ in. Angle Girder 16 is bolted between the upper ends of Girder 11 and Strips 12 at each side, the securing Bolts also holding an 18½ in. compound flat girder 17 in position to provide an external fascia "board".

Driver's Cabs

Like all other trams, the Bondi units were "double-ended", i.e., fitted with a driver's cab at each end. On the model, each cab is produced from two 2 in. Angle Girders 18, bolted one to each forward corner of Flat Plate 7. Attached to each end of this Angle Girder is a Fishplate, the securing Bolt in each case also holding an Angle Bracket in position. Fixed to the rearmost Angle Bracket by another Angle Bracket is a 1½ in. Angle Girder 19, the other end of which is attached to the main chassis Angle Girder by an Obtuse Angle Bracket extended by an ordinary Angle Bracket. Two 2½ in. Strips are also bolted to Plate 7 to complete the floor.

The rear of the cab is built up from two vertical 5½ in. Strips 20, attached to Plate 7 by Angle Brackets. The lower halves of the Strips are connected together by a 2½ × 1½ in. Flexible Plate, while, at the top, they are joined by a 1½ in. Strip, one of the securing Bolts also helping to fix a 1½ × ½ in. Double Angle Strip 21 between the Strips and the top of the saloon. Attached by an Obtuse Angle Bracket to the centre of the 1½ in. Strip is a 1 in. Double Bracket, in the lugs of which a ¾ in. Bolt carrying a ½ in. loose Pulley is fixed. The Pulley later serves as a guide for the trolley pole cord.

Now bolted between the Angle Brackets secured to the front end of Angle Girders 18, is a 2½ in. Curved Strip 22, which supports the tow-bar, supplied by a 3 in. Narrow Strip pivotally attached to Plate 7 by a lock-nutted ¾ in. Bolt. A ½ in. Bolt is fixed in the free end hole of the Strip. The track clearing grid 23 is made from a 3½ in. Rod or a 3 in. Screwed Rod, depending on the end of the model being constructed, and it is carried in the lower transverse bores of two

Threaded Couplings bolted to the underside of Flat Plate 7.

To complete the cab sides, a $5\frac{1}{2}$ in. Angle Girder is bolted to the rear Fishplate secured to Angle Girder 18, while a $5\frac{1}{2}$ in. Strip is bolted to the forward Fishplate, the securing Bolts fixing a $2\frac{1}{2} \times 2$ in. compound flexible plate 24 in place, the compound plate consisting of two $2\frac{1}{2} \times 1\frac{1}{2}$ in. Plates. The upper ends of the Strip and Angle Girder are connected by a $3\frac{1}{2}$ in. Angle Girder 25 and a $3\frac{1}{2}$ in. Flat Girder 26, the Angle Girder also being attached to the top of Girder 11 by an Angle Bracket. The cab front consists of two $5\frac{1}{2}$ in. Strips, each attached to the adjacent cab side by three Obtuse Angle Brackets, the two $5\frac{1}{2}$ in. Strips themselves being connected together at the top by a $2\frac{1}{2}$ in. Flat Girder and, lower down, by a $5\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 27. The Flat Girder is attached to Flat Girders 26 by Obtuse Angle Brackets. The space immediately below this Plate contains a Lamp Holder bolted to two Angle Brackets connected to the $5\frac{1}{2}$ in. Strips by Fishplates. One terminal of the Lamp Holder must be electrically insulated from the metal of the model and to this terminal is connected a length of insulated wire sufficient to reach the farther of the two trolley poles. The Lamp Holder itself is fitted with a clear Lamp. Beneath the Lamp Holder, a bumper bar is provided by two $2\frac{1}{2}$ in. Narrow Strips, one on top of the other, bolted to the $5\frac{1}{2}$ in. Strips.

Inside the cab, an imitation control lever is provided by a $\frac{1}{2}$ in. Bolt held in a Fishplate, secured to a Threaded Coupling which is, in turn, bolted to the $5\frac{1}{2}$ in. Strip included in the left-hand side of the model. A brake lever is provided by another $\frac{1}{2}$ in. Bolt held in a Fishplate, this one lock-nutted to an Angle Bracket connected to the right-hand $5\frac{1}{2}$ in. Strip.

The Roof

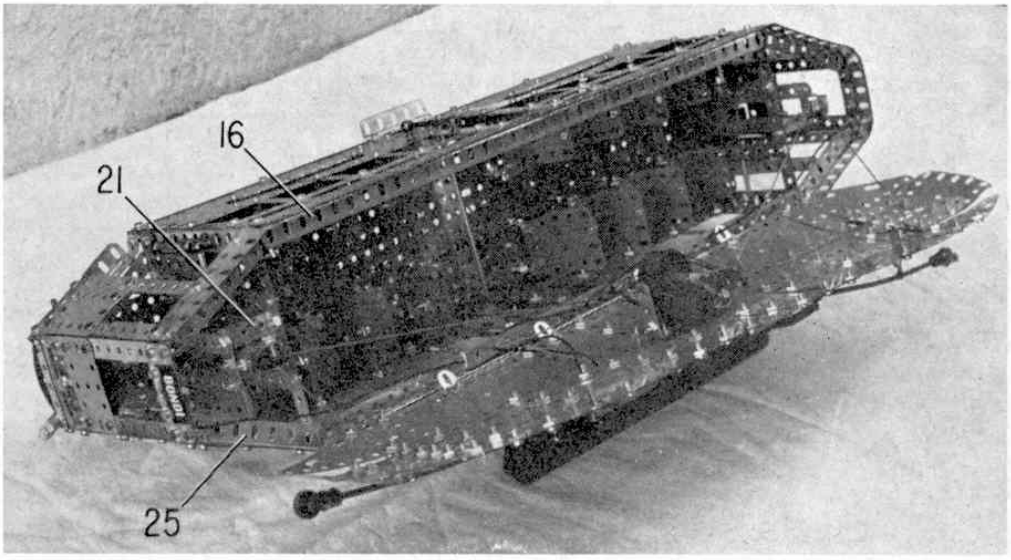
This brings us to the roof. Starting from the centre, six $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plates 28 are bolted together and extended each way by a $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate, thus producing a compound $6\frac{1}{2} \times 6\frac{1}{2}$ in. plate. This is further extended in each direction by two $5\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plates in the centre of the roof and two $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates 29 towards the outside, then three $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plates extend the roof to the end of the saloon. Secured to the centre one of these last Plates is a 2 in. Slotted Strip, to which four 2 in. Strips are bolted on either side. A $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate is bolted to these 2 in. Strips together with two $3\frac{1}{2} \times 2$ in. Triangular Flexible Plates 30 to complete the roof.

Attached at intervals to each side of the roof are four Obtuse Angle Brackets and, when ready, these are slid between Angle Girders 16 and compound flat girders 17, curving the roof at the same time. It is only necessary actually to bolt two of the Obtuse Angle Brackets to the body at each side, as the "spring" in the Plates will hold the roof in place. Similarly, the Triangular Flexible Plates are curved under the $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates, which slips under the Bolts at each end.

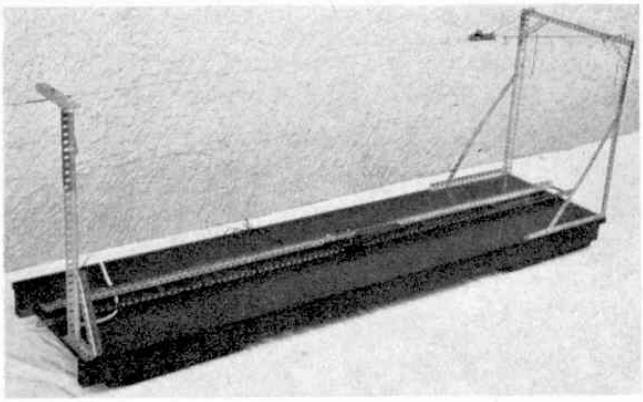
Trolley Poles

Two trolley poles are fitted to the model, these both being identical in construction. In each case an electrical Insulating Bush Wheel is bolted to the roof in the position shown, being spaced from it by a Washer on the shank of each securing Bolt. Note that the outer securing Bolt also holds the earthing contact, provided by a $1\frac{1}{2}$ in. Flexible Wiper Arm 31, the end of which is curved up to receive the pole. Attached by a $\frac{1}{2}$ in. Bolt to the boss of the Bush Wheel is a Double Bracket to the lugs of which two $2\frac{1}{2}$ in. Strips 32 are bolted, the securing Bolt passing through the second holes in the Strips and the Strips being spaced inwards from the lugs by a Washer on each Bolt. One motor wire and the wire from the Lampholder at the opposite end of the tram are also bolted between the Bracket and one of these Strips, then a Tension Spring is attached by a $\frac{1}{2}$ in. Bolt to the longer ends of the Strips, the Spring being positioned between the Strips. Held by a Pivot Bolt between the shorter ends of the Strips is a Coupling, in the longitudinal bore of which an 8 in. Rod is fixed. Mounted on this Rod is a Collar, to which the free end of the Tension Spring is attached by a Bolt. A Small Fork Piece, carrying a brass $\frac{1}{2}$ in. Pulley 33 on a Pivot Bolt, is fixed on the end of the 8 in. Rod.

Secured to the centre underside of the roof is an Emebo Motor, the drive shaft of which must first be removed and inserted in the other side of the Motor after being extended by a Rod Connector and 1 in.



A top view of the tram with the roof "opened" to show the seating arrangement. Note that all wiring is brought up one side only to allow the roof to be "hinged" to one side.



One of the end segments of track, with the support gantries, used at the Sydney Toy Fair.

Rod, to which a Collar is fixed. A length of Cord, long enough to reach both poles when they are fully extended, is knotted in the centre, this knot being located in the slit in the Rod Connector. Two guides for the Cords, provided by 1½ in. Strips, are attached to the underside of the roof by Angle Brackets, then the Cords are passed through these guides, around the guides in the cabs, through the Slotted Strips in the roof and tied to the trolley poles. One pole is then wound down to roof level by coiling the relevant Cord round the Motor shaft, after which the roof can be secured in place. The bogies can also be fitted at this stage, the earlier-mentioned 2½ × 1½ in. Flanged Plates being spaced from the floor of the saloon by six ¾ in. Washers.

It should be pointed out at this stage that the Emebo was fitted to provide automatic trolley pole changeover for exhibition purposes to enable the model to continue operating unattended. If automatic changeover is not required, then there is no need for the Motor, as the change over can be achieved by hand.

Electrical Wiring

In wiring up the electrical side of the model, care should be taken that all non-earthed joints are successfully insulated. The trolley pole Motor is wired to two 2 in. Wiper Arms 34, bolted to Insulating Strip 6, under the floor. These make contact with two copper strips (the only non-standard parts used in the model) at each end of the track. The two traction Motors with Gearbox are wired in series, one lead from one Motor being connected to the opposite lead from the other Motor. The remaining lead from one motor is earthed by connecting it to a metal part of the model, while the other lead from the other Motor is connected to the trolley pole, making quite sure that the trolley pole is insulated from the rest of the model. One terminal of each Lamp holder is earthed, while the other terminal is connected to the further of the two trolley poles.

The Track

The track used with the original model was made up of six similar sections, each section consisting of two 24½ in. Angle Girders connected by five 2½ in. Strips. The track was laid on three four feet-long boards, the two end boards being raised about 1 in. at the extremeties to allow easier control of the tram. The end sections of track were isolated from the main track by joining them to the main track with 2½ in. Insulating Strips instead of ordinary Strips.

The two contacts for the trolley pole motor were made from sheet copper about 6 in. long by ½ in. wide and were situated so that the trolley pole broke contact with the overhead wire when the rear wheels of the tram were just about to pass onto the isolated section. The overhead wire was provided by the reel of copper wire in the Electrical Set and was supported at each end by a Y arrangement to guide the trolley pole onto the wire. The Y was made from two suitably bent 3½ in. Strips attached to two 1in. Triangular Plates, the wire being clamped between these Plates by Washers. The wire was attached to end support gantries, built up from Angle Girders, by Cord.

It is worth mentioning that this model operated successfully during the Sydney Toy Fair and created an enormous amount of interest among visitors to the Fair.

PARTS REQUIRED

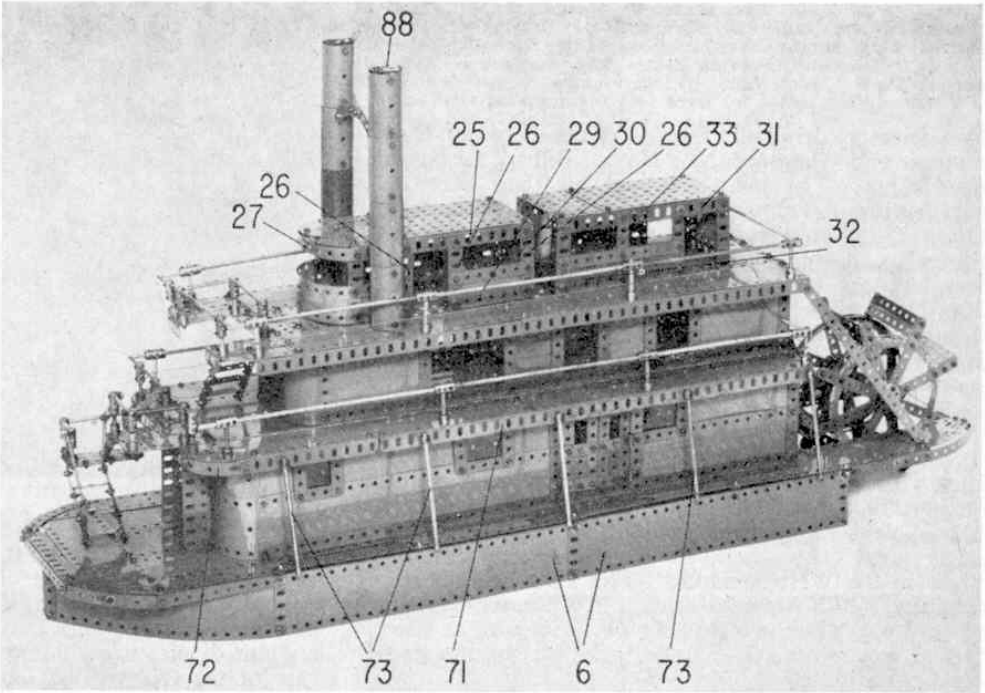
31—2	4—16	2—53a	62—188
14—5	2—16a	2—55a	4—189
8—6	4—17	11—59	2—190
8—6a	8—18a	2—63	8—191
4—7a	8—20	6—63b	6—192
4—8b	2—23 (Brass)	6—70	1—213
14—9	2—25	2—80c	4—225
4—9b	4—26	2—90	10—235
2—9d	4—29	4—103a	14—235a
4—9e	600—37a	4—103d	8—235d
6—9f	660—37b	2—103f	1—501
66—10	18—38	20—111	2—516 or 514
8—11	12—38d	8—111a	2—539
2—11a	1—40	2—116a	2—540c
34—12	2—43	4—126a	2—532
28—12c	36—48	24—136	2—533
2—13a	8—48b	4—147b	2 Motors with Gearbox
4—15a	2—51	2—173a	1 Emebo Motor

" BRITISH WARSHIPS 1845-1945 " and " STEAMSHIPS—1: Merchant ships to 1880," both written by B. W. Bathe and published by Her Majesty's Stationery Office and priced at 35p each.

These two delightful Science Museum booklets arived at the office recently and we were very impressed by their quality. Although only small booklets, they are extremely informative on their subjects and we must admit that we learnt a lot whilst reading through them. The British Warships booklet covers twenty different warships, each having a beautiful colour photograph and short history. The Steamships one also covers twenty subjects with a colour photograph of each, starting with the P.T. *Charlotte Dundas*, 1801, going right through the years to the P.S. *Inez Clarke* 1879. These two booklets are part of a series of Science Museum illustrated booklets and really are very good value for their nominal price of 35p. Other books in this range cover such subjects as Timekeepers, Ship Models, Railways, Chemistry, Aeronautics, Lighting, Making Fire, Cameras, Agriculture, Fire Engines, Astronomy, Surveying, Physics for Princes and Motor Cars—a very wide range, you must agree, and if they are all as nicely printed and informative as these two, would be well worth collecting. P.M.

(More reviews on page 193)

STEAM-BOAT BILL



Spanner describes an advanced model illustrating a famous period of American history

THANKS TO AN ENDLESS STREAM OF BOOKS, films and magazines we are all familiar with the wild days of American history—the war whoops of Indians mixed with the gunfire of Cowboys and Cavalry Patrols, the vast herds of buffalo and longhorn cattle, the slow-moving waggon trains of brave settlers pushing adventurously westward. We are especially familiar with the most publicised forms of travel in those pioneering days—the horse, the covered waggon, the stagecoach and the frontier railroads—but there is still another form of transport which does not receive quite so much publicity as all these, and yet which played a tremendously important role in American transport history.

I speak of the Riverboats—those unique craft, looking for all the world like large floating hotels or barns, which plied the thousands of miles of navigable waters found in rivers such as the Mississippi, Missouri and Ohio. Necessarily shallow in draft because of the frequent shallows present in the rivers they worked, these utterly captivating boats were probably first to really open up the interior of what was then a sparsely-populated country, not only carrying settlers hundreds of miles inland, with all their goods and possessions, but also supplying and generally servicing the communities, towns and cities the settlers founded, over a period lasting many years !

Perhaps significantly, the Riverboats of the type in question could never be compared with river craft of today. Manufactured almost entirely from wood at a time when steam traction was in its infancy, the typical Riverboat was powered by a rather crude, wood-fired steam engine and propelled by a huge stern-mounted paddle wheel. There was always a slight danger of the engine's boiler blowing up and even greater danger of the wooden superstructure of the boat being set alight by the clouds of sparks which frequently billowed from the engine's smokestacks, although the latter danger was minimised by building the smokestacks as long as possible. Taking all this into account, however, and overlooking the fact that the top-heavy construction of the boat made the possibility of capsizing an added danger, the old Riverboats did sterling work and won a well-deserved place in the affection of Americans everywhere.

All this now brings us to the Meccano model featured here. Needless to say, this is based on a typical Riverboat of the period and it does, in my opinion, capture all the charm of the subject. It will not float, of course, but it reproduces the general lines of the prototype and the paddlewheel revolves, powered by a Motor with Gearbox carried in the hull. Although large, it is not particularly difficult to build and, when finished, it makes a superb display model.

Hull

Beginning construction, like any true boat-builder, with the hull, a rectangular framework is built up from two 24½ in. Angle Girders 1 connected at the ends by two 9½ in. Angle Girders 2. Attached to the corners of the framework are four 2½ in. Angle Girders, the two Girders at one end being connected through their upper end holes by a 9½ in. Angle Girder 3 and the two Girders at the other end being connected through their second holes by another 9½ in. Angle Girder 4. The upper ends of the 2½ in. Girders are then connected longitudinally by two 33 in. compound angle girders 5, each built up from a 24½ in. Girder extended by a 9½ in. Girder. Note that each compound girder projects nine holes beyond Girder 3, but extends only eight holes beyond Girder 4.

Each side of the resulting girder framework is now enclosed by two 12 × 2½ in. Strip Plates 6, these Plates being extended forward by a 9½ × 2½ in. Strip Plate. The latter Plates at each side are curved round and connected together by Angle Brackets to form the bow. At the rear, the framework is enclosed by two 5½ × 1½ in. Flexible Plates 7 overlapped three holes.