CANCELLED 0\3 31-12-90

COMMONWEALTH OF AUSTRALIA

NATIONAL STANDARDS COMMISSION

Weights and Measures
(National Standards)
Act 1960-1966

Weights and Measures
(Patterns of Instruments)
Regulations

Certificate of Approval

CERTIFICATE NUMBER 6/14D/5

This Certificate replaces Certificate No 6/14D/5 dated 18th August 1971.

In respect of the pattern of

Howe Richardson Model 220 Class B Conveyor Belt Weigher and Variants.

Submitted and manufactured by: Howe Richardson Scale Co. Pty. Ltd.,
Denney Street,
Broadmeadow,
New South Wales. 2292.

This is to certify that the pattern and variants of the instrument illustrated and described in this Certificate have been examined by the National Standards Commission under the provisions of the abovementioned Regulations and have been approved as being suitable for use for trade.

The pattern was approved on 5th August 1971, and the variants were approved on 23rd May 1972.

Approval was granted on condition that:

1. all instruments conforming to this Certificate:

   (a) are appropriately marked NSC No 6/14D/5; and

   (b) comply with the General Specifications for Measuring Instruments to be Used for Trade;

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Cont'd over

2. the Commission is notified‡ of the location and serial number of:

   (a) the first ten instruments with a medium-duty basework,

   (b) the first ten instruments with a heavy-duty basework, and

   (c) the first ten instruments with a belt speed greater than 600 feet/minute,

   submitted to State or Territorial Weights and Measures Authorities for verification;

3. the Commission may re-examine any instrument after verification; and

4. the instruments are subject to a service period of three months.

This Certificate comprises:

Pages 1 to 8 dated 31st May 1972.
Figures 6/14D/5 - 1 to 19 dated 31st May 1972.

Date of issue 31st May 1972.

Signed

A person authorized by the Commission to sign Certificates under the abovementioned Regulations.

‡ Inspectors should not verify any instrument conforming to this Certificate until advised in writing by the Pattern Approval Laboratory that this condition has been complied with.

DESCRIPTION OF PATTERN

The pattern is of a Class B conveyor belt weigher of capacity 345 tons per hour, known as the Howe Richardson Model 220. It comprises a headwork (see Figure 1), a medium-duty basework (see Figure 2) which supports the conveyor belt on idler rollers, and a bend pulley.

Medium-duty Basework

The conveyor belt is supported by idler rollers which apply the load to the two second-order main levers comprising the weigh-frame (see Figure 3). The main levers each pivot on two sets of flexure plates (see Figures 2 and 4), which are supported by pillars from the belt conveyor frame. The nose-end knife-edges of the two main levers (see Figures 5 and 6) are connected through links containing self-aligning bearings to a second-order transfer lever (see Figure 7).

The transfer lever, which is pivoted on self-aligning bearings supported by pillars from the belt conveyor frame, transfers the load to a pullrod through knife-edges and self-aligning bearings in a U-shaped link. Attached to the end of the transfer lever is a shackle, which is pinned to prevent removal. A cover over the end of the transfer lever prevents any load from being readily attached to it.

Bend Pulley

The bend pulley, which comprises a roller driven by the inner surface of the return conveyor belt, drives the input shaft of the headwork integrating mechanism through a chain and sprocket drive at a nominal 260 rpm. The number of revolutions of the input shaft is directly proportional to the length of conveyor belt which has passed over the weigh-frame.

Headwork

The headwork (see Figures 8 to 12) integrates the load on the conveyor belt with the length of the conveyor belt which has passed over the weigh-frame so as to indicate the total weight carried by the conveyor belt.

The pullrod from the transfer lever (see Figure 7) applies the load through two knife-edges and two self-aligning bearings to a second-order main lever which is extended beyond the fulcrum to accommodate tare weights. The tare weights are held in position by a central nut and bolt and an offset pin which prevents rotation. A link couples the main lever to a second-order transfer lever through knife-edges and self-aligning bearings (see Figures 8 and 10).

The position of the link and the knife-edges and bearings is continuously adjustable along the main and transfer levers, allowing the lever ratio to be varied; in this way the load at the nose-end of the transfer lever is set to 7.411 lb, when the conveyor belt is loaded to its maximum capacity.

A link containing self-aligning bearings couples the transfer lever nose-end knife-edge to a knife-edge on the first-order weigh-beam assembly (see Figures 10 and 11). The weigh-beam assembly, which is a null balance steelyard with an automatic poise weight, is pivoted on flexure plates and has a tare weight, which is fastened similarly to the tare weight of the main lever, on one end and a mechanical cone-and-cylinder integrator and a zero adjustment on the other end. The zero adjustment is by a light spring which is tensioned by a screwdriver-adjusted worm drive.

The lines formed by the intersection of the curved surfaces of the cone and the cylinder with planes through the respective axes are straight within ± 0.001 inch.

Referring to Figure 9, movement of the conveyor belt is transmitted by the bend pulley to the integrator input shaft 1, which through gears 2 — located in the plane of the fulcrum — and gears 3, rotates the cone and one input shaft of the differential gear 4, in the same direction. The friction wheels 5 — held vertical by the poise weight 6, and carried on a wheeled assembly which is free to move along a shaft 7 between the cone and cylinder — drive the cylinder and thus the other input shaft of the differential gear 4 in the opposite direction to the cone (see Figure 12).

An increase in the load on the conveyor belt, transmitted through the lever system, will cause the integrator end of the weigh-beam assembly to deflect upward. During the deflection the friction wheels 5 will be held vertical by the poise weight 6, while the centre line of the cone will be at an angle to the horizontal. This will produce a horizontal reaction between the cone and the friction wheels, causing the friction-wheel assembly to be driven up the slope along the cone surface. This increases the moment arm of the poise weight 6 until such time as the load increase on the conveyor belt, which caused the out-of-balance condition, is balanced out. When the weigh-beam is again restored to equilibrium by the movement of the poise, the centre line of the cone will have returned to the horizontal, reducing the horizontal reaction on the friction wheels to zero. The system will again be in a state of equilibrium with the poise and the friction wheels in a different position. As the friction wheels are contacting the cone at a point of larger diameter the speed of the friction wheels, and thus the speed of the cylinder and the input to the differential gear 4, will have increased.

When the load on the weigh section of the conveyor belt is zero, the tare weights and the zero adjustment are set so that the input shaft from the cylinder to the differential gear 4 is at the same speed as the other input shaft to the differential gear, but in opposite directions. Thus at zero load on the conveyor belt there will be no output from the differential gear. An increase in load will cause the cylinder to rotate faster and thus the differential gear will produce an output which is proportional to the difference between the cone and cylinder speeds. A reduction in load will slow the cylinder down and causes the differential gear to produce an output in the opposite direction. The output of the differential gear, through a timing belt and sprocket, drives a semi-digital indicator with 0.01-ton increments which are viewed through an aperture that allows two numbers of each decade to be seen. Two engraved lines on the transparent cover indicate the quantity totalized.

The lever ratio of the main and transfer levers is adjusted by the movable link which couples the two levers, so that when the conveyor belt is loaded to its maximum capacity the weigh-beam will be in equilibrium with the friction wheels near the largest diameter of the cone. At this point, a guide roller 8, which is on the friction-wheel assembly and which is in contact with an adjustable track 9, will be immediately above the 100% capacity adjustment screw. Other track-adjustment screws are located on the track 9 at the 75%, 50%, 25%, 12.5% and 0% load positions. Changes in the track profile, by means of the adjustment screws, tilt the friction-wheel assembly, causing the friction wheels to take up a slightly different position from that which they would take up due to a deflection in the weigh-beam assembly only.

A pointer on the poise weight 6 indicates the approximate load rate on a load-rate percentage chart mounted on the weigh-beam assembly (see Figure 10).

The weigh-beam is damped by means of a sheet of copper 10 passing between two magnets.

A level indicator in the form of a plumb-bob about 17 inches long, visible from outside the cabinet, moves over a scale with a centre graduation line and two other graduation lines which mark the limits of change of level of the pattern. The graduation width is 0.375 inch.

The only access to the headwork of the pattern is by removing the front cover; all other panels are made irremovable by fastening from the inside. The front cover is fastened and sealed in position by two stamping-plug seals (see Figure 1). Visible through the front panel are the level indicator, a tare indicator with lettering on its circumference, the weight totalizer, and the flow-rate indicator. On the front panel, the tare indicator is marked "for taring only", the weight totalizer is marked "tons" (see Figure 1), and the flow-rate indicator is marked "for use at only 75% flow rate: 345 tons/hour" (see Figure 1).

The following is marked on the pattern:

1. Howe Richardson Model 220 Class B CBW (model number is optional);

2. Serial No ....;

3. Capacity 345 tons per hour;

4. Belt speed 568 fpm;

5. Load weight/foot 22.68 lb;

6. Totalizer increment 0.01 ton;

7. Effective weigh-length 26.5 ft;

8. Conveyor belt length 340.75 ft; and

9. Response time 2 seconds.

DESCRIPTION OF VARIANTS

1. With a heavy-duty basework (see Figures 13 and 14), which is similar to the medium-duty basework except that:

   (a) the main levers each pivot on roller bearings (see Figure 15);

   (b) an intermediate lever, which is pivoted on self-aligning bearings on a frame, transfers the load to a second-order transfer lever through knife-edges, and self-aligning bearings in a vertical link (see Figures 16 to 18); and

   (c) the transfer lever (see Figure 19) is pivoted on flexure plates supported on a frame.

2. In other capacities, and with other weigh-lengths, provided the maximum load in weight per foot on the conveyor belt is:

Length of Basework (Effective Weigh-length) feet	Medium-duty Basework Maximum Load Weight/foot Pounds/foot	Heavy-duty Basework Maximum Load Weight/foot Pounds/foot
10	4200	23100
15	1250	6850
20	530	2900
25	270	1500
30	160	860
35	100	540
40	70	365
45	50	255
50	35	190
60	20	110
70	12.5	70
80	8.5	45
90	6.0	35
100	4.5	25

3. With other flow rates between 75% and 100% capacity, in which case the flow-rate indicator is marked appropriately.

4. The totalizer with other values of increments.

5. With other belt speeds of not more than 600 feet/minute provided the totalizer input shaft rotates at a nominal 260 rpm.

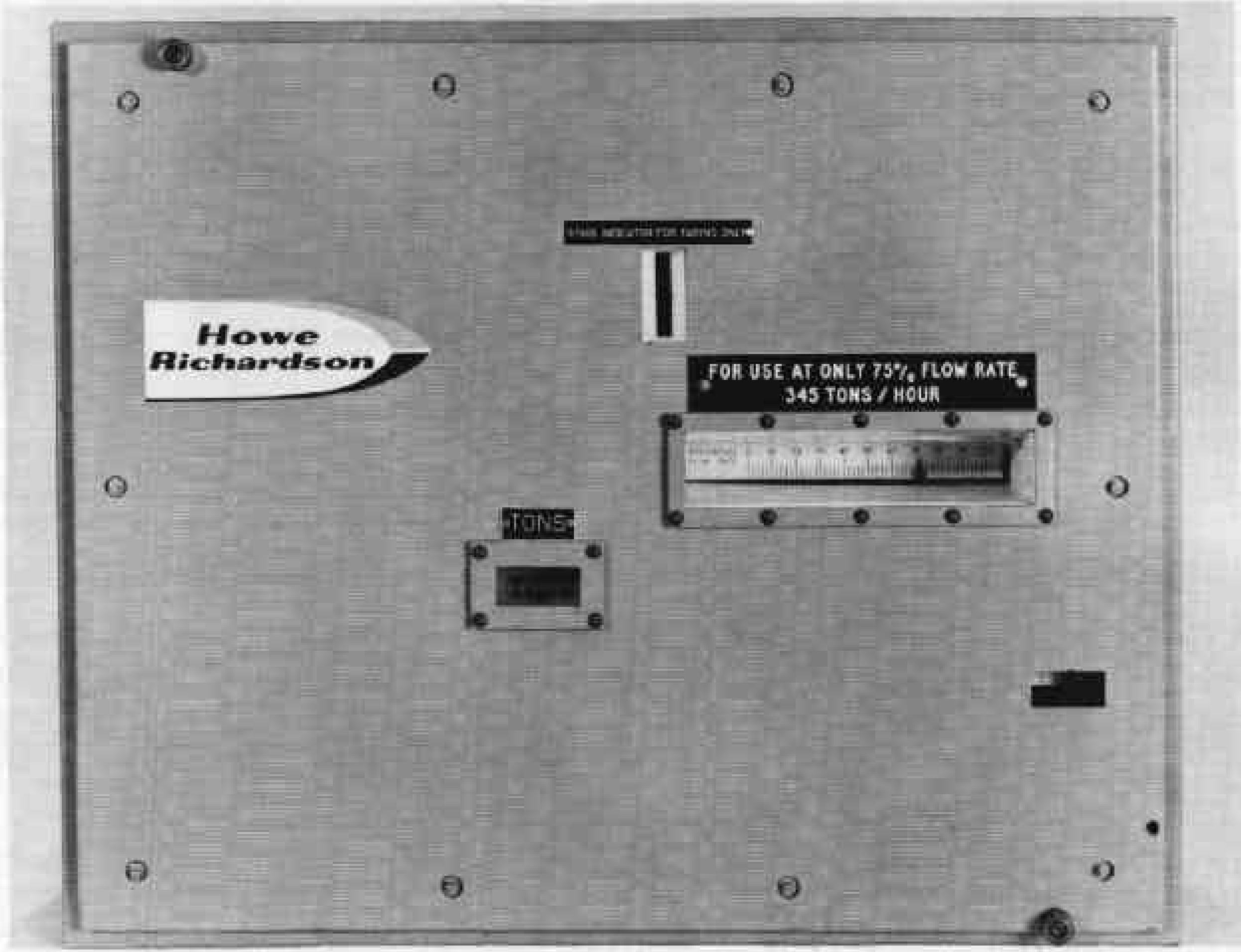
6. With other lengths of conveyor belt.

7. With the flow-rate indicator marked "for use at only ...... %* flow rate: ...... * ...... */hour".

   * Insert the verified flow rate, as a percentage of the capacity of the instrument, and as the equivalent in a number of tons or tonnes per hour.

8. With other belt speeds of not more than 830 feet/minute provided the totalizer input shaft rotates at a nominal 260 rpm.

FIGURE 6/14D/5 - 1



Headwork

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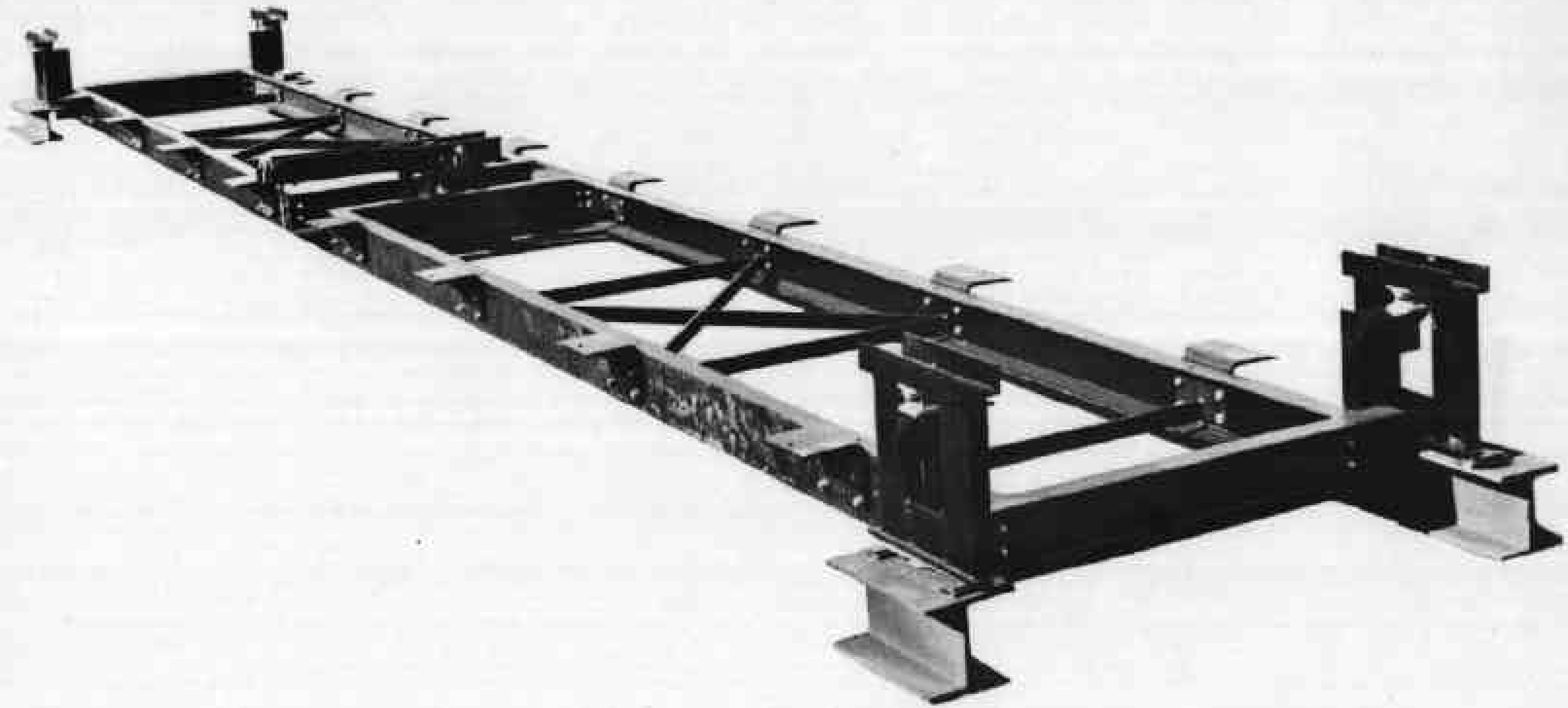
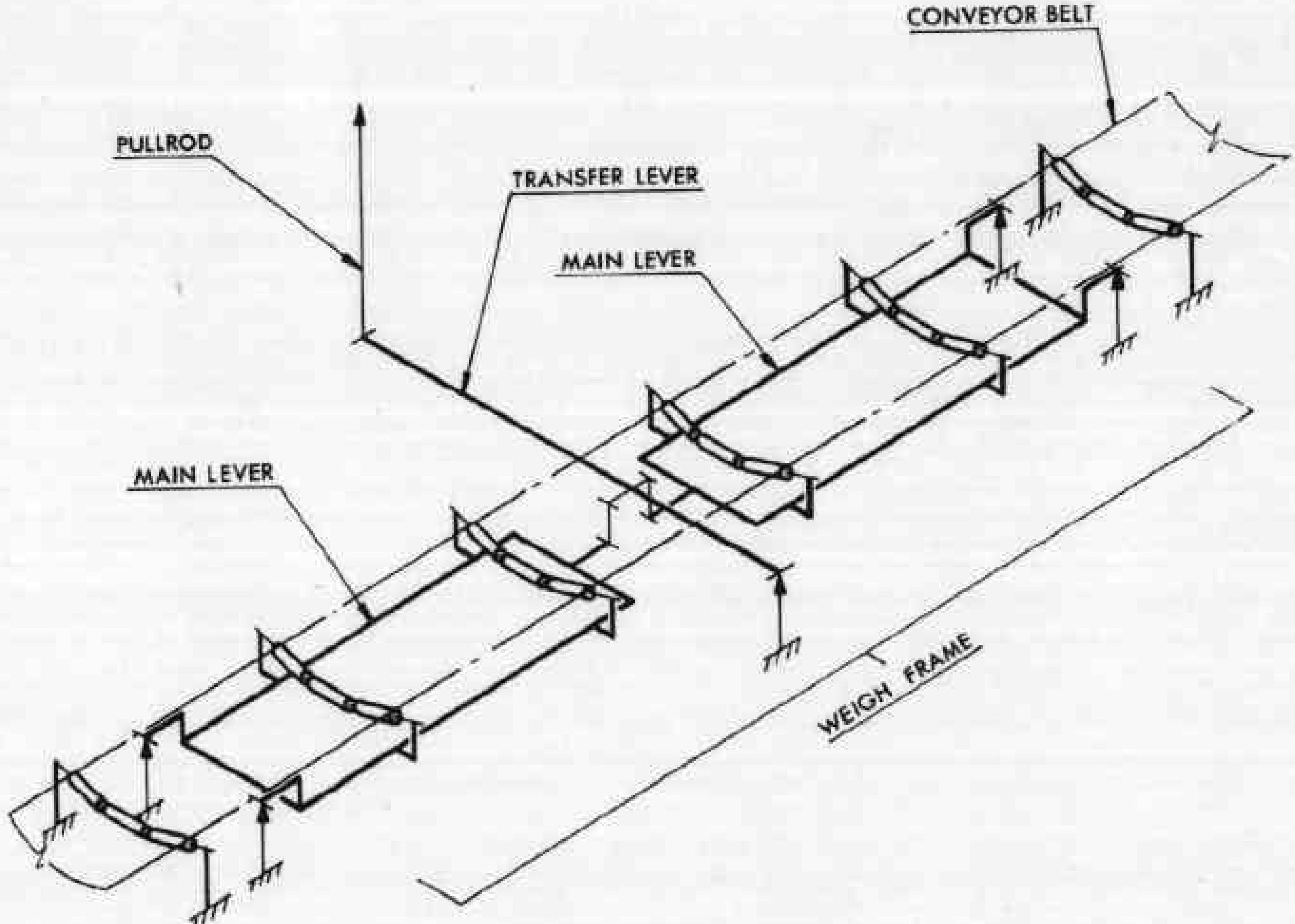
FIGURE 6/14D/5 - 2



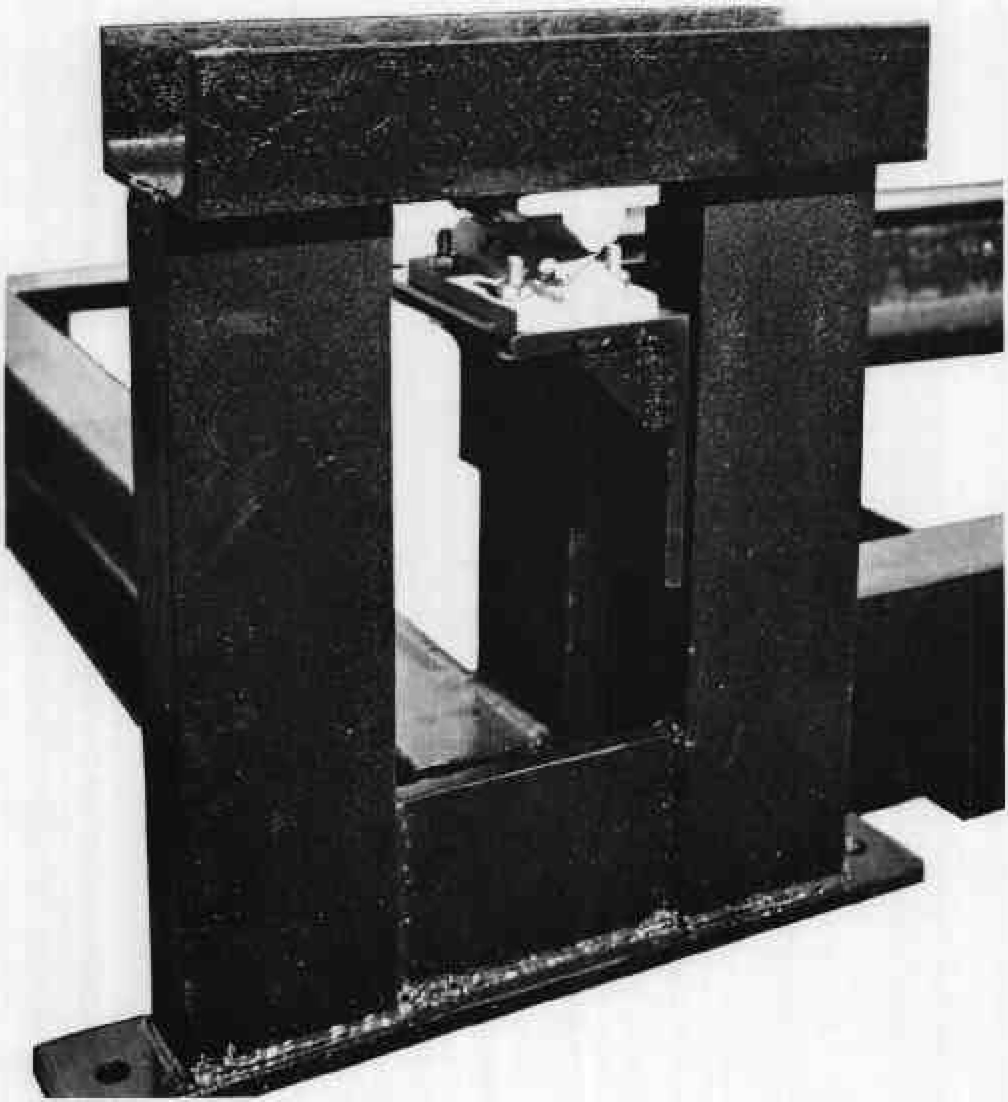
Medium-duty Basework

FIGURE 6/14D/5 - 3



Medium-duty Basework

FIGURE 6/14D/5 - 4



Medium-duty Basework Main Lever Fulcrum

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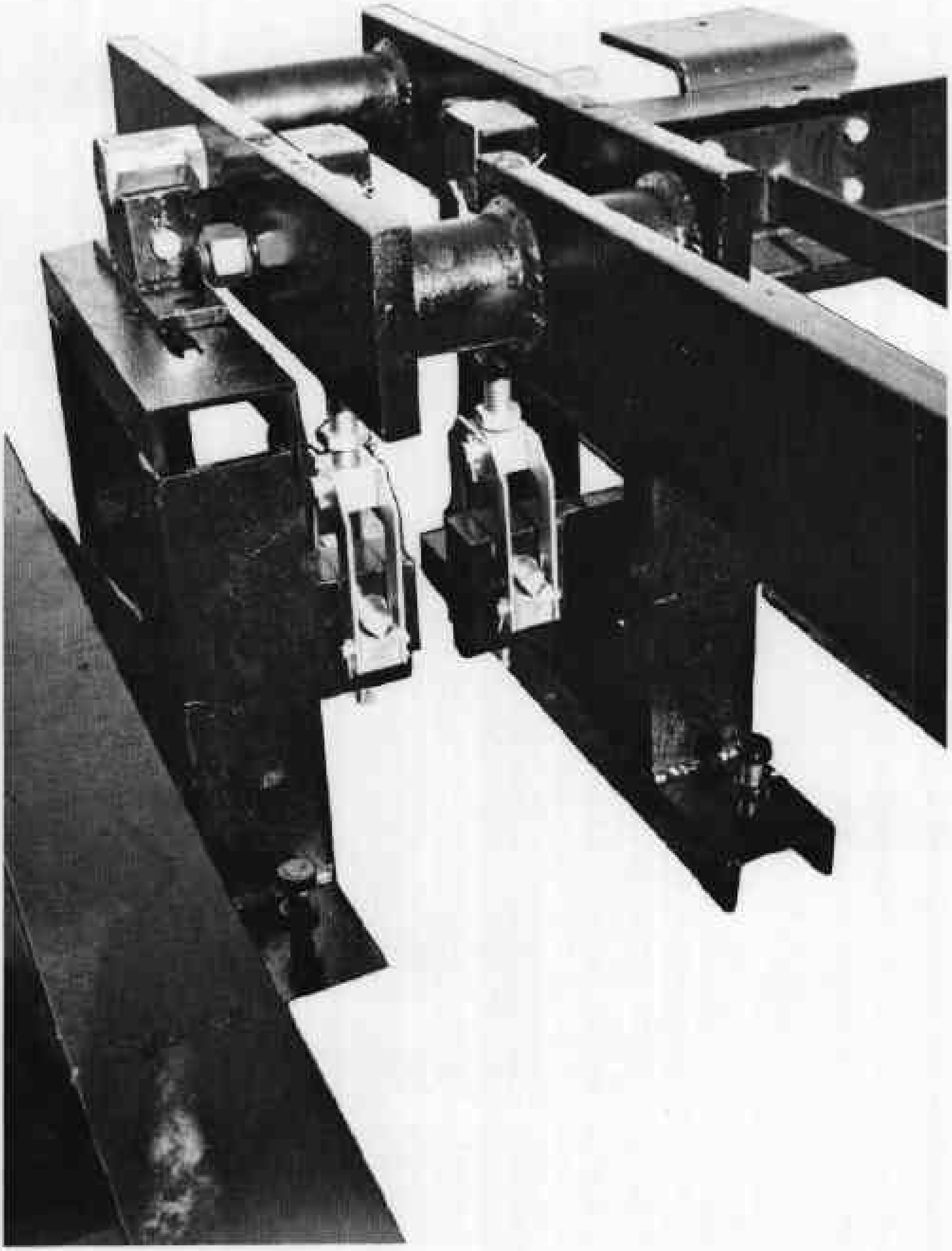
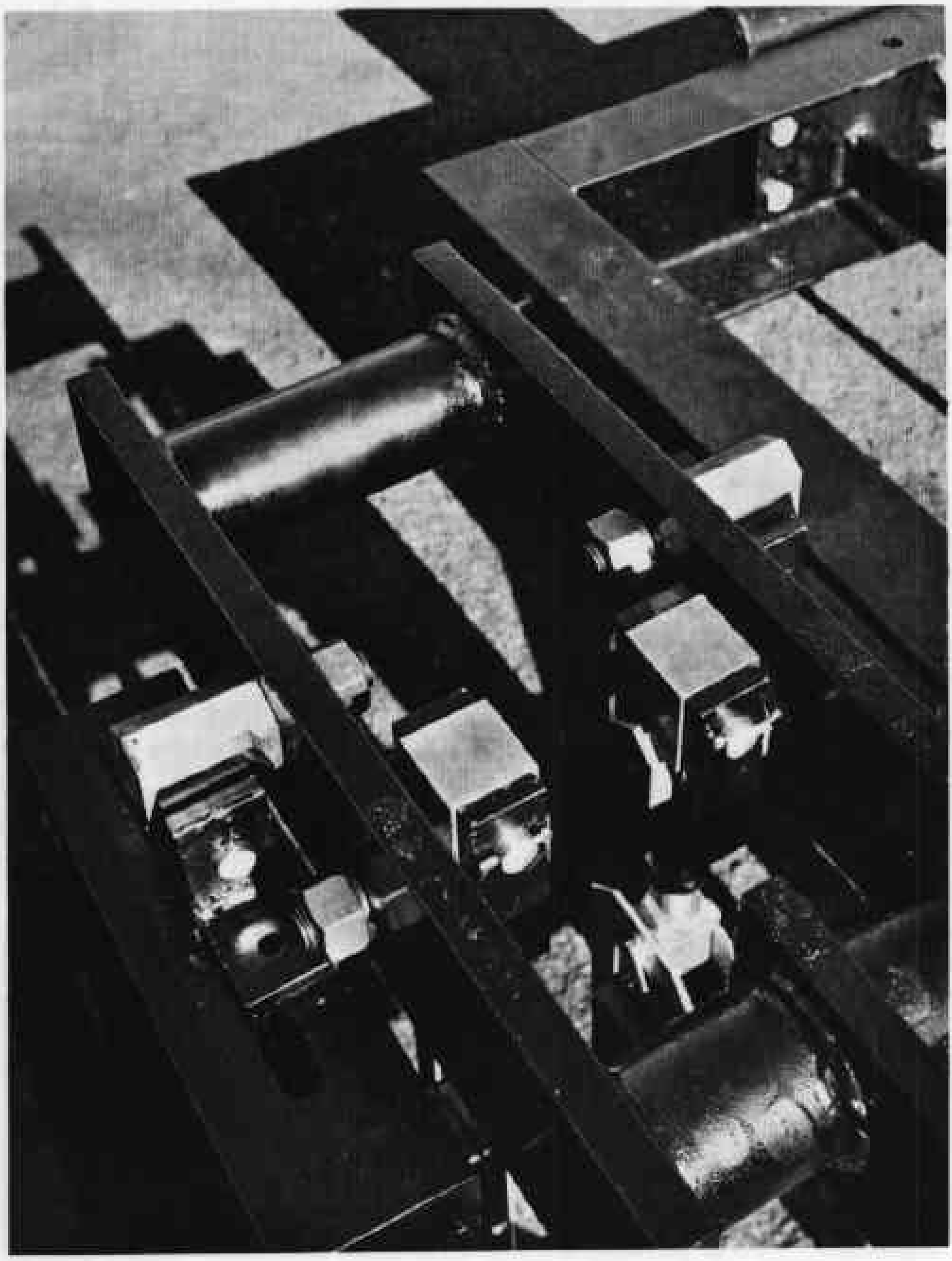


Medium-duty Basework Nose-ends of Main Levers

FIGURE 6/14D/5 - 6



Medium-duty Basework Fulcrum of Transfer Lever

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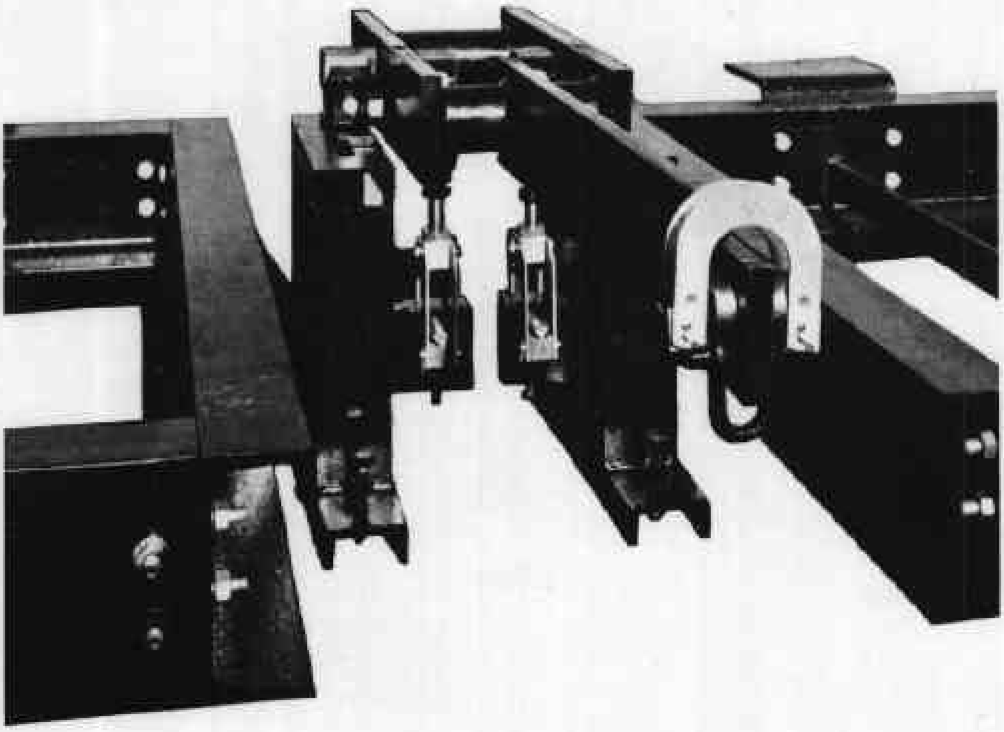
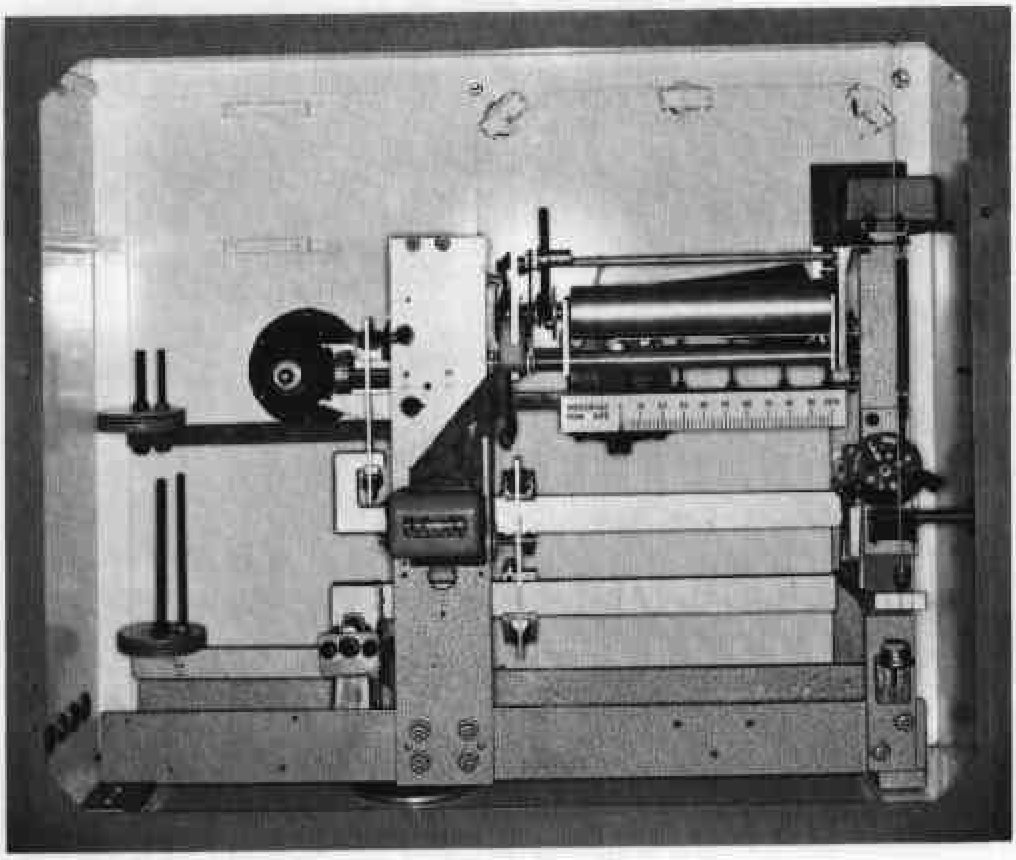
FIGURE 6/14D/5 - 7



Medium-duty Basework Transfer Lever

FIGURE 6/14D/5 - 8



Headwork with Covers Removed

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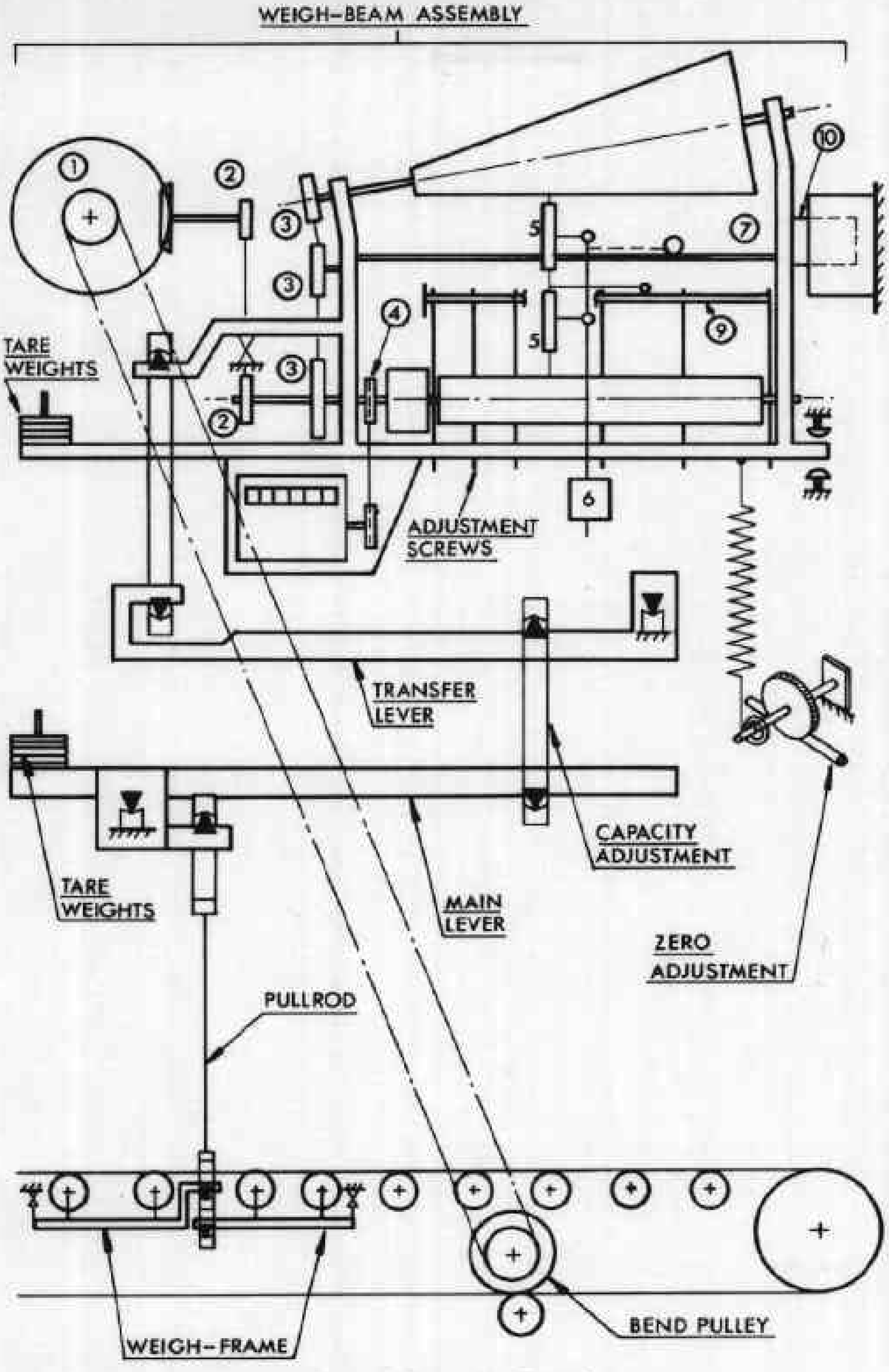
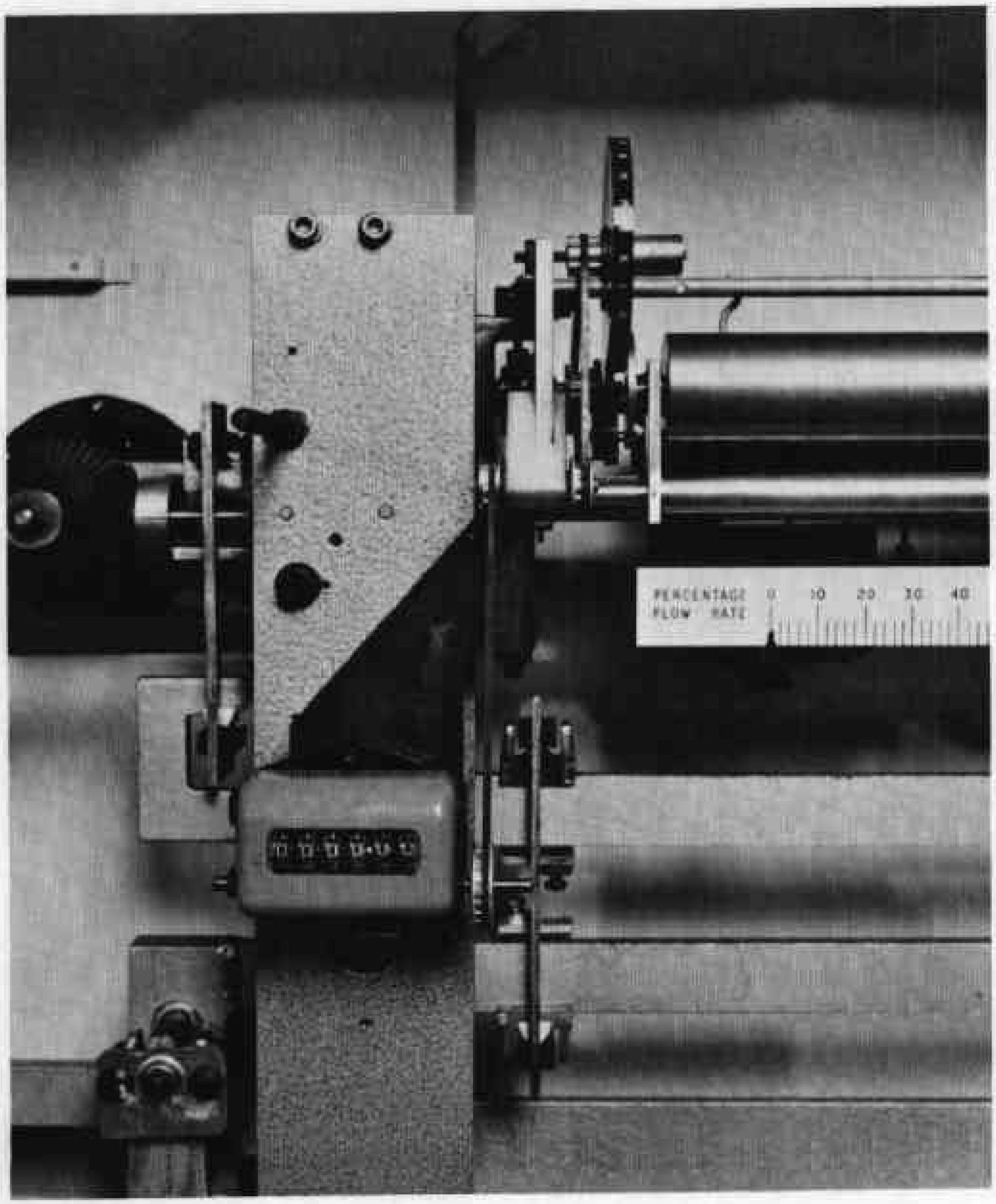
FIGURE 6/14D/5 - 9



Headwork — Schematic Drawing

FIGURE 6/14D/5 - 10



Coupling of Headwork Levers

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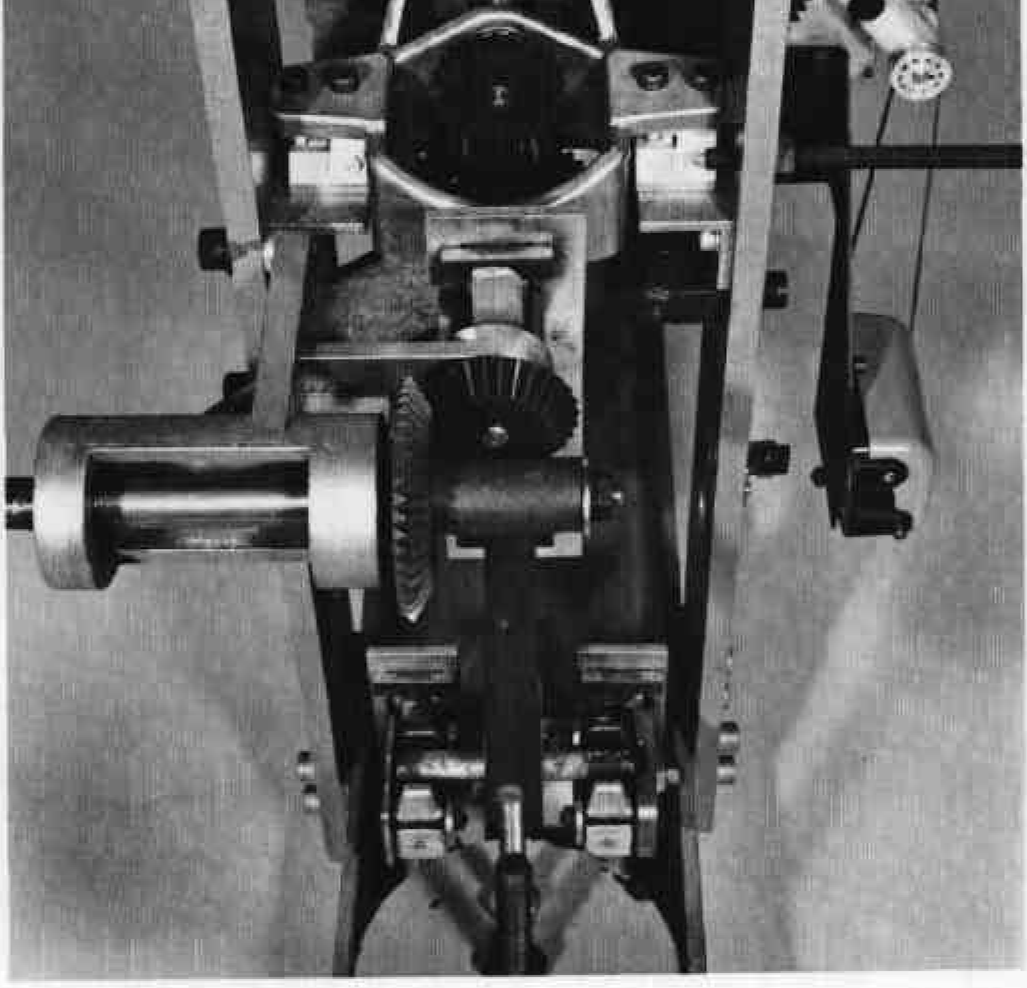
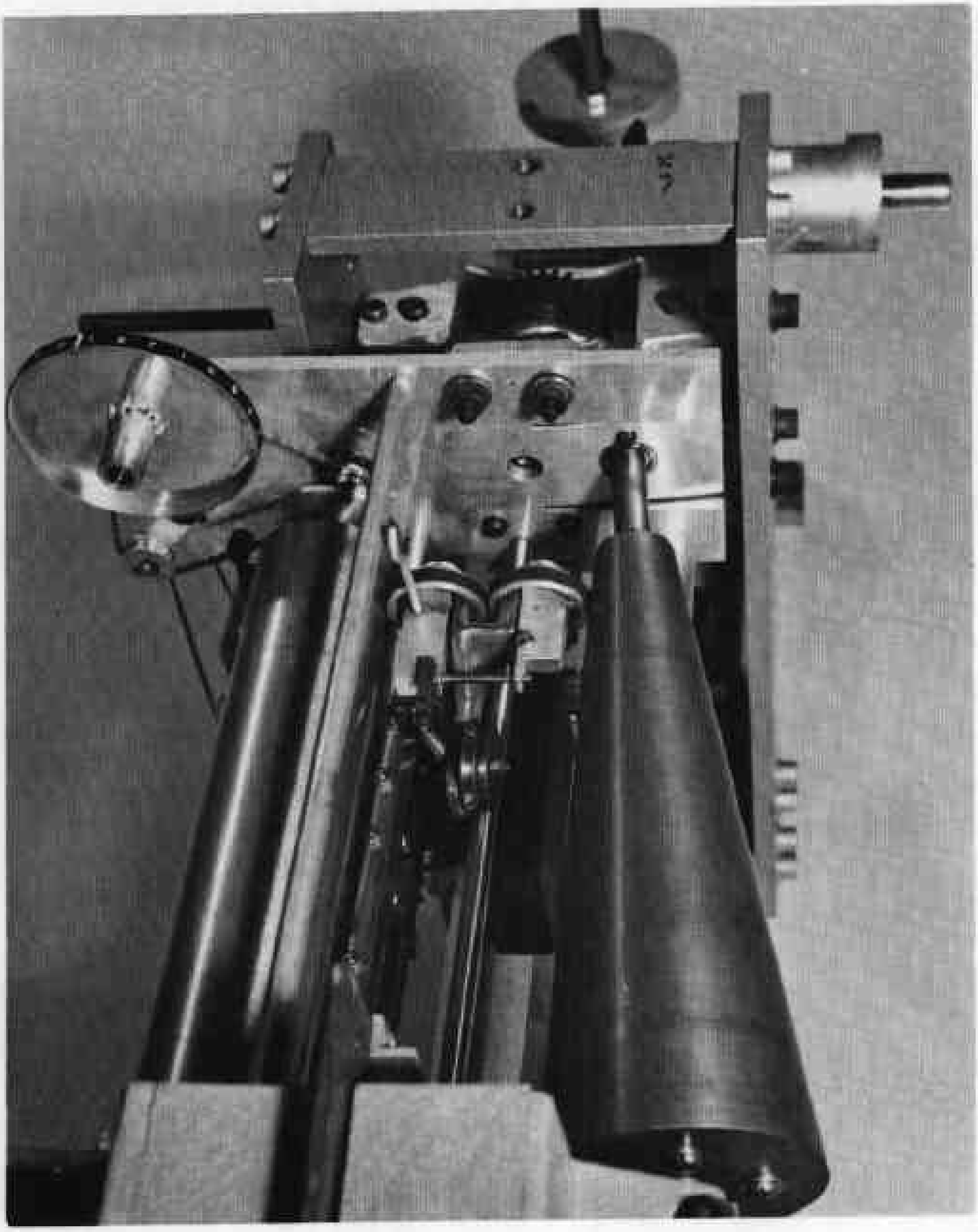
FIGURE 6/14D/5 - 11



Weigh-beam and Integrator Drive Gear

FIGURE 6/14D/5 - 12



Cone and Cylinder Integrator

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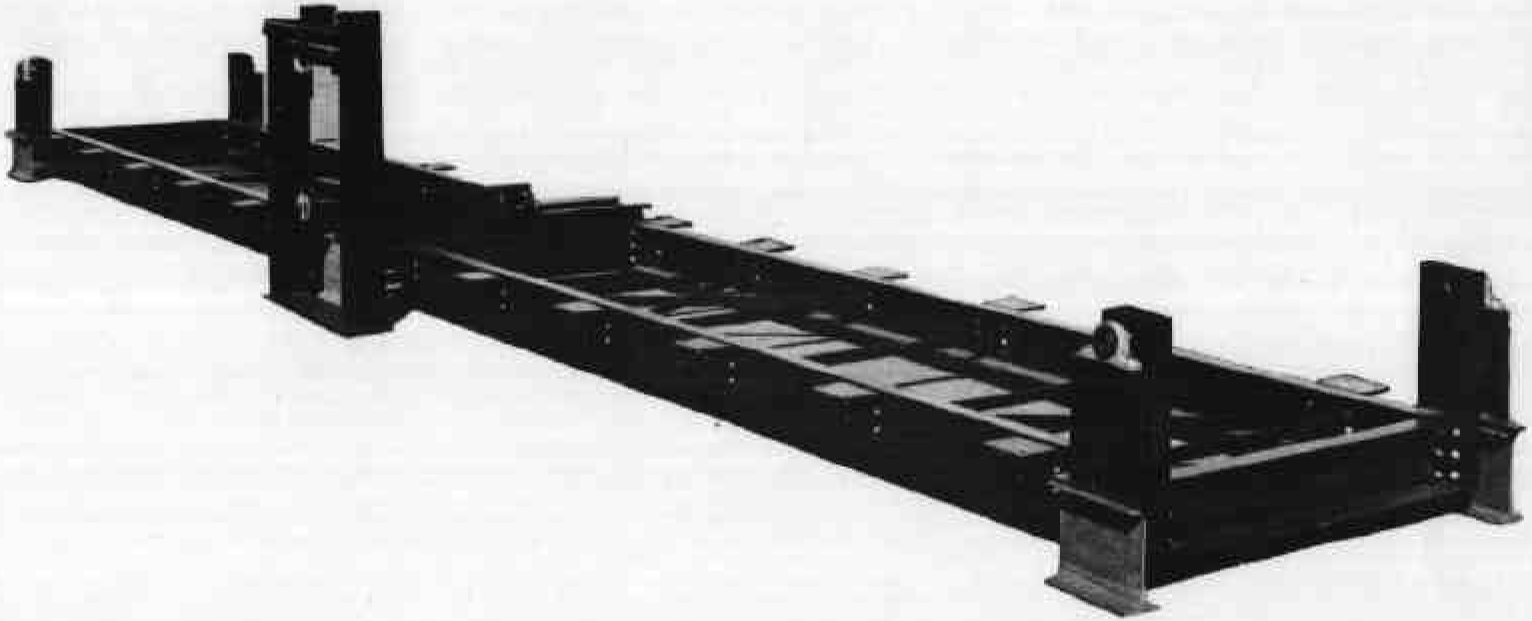
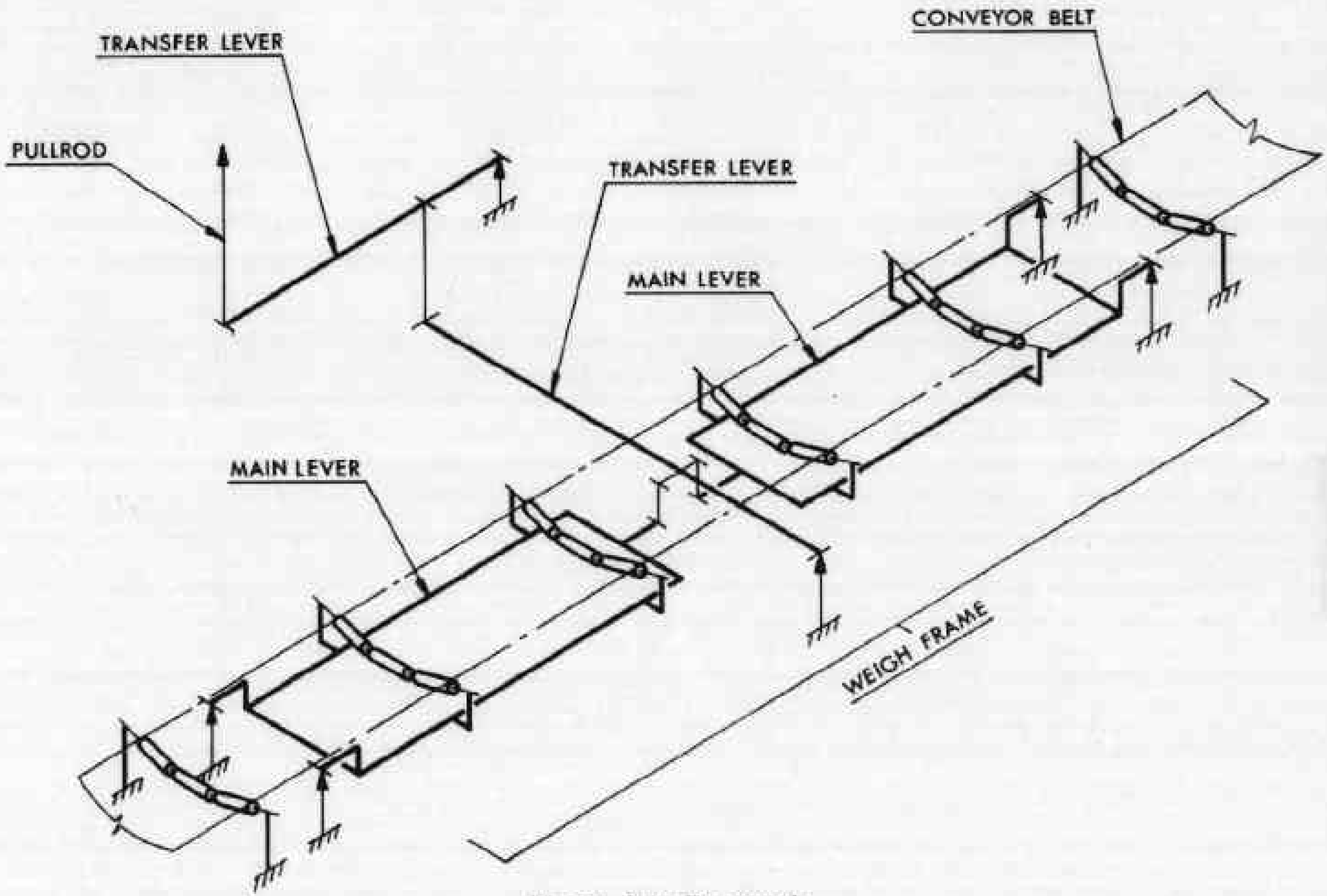
FIGURE 6/14D/5 - 13



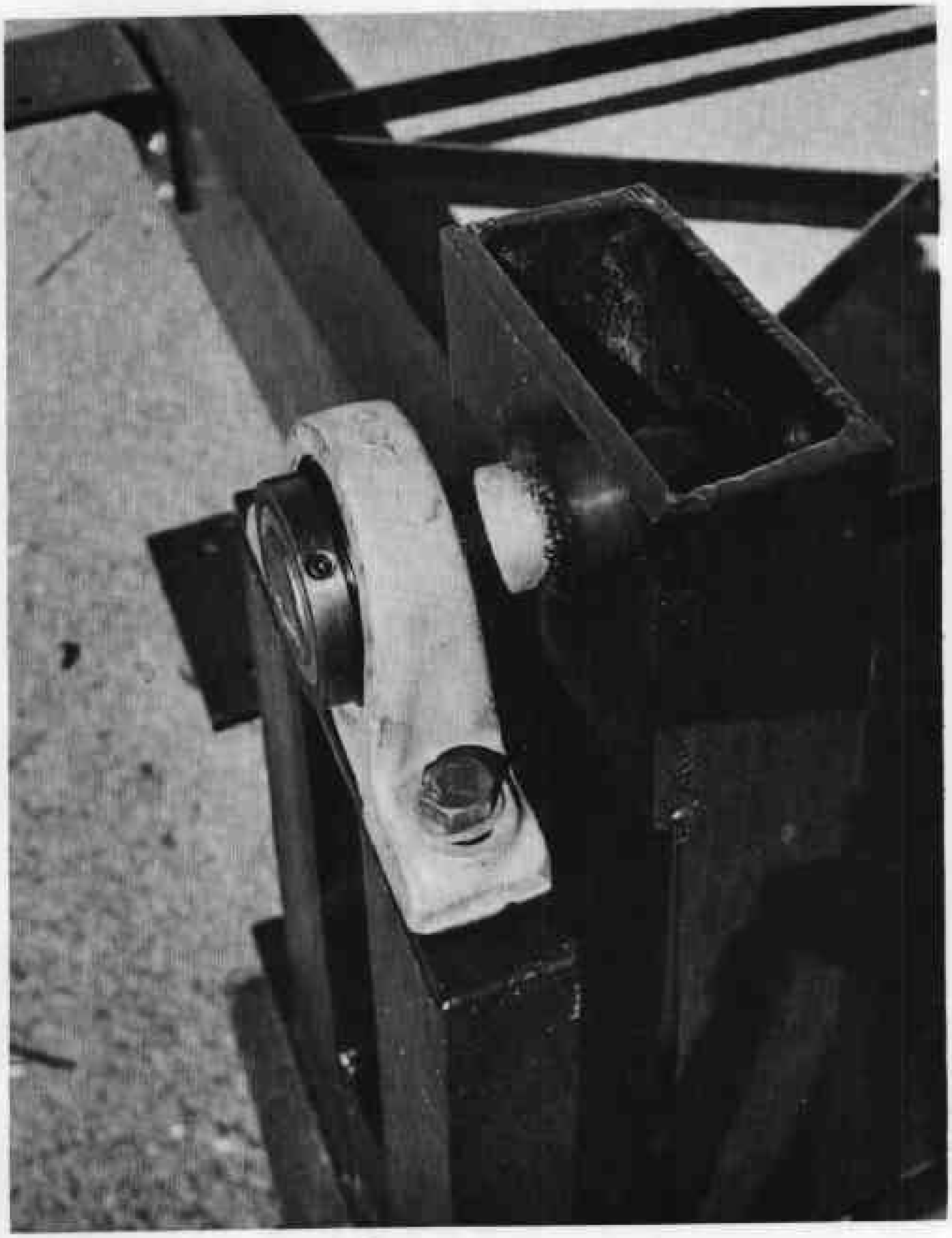
Heavy-duty Basework

FIGURE 6/14D/5 - 14



Heavy-duty Basework

FIGURE 6/14D/5 - 15



Heavy-duty Basework Main Lever Fulcrum

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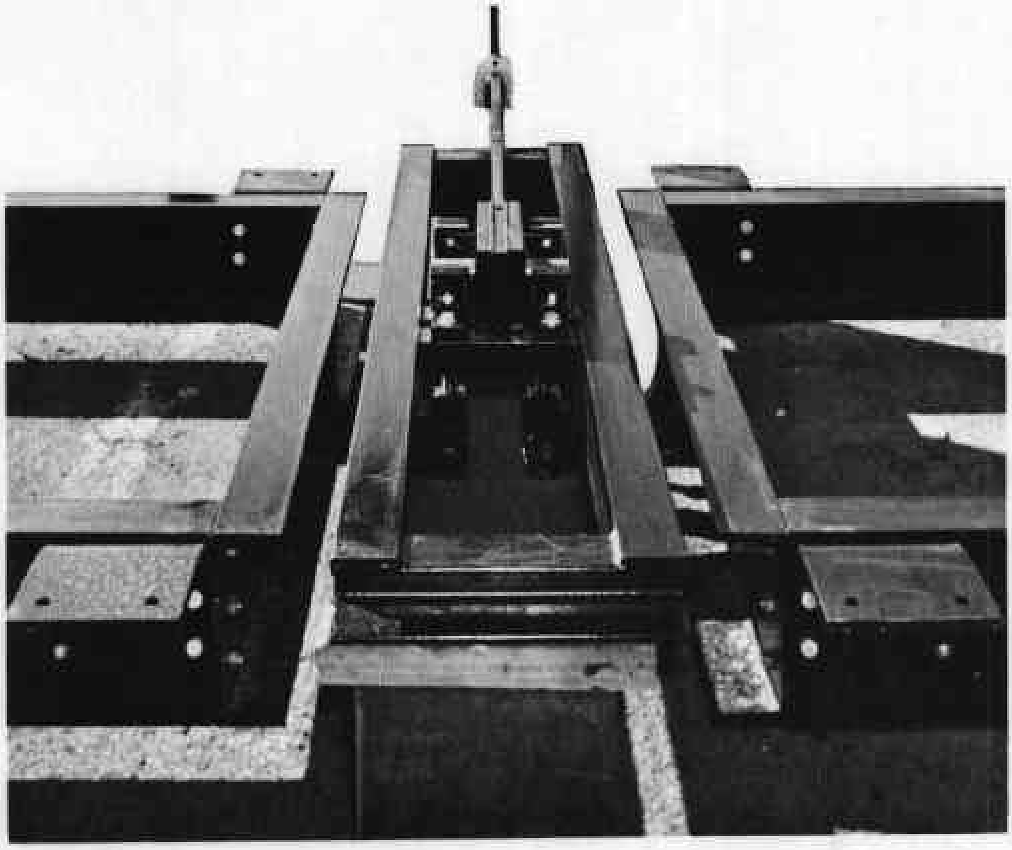
FIGURE 6/14D/5 - 16



Heavy-duty Basework Nose-end of Main Levers

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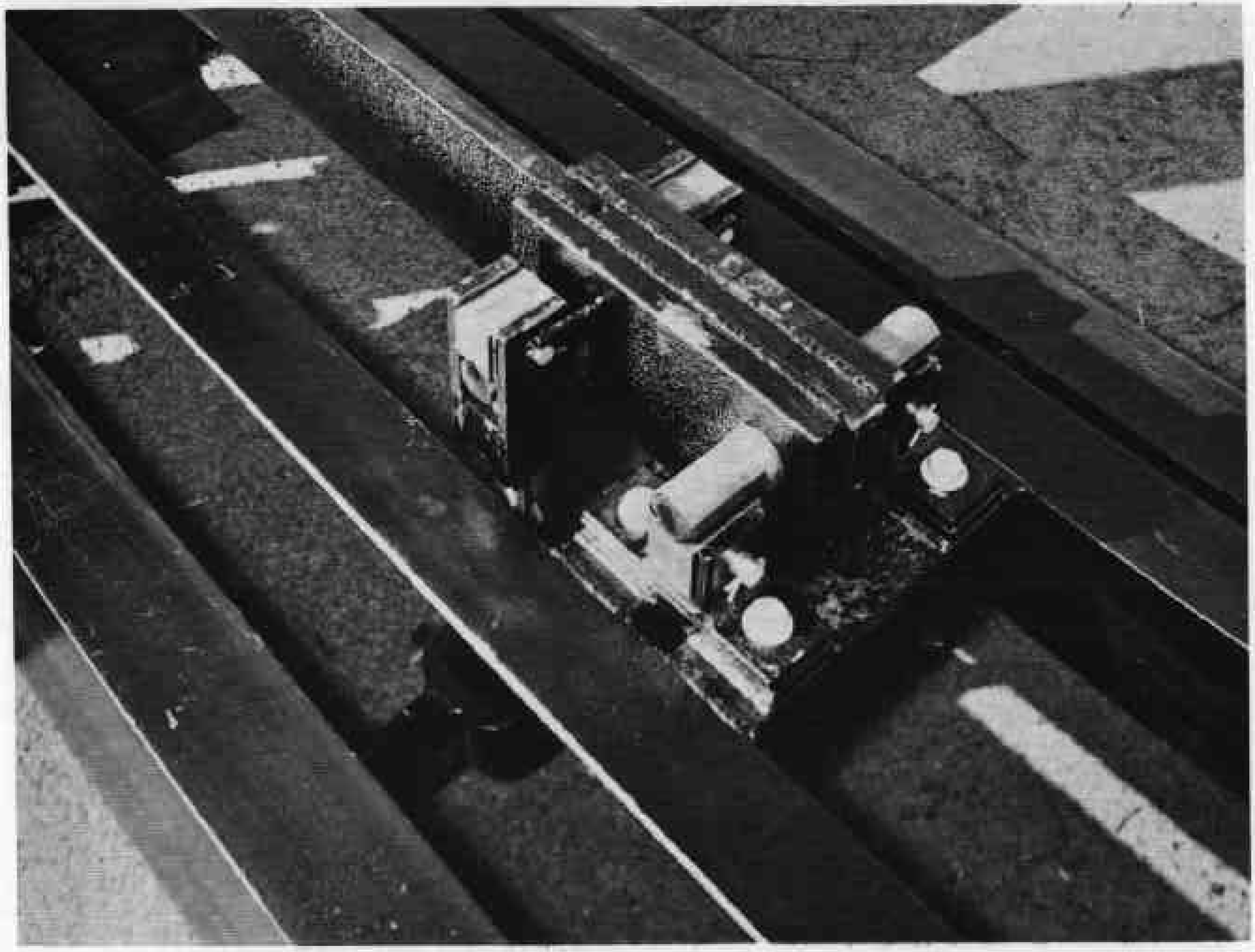
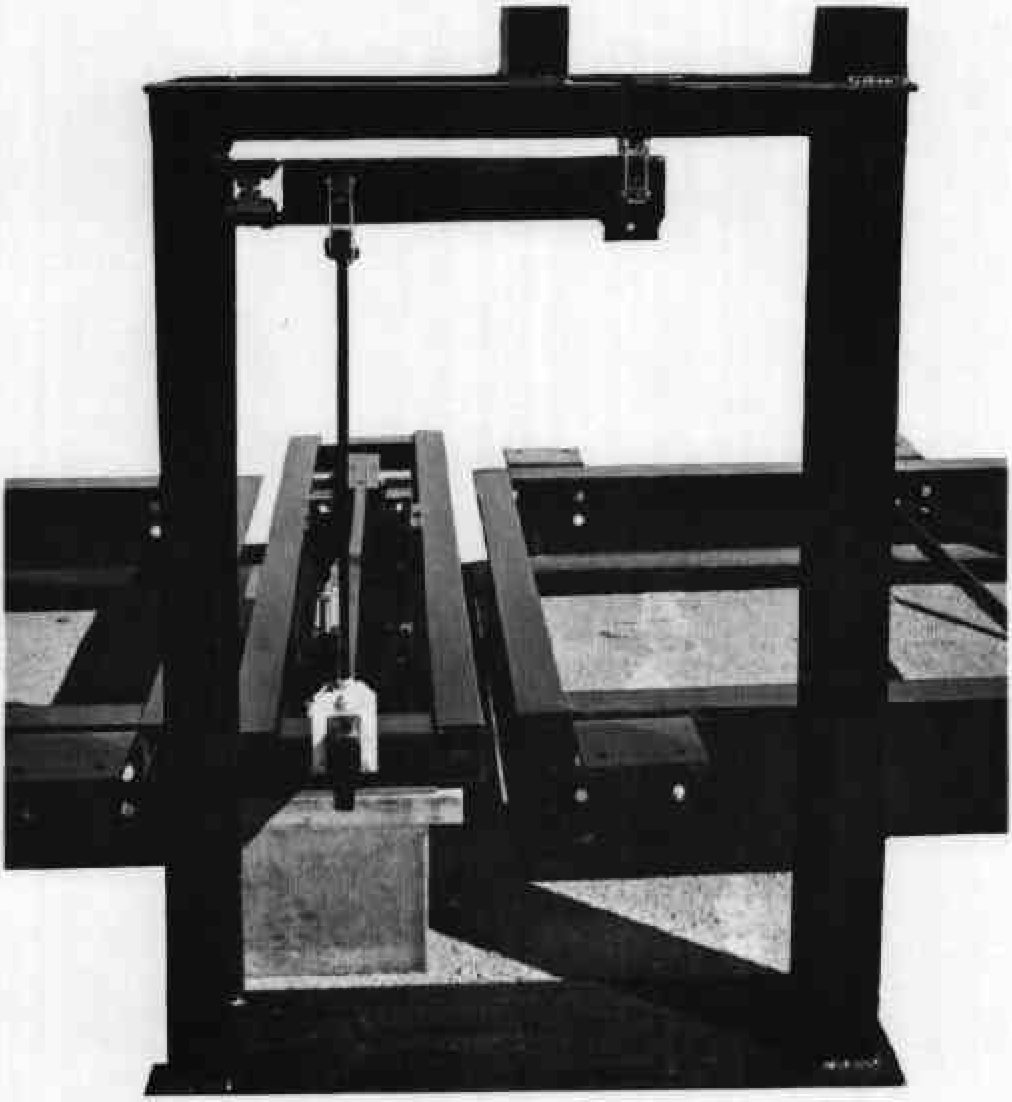
FIGURE 6/14D/5 - 17



Heavy-duty Basework Fulcrum of Intermediate Lever

FIGURE 6/14D/5 - 18



Heavy-duty Basework Intermediate Lever, Vertical
Link and Transfer Lever

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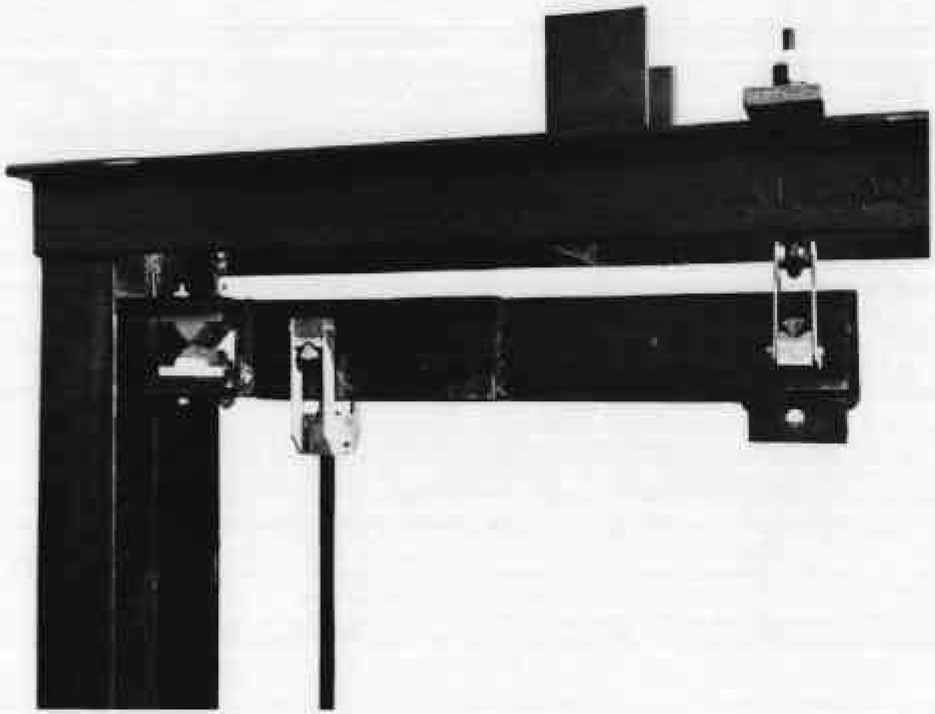
FIGURE 6/14D/5 - 19



Heavy-duty Basework Transfer Lever (without the pinned shackle)