Scientific Apparatus in Meccano

(*Continued from page 41*)

is the framework holding the lamp bulb; as will be seen this consists of two square end pieces composed of 3" Angle Girders bolted together. The support for the lamp holder may consist of either a piece of stout cardboard on tin plate having a hole cut in it sufficiently large to admit the screwed portion of the holder. Wires from the two poles of the holder are taken to terminals bolted to, but insulated from the frame.

The objective taken from the microscope is held between two pieces of stout cardboard or sheet tin 8. These are secured by 2½" Strips that are bolted to short Angle Girders which, in turn, are secured to two 5½" Strips. These Strips are bolted at one end to the framework holding the lamp and at the other end to a 3" Angle Girder, the ends of which are fastened by Angle Brackets to further Strips that slide in Eye Pieces bolted to the inner sides of the base Angle Girders.

The Rack Strip 5 is attached to one of these Strips by means of a Double Bracket. It is kept in mesh with the Worm 4 which is carried on an 11½" Rod. On turning the 1" Gear Wheel 3, the framework carrying the objective holder 8 and the lamp frame will move backward or forward while the slide holder 6 remains stationary. The holder carrying the condensing lens 7 is mounted on Eye Pieces so that it may be pushed to and fro on the 5½" Strips that are secured to the lamp framework, and the light focussed accordingly.

It now remains to construct the cover that is fitted over the lamp and incorporates the second condensing lens 9. Heavy cardboard should be used for the cover, so that all light is excluded except that issuing from the lens.

Operation of the instrument is very simple. A screen should first be arranged in the room where the demonstration is to take place. It may consist of a white sheet or a portion of the wall if it is of a plain white colour. The lamp having been coupled to an accumulator or transformer, etc., the slide is placed in its holder 6 and the wheel 3 rotated backward or forward until the specimen is seen to be in focus on the screen. The condensing lens 7 should then be adjusted.

How to Use Meccano Parts—

(*Continued from page 39*)

Meccano. Curved lines are not often required in mechanical engineering, but since Meccano is equally at home in the civil branch of the profession, arcs and circles, etc., are almost essential adjuncts to the system.

In mechanical engineering the Curved Strips prove useful in the construction of rotating mechanisms. Fig. 5 shows a useful flywheel built up from four 2½" small radius Curved Strips. The diameter of the circle so formed is not standard with the system, and therefore, in order to form spokes for such a wheel, it is necessary to connect 2½" Strips between the Curved Strips by means of Flat Brackets, the slotted holes of which allow the Strips to be secured centrally.

Complete circles suitable for flywheels, etc., may also be built up from eight 2½" large radius Curved Strips or from four 3" Curved Strips.

Fig. 6 shows how the Circular Strip may be used in a built-up roller bearing.

Flat Brackets, which are really two-hole Strips, will be dealt with in Class C, as also will Single, Double, and Cranked Bent Strips. Rack Strips are in Class O.

Meccano Biplane—

(*continued from page 50*)

It is attached to its respective fixed portion by Hinges 49. The two units—consisting of one fixed and moving plane—are spaced apart by 2½" Flat Girders 50 attached by means of ½" × ½" Angle Brackets to the Flat Girders 47. Bolted to the Flat Girders 50 are Hinges to which the rudders 51 are attached. The rudders each consist of a 2½" Triangular Plate, along the edges of which two 2½" Strips and a 1½" Strip are bolted.

Double-arm Cranks 53 are bolted to the two outside 2½" Flat Girders 50, and Collars 54 are secured on the ends of 1½" Rods held in the bosses of the Double-arm Cranks. The rudder wires 55 are to be taken round the shanks of ordinary bolts that are inserted in the set-screw holes of the Collars 54.

Two ¾" Bolts 56 are attached to the moving portion of each elevator at the extreme trailing edge. The control wires 57 are secured to these bolts, and are led through guides 58 consisting of Angle Brackets bolted to the leading edges of the Flat Girders 46.

The remainder of the instructions for completing this model will appear in next month's "M.M." In that number we shall publish illustrations of the wings, engines, landing wheels and a splendid front view of the complete model. Each part will be described in detail and full instructions will be given for assembling the various units.

Famous Inventions—

(*continued from page 20*)

The "Fire Suds" pump has two entirely separate gunmetal pump chambers, of positive action type, driven at engine speed by an extension of the first motion shaft through the change speed gearbox. One pump chamber takes its supply from either of the alkaline solution tanks and the other from one of the acid solution tanks. The suction pipes leading to the tanks are controlled by a group of gunmetal valves with copper pipes arranged conveniently for operation from the footboards of the engine.

The delivery from each pump chamber is taken to a hydraulic hose reel having two separate extensive lines of rubber hose, jointed together at the extreme end by a short length of rubber delivery hose with branch-pipe and nozzle. The acid and the alkaline solutions are pumped through the separate lines of hose, and mix at the base of the branch-pipe, thus forming "Fire Suds."

All the tanks are kept charged ready for immediate use on arrival at a fire. With the engine running, either or both the pumps are put into gear by a single lever to the left of the driver, and the clutch is then let in, bringing the pumps into operation. By means of control valves the outlets of one alkaline and of one acid tank are opened and the solutions are pumped through the hoses, the resulting mixture being directed on to the fire.

When the first solution tanks are exhausted, as indicated by a pressure gauge, the outlets are closed and those of the second two tanks are opened by the manipulation of the control valves. Before there is time for the latter to be exhausted, the first tank can be recharged with alkaline solution, and the process repeated until all six acid tanks have been emptied, by which time 1,800 gallons of "Fire Suds" will have been produced.

Our Daily Bread—

(*continued from page 23*)

and causes the grain to lose its starch. The risk of an outbreak of the disease is greatest at the end of a rainy growing season, for the fungus flourishes in damp weather. There have been no widespread epidemics since 1816, however, when the districts of Lorraine and Burgundy were ravaged by the disease at the end of a particularly wet summer, and now that wheat is displacing rye, further outbreaks on a large scale are very unlikely.

New Meccano Models—

(*continued from page 47*)

5 of No. 35; 36 of No. 37; 1 of No. 40; 2 of No. 48a; 1 of No. 52; 6 of No. 111c; 2 of No. 125; 2 of No. 126; 2 of No. 126a.

Stone Sawing Machine

No doubt many Meccano boys have watched giant stone sawing machines cutting their way slowly but surely through huge blocks of stone that sometimes weigh several tons. The designer of the Meccano model shown in Fig. 7 has endeavoured to reproduce one of these machines with the aid of a small Outfit, and we think readers will agree that he has succeeded remarkably well.

The swinging saw consists of a 5½" Strip lock-nutted to a 2½" Strip at each end, and these 2½" Strips are supported on 3½" Axle Rods journalled in the vertical members of the model. One of the Rods carries two 1" Pulleys that are clamped firmly against the 2½" Strips, and two further Pulleys are secured on the end of this Rod and clamped against another 2½" Strip, which is connected pivotally to a Bush Wheel by means of a 5½" Strip. The Bush Wheel is secured to a Crank Handle journalled in two Flat Trunnions bolted to the side frames of the model. Hence on rotation of the Handle the saw swings to and fro in a very realistic manner.

The Stone Sawing Machine comprises the following parts: 4 of No. 1; 7 of No. 2; 1 of No. 3; 3 of No. 5; 2 of No. 16; 1 of No. 19s; 4 of No. 22; 1 of No. 24; 6 of No. 35; 38 of No. 37; 4 of No. 37a; 1 of No. 48a; 2 of No. 126a.

Chocolates for New Year

The House of Cadbury have recently brought out many new chocolates of quality, the new assortments including Lady Betty, Bermuda, Riverside and the new Prince of Wales chocolates in their richly coloured box. We take this opportunity to remind our readers that Cadbury's cater for those who like hard centres by an assortment of that name, and for those who prefer soft centres there are such assortments as Esmond and Countess Cremes. Most Meccano boys have a little extra pocket money at this time of the year and we have no doubt that after carefully balancing the attractions of new Meccano parts and chocolates, they will manage to arrange matters so as to allow of a visit to the tuckshop!

A Pocket Surveying Instrument

An instrument that will be of interest to all boys is the Pocket Surveyor designed by Mr. G. C. Sherrin, and produced by George Philip & Son Ltd., 32, Fleet Street, London, E.C.4. Although it is simply made and costs only 2/6, it is very practical and may be used for an astonishing variety of measurements. With its aid the widths of rivers and the heights of hills and buildings are easily found, and even complete surveys may be made with fair accuracy.

The Surveyor will be especially valuable to Meccano boys who wish to reproduce a large engineering structure, such as a bridge, for they will be able to measure its dimensions and plan an exact scale model. Other interesting uses are suggested in the booklet that accompanies the instrument. Among these may be mentioned the levelling and correct marking out of football fields, tennis courts and camp sites.

The instrument is made of oxidised steel, and is rustless and unbreakable. It is only five inches in length, and when closed occupies little more space than a pocket knife.

comprising two short Rods joined together by an Octagonal Coupling. A Rod is held in the transverse bore of the Coupling and carries at its outer extremity a Universal Coupling, in the other portion of which is held a short Rod that passes upward through the centre of the tube 7 (Fig. 2). The top of this Rod is fitted with a Collar or similar part to fit the diameter of the tube. If the latter consists of a Sleeve Piece, the top end of the Rod may be equipped with a $\frac{1}{2}$" fast Pulley, which will be found to be a sliding fit in the bore of the Sleeve Piece. The specimen to be cut is retained in place on the top of the plunger by means of a small quantity of paraffin wax and lard, etc.

The method by which the slicing motion is given to the razor blade is very ingenious. A sliding frame comprising two $5\frac{1}{2}$" Angle Girders braced by $2\frac{1}{2}$" and 3" Strips, slides on the up-turned flanges of the $7\frac{1}{2}$" Girders that are bolted to the $5\frac{1}{2}$" $\times 2\frac{1}{2}$" Flanged Plates, and two 1" Gears are mounted on the front end of the sliding frame as shown in the illustrations. On the Rod of the far 1" Gear in Fig. 1 ; a $\frac{3}{4}$" Pinion is secured, and meshes with a portion of a Rack Strip 6 (Fig. 2) attached to a fixed portion of the frame of the model. In engagement with the 1" Gears are two Rack Strips 5 bolted face to face with the razor blade 4 clamped between them. They are held in mesh with the Gears by means of the Strips 8 pressing down on the upper one and a Spring attached to the lower one and to the sliding frame.

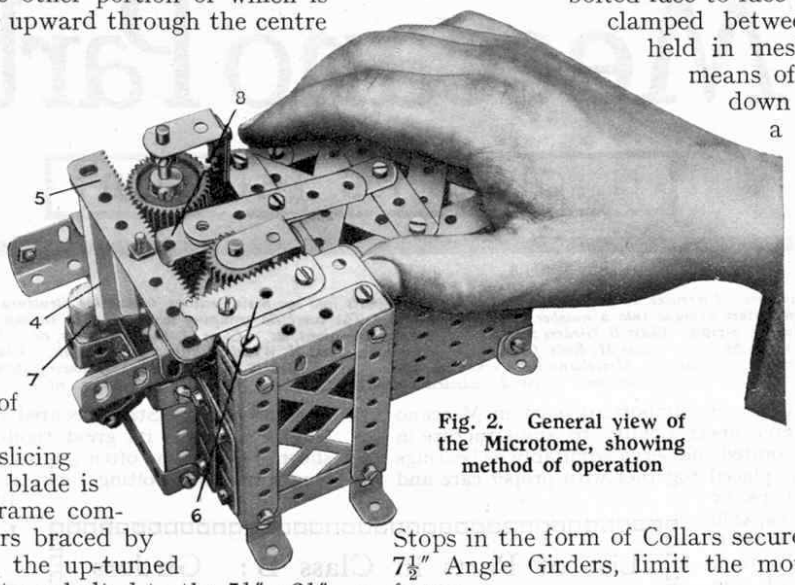


Fig. 2. General view of the Microtome, showing method of operation

When the frame is moved forward, the blade moves across the frame laterally at the same time, owing to motion imparted to the $\frac{3}{4}$" Pinion by the Rack Strip 6. Thus a perfectly clean cut is given to the specimen. Stops in the form of Collars secured to either end of the $7\frac{1}{2}$" Angle Girders, limit the movement of the sliding frame.

It will be seen that, by turning the Ratchet Wheel one or more teeth at a time, the thickness of the cut may be regulated to within very fine limits.

A Run on the "*Twentieth Century Limited*"

(*Continued from page* 99)

" thrashed " to her utmost limit.

Upward we go until at last, after 62 miles' continuous climbing, we reach the summit of Mount Washington. From here after a sharp drop to Pittsfield, where we may touch 70 to 80 m.p.h. the scenery is just one beautiful panorama after another.

Through sleepy towns and villages we tear, the speedometer hanging steadily on at the 72 mark, until, as we start to cross the historic Hudson River we commence to decelerate in readiness for our entry into the great Union Station at Albany, N.Y. Here, two minutes to the good, we detach our train, leaving it to be taken forward to Chicago by one of the new " Hudson Speed " type of engines of the New York Central. Recrossing the Hudson River we reach our resting place where " 596 " will be thoroughly inspected and washed in preparation for the return on the morrow.

No doubt you feel ready now for a wash and a sleep but that does not prevent tongues from chattering. How, asks somebody, would that great " Hudson Speed " or even our gallant " 596 " look at the head of the " *Cornish Riviera* " express ! That reminds me of an amusing little incident that occurred to me quite recently. That day I was driving " 598 " on the " *South Western Limited.*" We rolled into the terminal station of Boston and a few minutes later as I was looking over the engine a young fellow addressed me. It did my heart good to hear him speak. I am from England myself, you know, and he was from good old Lancashire ! He was greatly interested in the engine and after a few moments' conversation he mentioned that he was an ex-Lancashire and Yorkshire Railwayman. I asked him how the engine would look running into Exchange Station, Liverpool. " By gum ! " he replied, " I don't believe the beggar could get in ! "

Famous Trains—

(*continued from page* 109)

the first trough we have seen all the way from Liverpool !—and mount the $2\frac{1}{2}$ miles at 1 in 125 to Belstead Signalbox. A quick run down to the Stour Valley, with a last " 60 " maximum, precedes a severe slowing over the North curve at Manningtree, which takes us on to the Harwich branch. Sharp ups-and-downs along the right bank of the Stour estuary have to be negotiated with our heavy load, and then, as we run down the final incline from Wrabness, the lights of our arrival being timed at 9.18 p.m. Parkeston Quay bear into view dead ahead,

We are not allowed to stand at the long platform any longer than is necessary to unload passengers and luggage, as the " *Esbjerg Continental* " is due from Liverpool Street at 9.31 p.m., the "*Hook Continental* " 11 min. after that, and the "*Antwerp Continental* " 10 min. later still. This is one of the reasons why our timings have been on the leisurely side, as punctuality of arrival at Parkeston is of vital importance, and there is ample margin for recovery of lost time should one of our many connections put in a late appearance *en route*. After leaving Parkeston Quay we have but another two miles to run, calling on the way at Dovercourt Bay, ere we " make the port of Harwich " at 9.31 p.m. We have had, as I am sure you will agree, a most interesting day.

The New Channel Tunnel—

(*Continued from page* 131)

each dining car would be 55 tons in weight. A train unloaded would weigh 505 tons, and would consist of three first-class corridor coaches, each accommodating 100 passengers ; two third-class corridor coaches seating 132 passengers each ; one dining car ; one luggage van and one locomotive. The passengers and luggage represent an additional 45 tons, so that a loaded train would weigh 550 tons.

The estimated total cost of the project is £189,177,094. Of this enormous sum the English " overland " section is estimated to cost £58,529,345, the Channel Tunnel £30,811,200, and the French " overland " section £99,836,549. It is calculated that the fare for the entire journey would be approximately £2 ; that for the journey to Boulogne £1, and the shorter journey from Ashford to Boulogne 10/–. Based on these figures, the gross receipts are estimated at £35,166,664 per annum, of which £23,209,998 would be required to meet working expenses, leaving a net profit of £11,956,666.

The interesting details of the proposed high-speed railway given in our article were published exclusively by " *Modern Transport.*" We have been able to reproduce them through the courtesy of the Editor of that paper.

How to Use Meccano Parts

(*Continued from page* 135)

Another important function of the Circular Girders is illustrated in the Steam Shovel (Model No. 7.7, Special Instruction Leaflet No. 19,) where it is used as the upper guide rail of a built-up roller bearing unit (see also Standard Mechanism No. 106). The part is invaluable in building models of large cement-mixing machines, wagon tipplers, and similar models where circular structures are necessary.

Channel Segments (part No. 119), which resemble curved channel girders, are dealt with in Class N (Wheels, Pulleys, etc.), as also are Ring Frames (No. 167B), which resemble the Circular Girder. Girder Brackets and Channel Bearings, which might be compared with very small girders, are included under Class C (Brackets, Trunnions, etc.).

Lives of Famous Inventors—

(*Continued from page 202*)

table tops, and so near to perfection were these that a great demand for them arose.

At the time when Roberts first met Sharp he was greatly interested in locomotive developments, and before the close of the year he had taken out a patent respecting a new arrangement of the working valve of locomotives. He did not originate the idea of working steam expansively, but he claimed to be the first to perform it successfully by making "one arm of the intervening lever in the working gear of the induction valve changeable at any moment."

When the Liverpool and Manchester Railway was opened, Roberts realised that a new branch of engineering was beginning and, as Smiles put it, he "adroitly seized the opportunity presented by this new field of invention, and devoted himself for a time to the careful study of the locomotive and its powers."

During 1830 he patented "an arrangement for communicating power to both driving wheels of the locomotive, at all times in the exact proportions required when turning to the right or left." In the same patent he included his invention of the steam-brake—an idea to which George Stephenson also devoted much thought.

As the business grew, the premises in Faulkner Street proved inadequate, and a second works was established at Great Bridgewater Street. At these premises, in 1834, the firm began the manufacture of locomotives on a large scale, and had the distinction of turning out the first Manchester-built locomotive. This engine was produced for the Dublin and Kingstown Railway, and was of the "Hibernia" class—a type that did not prove successful. The engine had two vertical cylinders, one on each side, connected by crossheads and side links to bell crank levers that transmitted the power to the driving wheels.

This was followed by the "Atlas" type, the features of which—dome, side cylinders, frame and shape—were copied by nearly all other makers. It has been stated that the firm constructed nearly 1,500 engines during the period of the locomotive's most effective development.

How to Use Meccano Parts—

(*Continued from page 227*)

The Corner Angle Bracket, like the Architrave, is designed primarily for use as a corner strengthening piece. It is in the form of a triangle having a base $1\frac{7}{8}''$ in overall length and sides $1\frac{1}{4}''$ long, and owing to its smaller size it can be used in many places where the Architrave would prove unsuitable. Fig. 4 indicates other uses for the Corner Bracket. The illustration is of the front footplating of the Meccano Tank Locomotive, and it will be noticed that two Corner Brackets are used as strengthening pieces between the footplating and the front buffer beam.

Four other Corner Brackets are shown assembled to represent the steam pipes leading from the cylinders to the smoke box; the proper effect of these can only be obtained by referring to the general view of the model locomotive (see Special Instruction Leaflet No. 15). Two Corner Brackets bolted together along their base, with their apexes turned in opposite directions, form a plate $1\frac{1}{2}''$ square.

The Channel Bearing (part No. 160) is used principally to form bearings for Rods. Each side of the channel measures $1\frac{1}{2}'' \times 1''$ and is perforated with six holes, while the connecting piece is $\frac{1}{2}''$ wide and is pierced with three holes. The part is small but rigid and therefore very valuable where space is limited. In Fig. 13 it is seen attached to the side of an Electric Motor, where it provides bearings for two Rods carrying a part of the Motor reduction gearing. To build up similar bearings from other Meccano accessories would require a good deal of time and a number of small parts, and the result would not be nearly so neat or rigid.

The Girder Bracket (No. 161) is also primarily intended for forming bearings for shafting. It resembles a $2''$ Flat Girder with the addition along one side of a flange $\frac{1}{2}''$ wide. Two of these accessories bolted together would form a part similar to No. 160 but larger, and would provide excellent bearings for two, three, or more Axle Rods. A valuable feature of the part is the fact that the four holes in the flange are elongated, thus enabling certain adjustments to be made that would be impossible with the ordinary round holes.

Producing the "*M.M.*"

(*Continued from page 190*)

remove these defects. If, for instance, blue appears to be unduly prominent in one corner of the proof, the retoucher covers the rest of the plate from which blue is printed with the usual acid-resisting pigment. The plate is returned to the etching machine, where metal is removed until the dots in the unsatisfactory corner of the plate have been sufficiently reduced in size to give the required tone on printing.

By delicate and painstaking retouching in this manner it is possible to produce amazingly faithful reproductions of coloured pictures. When it is judged that shades and tones are quite satisfactory, the blocks are cut out, bevelled and mounted in the usual manner before despatch to the printer.

What is the Longest Word?

When asked to name the longest word in the English language, we are apt to suspect that the question is a catch. We expect to be told, for example, that "smiles" is longer than any other word because there is an indefinite distance to go after passing the initial letter!

Joking apart, the question is very interesting, and quite good fun may be obtained in trying to find the answer. Anyone acquainted with organic chemistry will immediately think of a word such as "phenylmethyltriazolecarboxylic," which has 30 letters; but strict fairness demands that it should be ruled out, for it is a special word built up by placing others end to end in the German manner.

A word that was formerly regarded as the longest in the English language is "honorificabilitudinitatibus," but this is a faked word that appeared in an eighteenth century play. A genuine word that actually has two more letters is "antiundenominationalistically." Even this has now been displaced by the magnificent combination "antiinterdenominationalistically," which first appeared in print in 1927. This has 32 letters and is a genuine word that expresses an idea for which no other word or even phrase is sufficient. Its author claims that it is probably the longest simple word in any language.

The Story of Rubber—(*Continued from page 378*)

that it contains. As the latex flows better during the early morning, tapping of the trees in each area is commenced about 6 a.m., each tapper dealing with from 300 to 500 trees, according to his capacity and the contour of the area allotted to him. The strips of bark that are pared off the trees have a certain amount of latex adhering to them and they are collected.

The tapper arranges his route so that the last few trees to be dealt with bring him back to his starting point. He then obtains from the factory two pails, one of which he fills with water, and armed with these he sets out on a second tour of his district. By this time the latex in the trees that were tapped early has ceased to flow, and commencing with these the native goes along emptying the cups of latex into the empty pail. A small amount of latex adheres to the cup when it is emptied, and the native removes this by washing the cup in the pail of water. Instead of washing the cups in this manner it is the practice at some plantations to allow the remnants of the latex to dry and then to remove it in the form of a thin film. This is known as " cup-washings scrap," and at the factory it is worked up into Crêpe Rubber, to which we shall refer next month. The work of emptying the cups is carried out swiftly, for the latex coagulates, and a naturally-coagulated latex cannot be converted into the finest form of rubber. (*To be continued*)

How to Use Meccano Parts—

(*Continued from page 389*)

through them and inserted in the holes of new style Collars carried on the 3½" Rod, these bolts serving also to secure the Collars to the Rod. The lower end of the latter may be secured to the model by a Crank or any other suitable means.

Another excellent illustration of the adaptability of Sleeve Pieces in forming chimneys, etc., will be found in the Meccano Giant Dragline (see Special Instruction Leaflet No. 27).

Besides the uses of the Chimney Adaptor mentioned above, this part may be employed for several quite different purposes. In Fig. 2 it is shown as the oil receptacle in a Meccano syphon lubricator. The Adaptor is bolted just above the journal bearing and the oil is led through a piece of wool, which is encased for part of its length in Spring Cord, to the set-screw hole of the Double Arm Crank that forms the journal bearing.

Face Plates (part No. 109) are included in Class N (Wheels, Pulleys, etc.) and therefore will be dealt with in a future article in this series.

Producing the " M.M."—(*Cont. from page 361*)

condition and colour, and are carefully sorted on arrival at the paper mills. They are then cut into small pieces and shaken thoroughly in a revolving drum lined with fine wire mesh in order to remove dust and dirt. Then follows a boiling process that removes chemical impurities and, at the same time, softens the material. The rags are usually boiled in caustic soda for several hours, after which they are reduced to a rough pulp in a " breaker " containing revolving knives that tear and rend the material in such a manner that the fibres are separated. Water flows through the machine during the operation, at the end of which the material is thoroughly broken up and is in the condition known as " half-stuff." By subsequent processes of bleaching and purification it is reduced to a pulp suitable for paper-making.

Esparto undergoes somewhat similar treatments. After the removal of dust, it is boiled with caustic soda in large cylinders, capable of holding from 2½ to 3 tons of grass. The boiled grass is then transferred to a breaking machine where it is washed and broken down into " half-stuff " exactly as in the case of rags. On the Continent certain varieties of straw are sometimes used instead of esparto. The straw is boiled with caustic soda and broken in the same manner as the grass, but it requires more drastic handling.

Story of the Bell—(*Continued from page 358*)

When these delicate adjustments have been made the clapper, which is moulded and cast separately, is fitted into place and the bell is given a final testing for trueness of tone after which it is ready for dispatch.

Mention has been made already of the recent casting by the Croydon Bell Foundry Ltd. of the largest bell ever produced in this country. Another bell of almost equal size was cast by the same foundry in 1926. This bell weighs 18¼ tons, to which must be added the weight of the headstock and the clapper, amounting to approximately 7¼ tons. It is one of four to be hung in the clock tower of the Riverside Drive Church, New York, and being the " bourdon," or largest bell of the group, it will sound the hours.

Among large contracts recently carried out by the Croydon Bell Foundry Ltd. is one for a carillon of 49 bells for the Wellington War Memorial, New Zealand, and another for a carillon of 32 bells for the New Regal Cinema, London. The completion in May last of a carillon of 48 bells for the University of Louvain, Belgium, was made the occasion for a visit to the foundry by the Belgian and the American Ambassadors, the Burgomaster of Louvain and the Lord Mayor and the Sheriffs of London. The total weight of the Louvain carillon is 31¼ tons and it is the largest in the Eastern Hemisphere, the next largest being that at Malines Cathedral, which has 45 bells.

Suggestions Competition—

(*Continued from page 397*)

THREE PRIZES, each consisting of a copy of " Famous Trains " by C. J. Allen : E. Smith, Rosemount, Montreal, Canada ; L. M. Noguera, Buenos Aires ; J. A. McMillan, Auckland ; New Zealand (11). Two PRIZES, each consisting of a 4-7 Manual ; D. R. Edwards, Green Point, Cape Town ; A. H. Godfrey, Nairobi, Kenya Colony (9). SEVEN PRIZES, each consisting of a Meccano Engineer's Pocket Book : S. Foreman, Preston, Ont., Canada ; R. J. Ranikhetvala, Bombay, India ; J. R. Combrino, Turin, Italy ; Austen W. Smith, Dayton, Ohio, U.S.A. ; D. Vesborton, Adelaide, S. Australia ; J. Breitz, Hamburg ; S. Coombs, Vancouver.

Special Prize, £1 - 1s., A. M. Johnston, Dunstable, for Suggestion No. 139.

Conquest of the Air—(*Continued from page 381*)

to that time by British experimenters that the actual fliers at the meeting were all French. The only Englishman who made a definite attempt to fly was Sir A. V. Roe, who on the following day accomplished some long jumps in a triplane named "*The Bull's Eye.*" The wings of this machine were covered with paper.

The first aviation meeting in this country at which British airmen carried out successful flights was held in June, 1910, at Wolverhampton, and was followed a month later by one at Bournemouth. The success of the Bournemouth meeting was marred by a fatal accident on the second day to the Hon. C. S. Rolls. A tail elevator that had been attached to his Wright aeroplane capsized during a flight, and the machine crashed to earth.

"A Model Railway with Unusual Features"

(*Continued from page 409*)

with lead in order both to make them run more steadily—especially engines with their cardboard wheels—and to enable them to endure the pull of the rest of the train on a curve when next to the engine. Hornby couplings are fixed to all engines and passenger vehicles to prevent buffers interlocking. The tiny circles in the plan near the terminus mark the positions of ground signals.

The construction of the plan should be quite clear, except, perhaps, the scissors-crossing outside the terminus. This is built of four ordinary points joined to a cross-over, which is considerably cut down to suit the width of the platform. The two points of the scissors-crossing on the number 2 platform line are separated by the length of one straight rail, while those on number 3 platform line are divided by one half and one quarter straight rails.

How to Use Meccano Parts

(*Continued from page 469*)

The various devices dealt with in the Manual have been divided into thirteen different sections, under such headings as Gear Ratios, Belt and Rope Mechanism, Clutches, Reversing and Drive-changing Mechanisms, Brakes and Governing Appliances, Steering Gear, etc., and they are arranged so that immediate reference may be made to any particular motion that it is desired to incorporate in a model. Used in conjunction with the ordinary Instruction Manuals, the Standard Mechanisms Manual will form a very useful and instructive book.

Forging Fifty-Ton Crankshafts

(*Continued from page 463*)

which is held in a special carrier bracket mounted on the arm of the milling machine. The tool is adjusted to the correct finished depth in one of the splines and the machine table is then traversed by hand to plane out the surplus 0.002 in. of metal left by the milling cutter. By means of the indexing attachment, the other splines are similarly dealt with, and in this way they are left with a perfectly smooth finish in which no signs of the cutter traverse can be detected. It is interesting to mention that although, in this work, the splines are not touched by hand, the shaft can always be guaranteed to fit any hub and to give perfect contact over the whole of the surface. This is indeed a remarkable tribute to the great accuracy of the manufacturing processes.

Crankshafts are occasionally made of extraordinary, one might almost say weird, shape and proportion. Recently the writer saw one in which the crank pins are set at an angle of about 30 degrees to the line of the main bearings! Naturally the production of such a shaft with ease, accuracy and yet without undue cost, was only made possible by employing a special crank-pinning machine of the type already mentioned.

The crankshaft in question measures 17 ft. in length and has three 9¼ in. diameter bearings, its total weight being 2 tons 6 cwt. The shaft is of the single-throw counter-balanced type, machined from a chrome-nickel steel forging and "finish" machined all over. It is hollow throughout its length and is used to distribute oil to all parts of the engine. Counter-weights are bolted to extensions of the crank-cheeks.

September Model-building Contest Results—

(*Continued from page 471*)

up the track towards the winning post. If any competitor should attempt to increase the speed of his car by turning his Crank Handle at a greatly increased rate, the centrifugal governor mechanism comes into play and draws the "idler" Pinion out of engagement, thus disconnecting the gear train between the Crank Handle and winding drum and bringing the car to a standstill. From this brief description readers will understand what an exciting and ingenious game the model must be. To be successful in a contest of this kind a steady hand is essential. When nearing the finishing post, however, I can well understand how difficult it would be not to give the Crank Handle an extra quick turn, but to do this would, of course, spell disaster.

Binding the "M.M."

In response to many requests, we have arranged for binding cases for back numbers of the Magazine to be supplied by Messrs. O. H. Bateman and Co., 23, Hanover Street, Liverpool. These cases are supplied in two sizes (1) for six copies, price 3/6 and (2) for twelve copies, price 5/3 post free in each case. The binding cases are supplied in what is known as "Quarter Basil, full cloth"—that is to say three-quarters of the sides are dark crimson cloth

and the back and a quarter of the sides are dark crimson leather as shown above. The case is tastefully embossed in gold with the name "Meccano Magazine," and on the back is the name and volume number.

Binding Six or Twelve Copies

These binding cases are supplied so that readers may have their Magazines bound locally, but where desired, the firm mentioned above will bind Meccano Magazines at a charge of 6/6 for six issues or 8/6 for twelve issues, including the cost of the binding and also return carriage. The covers of the Magazines may be included or omitted as required, but in the absence of any instructions to the contrary they will be included.

Whilst the binding of the twelve Magazines is quite satisfactory, they form a rather bulky volume and for that reason arrangements have been made to bind six months' Magazines where so desired, as explained above. Back numbers for any volume can be bound and the case will be embossed with the volume number.

Readers desiring to have their Magazines bound need only make a strong parcel of them, include a note of their name and address together with the necessary remittance, and send the parcel direct to Messrs. O. H. Bateman and Co., 23, Hanover Street, Liverpool, carriage paid.

Meccano Cycle Pennants

The arrival of summer with its sunny days will awaken the interest of our cycling readers in their favourite outdoor recreation. Machines will be overhauled in readiness for long days in the saddle, and while this annual process is in operation we suggest that a Meccano handlebar pennant be fitted.

The pennants are attractively prepared in the standard Meccano colours, red and green. They make a very attractive ornament to any machine, and in addition serve as an introduction to fellow Meccano enthusiasts when they are encountered on the road.

Messrs. R. Crook & Sons, The Arches, Kew Green, London, W., will be pleased to give full particulars to all enquirers.

Hospitals for Crippled Ships—

(*Continued from page 437*)

submerged in order to receive submarines into its chamber, where they were subjected to hydraulic tests. In addition it could be used as an ordinary floating dock and it could drydock two submarines at once.

After the Armistice this dock came into the hands of the British Admiralty and was towed to England. The Admiralty had no use for it, however, and ultimately it was purchased by Cox & Danks Ltd., who towed it to their Queenborough ship-breaking yard for demolition. While this work was in progress, Mr. E. F. Cox, the Managing Director of the firm, became increasingly impressed with the enormous lifting capacity of the dock, and the idea occurred to him that with the aid of the dock the scuttled German fleet at Scapa Flow could be salvaged.

Although salvage experts in general considered the idea impracticable, the firm made ready to carry it out. Four of the sunken German destroyers and the capital ships "*Hindenburg*" and "*Seydlitz*" were purchased from the Admiralty, and the adapting of the floating dock to the task of raising them was commenced. The cylinder was entirely demolished and one side wall and part of the under-structure were cut away. Along the 400 ft. length of the new face of the pontoon, 6 in. diameter steel shafting, fitted with specially-designed 42 in. diameter pulleys faced to take either cable chain or wire rope, was erected. The other wall was converted into workshops fitted with the necessary machinery and tools to provide for the full equipment of the dock. Twenty triple-geared hand winches, each having a capacity of 10 tons direct off the drum were erected, and 20 pairs of five and six sheave blocks with 20 in. sheaves, capable of a lift of nearly 150 tons each, were installed for working with the winches.

It was not considered advisable to carry out any further work at Queenborough and the next task was to get the dock to Scapa Flow. Great difficulty was experienced in getting the dock off the mud and afloat. For a whole fortnight, as tide after tide flowed, desperate efforts were made to move the dock, but the rate of progress was only inches at a time. Then dogged determination had its effect and, by the combined efforts of tugs, winches and men, the dock was re-floated. Three tugs took charge of her and the voyage of 700 miles up the North Sea was commenced. The dock was an awkward thing to tow, but fortunately the weather remained fine and after a voyage of eight days Scapa Flow was reached safely.

In order to carry out the projected lifting operations it was necessary to cut the dock into two pieces so as to turn it into two pontoons. This work was carried out by means of the oxy-acetylene flame. One half of the dock was then swung round so that shafting and pulleys faced one another, each pontoon having its own set of 10 winches and 10 pairs of lifting blocks.

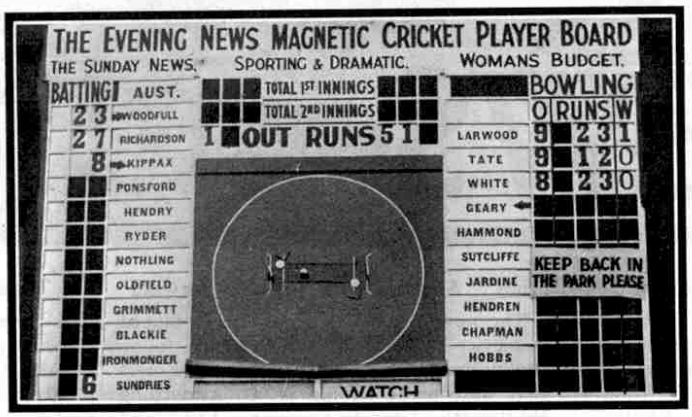
The pontoons were moored over the vessel to be raised and flexible steel wire rods were then passed over the pulleys of one pontoon, beneath the hull of the sunken vessel, and then over the corresponding pulleys on the other pontoon. Hauling was commenced at low tide and as the tide rose the vessel was slowly dragged to the surface. Tugs then towed the pontoons and their burden into shallow water where the vessel was beached.

The operator moves his electro-magnet in accordance with these directions, and thus causes the steel ball in front of the zinc plate to reproduce the movements on the field of play of the real cricket ball. At the same time assistants move the discs representing the batsmen backward and forward in the slots as the runs made are called over the telephone.

Although the "batsmen" on the board were not human figures, and the swerve or break of the ball could not be represented, the faithfulness with which the play was reproduced was almost uncanny. Every stroke could be followed by the crowd in front of the board, who watched the progress of the iron disc across the zinc circle almost at the very moment that its prototype travelled over the field on which the match was being played, even when this was in Brisbane, Melbourne, or Adelaide, hundreds of miles away.

When a wicket was broken the operator removed the bail by the touch of a lever, and even the rebound of the ball from the picket fence when a boundary was scored was made plainly visible! When a batsman made a good stroke, or a bowler secured a long-wanted wicket, the applause of the people in the Park was almost simultaneous with that of the crowd at the cricket field.

There is no doubt that the magnetic scoring board provides a splendid means of following the fortunes of rival teams in matches played at a distance, and its performance will only be bettered when television reaches the stage when the transmission of open-air scenes has become a practical reality.



A close up view of the Magnetic Scoring Board. This shows clearly how the details of play on grounds hundreds of miles away were reproduced almost simultaneously in Sydney

Mystery Photograph No. 7

Those readers who are fond of searching for outlandish ideas had a royal time over the seventh of the puzzle pictures, the subject of which was the milling on the edge of a half-crown, as seen under a low power microscope.

Waterfalls and sluice gates poured into the Editorial sanctum; the tongues of bumble bees tried to lick the covering from the secret, while sparks of electricity flashed across insulators in a desperate attempt to discover the truth. "Zip" fasteners, corroded firebars, fuse boxes, combs, caterpillar tracks, nail brushes, motor tyre treads, stripped cells of high tension batteries, pieces of corrugated paper, louvres on motor car bonnets, a row of organ pipes, and a stack of cigarettes were other ideas. For these, of course, there was some justification, only a slight stretch of imagination being necessary to see the competitors' viewpoint.

Hundreds of Meccano boys were convinced that the picture represented the teeth of a Meccano gear wheel, but only slightly more than 50 succeeded in giving the correct answer. The first of these was Frank Heslop, 84, Wentworth Road, Doncaster, to whom an autographed copy of my book "*Engineering for Boys*" has been sent.

How to Use Meccano Parts—

(*Continued from page 549*)

intended primarily for connecting Meccano Rods at various angles to each other. Typical uses of the part are shown in Figs. 4 and 6. The use of the Coupling in Fig. 11 has already been described.

There are several special types of couplings designed for specific purposes. The Strip Coupling is intended for coupling a Strip to a Rod as shown in Fig. 7. The Threaded Coupling has the longitudinal bore tapped for half its distance, so that a Screwed Rod may be inserted in one end and an ordinary Rod in the other. The object of the flat surfaces in the Octagonal Coupling is to receive Strips when it is required to bolt them to the side of the Coupling. The part will also form a kind of ratchet when it is desired to turn a Rod step by step, a spring strip being caused to press upon the flats.

The Train Coupling (part No. 121) provides means of connection between Meccano models of railway subjects and Hornby rolling stock. The Universal Coupling is intended to couple two shafts together end to end, so that they may rotate through almost any angle to each other. In all motor cars a universal joint or coupling is used to connect the main driving shaft with the propeller shaft, to enable the latter to follow the vertical vibrations of the back axle. The Meccano Chassis embodies a Universal Coupling.

The Socket Coupling is designed to couple two wheels or gears together rigidly so that they can turn as a unit upon a shaft, or alternatively remain stationary while the shaft carrying them turns in the Coupling. Fig. 1 shows a Socket Coupling used to connect a section of a Dog Clutch to a 57-teeth Gear Wheel. The slots 1 of the Coupling (Fig. 2) enable wheel bosses to be inserted without removing the set-screws, while the grub-screws 2 secure the bosses in position. The groove 3 is provided to facilitate the sliding movement of the Coupling.

The Swivel Bearing (part No. 165) is intended for coupling rods together when they are used as levers, etc. Two Swivel Bearings are illustrated in Fig. 4, which shows a linkage for converting a pull on one lever to a thrust on another.

The End Bearing (part No. 166) has functions similar to those of the Strip Coupling. In Fig. 10 it is used as the crosshead between the piston rod and connecting rod of a small reciprocating engine.

Electricity to Propel Giant Liners—

(*Continued from page 516*)

total heating surface of 55,176 sq. ft. and a total superheating surface of about 16,000 sq. ft. They are arranged three abreast in two boiler rooms and operated under forced draught with double-front furnaces equipped with Peabody burners.

The condenser set in the "*California*" is the largest ever installed in an American-built liner, and consists of two 1,600 gall. main and two 400 gall. auxiliary condensers. Each of the main condensers contains 5,300 $\frac{3}{4}$ in. diameter brass tubes and has 11,000 sq. ft. of cooling surface, while each auxiliary condenser contains 1,644 copper tubes and has a cooling surface of 2,800 sq. ft. The four condensers have a total of 27$\frac{1}{2}$ miles of tubing.

The "*California*" is a twin-screw ship and each of her huge three-bladed propellers is 18 ft. in diameter and nearly 17$\frac{1}{2}$ tons in weight. They are constructed of manganese-bronze and have detachable blades; and they are carried on shafts that revolve in bearings of lignum vitae, set in heavy built-in skeleton frames. The rudder is of the balanced type and, complete with stock, weighs 45 tons. It has a larger area than is usual, to provide an extra margin of safety when the ship is passing at low speed through the Panama Canal. The rudder is controlled by hydro-electric steering gear.

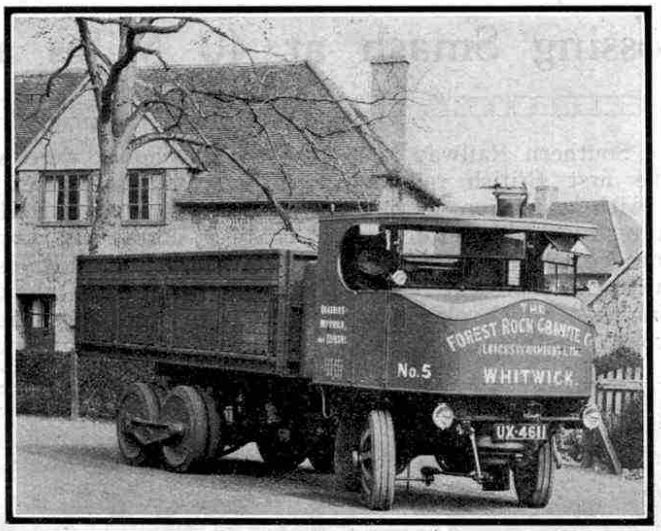
The "*California's*" official trials took place off Virginia Capes, U.S.A., on 7th January last year, and during a 32-mile run the ship was tested thoroughly under various engine conditions. With both turbo-generators working she maintained easily her contract speed of 18 knots, while with one turbo-generator only, and both motors in operation, a speed of 15 knots was attained. The propeller speeds were 120 r.p.m. and 77 r.p.m. respectively.

The sister ship "*Virginia*" was launched on 18th August, 1928, and her efficient performance during her trial run in November last showed her to be equally as fine a ship as the "*California.*" Both these ships have a maximum speed of 19$\frac{1}{3}$ knots and can accomplish the voyage of 5,600 miles from New York to California or vice versa in 13 days.

A third ship, to be named the "*Pennsylvania,*" is now being built on the slipway from which the "*Virginia*" was launched, and it is expected will be ready for service in November this year.

and up-to-date power house. This is situated in the extreme corner of the works. The equipment consists of two Bellis and Morcom compound high-speed engines driving two tandem generators of 200 kw. each. For the supply of compressed air in the works, where it is extensively used for driving hand drills, riveters, chisels, etc., there are four Alley and McLellan compressors driven by standard "Sentinel" wagon engines. In addition to supplying power and light to the works, the power house also supplies light and hot water to the garden suburb on the other side of the road. This suburb was brought into being by the shortage of houses experienced immediately after the war. It consists at present of 100 houses of the village type, but eventually the scheme visualises 400 houses.

For over 25 years the "Sentinel," and subsequently the "Super-Sentinel," steam wagons have been familiar on every road in the country. More recently a new model has made its appearance. This wagon is a six-wheeler with a load capacity of from 12 to 15 tons, and has been introduced with the special object of dealing with the heavier loads that have become customary since the War. It has many novel and interesting features, prominent among which is the oscillating rear bogie that carries the four driving wheels. This bogie consists essentially of a fixed axle of great strength, on each end of which is pivoted a pair of cast steel arms. At each end of these pairs of arms are short fixed axles on which the rear wheels run.



Courtesy] ["*Sentinel*" *Wagon Works Ltd.*

A "Sentinel" six-wheeler standing outside the Garden Suburb in which many of the men employed in the "Sentinel" Works reside

The result of this arrangement is that, no matter what irregularities may be met with on the surface of the road, the arms will swing automatically and allow the weight of the wagon and its load to be distributed evenly between both wheels on each side of the vehicle. This, of course, reduces the amount of power required to propel the "Sentinel" D.G.6, as this model is called, for instead of the power of the engine being absorbed in lifting the weight of the wagon and load over irregularities, it is expended usefully in driving it forward. The result is that less steam is required for the engine, and consequently less coal needs to be burnt in the boiler.

To-day the steam wagon is being used more and more for the transport of heavy loads, and from a national point of view this is all to the good, as every one put into service on our roads adds its quota of employment for the miners and keeps money in the country that otherwise would go abroad to pay for imported liquid fuel.

How to Use Meccano Parts—

(*Continued from page 638*)

employing the special units. Such a built-up Roller Bearing, employing guide races formed from Channel Segments, is described under Standard Mechanism No. 131.

The standard Meccano Ball Bearing (part No. 168) is illustrated in Fig. 14, and as will be seen it consists of three sections, namely, one Flanged Ball Race, one Geared Ball Race, and one Ball Casing complete with Balls. With its aid a structure may be turned about a central pivot freely and in a steadier manner than is possible with ordinary bearings. It is intended for use, of course, where the Roller Bearing would prove unnecessarily cumbersome.

Fig. 13 shows the application of the Ball Bearing to a small crane. The Flanged Ball Race 1 is secured by bolts to the 5½" × 2½" Flanged Plate 2, and the Geared Ball Race 8 is fastened to the swivelling structure. The Ball Casing is placed between these two parts so that the Flanged Ball Race rests upon the Balls. Hence the weight of the structure rests entirely upon rolling surfaces, with the result that friction is reduced to a minimum. A short Rod passed through the centre of the Ball Races 1 and 8 and maintained in its position by Collars, holds the unit together. The superstructure is rotated by means of a Sprocket Chain passing round the teeth of the Geared Ball Race 8 and engaging a 1" Sprocket Wheel 3 which is secured to a driven Rod 4.

Another example of the use of the Ball Bearing unit is illustrated in Fig. 12. Here it is shown applied to a model mechanical digger and in this case the Flanged Ball Race 1 rests upon the Balls, although in the illustration it is seen lifted clear. Also, spur gearing is employed to rotate the superstructure instead of Sprocket Chain mechanism as in Fig. 13. The 3½" Gear Wheel 2, which replaces the Geared Ball Race, is secured to Girders in the travelling base of the model by four ½" Reversed Angle Brackets 4. The ½" Pinion 5, which is secured to a Rod that is driven by any suitable means from the motive power carried on the superstructure, engages with the Gear Wheel 2 and thus effects the swivelling movement.

New Meccano Models—

(*Continued from page 635*)

consists of two triangular frames formed from 5½" Strips, and connected together by 2½" × ½" Double Angle Strips. Two Flat Trunnions form bearings for a Crank Handle upon which the lower ends of the bascules are pivoted. The latter each consist of two 12½" Strips spaced apart by means of Double Angle Strips. If necessary cardboard may be added to form a roadway.

Two separate lengths of cord are wound round the shaft of the Crank Handle, each length being passed over a 1" Pulley Wheel journalled on a 3½" Rod passed through the 5½" Strips and secured to the top of its respective bascule.

The parts required to build this model are as follows:—4 of No. 1; 6 of No. 2; 1 of No. 16; 1 of No. 19s; 2 of No. 22; 8 of No. 35; 16 of No. 37; 2 of No. 38; 6 of No. 48a; 2 of No. 126a.

Foot Treadle Hammer

The prototype of the model shown in Fig. 7 may often be found in a small forge or village smithy, the owner of which has not yet called in the aid of steam or electricity to assist him at his task!

To build the model hammer, four 5½" Strips should be bolted to a 5½" × 2½" Flanged Plate and connected together at their upper ends by two 2½" Strips and two 2½" × ½" Double Angle Strips.

The "hammer" consists of a 5½" Strip bolted to a Bush Wheel that is mounted on a 3½" Rod journalled in one of the pairs of 5½" Strips. The Rod also carries two 1" Pulleys butted against a 2½" Strip. A weight consisting of a number of short Strips is secured to the end of this 2½" Strip, so that the hammer is raised automatically after each stroke.

Parts required to build the Treadle Hammer are:—6 of No. 2; 1 of No. 3; 9 of No. 5; 1 of No. 12; 2 of No. 16; 4 of No. 22; 1 of No. 24; 2 of No. 35; 15 of No. 37; 4 of No. 37a; 2 of No. 38; 2 of No. 48a; 1 of No. 52; 4 of No. 90a; 2 of No. 111c.

Models in the £100 Contest—

(*Continued from page 653*)

and a 1½" Angle Girder secured to the end of the exhaust pipe to form the "baffle chambers," while a Corner Piece represents a "fish tail" of extra large size!

In addition to the solo machines, model cycle and sidecar combinations were to be found in great profusion, constructors here again showing preference for the racing types of machines. Many interesting types of sidecars were to be found amongst these models, the examples ranging from flat "stream-line" patterns composed of Sector Plates and Flat Girders, to graceful boat-shaped bodies built up from various sizes of Curved Strips.

An original feature of C. R. Weller's model cycle and sidecar is the inclusion of a two-speed gear box. The engine in this machine has been represented by an Electric Motor, and the gears comprising the speed change mechanism are mounted in the perforated side plates of the Motor. In this instance, the additional speed ratio will be found useful, as a rather massive sidecar is attached to the cycle.

By employing a Meccano Clockwork or Electric Motor, the attraction of a model motor cycle is enhanced considerably, but unless special care is taken in fitting, the appearance of the complete machine is likely to suffer.

Diving for Sunken Treasure

At the present time sixteen vessels of a Spanish treasure fleet—or all that is left of their timbers—lie submerged in 80 ft. of water in Vigo Bay. How they came there is an interesting story. In 1702 the treasure fleet arrived off Cadiz, to find there a blockading British and Dutch Fleet, for Spain was then at war with these countries. The Spanish vessels fled northwards and took refuge in the harbour at Vigo, where a boom was constructed across the entrance in order to keep out the pursuing fleet. A vigorous combat ensued, nevertheless, the combined fleets of the Allies forcing the boom and sinking many vessels. They did not capture the whole of the treasure fleet, for after removing as much of their precious cargo as time allowed, the Spaniards fired the galleons in order to save them from falling into the hands of their enemies.

It is believed that more than £10,000,000 worth of gold and silver still remain in the vessels at the bottom of the sea, for of the £20,000,000 worth of treasure brought from America only half was carried ashore before the fight. From time to time efforts have been made to recover this wonderful treasure, but all diving operations so far have proved unavailing. Time has rendered the work of recovery very difficult indeed, for the decks and sides of the vessels have been crushed in and the galleys themselves choked with silt and sand. An Italian syndicate now has revived the project, however. Divers employed by them have succeeded in locating the galleons, and with the improved resources at their command greater success may attend their efforts than has been the case with previous treasure seekers at Vigo.

How to Use Meccano Parts—

(*Continued from page 797*)

3″ Sprocket, which is free on the axle.

It will be evident that the axle and Sprocket Wheel can each move independently in one direction only. The driving power may be imparted primarily to either the axle or the Sprocket, to suit requirements. Exactly the same results would be obtained by using only one Pawl in engagement with the Ratchet Wheel, but the second Pawl is added in order to obtain exact balance.

A mechanism of this kind is also invaluable for converting reciprocating motion into intermittent rotary motion. For example, if the Sprocket Wheel shown in Fig. 2 is attached to a connecting Rod or other reciprocating part so that it moves through part of a revolution and then returns, the axle of the Ratchet Wheel will be given an intermittent rotary motion in one direction only.

The Pawls may be obtained complete with a Pivot Bolt and two nuts. This Bolt forms an ideal pivot for the Pawl; it should of course be clamped to a Meccano part by the two nuts so that the Pawl is allowed plenty of freedom.

The Circular Saw (part No. 159), although a toothed part, is included under Class P since it is for use as a saw only and has nothing to do with gearing.

A Happy Memory of the Holidays

One of our readers, G. K. Benn of Grantham, is so deeply interested in the contents of the "*M.M.*" that he has not noticed the photographer

British Air Triumph

(*Continued from page 782*)

effort attained success with a speed of 332.49 m.p.h.—the fourth record breaking effort of the day! Actually this lap, in conjunction with the third, provided two new records—for the 50 and the 100 km. closed circuits. Atcherley must have been doing over 370 m.p.h. on the straight, and it was unfortunate that one mistake, his failure to round the Hayling Island pylon on his first lap, should involve disqualification. Fortunately the whole of his flight was officially observed, and his records stand.

The entry of the third Italian, Lieut. Monti, came at 3.45, and for a few minutes it seemed possible that Italy could still make a fight for the Trophy. The Macchi 67 screamed round the course to return an average of 301.47 m.p.h., but almost before the figures were announced it was seen that again bad luck had dogged the challengers. When close to the Hayling Island turn Monti's machine was seen to make a sudden flashing swoop on to the water and come to a standstill. Later it was learned that an oil pipe in the machine had burst, and Monti was compelled to act with lightning rapidity to get down safely. It is a tribute to the skill and pluck of the pilot that he accomplished this perilous landing successfully, although seriously scalded about the arms by the oil flowing into the cockpit.

Thus Great Britain retained its grip upon the Schneider Trophy. Every British subject may take pride in this great successful effort, for the machines were produced by a national effort and flown by a team of pilots of the Royal Air Force. It is the national character of the Schneider Trophy Contest that has endowed its magnetic lure for the "man in the street." It is the only international contest in which the contestants are truly nations and not individuals.

Home Billiards for Winter Evenings

The problem of providing healthy recreation during the long winter evenings is one that puzzles many parents. One excellent solution lies in the provision of home billiards. No indoor game combines excitement and interest to the same extent as billiards, and there is no limit to the pleasure introduced into a home where a good table is installed. A full-sized table is out of the question for any ordinary room, and for this reason tables of a suitable size have been specially designed by Rileys of Accrington, whose name is known wherever the game is played.

One of the most popular tables made by this firm is the 6 ft. table, which rests comfortably on an ordinary dining table. A splendid game may be played on this, and it affords excellent practice for subsequent play on a standard table. There are many other sizes, however, both larger and smaller, to suit any room, and details of these will be found in the advertisement on page 822.

Price lists of these tables may be had free on application to E. J. Riley Ltd., Deal Works, Accrington, or at Dept. U, 147, Aldersgate Street, London, E.C.1.

Television

(*Continued from page 767*)

a separate photo-electric cell is provided. Thus two electric eyes are used and the impulses derived from them are transmitted alternately to the receiver.

The effect of using two photo-electric cells in this manner is exactly the same as if the object were viewed first with the left eye and then with the right. At the receiver a similar double scanning disc is necessary, of course, and the images produced from the two points of vision are flashed in turn on the screen. The alternation is made with such great rapidity that the impressions are retained by the eye and combined into an image that conveys a stereoscopic effect.

Naturally this means that for complete success a larger number of flashes must be transmitted than in ordinary television, but in practice there is very little difficulty in getting a sufficient number to give an excellent result. Seen with the aid of two electric eyes and double scanning discs a human figure stands out in wonderful relief from its surroundings, and it is quite easy to form reliable judgments of comparative sizes and distances.

Stereoscopic television may be combined quite easily with colour television. We have already noted that for the latter three spiral sets of holes are necessary—each set transmitting one of the three primary colours. In order to give a stereoscopic effect to the image on the screen of a televisor, therefore, two sets of perforations, each consisting of three spirals, are arranged on the discs.

The final step in the development of complete television must come when stereoscopic colour television is combined with the use of daylight or artificial light of the ordinary kind as the illuminant. When the practical difficulties have been overcome, and a sufficiently large image can be projected on the screen of a receiver, it will then be possible to see what is happening at a distance almost as well as if one were actually present.

Mystery Photograph No. 10

The solving of the Mystery Photograph No. 10 that appeared in the September "*M.M.*" apparently presented little difficulty, for most competitors decided, quite correctly, that the curio represented in last month's photograph was nothing more than a simple funnel laid on its side, so that the handle obscured all but the tip of the spout. Rather curiously, a big percentage of the incorrect entries declared that it was an oil can with the spout knocked off.

An old-fashioned lamp or candlestick was another popular choice. A motor headlamp, an inkwell, a kettle, a megaphone, a speaking tube, a milk strainer and a tobacco pipe were other suggestions, and for each of these I can see a reason. Freak ideas, in fact, were completely absent.

The first correct entry was from Eric Whalley, of 20, Beverley Street, Blackburn, to whom an autographed copy of my book "*Engineering for Boys*" has been sent.

Earlier in the year I promised special prizes to those boys who succeeded in giving 10 correct solutions in the first set of mystery photographs. Examination of the records shows that no one can now qualify for these, and instead I have decided to give several consolation prizes in each of the remaining contests in the series. I have also awarded 25 of these in the September contest. The list of names is too long to give here, but on request a copy will be forwarded to any boy who has a legitimate interest in the competition.