MECCANO
Combine Harvester

(MODEL No. 10.13)

SPECIAL FEATURES

This model represents one of the many mechanical appliances used on modern farms. A two-speed and reverse gear-box gives different traction speeds, and other features include workable steering gear and a power-driven reel or beater.

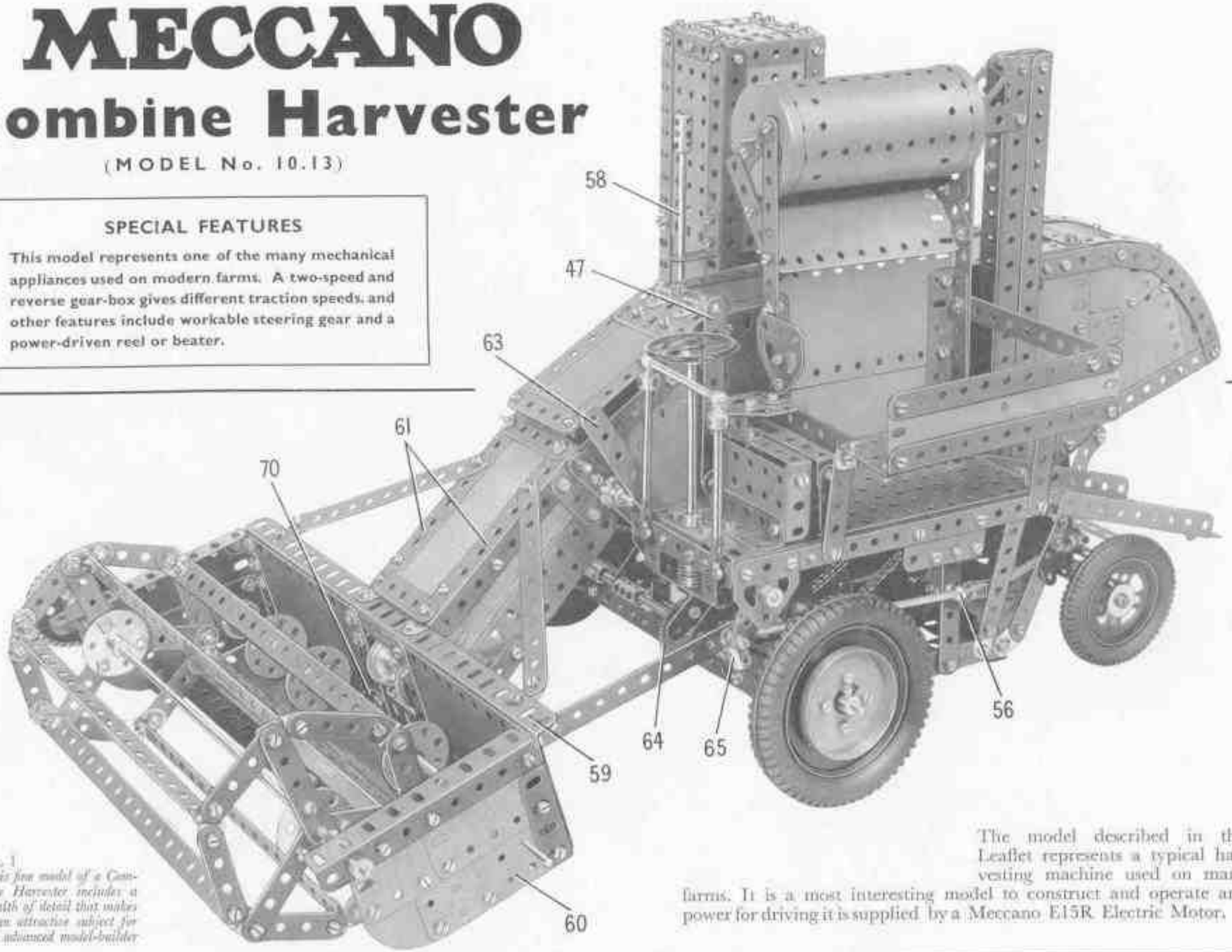

FIG. 1
This fine model of a Combine Harvester includes a wealth of detail that makes it an attractive subject for the advanced model-builder

The model described in this Leaflet represents a typical harvesting machine used on many farms. It is a most interesting model to construct and operate and power for driving it is supplied by a Meccano E15R Electric Motor.

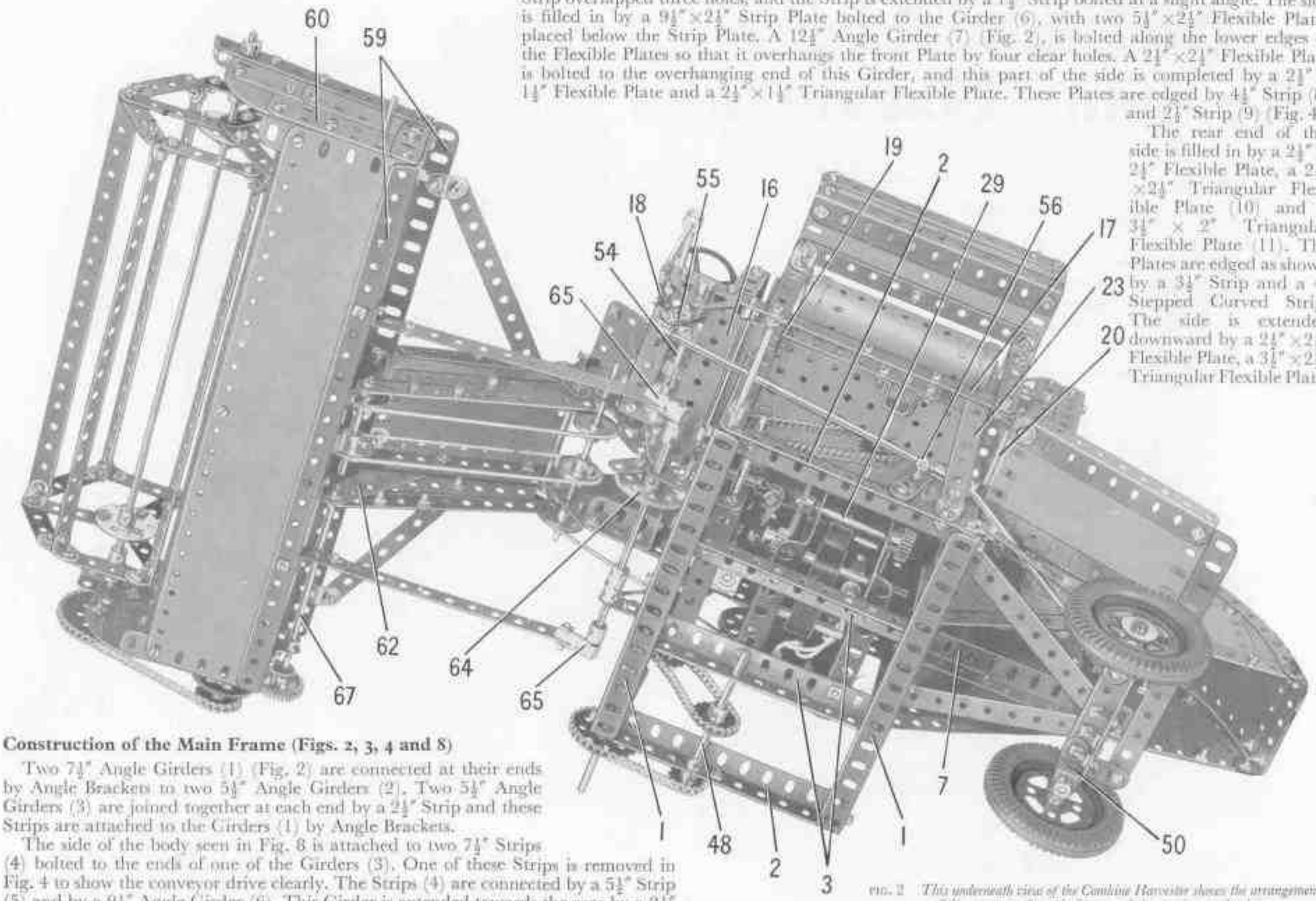

Fig. 2 *This underneath view of the Combine Harvester shows the arrangement of the conveyor, the underframe and the steering mechanism*

Strip overlapped three holes, and the Strip is extended by a 1½" Strip bolted at a slight angle. The side is filled in by a 9½" × 2½" Strip Plate bolted to the Girder (6), with two 5½" × 2½" Flexible Plates placed below the Strip Plate. A 12½" Angle Girder (7) (Fig. 2), is bolted along the lower edges of the Flexible Plates so that it overhangs the front Plate by four clear holes. A 2½" × 2½" Flexible Plate is bolted to the overhanging end of this Girder, and this part of the side is completed by a 2½" × 1½" Flexible Plate and a 2½" × 1½" Triangular Flexible Plate. These Plates are edged by 4½" Strip (8) and 2½" Strip (9) (Fig. 4).

The rear end of this side is filled in by a 2½" × 2½" Flexible Plate, a 2½" × 2½" Triangular Flexible Plate (10) and a 3½" × 2" Triangular Flexible Plate (11). The Plates are edged as shown by a 3½" Strip and a 4" Stepped Curved Strip. The side is extended downward by a 2½" × 2½" Flexible Plate, a 3½" × 2½" Triangular Flexible Plate,

Construction of the Main Frame (Figs. 2, 3, 4 and 8)

Two 7½" Angle Girders (1) (Fig. 2) are connected at their ends by Angle Brackets to two 5½" Angle Girders (2). Two 5½" Angle Girders (3) are joined together at each end by a 2½" Strip and these Strips are attached to the Girders (1) by Angle Brackets.

The side of the body seen in Fig. 8 is attached to two 7½" Strips (4) bolted to the ends of one of the Girders (3). One of these Strips is removed in Fig. 4 to show the conveyor drive clearly. The Strips (4) are connected by a 5½" Strip (5) and by a 9½" Angle Girder (6). This Girder is extended towards the rear by a 2½"

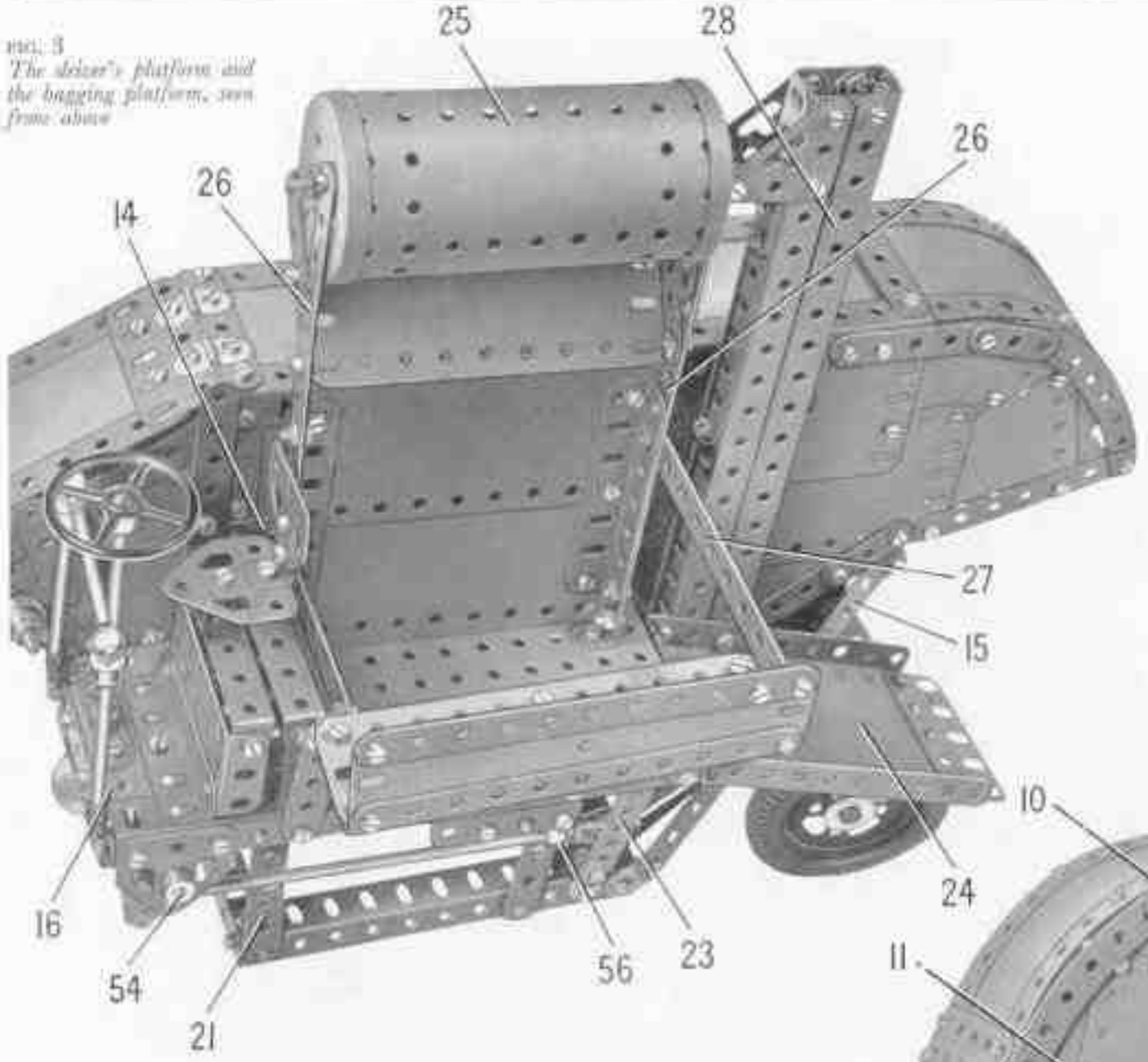

FIG. 3
The driver's platform and the bagging platform, seen from above

(12), and a $2\frac{1}{2}" \times 1\frac{1}{2}"$ Triangular Flexible Plate (13), edged by a $5\frac{1}{2}"$ Strip that is extended one hole by a $1\frac{1}{2}"$ Strip.

The side seen in Fig. 1 is similar in general design, but only one $7\frac{1}{2}"$ Strip is fixed to the Girder (3), and the front one of the $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plates is replaced by a $4\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plate. This construction leaves a gap $\frac{1}{2}"$ wide in front of the Plate, and later this gap is used to accommodate the lever that controls the drive to the conveyor. The gap is edged by a $1\frac{1}{2}"$ Strip (14) (Fig. 3) and a $2\frac{1}{2}"$ Strip.

The sides are connected at the top by a $9\frac{1}{2}" \times 2\frac{1}{2}"$ Strip Plate bolted to the Girders (6) (Fig. 4), with a $2\frac{1}{2}"$ Strip at each end of the Strip Plate. The rear section of the top is filled by a $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plate edged by two curved $5\frac{1}{2}"$ Strips and extended by a $2\frac{1}{2}"$ Flat Girder. The Flat Girder is bolted to a $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip fixed between the sides.

A stay (15) (Fig. 3) is attached to a Fishplate bolted to the body, and is connected to one of the Girders (2) by an Obtuse Angle Bracket. This stay consists of two $3\frac{1}{2}"$ Strips overlapped two holes.

The Driving and Bagging Platform (Figs. 1, 2 and 3)

The platform consists of a $5\frac{1}{2}" \times 3\frac{1}{2}"$ Flat Plate extended forward by a $2\frac{1}{2}" \times 2\frac{1}{2}"$ Flat Plate (16) (Figs. 2 and 3). The $5\frac{1}{2}" \times 3\frac{1}{2}"$ Flat Plate is edged by a $7\frac{1}{2}"$ Angle Girder (17) (Fig. 2) and to this are bolted three $3\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips indicated at (18), (19) and (20). The inner lugs of these Double Angle Strips are used to attach the platform to the side of the body, the bolts being passed through the Girder (7) of this side.

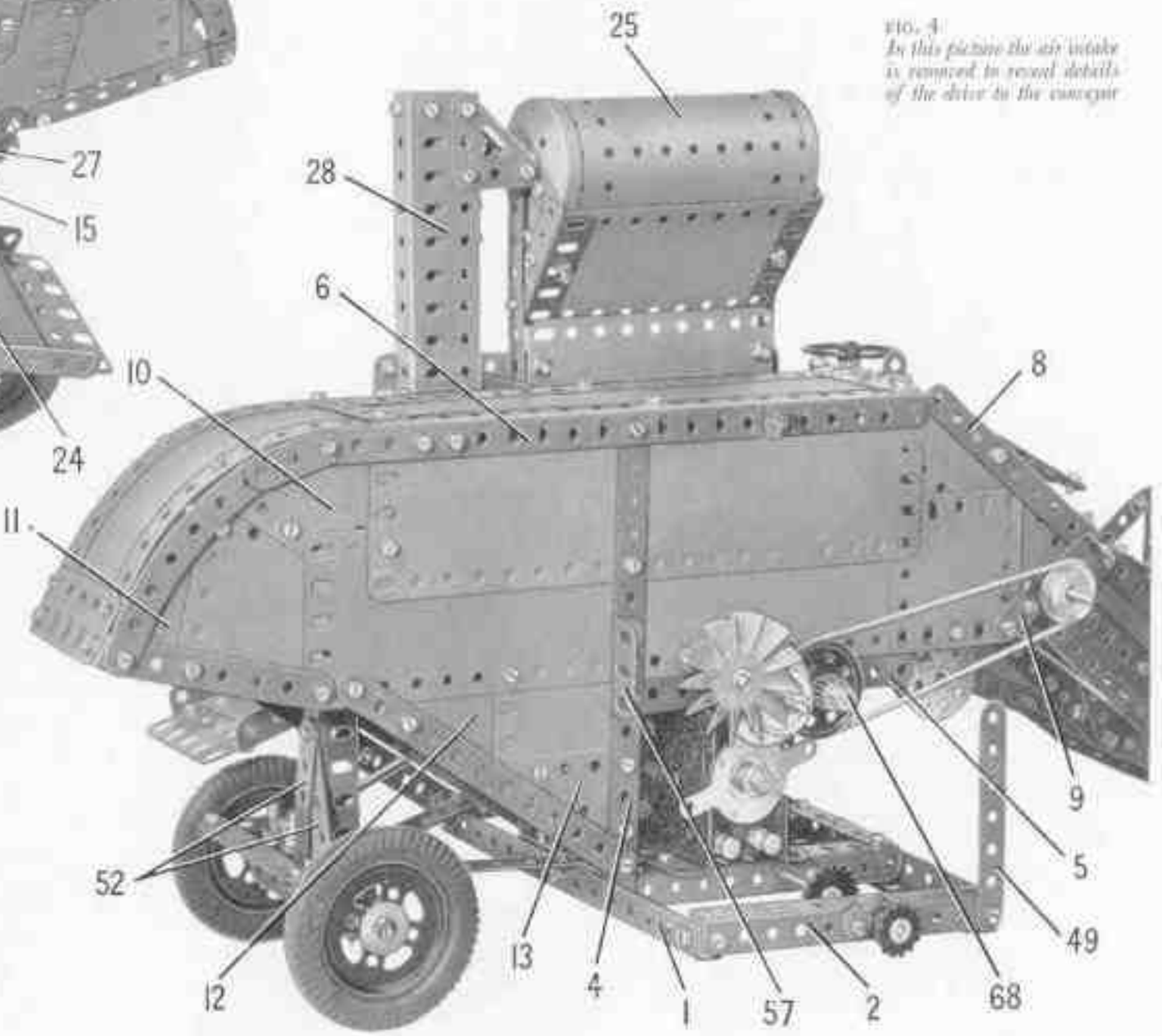

FIG. 4
In this picture the air intake is removed to reveal details of the drive to the conveyor

A built-up strip (21) (Fig. 3), made from two 2" Strips overlapped two holes, is bolted to one of the Girders (2) (Fig. 2) and is connected to Double Angle Strip (19) by an Angle Bracket. A 3" Angle Girder (22) (Fig. 10) is fixed to one of the Girders (1) and is attached to the Double Angle Strip (19) by a ½" Corner Angle Bracket (see Fig. 10). A 3½" Strip (23) is secured to the Girder (17) and is connected to one of the Girders (2) by an Obtuse Angle Bracket.

A chute (24) at the rear end of the bagging platform consists of a 4½" × 2½" Flexible Plate edged by 4½" Angle Girders and fitted at one end with a 2½" Strip and at the other end with a 2½" Flat Girder. The chute is attached to the platform by Angle Brackets.

Bagging Attachment and Grain Elevator (Figs. 1, 3, 4 and 7)

The bagging attachment is represented by a cylinder (25) (Fig. 3) formed by a Boiler pressed into two Wheel Flanges. Each Wheel Flange is bolted to a Corner Gusset that is edged by a 2½" Angle Girder and is fixed to a 7½" Strip (26). A 4½" × 2½" Flexible Plate is supported by the Angle Girders and the Strips are attached to the bagging platform by Angle Brackets. Two 3½" Angle Girders are bolted to the ends of two 4½" × 2½" Flexible Plates, and are fixed to the Strips (26).

A seat is formed by two 5½" × 1½" Flexible Plates connected by a 5½" Angle Girder, and is attached by Angle Brackets to 2½" Strips bolted to the Girder (17) (Figs. 2 and 10). The seat is connected to one of the Strips (26) by a 3" Strip and an Angle Bracket, and is braced to the other Strip (26) and to the side of the body by a 5½" × ½" Double Angle Strip (27).

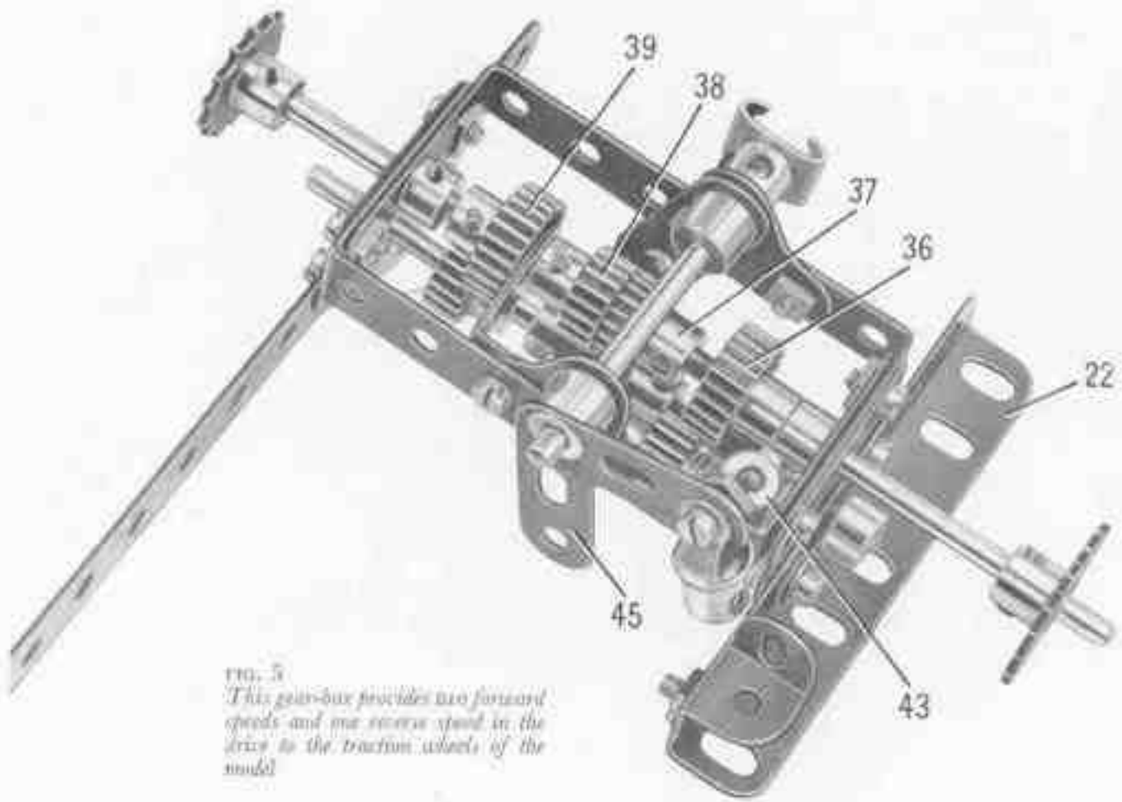

FIG. 5
This gear-box provides two forward speeds and one reverse speed in the drive to the traction wheels of the model

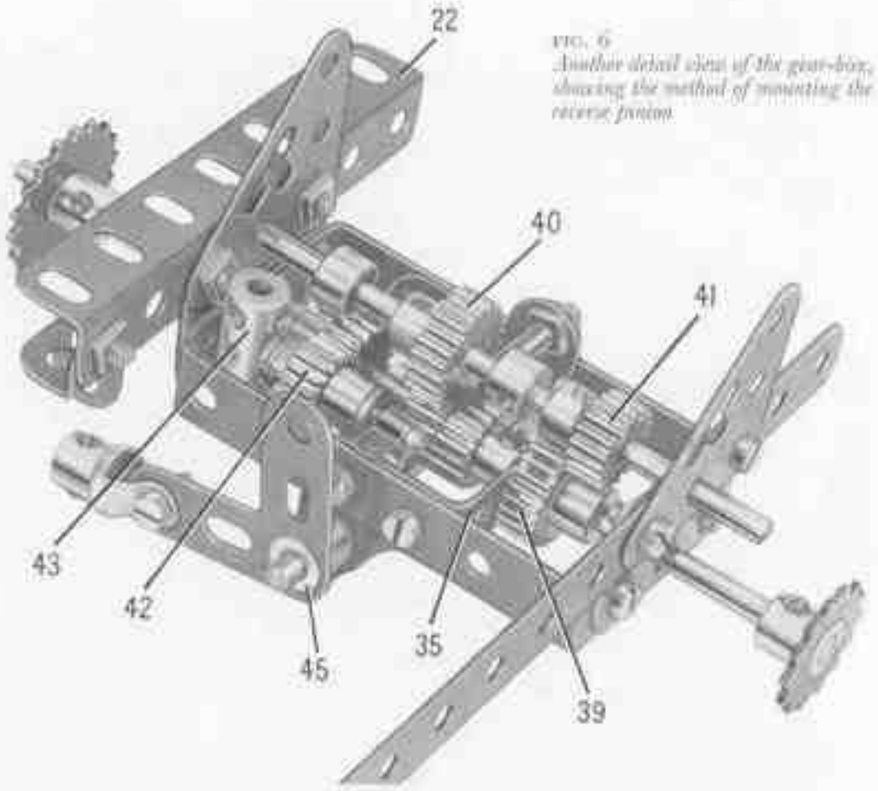

FIG. 6
Another detail view of the gear-box, showing the method of mounting the reverse pinion

The box that supports the driving seat consists of two 2½" × 1½" Flanged Plates, each fitted with a 2½" × ½" Double Angle Strip. One of the Flanged Plates is bolted to a 2½" Angle Girder fixed to the Flat Plate (16) (Fig. 3), and the other Flanged Plate is bolted to one of the Strips (26) and is attached to the bagging platform by an Angle Bracket. The seat is formed by two Flat Trunnions connected by a 1" × ½" Angle Bracket, and it is attached to the box by a Double Bracket.

The cover (28) for the grain elevator consists of two 9½" Angle Girders connected at their upper and lower ends by 1½" Flat Girders. A 5½" Angle Girder is bolted to the top end of each 9½" Angle Girder and a 5½" Flat Girder is used to connect the 5½" Angle Girders together. The cover is attached to the body by a 1" × ½" Angle Bracket, and it is bolted also to the chute (24). Two 1½" Corner Brackets are fixed to the top of the cover and are attached to the lugs of a Double Bracket that is bolted to one end of the cylinder (25).

Arrangement of the Power Unit, Reduction Gearing and Fan Drive (Figs. 2, 4, 8 and 9)

An E15R Electric Motor is bolted by its flanges to the Angle Girders (3) (Fig. 2), and a ½" Pinion on its armature shaft drives a 57-tooth Gear on a 2½" Rod (29). A ½" Pinion on this Rod engages a 50-tooth Gear on a 2½" Rod that carries a Worm (30) (Fig. 10). This Worm drives a ½" Pinion

on an 8" Rod (31), which is mounted at one end in a 2" Flat Girder bolted to the Angle Girder (17), and in a Double Bent Strip fixed to the Flat Girder. The Rod passes through holes in the Strips (5) (Fig. 4), and it carries a 1" Sprocket (32) (Fig. 10), a 57-tooth Gear (33) and a 1" Pulley (34) (Fig. 8). The Rod is held in place by a Collar and by the ½" Pinion driven by the Worm (30). This Pinion is located against a Double Bent Strip that is bolted to one of the Strips (5) (Fig. 4).

The Pulley (34) is connected by a Driving Band to a ½" fixed Pulley on a 4½" Rod that carries a Fan. The Rod is mounted in the sides of the body and is held in place by a Collar and one half of a Dog Clutch.

Gear-box and Drive to the Traction Wheels (Figs. 2, 5, 6 and 8)

The gear-box is shown removed from the machine in Figs. 5 and 6. The frame consists of two 3" × 1½" Double Angle Strips with their lugs overlapped, and with a 1½" Flat Girder fixed at each end by bolts through its slotted holes. A 1" × 1" Angle Bracket (35) is bolted to the frame at one side, the same bolts holding also a 1" Corner Bracket. Another 1" Corner Bracket is fastened to the other side of the frame.

The input shaft is a 3½" Rod that carries a ¾" Pinion (36) and a ½" Pinion (37). The Rod projects slightly beyond the Pinion (37) into a ½" Pinion (38) on the output shaft. This shaft is a 3" Rod, and it carries also a ¾" Pinion (39). The layshaft is a 4" Rod fitted with a ¾" Pinion (40) and a ½" Pinion (41). The layshaft is able to slide in its bearings, but its movement is limited by Collars. A reverse ½" Pinion (42) is held by a Spring Clip on a 1½" Rod and is spaced from a Coupling (43) by four Washers. The Rod is fixed in the Coupling, which is screwed on to a bolt at one end of the gear-box housing. The housing is bolted to one of the Strips (4) and to the Girder (22) as shown in Figs. 8 and 10, and the 1½" Flat Girders are adjusted by their slotted holes so that the ½" and ¾" Pinions mesh accurately. The bolts that fix the housing in place secure also 1½" Corner Brackets (44) (Fig. 8).

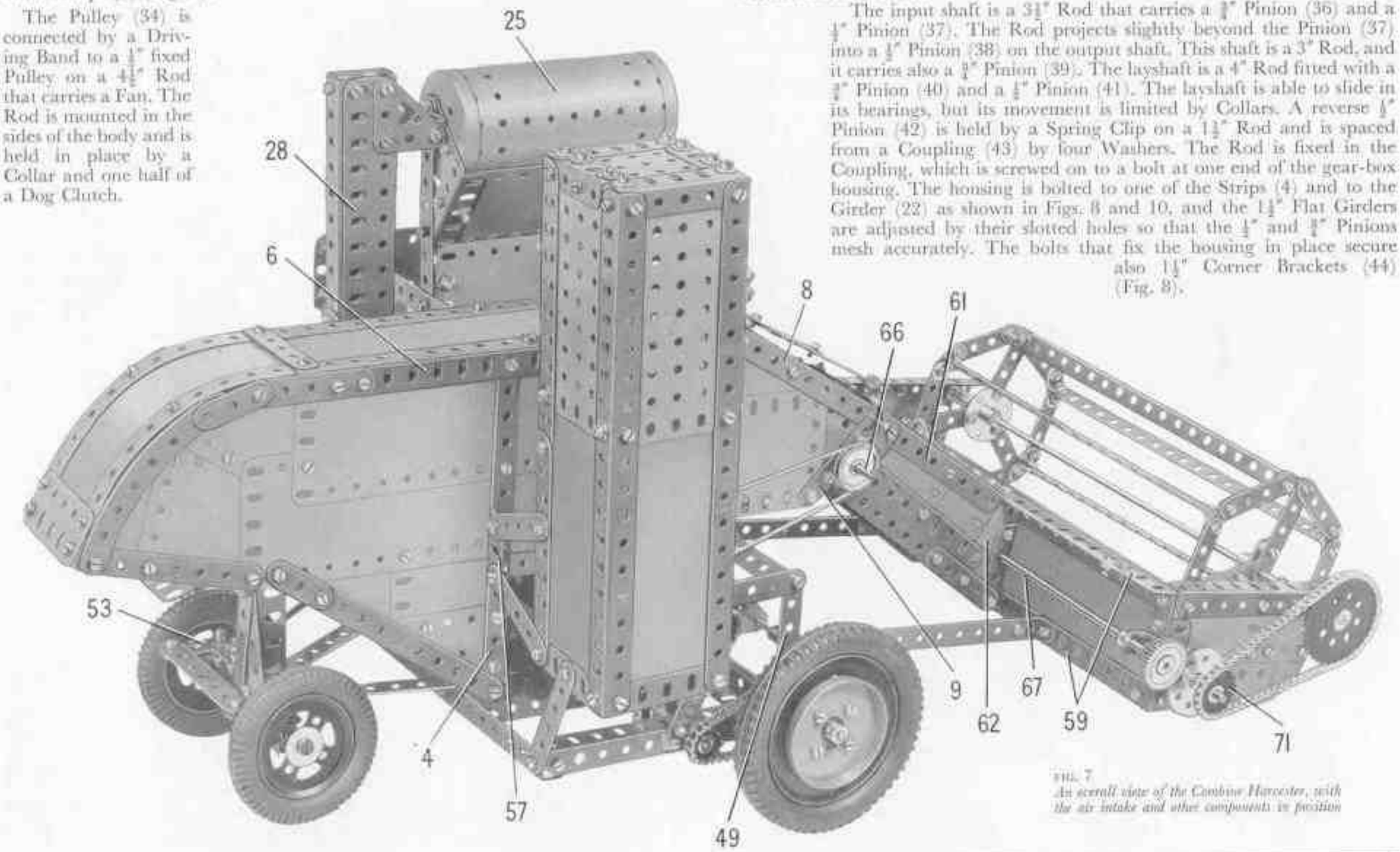

FIG. 7
An overall view of the Combine Harvester, with the air intake and other components in position

The movement of the gear-box is controlled by a Threaded Pin located between a Collar and the Pinion (40) (Fig. 6). The Threaded Pin is attached to a Crank, which is fixed on a 2½" Rod mounted in the 1" Corner Brackets and is held in place by a Bell Crank (45) and a Slide Piece. An End Bearing *lock-nutted* to the Bell Crank is connected by a 1" Rod to another End Bearing (46) (Fig. 9). The End Bearing (46) is *lock-nutted* to a lever (47), made from a 3½" Strip and a 3" Strip overlapped two holes. A Double Arm Crank is bolted to the lever with its boss over the third hole from the lower end of the 3½" Strip. The Double Arm Crank is fixed on a 4½" Rod mounted in one of the Girders (7) and in the Girder (17) (Fig. 10). The lever is spaced from the side of the body by four Washers, and the 4½" Rod is held in place by the other half of the Dog Clutch.

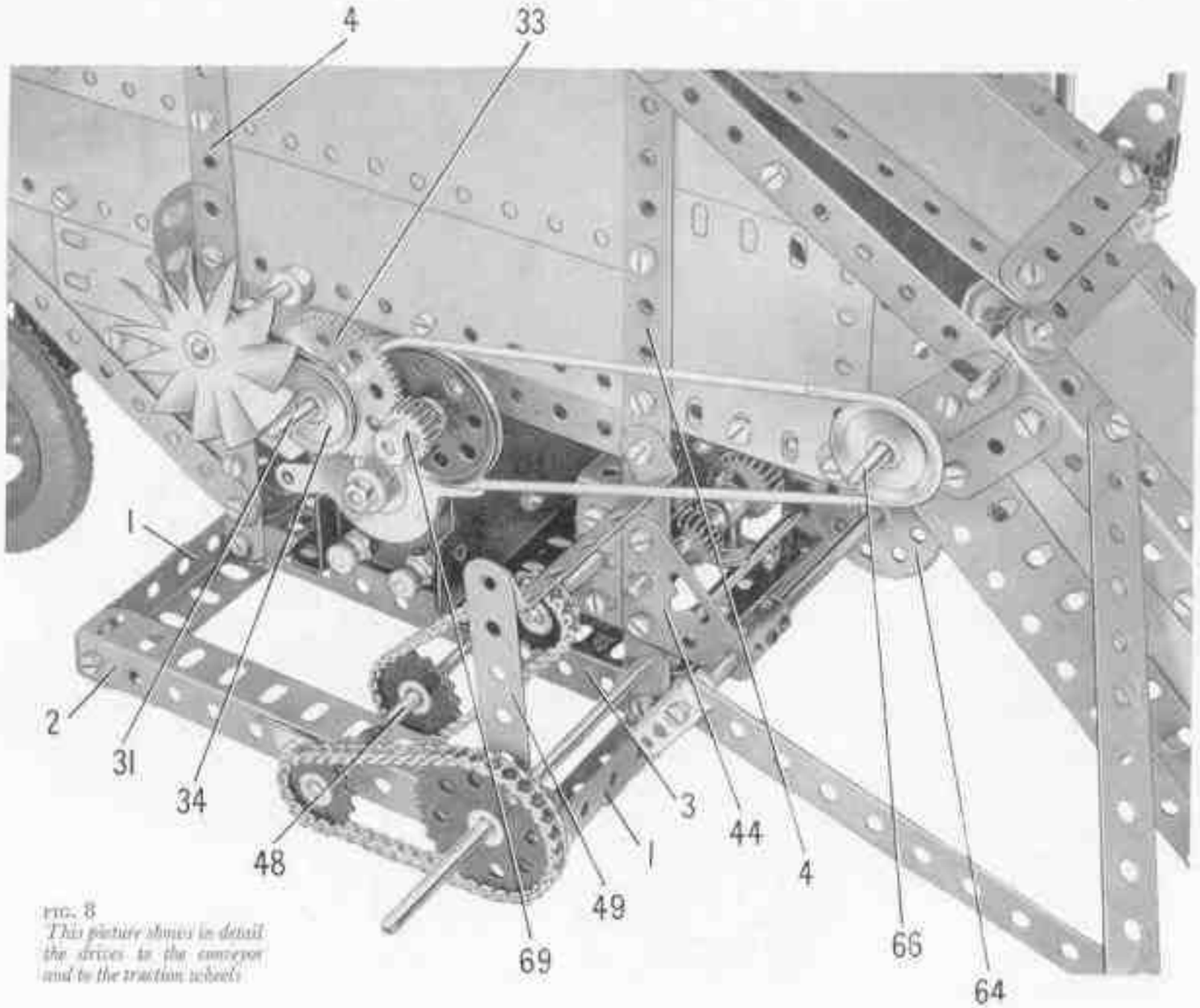

FIG. 8
This picture shows in detail the drives to the conveyor and to the traction wheels

The Sprocket (32) (Fig. 10) is connected by Chain to a 1" Sprocket on the gear-box input shaft. A ¾" Sprocket on the output shaft drives a 1" Sprocket on a 3½" Rod (48) (Fig. 8), and a ¾" Sprocket on the same Rod is linked by Chain to a 1½" Sprocket on the main axle. This axle is an 11½" Rod mounted in the Strips (4) (Fig. 4) and (21) (Fig. 3), the Angle Girder (22) (Fig. 10), and in a 3½" Strip (49) (Fig. 8). This Strip is connected to the side of the body by a 2½" × ½" Double Angle Strip.

When the layshaft is moved to the right (Fig. 6), the Pinion (40) engages Pinions (37) and (38) and bottom gear is engaged. By moving the layshaft slightly to the left Pinion (41) meshes with the Pinion (39) and Pinion (40) engages the Pinion (37), to provide top gear. Reverse is obtained by moving the layshaft to the extreme left, so that the drive is transmitted from Pinion (39) to Pinion (41) and through Pinions (36), (42) and (40).

Details of the Steering Mechanism (Figs. 2, 4, 7 and 10)

The axle beam is a 3½" Angle Girder fitted at each end with a ½" Reversed Angle Bracket (50) (Fig. 10). A vertical 4½" Strip (51) is bolted to the axle and to a 2½" Angle Girder fixed one clear hole from the ends of the Girders (7) (Fig. 2). The Strip (51) is strengthened at the back by a 3½" Angle Girder, and is braced to the axle beam by two 3½ Strips (52) (Fig. 4). The axle beam is connected to the main frame of the model (Fig. 2) by a 5½" Strip and a 4½" Strip.

Each of the steerable wheels is free to turn on a Pivot Bolt screwed into a Collar on a 1½" Rod. The wheel is spaced from the Collar by two Washers, and the 1½" Rod is mounted in the axle beam and in one of the Reversed Angle Brackets (50). The top end of one Rod is fitted with a Crank, and the other Rod carries a Bell Crank (53) (Fig. 10). The Bell Crank and the Crank are linked by a 3½" Strip pivoted on *lock-nutted* bolts.

The steering column is a 5" Rod supported in the Flat Plate (16) (Fig. 3) and in a 2½" Strip that is attached to the Double Angle Strip (18) (Fig. 2) by two 1" × 1" Angle Brackets. A Worm on the steering column drives a ½" Pinion on a 4" Rod (54), which is mounted in a Double Bracket and an Angle Bracket bolted to the 1" × 1" Angle Brackets, and in Flat Trunnions attached to the Girder (17) and one of the Girders (7). The Rod is held in place by Collars, and it carries a Crank (55) to which a Fishplate is bolted. A bolt passed through the Crank and the Fishplate is fixed by a nut in a Collar, which is fixed on a 6½" Rod held in a Handrail Support (56). The Handrail Support is *lock-nutted* to a 2½" Strip, and the Strip in

turn is *lock-nutted* to one of the Girders (1). A Swivel Bearing is fixed on the rear end of the 6½" Rod, which carries also a second Swivel Bearing that is pivotally connected to an arm of the Bell Crank (53) (Fig. 10). A ½" Bolt passed through the 'spider' of the Swivel Bearing is fixed in the Bell Crank by two nuts.

The Radiator Air Intake (Fig. 7)

The air intake column is made from four 4½" × 2½" Flat Plates and three 5½" × 2½" Flexible Plates bolted to two 9½" Angle Girders and two built-up 9½" girders. Each built-up girder consists of a 5½" and a 4½" Angle Girder. The top and lower edges of the column are strengthened as shown in Fig. 7 by 2½" and 1½" Angle Girders, and the top is filled in by a 2½" × 2½" Flat Plate. The column is attached to the body by two 2½" Strips bolted to a 1½" Angle Girder (57) (Fig. 7) and by a 3" Strip attached to the end of one of the Girders (1). Another 3" Strip is connected to the column by an Angle Bracket and is bolted to the Strip (49).

The exhaust pipe (58) (Fig. 1) is an 8" Rod supported in two 1" × 1" Angle Brackets bolted to the column. The Rod carries a Coupling at each end, and at its lower end a cylinder formed by a Sleeve Piece and two ¾" Flanged Wheels. The cylinder is placed above one of the 1" × 1" Angle Brackets and the lower Coupling is fixed underneath the same Angle Bracket to hold the Rod in position.

Reaping and Gathering Head (Figs. 1, 2 and 7)

The head is made by bolting two 5½" × 2½" Flexible Plates, each strengthened by two 2½" Strips, to the ends of two 12½" Angle Girders (59) (Figs. 1 and 7). A 2" Angle Girder is fastened to each end and to this is attached a 3" × 1½" Flat Plate (60), two 2½" × 1½" Flexible Plates and a Semi-Circular Plate. A 4½" Angle Girder is bolted along the top edges of the Flexible Plates and is attached to the top Angle Girder (59) by an Angle Bracket. A 12½" × 2½" Strip Plate is bolted to the lower one of the Girders (59) and is connected to the Flat Plates (60) by 1½" Angle Girders. Two 6½" Rack Strips bolted along the front edge of the Strip Plate represent the cutters.

The frame for the conveyor between the gathering head and the body of the machine, consists of two 4½" Angle Girders (61) connected by two 2½" Strips and a 4½" × 2½" Flexible Plate. A 1½" Strip and a 2½" × 2" Triangular Flexible Plate (62) are bolted to each of the Girders (61) and are connected at their lower ends by a 4½" Flat Girder that is extended by a 2½" Strip. Each side is filled in by two 2½" × 1½" Flexible Plates. The Girders (61) are attached to the top Angle Girder (59) by Obtuse Angle Brackets, and 2" Angle Girders are bolted to the Triangular Flexible Plates (62) and to the back of the head. A 3½" Rod is passed through the top ends of the Angle Girders (61) and through the Strips (8) (Fig. 7) and is held in place by Spring Clips.

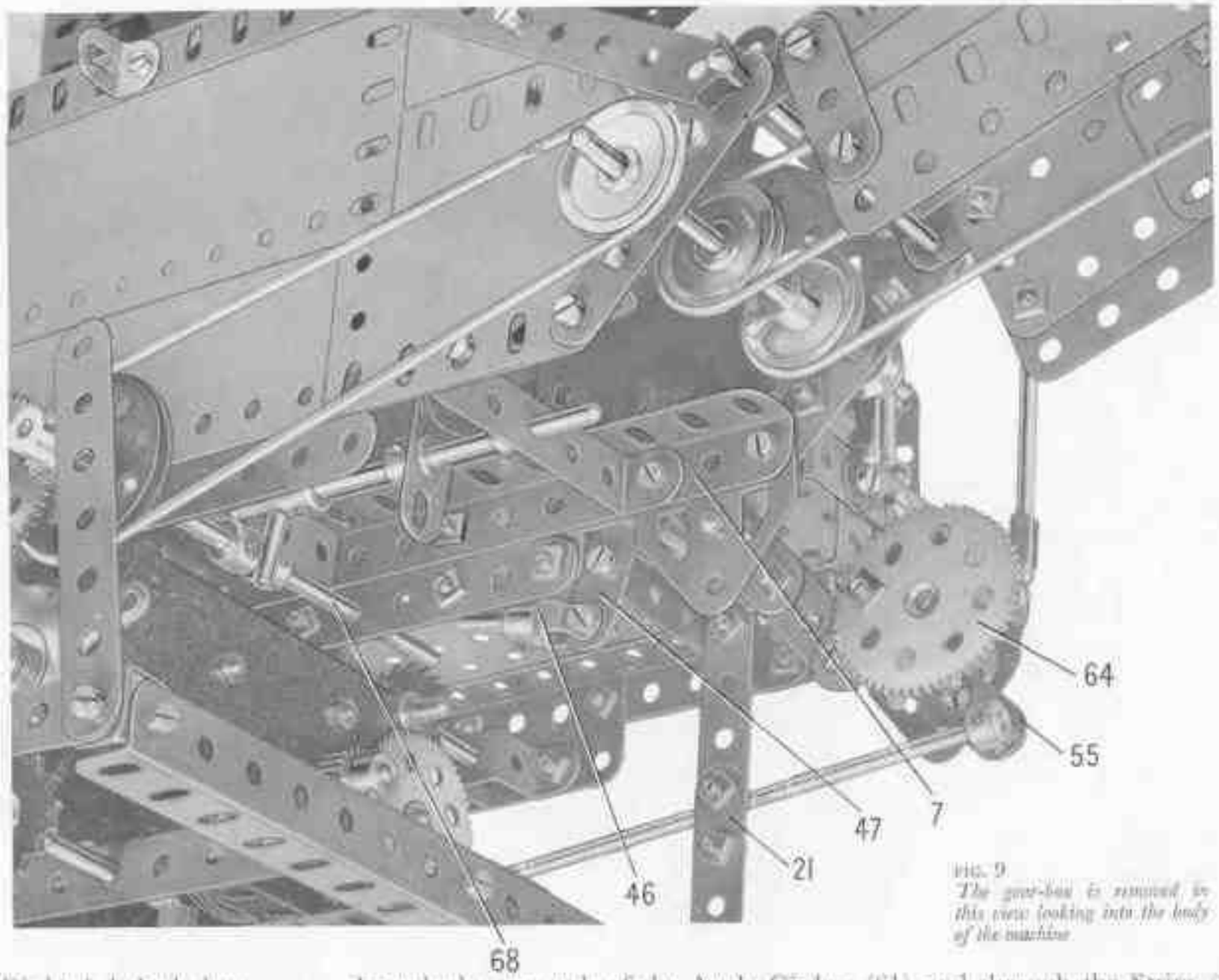

FIG. 9
The gear-box is removed in this view looking into the body of the machine

The conveyor assembly and the head can be raised or lowered by operating a lever (63) (Fig. 1). This is a 5½" Strip to which a Double Arm Crank is bolted so that its boss is in line with the fourth hole from the lower end of the Strip. The Double Arm Crank pivots freely on the Rod (54) (Fig. 10). The lever is *lock-nutted* to a 1½" Strip, and this in turn is *lock-nutted* to a 57-tooth Gear (64) (Fig. 2). At each end of the Rod a Rod Socket is fixed, with a Strip Coupling (65) screwed on to the shank of the Rod Socket and held tightly in place by a nut. A 5½" Strip is pivoted on a ½" Bolt screwed through each Strip Coupling, and is *lock-nutted* to a 1" × ½" Angle Bracket that is bolted to the back of the gathering head.

The conveyor is represented by two endless belts of Spring Cord passed round 1" Pulleys on a 4½" Rod (66) and an 8" Rod (67) (Fig. 7). These Rods are

mounted as shown, and a 1" Pulley at one end of Rod (66) is driven by a Spring Cord belt from a 1½" Pulley on a 5" Rod (68) (Fig. 4), which carries also a ½" Pinion (69) (see Fig. 8). The Rod (66) can be moved sideways in its bearings to bring the Pinion into mesh with the Gear (33) (Fig. 8). The movement of the Rod is controlled by a short Rod in a Coupling, which is fitted at one end with a 1" Rod and at the other end with a 3" Rod. These Rods are mounted in 2½" × ½" Double Angle Strips bolted between the Girders (7) (Fig. 9). A Double Arm Crank is fixed on the 3" Rod, and to it is bolted a 2½" Strip fitted at its other end with a Threaded Pin. The Strip projects through the gap edged by the Strip (14) (Fig. 3).

The Augers and the Reel (Figs. 1 and 2)

In the actual machine the augers form a spiral feed mechanism that carries the harvested crop to the centre of the gathering head and loads it on to the conveyor. In the model the spirals are represented by four Bush Wheels (see Fig. 1) on a built-up rod mounted in the Flat Plates (60) and in Fishplates bolted to 1" × ½" Angle Brackets (70). The rod is made from an 8" and a 6½" Rod joined by a Coupling, and it is held in place by ½" Flanged Wheels. A 1" Gear on the Rod (67) (Fig. 7) drives a 57-tooth Gear on the built-up rod, and a 1" Sprocket (71) also is fixed on this rod.

The reel or beater is made by bolting three 2½" Strips as shown in Fig. 1 to each of two Bush Wheels (six-holes). The outer ends of the 2½" Strips are connected by Angle Brackets and 2" Strips, with six 9½" Strips bolted between the Angle Brackets. The reel is fixed on a built-up rod made from an 11½" Rod extended at one end by a 1" Rod and at the other end by a 1½" Rod. The Rods are connected by Couplings, and a 2" Sprocket fixed on the 1½" Rod is driven by Chain belt from the 1" Sprocket (71) (Fig. 7).

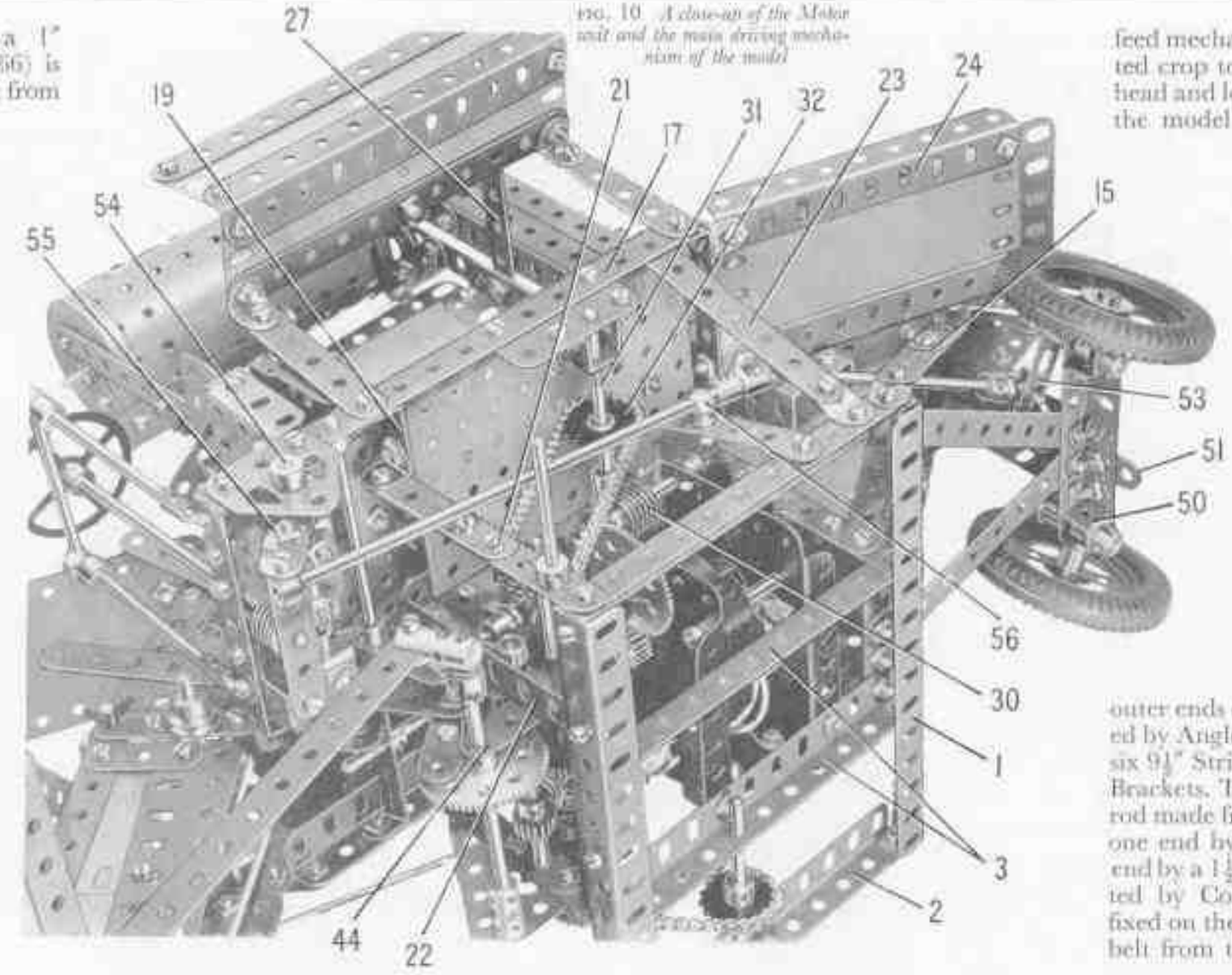

FIG. 10. *A close-up of the Motor unit and the main driving mechanism of the model*

Parts Required to Build the Meccano Combine Harvester

1	of No.	1	8	of No.	9a	3	of No.	15	2	of No.	23a	2	of No.	30d	3	of No.	62b	1	of No.	103a
6	" "	1a	3	" "	9b	4	" "	15a	4	" "	24	2	" "	45	8	" "	63	2	" "	103c
5	" "	1b	7	" "	9d	2	" "	15b	2	" "	24b	2	" "	47a	3	" "	63b	3	" "	103f
14	" "	2	4	" "	9e	3	" "	16	4	" "	25	6	" "	48a	2	" "	72	1	" "	103g
5	" "	2a	8	" "	9f	4	" "	16a	8	" "	26	3	" "	48b	2	" "	73	2	" "	103h
10	" "	3	4	" "	10	4	" "	16b	1	" "	27	1	" "	48d	1	" "	79a	2	" "	108
6	" "	4	4	" "	11	4	" "	18a	4	" "	27a	1	" "	50	2	" "	89b	2	" "	110a
36	" "	5	45	" "	12	4	" "	18b	3	" "	31	2	" "	51	1	" "	94	3	" "	111a
12	" "	6	6	" "	12a	2	" "	19b	2	" "	32	1	" "	52a	1	" "	95	2	" "	111c
3	" "	6a	6	" "	12b	2	" "	20a	3	" "	35	4	" "	53a	1	" "	95a	2	" "	114
4	" "	8	8	" "	12c	2	" "	20b	445	" "	37a	1	" "	58	4	" "	96	2	" "	115
6	" "	8a	2	" "	13	4	" "	21	429	" "	37b	24	" "	59	2	" "	96a	2	" "	125
3	" "	8b	4	" "	13a	1	" "	22	51	" "	38	3	" "	62	1	" "	103	4	" "	126a
9	" "	9	2	" "	14	6	" "	22												

2	of No.	128	1	of No.	163	2	of No.	212											
4	" "	133	2	" "	165	2	" "	214											
2	" "	133a	2	" "	166	4	" "	221											
1	" "	136	2	" "	179	2	" "	222											
2	" "	136a	1	" "	185	2	" "	223											
4	" "	137	1	" "	186	2	" "	225											
2	" "	142a	10	" "	188	2	" "	226											
2	" "	142b	2	" "	189														
1	" "	144	6	" "	190														
2	" "	147b	1	" "	190a														
1	" "	154b	6	" "	191														
1	" "	157	9	" "	192	1 E15R Electric Motor (not included in Outfit)													
1	" "	162b	3	" "	196														
			1	" "	197														

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