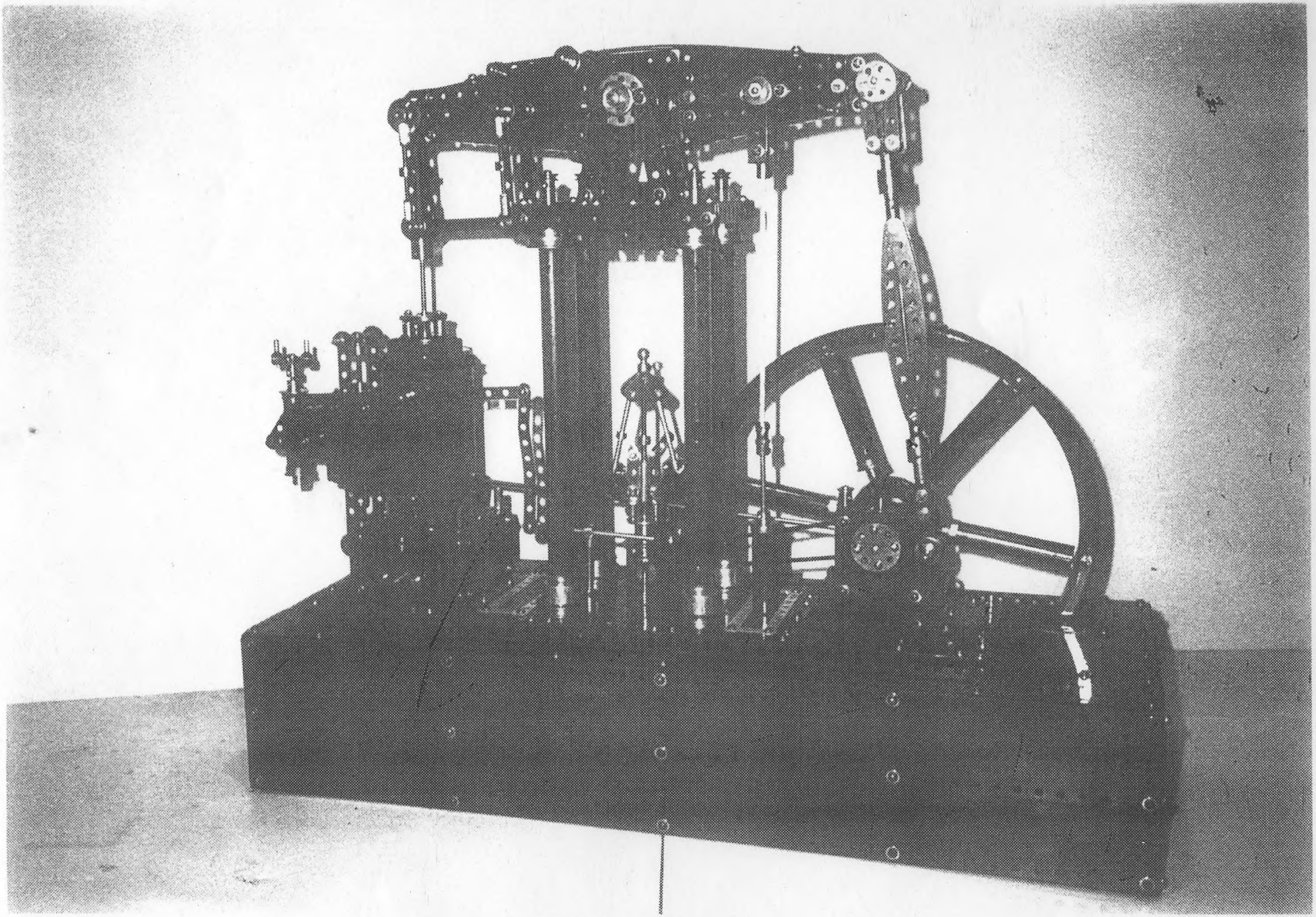

Summer 1993. A FOUR PILLAR BEAM ENGINE.

This is the smaller version of my previous model Giant Beam engine of several years ago-and made from Blue/Ylw/Zinc parts and with an old Fracmo mains motor drive. This model has a smaller mains Induction motor driving onto the flywheel rim by a flat elastic belt-and gives a nice display speed without any further reduction gearing. The flywheel consists of two replica channel rings in Red-with six spokes made from MW Models longer sleeve pieces of 3½"length with small flanged wheels at the ends near the hub. Exacto faceplates give the six holes for the spokes-or you can drill four extra holes in old Meccano faceplates with the use of a six hole wheel disc as a drilling template.The four pillars are 4½"length sleeve pieces-with chimney adaptors at the joins and ends for location purposes. The cylinder is NOT from Meccano-but can be made from boiler sections opened out to give an approx dia of 3".

THE MAIN BASE PLINTH.This is 24½"long by 9½"width and 4½"depth and is covered at the sides by strip plates overlapping flat plates for strength-and with corners of 4½"angle girders. The engine baseplate is 19"long by 5½"width and covered with a variety of flat plates except for the main crank well which is open. The main plinth also has a slot for the flywheel-and this is 11½"long and 2½"wide at the "open"section and edged with strips as a contrast to the Red plates. The cylinder base rests on a sq top of doubled 3½x3½"plates(Exacto or MW) and is 2" in height bolted to 3½"angle girders at top and bottom and with a 3½"x2" plate at thepillar side-and open at the left end for the valve lift linkage.The cylinder is bolted central on the top plate by angle brkts and has two long screwed rods to hold a 3" pulley-a wheel flange-and several layers of wheel discs as shown in the print. The valve chest is rectangular and made from a pair of 2½x 1½"flanged plates and with sides of flat plates of 2½x1½"size bolted to 1½"a/girders at the top edge. A double arm crank holds the valve rod which must be free to slide in the boss and top 1½x1½"flat plate. The valve lift shaft bearings are pairs of channel bearings each side as shown-with the rod at the centre and retained by collars at each side. The pillar legs have small flanged wheels at the bottom-their bosses inside the sleeves-and zinc wheel hubs under plus several layers of wheel discs(seven).

The tops are extended by large flanged wheels with bosses on the inside of the sleeves-and two zinc hubs for each leg-all held by long screwed rods with threaded bosses at the tops. The beam pivot plate is 5½x4½"-edged with girders and a top surface of flat doubled plates 4½x2½"plus two a/girders of 2½" length for the beam support.Two further a/girders under the top with flat girders bolted to the flanges. These girders at top and under-are spaced seven holes apart and other girders of 3" length are attached to each end-and to opposite holes in bush wheels with bosses outwards. A rod passed through both bush wheel hubs-holds the rocking beam and is retained by small flanged wheels.

THE MAIN BEARINGS.Which hold the flywheel and big end crank-are 2½x2½"flat plates bolted to 3½"a/girders at their slotted holes and 1½"apart.The front plate also has a 2½"a/gdr bolted at the top which holds two threaded bosses attached to screw rods passing down into the base plinth and held by locknuts to give a good vertical support to the frame. The inner bearing is just the plate in line with the front one. Another made up bearing is fixed to the offside of the flywheel and in line with the others and to support the weight of the flywheel and crankshaft.You can now test the flywheel on a rod through the bearings and adjust to give true running and for correct level across the engine.

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THE ROCKING BEAM. You will need four sector plates, two 2½x2½"flat plates-and two 1½x1½"plates. Plus four flat trunnions and four double arm cranks-two wheel flanges and two bush wheels. At the middle of the beam-the two small plates are sandwiched between the 2½"plates to allow the sector plates to be bolted to them -one each side-and with a further two 1½" plates bolted at the outer ends for the four trunnions to be bolted and with double arm cranks at both sides as shown. The bosses of the cranks are in line and washers are used for spacing purposes. Two more d/a cranks are bolted along the beam at the middle of both sector plates-four cranks being used-two on each side. Overlaid on 4½" strips in each case. The tops and bottom of the beam have strips bolted(9½") and curved to give better support. Test the beam to see that the ends are directly above the cyl centre and the main crank and adjust as necessary.

THE PARALLEL WATT MOTION. Made from NARROW strips and collars and couplings. The front hanging links are two 3½"narrow strips placed on a short rod through the D/A cranks and held by small 1" bush wheels. The rear links are 4½"narrow strips-the top ends both fitted with threaded pins outwards. These pins hold 2½" narrow strips which are pivoted to further threaded pins at the tops of 2½"curved strips firmly bolted to the 1½" a/girder on the beam supports. These curved strips have to be adjusted to ensure the piston rod rises and falls in a vertical plane when connected.

The other two d/a cranks at the main crank end of the beam has two 2" strips bolted to the lugs of a 1½x½"double angle strips fitted with a rod socket at it's centre. This holds a long rod for the condenser pump. The piston rod has a large fork fixed at it's top with a short rod holding two more 3½"narrow strips and spaced with washers and held in place by collars and larger washers. The rear link has a longer short rod with couplings between the links and connected to the 4½"narrow strips previously mentioned.

Fixed collars are at the middle holes of the four hanging links and hold four screw rods as shown for embellishment only. Now adjust the motion by hand and alter the settings for smooth motion in the links and piston rod. The beam and parallel motion should operate smoothly-and oil all links and bearings.

THE SWEEP ROD AND CRANK. The two hangers for the sweep rod are made from 2" narrow strips bolted to the faces of two small bush wheels -their bottom ends being fastened to the tapped holes in two std couplings with each coupling on the inside of the strips-leaving the centre drilled bores free to take a rod. This rod has another coupling loose on it's transverse end bore-and holding securely a long rod by a grub screw. Further couplings are fixed to the rod and also two pairs of 5½"curved strips each side as shown. Another coupling at the bottom has two 2" strips attached-on each side of the coupling-the bottom holes being free to rotate on the crankpin. The built up crank consists of a bush wheel-boss inwards-fitted with a flat trunnion-the long holding bolts also having a wheel disc-another trunnion-and layers of 2" strips equal to the width of collars-three of which are used on the bolt shanks to match the layers of strips. A long plain threaded pin is fixed to the strip ends by nuts and this holds the bottom of the sweep rod and with layers of 3/4" washers between the strip endsand one on the outside held by a collar. This made up crank gives a good throw for the beam but must be at right angles to the crankshaft. The condenser pump is another 2½"sleeve piece fitted with a small flanged wheel at the top-and passed over a chimney adaptor bolted to the engine plinth. A swivel bearing is fixed to the top end of the pump rod-and also to the clock-kit rod held in the rod socket at the beam pivot. Oil all moving parts and test for free movement.

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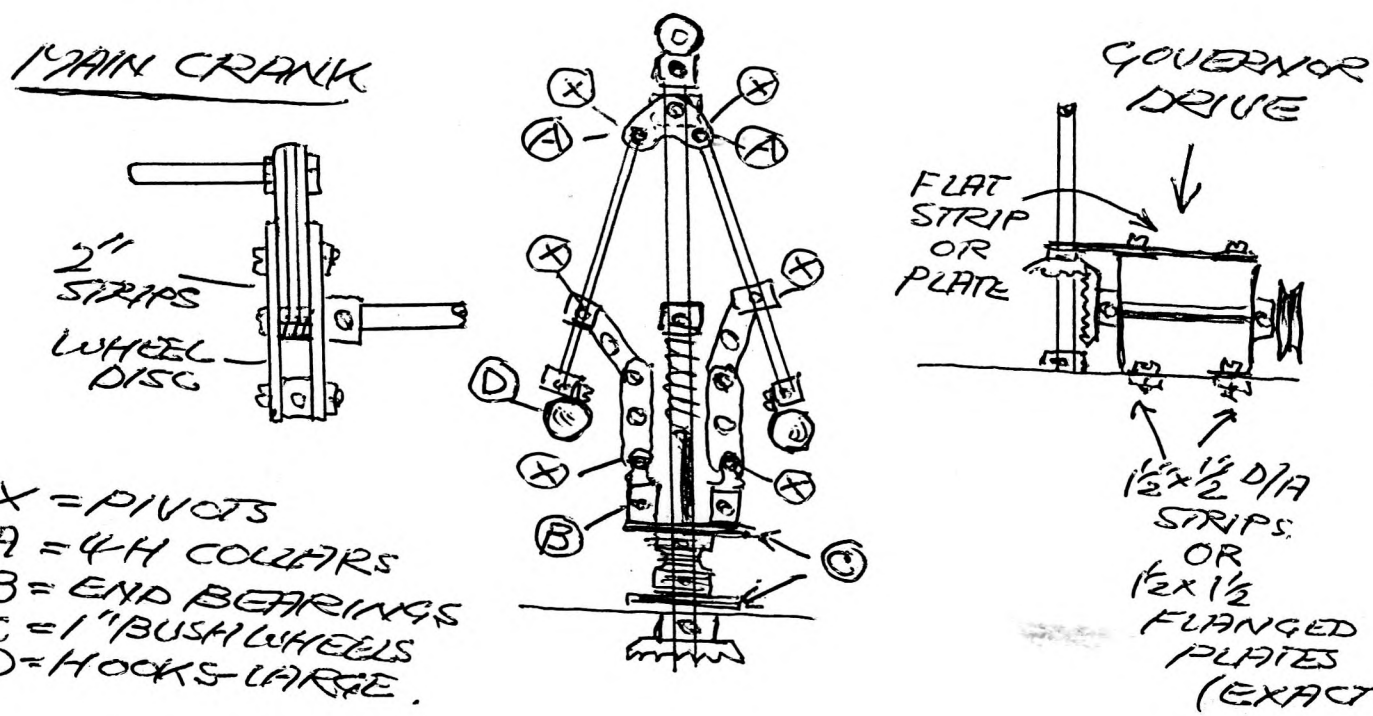
THE VALVE GEAR MECHANISM. A small eccentric is fitted with a coupling to it's strap by short setscrews-allowing a long rod to be held in the bore of the coupling. The other end of this rod is secured in a collar which is pivoted on a 2½"strip that is bolted to a single arm crank at it's outer hole in the strip giving a 2½"leverage. This crank is then fixed to the transverse rod under the cylinder. This rod has two couplings holding equal length rods(short ones) fitted with rod and strip connectors and in line. The valve rod is held by a handrail coupling at the top centre-with a transverse rod for the side strips. These are 6½" narrow strips(Exacto) and are pivoted to,the rod and strip connectors by threaded pins and collars. Now turn over the engine motion and adjust the lifting levvers to clear the end of the platform girders and impart reciprocating motion to the valve spindle. Adjust with care-and then oil moving parts. The drive to the governor is taken by a rubber belt from a pulley on the c/shaft on the nearside of the small eccentric-to another pulley on a shaft in the governor plinth. This plinth is made from two 1½"square flanged plates(Exacto or MW) and with a 2½x1½"flat plate on the top to hold the vertical shaft. Two small bevels take the drive and note the sketch of the governor attached to these pages.

A cut-off linkage is made from narrow strips attached to the steam inlet box by a single arm crank on a short rod passed through the inlet box via a double arm crank. Another 2½"sleeve piece acts as the control-fitted with two small flanged wheels and a turn-handle made with a handrail coupling-two collars and small pins or threaded pins. The motor is situated in front of the flywheel and in line with the rim. The top of the base is filled with various strip and flexible plates-all bolted to cross girders underneath to give a strong flat surface.

To get the correct length of the sweep rod-turn the crank to 90 degrees on the crankshaft and the beam on the level. The distance from the beam end to the crank pin is the correct length of the sweep rod. Use plenty of cross girders to support the engine and the base plinth. The engine base can be removed by the threaded bosses holding it to the main base plinth. The governor is fully operational-but the slow speed of the engine does not allow the ball-arms to fly out-and thus lift the linkage to the valve inlet box. The small box at the extreme rear is a channel bearing attached to the main box by long screws. Here is the governor sketch:-



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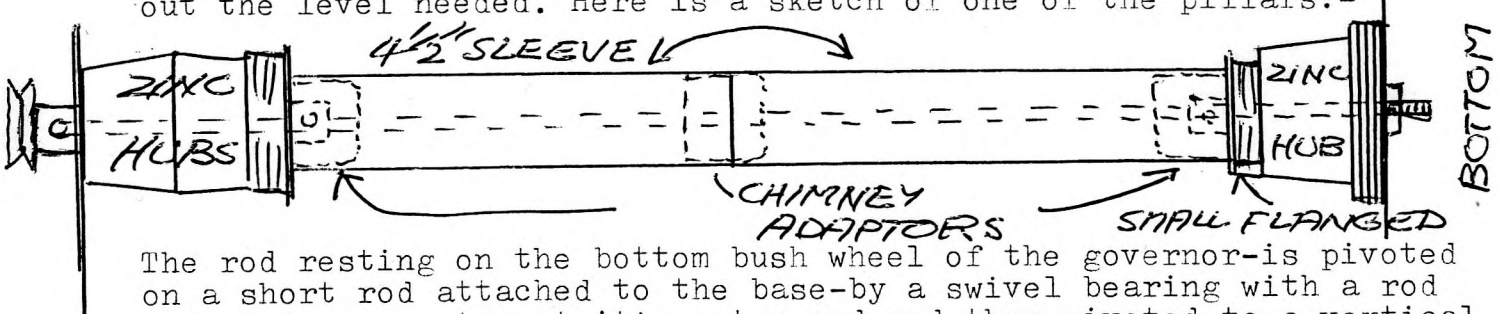
Some notes on the governor-see sketch. The main rod has a rod connector placed over the top bush wheel to allow the compression spring to clear the end bearing bosses which are fixed to two threaded pins in the face of the bush wheel. The rod connector will NOT allow the governor to function as it does not slide on the rod-a piece of tube is better here that can move on the rod.

As the large hook balls fly outwards-the linkage lifts both bush wheels and the socket coupling(no grub screws fitted) and thus lifts the arm on the linkage back to the valve chest. You can make the governor in different ways to suit your parts.My hooks have the HOOK part removed and I keep these for the purpose. They are attached to collars by small set screws as shown.

The bush wheels are intended to slide against the compression spring held in place by a collar. The main rod is an 8" one or near and passes down into the engine base and driven by it's bevel from the drive brackets(see sketch). The well under the main crank is NOT needed as the crank clears the base .The crank is two holes down in the square flat plate and can be adjusted in the angle girder slotted holes. Note that the sweep rod has some brassware embellishments as does the engine in general for good visual purposes.The crank pin is four holes out of the centre rod crankshaft-so the cylinder must clear when the piston is "down" at the top of the crank throw.There is plenty of room in the fly-wheel slot for a different motor drive-either by belt or sprockets.

POINTS TO WATCH.The beam ends MUST lie over the centre of the cyl and over the crank-pin-and must be vertical and true on the base. Make sure the valve lifting arms do NOT touch the plinth frame and adjust the position of the operating crank arm on the offside of the cylinder. Oil the piston rod and all linkages and bearings. Note that the engine base plinth is 19" long-and not 18½"-this is because the top flat plates need the extra ½" to be flat and NOT overlapped anywhere-important when the thickness of a plate throws out the level needed. Here is a sketch of one of the pillars:-

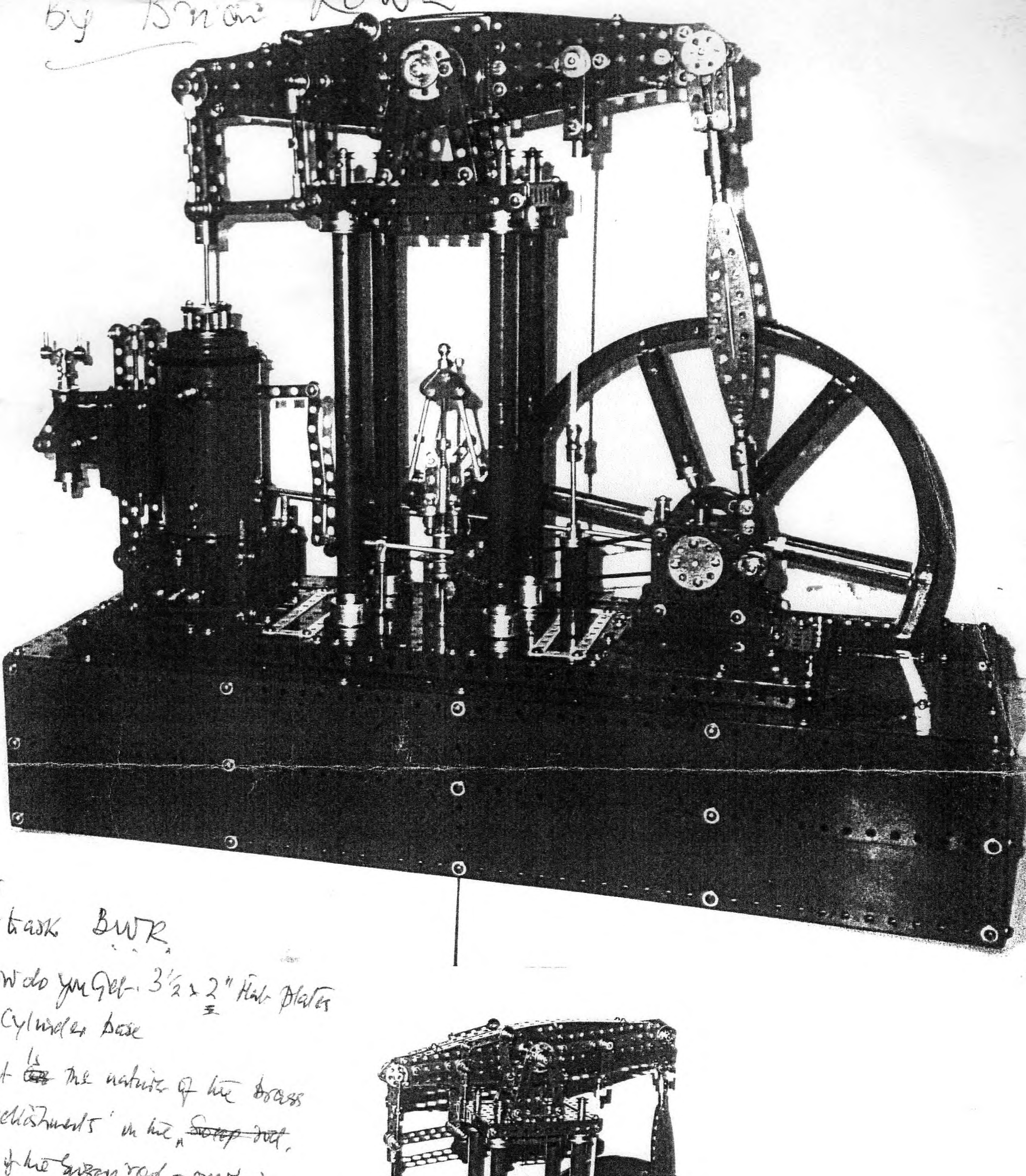


The rod resting on the bottom bush wheel of the governor-is pivoted on a short rod attached to the base-by a swivel bearing with a rod and strip connector at it's outer end-and then pivoted to a vertical narrow strip-and again to a longer narrow strip also pivoted to the cylinder side-use a threaded pin with a large washer and collar. The drive pulleys for the governor need be any size to fit the drive band stretch-not too tight-but enough to turn the governor.

Note the position of the three chimney adaptors inside each pillar leg-and the long screwed rod.Use plenty of brassware to give a pleasing finish to the engine.I can give you full instructions to build a six spoke flywheel if required-and you cab contact me at anytime if you have any problems.

FINIS

By Brian ROWE



Q's to ask BWR

1. How do you get 3½ x 2" flat plates (cylinder base)

2. What ~~are~~ is the nature of the brass 'embellishments' on the ~~Sweep rod~~ ends of the sweep rod – overlying them couplings