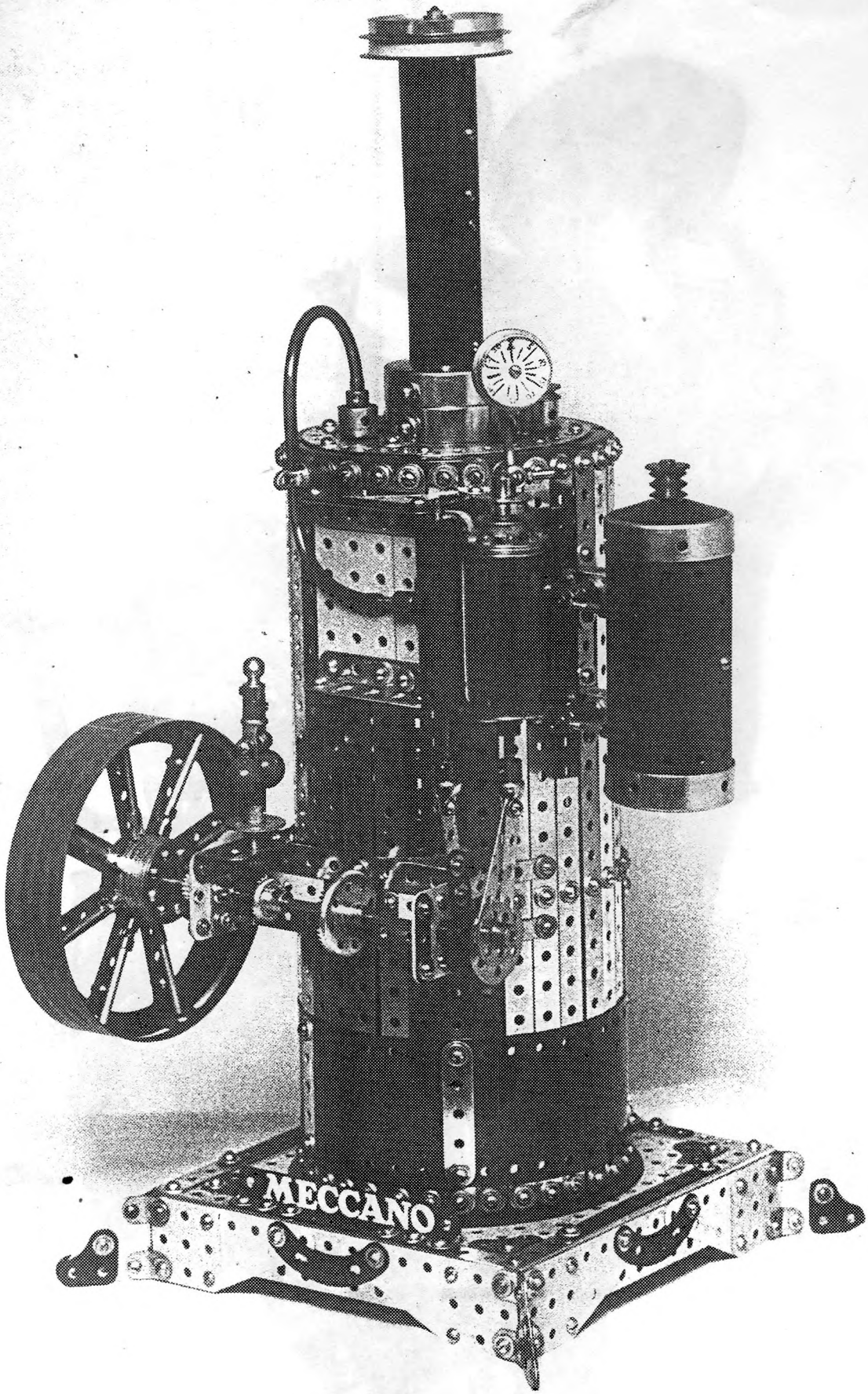


VERTICAL BOILER STEAM ENGINE.

Full building instructions for this model will be found on page 55. Mains or low voltage unit is inside the firebox with rubber belt drive.

SHEET ONE. BING VERTICAL BOILER ENGINE WITH END CRANK.

This working model is based on an engine depicted in a 1913 reprint of Gamage's catalogue where several pages are devoted to all types of engines both steam and hot air operated. Mostly shown with a "Gamages" sticker-these engines are German made by such firms as Ernst Planck,Bing and Marklin-but these firms are NOT mentioned in the text due to anti-German feeling between the Wars. This particular engine model stands around 30" in height with a square base of 7½" and derives it's motion from a small mains induction type motor which is situated in the firebox area inside the boiler. It is not advisable for young enthusiasts to use these motors-but low voltage Meccano types can be employed as desired. Construction should commence with the base plinth which is made from 7½" strips and girders-with flat plates for filling in the top to allow a FLAT surface. If you have any Argentine Exacto parts-certain plates are ideal for the flat top required. The 7½" square thus formed has a 6" circ plate and a Hub disc bolted to the centre of the square and it is best to fit the selected motor at the centre and with a ½" pulley(or similar) on the output shaft. If a Gearbox motor is used-select a low reduction gear at this stage-and bolt the motor with the output shaft facing to the rear(as viewed from the front). Fit any plugs and wires and pass the leads through one of the slotted holes in the hub disc directly in line with the motor spindle. Leads should be long enough to connect to a Transformer or battery box-or through a mains connector if used.

The boiler casing comprises 25 strips of 12½" length-and also seven of 9½". The latter are fixed at the rear of the boiler to allow space for the firebox door-and access to the motor. The use of flat washers under all bolt heads-helps to preserve any enamel finish of strips-not necessary where Zinc is used. A 5½"dia circ girder is next bolted inside the boiler at a position eleven holes up from the hub disc.Note that the long strips are bolted evenly around the boiler starting at the front middle and are spaced evenly in the round and slotted holes of the discs. Two strips are NOT bolted to the circ gdr but are free to take a long rod for the motion passed through from front to back and in line with the motor spindle. A 6" rod is passed through the clear holes and MUST be free to rotate. A 3" pulley is fixed to this rod in line with the motor pulley-and takes a rubber belt drive. Sprockets are not recommended as chain tends to stretch and will eventually wrap itself around the set screws and possibly sto the motor. Another circ girder is fixed at the top of all the strips with it's flange down inside and this allows access to the interior for fixing ancillary items. The door for the firebox is made from a 3½x2½"flex plate-curved to shape-and is attached by two hinges to one of the vertical strips.A door catch is made from a handrail coupling holding a 1" rod and with a pawl attached-this engages with the other vertical strip on the opposite side of the firedoor. The motion frame consists of two 4½x½" double angle strips bolted by their central hole and three holes apart-above and below the 6" driving rod.A small 15th pinion is held on the rod-boss outward-and this engages with a large contrate on the crankshaft. The bearings for the c/shaft are two 1½xl½ flat plates-bolted to the lugs of the two d/A strips-the bolts also holding two 3" narrow strips at each end which support the frame to the boiler(bend these slightly).To the L/H plate-bolt an 1"xl" a/brkt by one bolt only-so that the c/shaft runs through the vacant hole. The top lug of the a/brkt holds a double arm crank-so that the vertica governor rod will engage with a small contrate on the c/shaft-use a small pinion on the vertical rod to engage with the small contrate.

The governor consists of a small fork-the lugs holding two small hooks with weights by small setscrews.The fork is fixed to the top of the rod-then a collar-and underneath the bearing-a 15th pinion.

contd/----

BING VERTICAL-WITH END CRANK.

The governor is non-functional but follows correct practice for this type of engine. Double arm cranks bolted to each 1½"plate give firm support to the c/shaft. The flywheel is made from two Hub discs,a quantity of wheels discs,and two bush wheels.Bolt the two hub discs together with small setscrews at the outer edge of holes. Use long bolts to attach the wheel discs and bush wheels and make sure the wheel runs true BEFORE tightening bolts.Place this washers under the bush wheel hubs-as their bosses stand "proud" and the wheel MUST run true. You can fix adhesive tape to the rim of the wheel-not necessary-but easily removed. Next,select a STRAIGHT 8" rod and pass this through the small plate bearings. This rod holds the following items-from the left side:- A cone pulley,the f/lywheel,a collar,a small contrate,a large contrate. The eccentric valve gear and the piston rod are both on the OUTSIDE of the far 1½"plate. At this stage-it is a good idea to test the motor drive and make any adjustments that may be necessary. The drive pinion through the boiler-must NOT be in tight engagement with the large c/shaft contrate-but allow for good running and oil all moving parts.

Use the SMALLEST grub screw in the boss of the 15th pinion-to prevent the teeth of the contrate fouling the pinion setscrew if used. Next stage is the cylinder and valve chest and it is essential that these units be built carefully to ensure free running.

Two 3"x 1½"plates are butted together by their lengths-edge to edge-and are attached to 3" angle girders at the top and bottom of the plates-by their round holes.A 2½" a/girder is then bolted to the lower five holes at the cyl edge of the plates by it's round holes-and a 2½"FLAT girder is then bolted to the slotted holes of the 2½" a/girder. This assembly is then bolted to the boiler at a position two holes down from the top of the central 12½"strip.The valve and cylinder chests are attached to the 2½" flat girder-but the cylinder is spaced from it by three 2½"strips.The securing screws are first passed through the sleeve pieces(2) forming the valve chest,and then secured through the 2½"strips into the cylinder.The join of the cyl and the open slots in the two sleeve pieces-face to the rear. Before the attachment of the sleeve pieces-bolt a rod socket to the side of the lower sleeve piece-this will hold the steam pipe(a piece of plas tubing will suffice).Two chimney adaptors are pushed into the ends of the sleeve pieces to allow a valve rod to slide in the centres of the adaptors.The cyl is capped at the top with three 8-hole wheel discs held in place by 3" screwed rods-passed through the cyl and trapping a bush wheel-boss down-at the bottom.Pass a rod through the boss and then centralise the wheel discs and bush wheel to the cyl ends.The cyl is capped also with a ½"pulley-held on a threaded pin bolted to the middle holes of the wheel discs. The piston rod must not reach the top of the cyl-so choose a short one.This framework is further supported by 2" slotted strips attached to the top and botto 3"angle girders behind the valve chest-these strips being bolted to ½"angle brkts fixed to the boiler side and in line. You then have a firm support with the piston rod in line with the c/shaft.The valve mechanism consists of a small eccentric to which is bolted a 2½" narrow strip-bent to allow a pivot on a collar fixed to the end of the valve rod.. The cyl crank can be made in several ways-but a Bush wheel on the end of the c/shaft is fitted with a small 1" bush wheel (no grub screw) on a pivot bolt in one of the outer holes of the lar bush wheel. Two 3" NARROW strips are attached to the opposite holes of the small bush wheel-on it's face and with boss outermost.The two ends of these strips being pivotally attached to a collar-or you can use an end bearing to line up the piston rod with the connecting rod whichever. Bend the narrow strips to align with the piston rod and test for free running before tightening bolts.

contd/----

Oil all sliding rods and motion-which is now complete. A pressure gauge is made from a large(or small) flanged wheel attached to a collar by a tapped hole-this being held on a 3½" handle held to the boiler side by handrail supports or collars. Or by other means.

The auxiliary tank is a complete boiler with it's ends held in place by a long screwed rod and capped with brass ½" loose pulleys -held against the main boiler by threaded bosses.An auxiliary feed pump can next be added-a small eccentric fitted with a short narrow strip and pivotally attached to a short rod by a collar.

This rod being journalled in two chimney adaptors inside a sleev piece held on the side of the boiler behind the flywheel.A water gauge level is simply two handrail supports with a short rod fitted between the two and fixed just above the governor.The top of the boiler can be built in one piece-as it is attached to the top by four short bolts which are held in four threaded bosses secured under the top circ girder-so that the tapped holes in the bosses align with the slotted holes in the circ girder.Either a 6" circ plate-or a 4" ditto-holds the stack and plinth.The 4" plate having short strips radiating in four positions to allow fixture to the internal threaded bosses. The stack is made from two cylinders bolted together with their seams in line-and held together by short narrow strips on their insides.A 6" screwed rod is attached to the middle hole of a boiler end and the stack is passed over this rod and capped with a face plate and wheel flange-the whole being centr ised and held tight by a nut at the top of the screwed rod.

An exhaust pipe made from a plain 5" crank handle is fitted to the side of the stack by handrail supports-the cranked part of the handle passing over the top of the boiler end to be secured in a rod socket held in the top circ plate. The boiler end has four flat brkts attached to opposite holes in it's flange-the outer ends then being fastened to another boiler end flush with it's partner-the whole being fixed to the top by ½" angle brkts spaced with washers.

The main steam supply pipe can be a piece of plastic tube that is secured to the valve chest rod socket on an 1" rod-and to the top of the boiler by a threaded adaptor-or made up piping from rods couplings and rod connectors. Final embellishments are black plasti flexible plates passed around the boiler at top and bottom-and then joined by 2½"strips. Various taps and cocks can be added with small brassware utilised-and polished.

Another similar end crank engine is shown on a separate photo-copy sheet with minor detail changes only.

FINIS

MECCANO CORNER

E.73

A project for the experienced builder described by Brian W Rowe

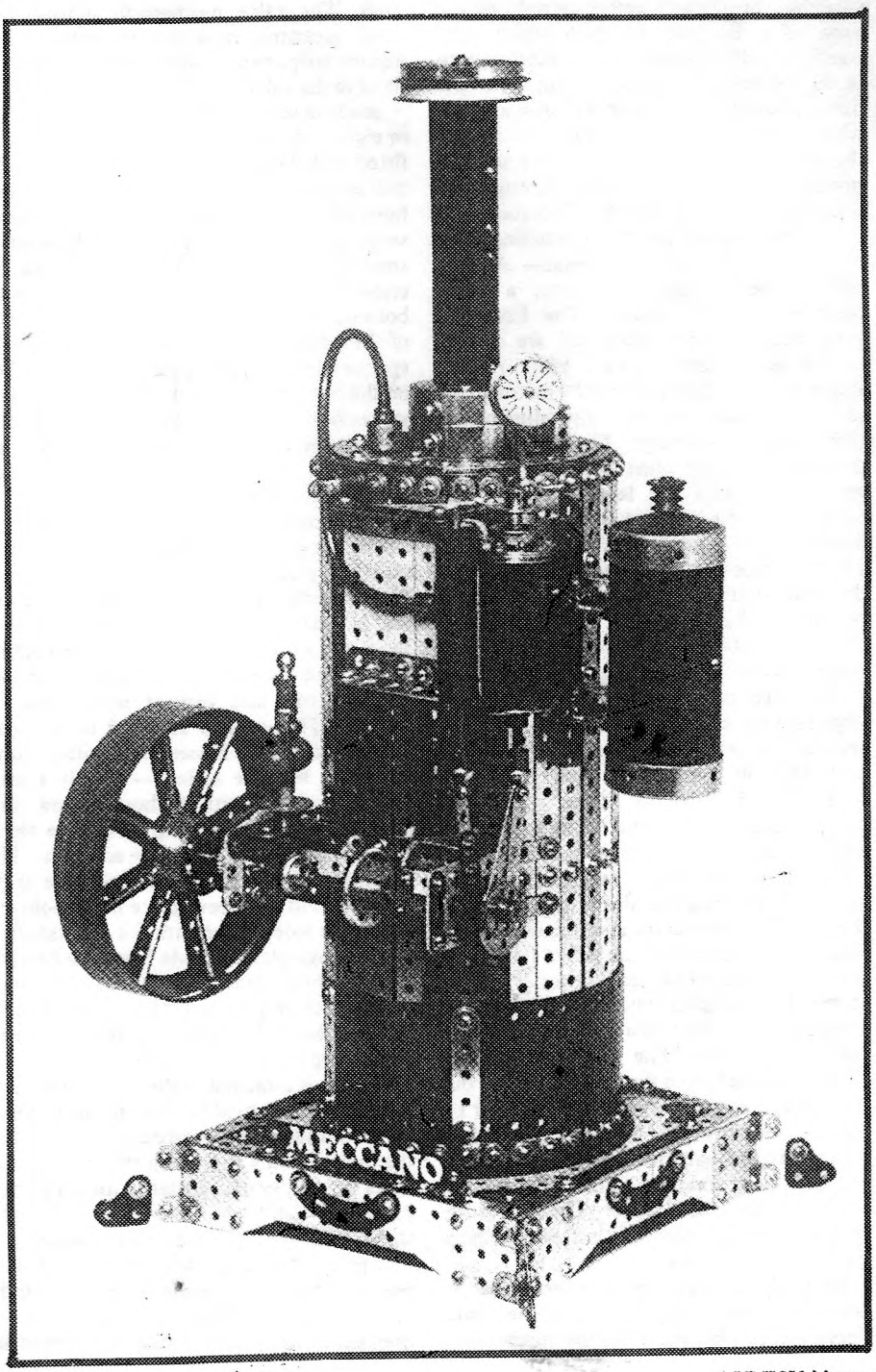
THE working model shown here is based on an engine depicted in a 1913 reprint of Messrs Gamage's catalogue where several pages are devoted to all types of engines — both steam and hot air operated. Mostly shown with a 'Gamages' sticker or name-plate these engines are German made by such firms as **Ernst Planck, Marklin** and **Bing,** but these names are not mentioned in the text. This particular model stands around 30" in height with a square base of 7½"and with a boiler diameter of 5½" overall. Motion is derived by a small mains induction motor situated in the firebox at the base. It is NOT advisable for the younger element to use this type of motor but several low-voltage **Meccano** types are available and should be used where possible.

Construction should commence with the base plinth which is made from 7½" strips and girders to form a square with suitable plates arranged to enable a 6" Circular plate and a Hub Disc to be bolted to the centre. The ex-Argentine Flat plates of 7½"×2½" are ideal for the flat surface required, but other size plates can easily be employed. The selected Motor is bolted to this base so that the output spindle faces to the rear and a ½" pulley is firmly fixed to this shaft. If a Meccano Gearbox motor is to be utilised-select a low reduction gear before fitting the boiler strips and also make leads long enough to pass out from the slotted holes of the Hub disc at the rear-to a Transformer or Battery box in line with the motor shaft. You will note from the photograph — the base plinth is increased in height by the use of eight 1½"×1½" flat plates at each corner and 1" corner brackets are fixed at each corner by obtuse angle brackets. The gaps between these plates are filled in with 1½" wide flexible plates and triangular plates. The boiler casing comprises 25 strips of 12½" length, and also seven of 9½". The latter are fixed at the rear so that a space remains for the firebox door. Starting at the front, bolt the 12½" strips around the circumference of the Hub disc and space evenly. Where coloured parts are used — it is a good idea to place Washers under bolt heads to avoid damage to the enamel but this is not necessary if Zinc or Nickel items are employed. a 5½" Circular Girder is next bolted inside the boiler at a position eleven holes up from the base-flange down — and all the strips are bolted to this girder with the exception of two.

The two vacant holes — facing front and rear, allow a 6½" rod to pass through both sides of the boiler and in line with the motor spindle. A 3" Pulley, fitted with two set or grub screws is attached to this spindle in line with the ½" pulley on the motor and is connected by a suitable driving band. If the model is required to run for long periods — the rubber belt drive is preferable to sprocket and chain as there is a tendency for the chain to stretch and ride off the sprockets sometimes with drastic results as the chain can wrap, itself around the set screws of the sprockets and stop the motor.

Another Circular Girder is fixed to the tops of the 12½" and 9½" strips with its flange down — and this allows access to the boiler interior for the attachment of anciliary items such as the cylinder and valve chest. A hinged door for the firebox is made from 3½×2½" flexible plate, curved to shape the contours of the boiler, and is attached by two hinges to one of the vertical 12½" strips. A door catch is made from an 1" rod fitted with a handrail coupling on the outside, and a pawl with boss, serving as the catch which engages with one of the vertical strips. The motion frame consists of two 4½×½" double angle strips bolted by their central holes three holes apart above and below the drive shaft running through the boiler and the central Circular girder.

A ½" or 15th pinion is fixed to the end of the 6½" rod — boss outwards — to give a right-angle drive to a large Contrate gear on the crankshaft. The bearings for the crankshaft are two 1½×1½" flat plates — each bolted to the lugs of the 4½" double angle strips at each side — the bolts also holding two pairs of 3" narrow strips that are attached to the boiler sides for support. To the left hand plate, bolt an 1"×1" angle bracket by one bolt only so that the crankshaft runs through the outer hole of the bracket. The other 1" lug faces inwards, and a bearing in



the form of a double arm crank — is bolted to the lug so that a vertical rod for the governor will engage with a small contrate on the crankshaft. The Governor consists of a small Fork piece — the lugs holding two weighted hooks by means of small set-screws. The fork holding the ball hooks is fixed to the topof the rod, then a collar and, underneath, a 15th pinion engages with the small contrate. The governor is non-functional but follows correct practice for this type of engine. Double arm cranks bolted to each 1½" flat plate give additional support to the crankshaft.

The Flywheel is made from two hub discs and a quantity of wheel discs and two bush wheels. Bolt the two hub discs together by their outer periphery holes and attach the two Bush wheels and the wheel discs by ¾" bolts to give some weight to the Flywheel. Make sure the wheel runs true before tighting the long bolts. Because the Bush wheel hubs stand 'proud' — place thin washers on each of the holding bolts before fitting the wheel discs. Careful construction will give a heavy wheel and the use of Green adhesive tape on the rim enhances the effect. Next select a *straight* 8" rod and pass this through the bearings of the motion plates. This rod holds the following gears and pulleys starting from the left side facing the engine:— A cone pulley, the Flywheel, a collar, a small contrate, a large contrate. The Eccentric valve gear and the piston rod are on the outside of the right hand 1½" plate. At this stage, it is a good idea to test the motor-drive to the crankshaft and make any adjustments that may be necessary. The drive pinion through the boiler must not mesh in close engagement with the large contrate, but allow for good running and lubricate all bearings. The pinton on the rod engaging with the large contrate should be fitted with the smallest grub screws and a washer should be placed behind it against the vertical strip bearing. A set-screw will foul the face of the contrate as would a larger grub screw.

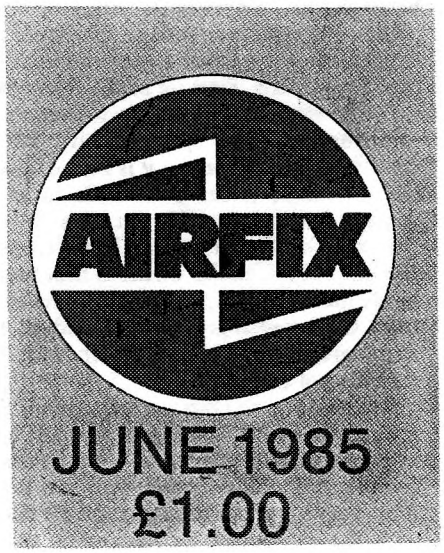
Once free movement is obtained, the next stage calls for the construction of the cylinder and valve chest and it is essential that these units be built carefully to ensure free running. Two 3"×1½" flat plates are butted together edge to edge, and are attached to 3" angle girders at the top and bottom, the plates bolted to the round holes of the girders. A 2½" angle girder is then bolted to the lower five holes at the cylinder edge of the plates by its round holes and a 2½" flat girder is then bolted to the slotted holes of 2½" angle girder. The assembly is bolted to the boiler at a position two holes down from the top on the central 12½" strip. The valve and cylinder chests are attached to the 2½" flat girder but the cylinder is spaced from the flat girder by three 2½" strips. The securing screws are first passed through the sleeve pieces forming the valve chest and then secured through the 2½" strips into the cylinder. The join of the cylinder and the open slots in the two sleeve pieces face to the rear.

Before attachment of the sleeve pieces, bolt a rod socket to the side of the lower sleeve piece. This will hold the steam pipe. Two chimney adaptors are pushed into the ends of the sleeve pieces to allow a valve rod to slide in the chimney adaptors. The cylinder is capped at the top with three eight-hole wheel discs held in place by 3" screwed rods (3) passed through the cylinder and trapping a Bush wheel, boss outer, at the bottom, Pass a rod through the bush wheel boss and centralise the wheel discs and bush wheel to the cylinder ends. The cylinder top is capped with a ½" pulley with boss held on a threaded pin bolted to the central holes of the wheel discs.

This framework is further supported by 2" slotted strips attached to the top and bottom 3" angle girders behind the valve chest, these strips being bolted to ½" angle brkts fixed to the boiler side. You then have a firm support with the piston rod in line with the crankshaft. The valve mechanism consists of a small eccentric to which is bolted a 2½" narrow strip, bent to allow a pivot on a collar fixed to the valve rod. The cylinder crank can be made in several ways but a Bush wheel (six or eight hole) on the end of the crankshaft, is fitted with a small Bush wheel held by a pivot bolt in one of the periphery holes of the large bush wheel on the crankshaft. Two 3" *narrow* strips are attached to the opposite holes of the small Bush wheel on it's face, and the two ends are again pivotted to a collar held on the bottom of the piston rod. Note that the boss of the small bush wheel is outermost and is spaced from the large bush wheel by washers on the pivot bolt. Line up the two rods in the valve chest and cylinder by carefully bending the narrow connecting strips. Test for free movement and lubricate the sliding rods. The motion is now completed.

A pressure gauge is made from a large (or small) flanged wheel attached to a collar held on a 3½" plain handle. The cranked portion of the handle passes over the top of the boiler and is held in a double arm crank bolted to the top 3" angle girder. The auxiliary tank is a boiler with its ends held in place by a long screwed rod and capped with brass ½" pulleys. This unit is attached to the main boiler by threaded bosses. An auxiliary pump drive can next be added — simply a small eccentric fitted with a short narrow strip attached to a rod passing through a sleeve piece holding two chimney adaptors. This eccentric is situated on the inner side of the flywheel and the sleeve piece being bolted to the boiler side in line with the crankshaft. A water gauge glass is made from two handrail supports holding a 1½" rod fitted with a short piece of clear plastic tubing. The gauge is fixed to the boiler just above the Governor.

The top of the boiler can be built in one piece as it is attached to the top by four short bolts which are held in four threaded bosses secured under the top circular girder so that the tapped holes align with the small slotted holes in the circular girder. Either a 6" circ. plate, or a 4" ditto, holds the stack and plinth, the 4" plate having short strips radiating in four positions to allow fixture to the threaded bosses. The stack is made from two cylinder units, butted together with their seams in line, and held by narrow strips on their inside curvatures. A long screwed rod (6") is attached to the middle hole of a boiler end the stack is passed over this rod and capped with a face plate and wheel flange — or several large flanged wheels — the rod being centralised and held tight by a nut at the top of the screwed rod. An exhaust pipe made from a plain 5" crank handle, can be fitted to the side of the stack, held by a hand-rail support — the cranked part passing over the boiler end to be secured in a rod socket held in the top plate. The boiler end has four flat brackets attached to opposite holes in it's flange. These brackets being bolted to another boiler end flush with it's partner, the whole being attached to the top by ½" angle brackets spaced with washers. The main steam supply pipe can either consist of a piece of plastic tubing secured to the valve chest rod socket on a 1" rod — and to the top of the boiler by a threaded adaptor or made-up piping from rods, couplings and rod connectors. Final embellishments can be added in the form of plastic flexible plates passed around the boiler at the bottom and midway on the boiler — the joins being overlapped by 2½" strips. Various taps and cocks may be added by means of Brassware — suitably polished and lacquered for effect. The use of bright bolt heads and washers all add to an attractive model for display purposes and the use of an induction motor gives quiet and trouble-free operation. □



BRIAN W. ROWE runs a Meccano Exhibition Centre from his home in Devon.