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COUNTRY USSR

REPORT

SUBJECT Soviet Truck-Mounted Crane

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REFERENCES

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SOURCE EVALUATIONS ARE DEFINITIVE. APPRAISAL OF CONTENT IS TENTATIVE.

1. Crane equipment, type LAZ-690, is mounted on vehicle types ZIS-150, ZIL-150, and ZIL-164 manufactured at the same plant /Moscow Motor Vehicle Plant i/n Likhachev/. The crane has a lifting capacity of three to four tons. A more powerful version, the AK-5, has a lifting capacity of five tons. [redacted] loaded 300 to 400 cubic meters of logs, five to six and one-half meters long, onto trucks in eight hours with the LAZ-690 crane. Operations carried out in this period had included hooking and unhooking of loads, distributing of logs on the truck, and assembling of logs for loading.

2. [redacted] sketches and legends describing the crane parts and their operation. 50X1-HUM

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SOVIET TRUCK-MOUNTED CRANE

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The crane equipment, type LAZ-690, is mounted on motor vehicles of types ZIS-150, ZIL-150, and ZIL-164, made in the same plant. The ZIS-150 is an older model, the ZIL-164 a more recent model.

The crane is attached to the frame of the truck by means of clamps. The only other addition is a gearbox for power take-off. This gearbox is placed behind the driver's cab, under the gas tank. The drive shafts are of a special type, being mounted in bearings in the power take-off gearbox.

The truck weighs 4 tons, the crane 3 tons, total 7 tons.

According to the manufacturer's description, the crane has a lifting capacity of 3 tons, but it is capable of lifting 4 tons. With an arm extension (the horizontal distance between the crane hook and the central axis) of 2.5 meters, the capacity is 3 tons, and with an extension of 5.5 meters, 1 ton.

These movements can be carried out simultaneously:

1. Load lifting and crane arm lifting
2. Load lowering and crane arm lowering
3. Load lifting and swing to the left
4. Load lowering and swing to the right.

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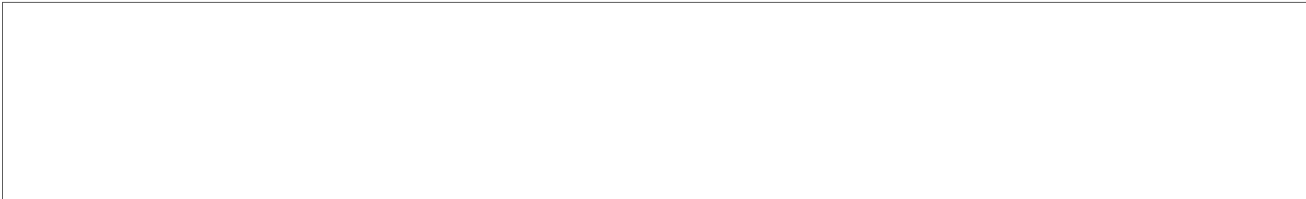


Crane arm movements and crane swinging on the spot cannot be carried out simultaneously [sic].

Loading speed is very high  300-400 50X1-HUM cubic meters of logs (log length 5 -6.5 meters) onto trucks in eight hours. The loading operations carried out in this period included hooking the loads together, unhooking the loads, distributing the logs on the truck, and assembling the logs for loading. In working with prepared loads (with the crane doing all the work), the loading speed might be two or three times as great.

The road speed of the crane truck is equal to that of a flat bed truck of the same make.

A more powerful version of the crane, the AK-5, has a lifting capacity of 5 tons. Its outrigger feet are longer and some of the crane elements are reinforced.



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Appendix 1

Assembly drawing.

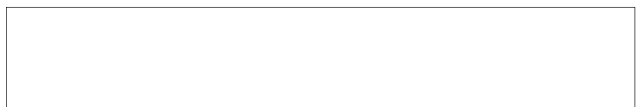
Appendix 2

Drawing: Power takeoff from truck engine to crane.

Explanation of numbers in drawing:

1. Truck gear box
2. Gear box for power take-off for crane
3. Gear shift lever for power take-off

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4. Crane drive shaft
 5. Truck drive shaft
 6. Bevel gear
 7. Reversing gear box
 8. Gear shift lever for truck gear box
 9. Intermediate drive shaft.
 10. Axle with clutch fork for control of forward and backward crane movement
 11. Reverse gear box axle.
 12. Connecting sleeve (inside grooved)
 13. Shaft with channel for gas and clutch controls
 - a. conical clutch gear
 - b. conical gear similar to a.
 - c. clutch sleeve
 - d. conical gear
 - g. cylindrical gear

Engaging the Crane for Operation

To put the crane into operation, the lever is moved in the direction opposite to the forward direction of the truck, and the truck gear shift lever (8) is placed in position I, II, or III, depending upon the desired working speed. The lever (3) disengages the truck drive shaft (5) and at the same time engages the crane drive shaft (4). This engagement and disengagement takes place in the lower part of the crane power take-off box (2). ~~The gear box~~ (2). The gear box (2) has one additional set of speed control gears. Engagement and disengagement of the truck drive shaft (5) and engagement and

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disengagement of the crane drive shaft (4) takes place in the lower part of the gear box (2) [which is] lined up with drive shaft (5) and intermediate drive shaft (9). Gear box (2) also has, above this coupling, two more shafts, lying one above the other and having gears.

Crane Operation

A lever in the crane operator's cab controls the shaft (10). Gears (a and b) rotate freely on bushings on shaft (11), both gears being in constant mesh with conical gear (d). Cylindrical gear (g) and conical gear (d) are fixed to shaft (13). Clutch sleeve (c) is fixed to a spline on shaft (11) and can be moved up or down by means of fork and shaft (10). When the clutch sleeve is moved upward, the teeth of sleeve (c) engage the teeth of gear (a), and gear (a) rotates ⁱⁿ the same direction as shaft (11), transmitting its rotary movement to gear (d). Meanwhile, the lower conical gear (b) is rotated by gear (d) in the direction opposite to that of the upper gear (a) on the opposite side of shaft (11).

Downward movement of sleeve (c) frees upper gear (a) and the teeth of sleeve (c) engage the teeth of lower gear (b), causing the lower gear to rotate in the same direction as the shaft, transmitting the rotary movement to gear (d). Upper gear (a) will now move in the direction opposite to that of the shaft. Since gear (d) is driven by upper gear (a), gear (d) moves in one direction, but if it is driven by lower gear (b), gear (d) moves in the opposite direction together with gear (g). This is the means of rotating the crane to the left or right, lifting and lowering the load, and lowering and raising the crane arm.

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Appendix 3

Reverse Gear Idling Shaft and Gear

See shaft 11 and gears 13 a and b in Appendix 2.

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- a. Clutch teeth
- b. Bronze or cast iron bushing
- c. Conical gears
- 11 a. Threads for nut
- 11 b. Bearing position
- 11 c. Screw for fastening spline
- 11 d. Spline, on which clutch sleeve 13 c moves.
- 11 e. Shaft part for gear
- 11 f. Bearing position
- 11 g. Threads for lower nut
- 11 h. Fluting for coupling to coupling sleeve (12) connected to the bevel gear box below (6).

Vertical shaft (11) has an interior channel through which pass the clutch and throttle controls. Gear (13 d) is fastened to its shaft with a spline and secured to the shaft with a nut. Clutch sleeve (13 c) engaged the left-right rotation of all crane mechanisms. Clutch teeth (13 c).

- 13 c₂. Groove for clutch control fork
- 13 c₃. Lower clutch teeth
- 10. Clutch control fork c.

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Appendix 4

Crane Mechanisms

1. Right gear for swinging the crane 50X1-HUM
2. Cog wheel " " " "
3. Bracket for the rollers on which crane swings
4. Rollers on which crane swings
5. Truck frame
6. Fixed crane frame
7. Gasoline tank
8. Ring with circular track for rollers
10. Winch drums
11. Wire from winch drum to load hook
12. Crane arm wire from winch drum to crane arm
13. Control wires to the power take-off
14. Throttle control wire (for increasing truck engine r.p.m.)
15. Shielding for crane operator
16. Winch worm gear
17. Worm gear drive
18. Crane rotation drive gear wheel
19. Crane rotation drive worm gear
20. Supports for upper wire block
21. Upper wire block
22. Winch drive shaft
23. Winch gear box

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- 24. Searchlight
- 25. Searchlight conduit
- 26. Shaft to crane rotation gear.

There are three brackets (3) holding rollers (4). Two rollers are fastened to each bracket. The control wires pass through in pipes which do not rotate with the crane. At their upper end there is a fastening provided with rollers and a track corresponding to the track (8) and rollers (4) on which swing the crane rotates. The teeth of the worm gears of the winch and the crane rotation drive are not straight but curved, and all worm gear wheels and worm gears in the winch, respectively, are similar, while the worm gears of the rotation drive are longer and of different shape, the worm gear wheel also being of different shape. The winch worm gear wheels are of cast iron and can be removed from the winch drum for replacement when worn out.

Appendix 5


Winch and Operating Mechanisms

1. Winch wire drum
2. Winch drum for crane arm wire.
3. Grooves for wire
4. Through drum shaft
5. Winch brake disks
6. Worm gear fastened to the winch drums with bolts
7. Brake disk for crane rotation
8. Worm gear for crane rotation
9. Nut for compressing spring against upper cone disk of rotation drive

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10. Gear wheel of rotation drive
 11. Upper conical disk of rotation drive
 12. Lever with shaft for putting the crane rotary motion and crane arm winch in gear.
 13. Lever with shaft for putting loading winch into gear.
 14. Lever for forward or reverse crane movement
 15. Channel through the axles down to the lower transmission gear, through which pass tubular links for clutch and throttle controls.
 16. Crane cab
 17. Crane operator's seat
 18. Clutch pedal
 19. Throttle
 20. Reversing fork
 - a. Upper conical gear with drive teeth
 - b. Conical gear
 - I. The winch is engaged or disengaged here
 - II. The crane-turning and crane arm movement gears are engaged or disengaged here

There are three axles. To the middle axle is splined a gear wheel which rotates with the axle. The place where it is engaged or disengaged is marked in Appendix 8.

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Appendix 6

The Worm Gear and the Conical Disk of the Crane Turning Gear Box

The upper conical disk (4) is splined to the axle, while the worm gear wheel (5) moves freely. When by means of the spring (3) the upper conical disk is pressed into the conical recess in the gear wheel the axle is engaged and begins to turn. The disks are not exactly conical in form, but somewhat elliptical to provide a better connection and smoother operation without jerks or shocks. A jerk or shock results in the conical disk being lifted by the pressure of the recess and dropping back into the elliptical recess after one turn under the pressure of the spring.

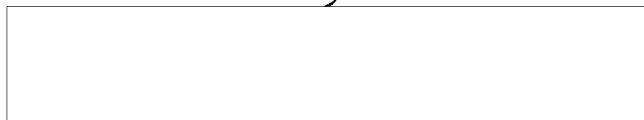
1. Approximate shape of the cone and the conical recess, seen from above.
2. Thread for the nut which compresses the spring for the conical disk.
3. Spring
4. Upper conical disk
5. The gear wheel with the conical recess for the upper conical disk
6. Spline
7. Axle of the crane-turning gear.

Appendix 7

The Crane Seen From the Rear

1. Wires
2. Winch drum
3. Casing for the worm gear and gear wheel

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4. Brake casing
5. Crane arm brake
6. Bracket with rollers
7. Brake for the loading winch
8. Outrigger foot in position for road travel
9. " " " " " loading

The truck crane has four outrigger feet that are lifted when the crane is moved. The outrigger feet act as supports to prevent the crane from tipping over when loads are lifted. The other pair of feet is found in the forward part of the crane.

Appendix 8

Manner of connecting truck clutch pedal and throttle with clutch pedal and throttle in the crane cabin

- a. and b. Connecting links
7. Throttle in the crane cab
8. Clutch pedal in the crane cab
9. The transmission gear box under the crane
10. Tubular clutch link
11. Clutch fork in transmission
12. Throttle fork in transmission
13. These axles extend through the transmission and casing and have angle links at their outer ends.
14. Clutch link, attached to 5.

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5. Link to clutch pedal
 6. Link to throttle
 15. Throttle in truck cab

When the clutch pedal is pressed down the tubular links are lifted through links 1, 2, 3 and 4, and the clutch and throttle [in the truck cab] are controlled through links 5 and 6. Upper fastenings a. and b. are so arranged that they are not interfered with by the turning of the crane. The fastenings are placed on the tubular links and have grooves for collars gripped by forks[#] linked with link rods 2 and 4.

Appendix 9

Reverse Gear Box

- b. Fluted track on which toothed sleeve A moves
- c. To crane-swinging gear box
- d. Drive shaft to crane arm winch
- e. Fluted axle
- g. Middle axle
- h. Fluted axle
- k. Handle with link for engaging and disengaging the loading winch through sleeve B.
- l. Handle with link for changing over to crane swinging or crane arm lifting through sleeve A.
- m. Gear teeth
- o. Conical gear wheel with gear teeth, see Appendix 3, 13 a and b.
- p. Control fork for sleeve o.

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s. Control lever for reversing, swinging the crane left or right, and for other crane mechanisms.

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t. Fork ends which move sleeve B.

u. Groove for fork.

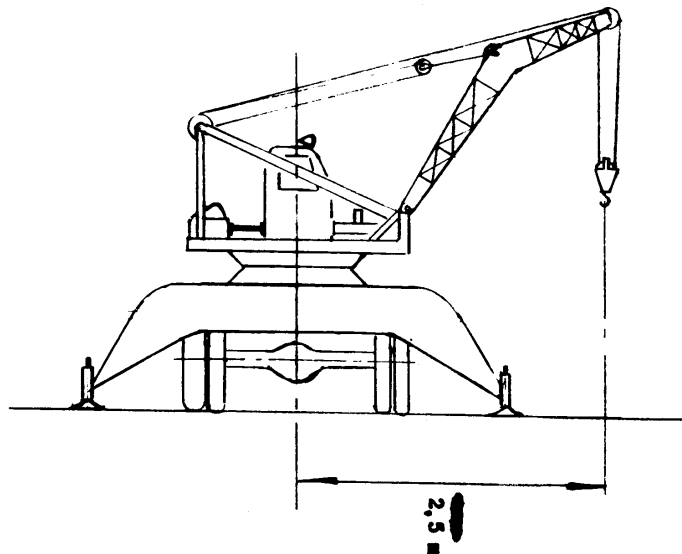
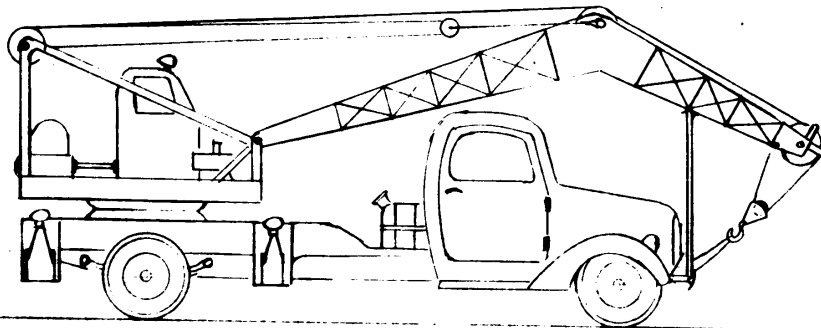
Conical gear (D) and cylindrical gears 1 and 2 are affixed to axle (g). Gear wheels 3, 4, and 5 ride on bushings and are in constant mesh with gears 1 and 2. Axles e and b/h are fluted, with sleeves A and B sliding in the flutings. When lever k moves sleeve B to gear wheel 3, engaging teeth m, axle a will rotate. In turn, the axle will transmit the rotary movement to the loading winch. The same thing takes place with axle b/h. The difference is that sleeve A has teeth at both ends, one end engaging the crane arm winch, the other end the crane turning transmission. Turns to the left or right are engaged in the turning transmission by means of fork p and the toothed sleeve (c in Appendix 2) found under the conical gear wheel (7 in Appendix 2). Axle h is in two sections. When sleeve A is meshed with gear 4, the part of the axle which extends to the crane turning transmission does not rotate. When sleeve A engaged gear 5, the part of the axle which extends to the crane arm winch does not rotate. One of the axle sections rests in two bearings, one end of the other section resting in a bearing and the other end extending into one end of the other axle section.

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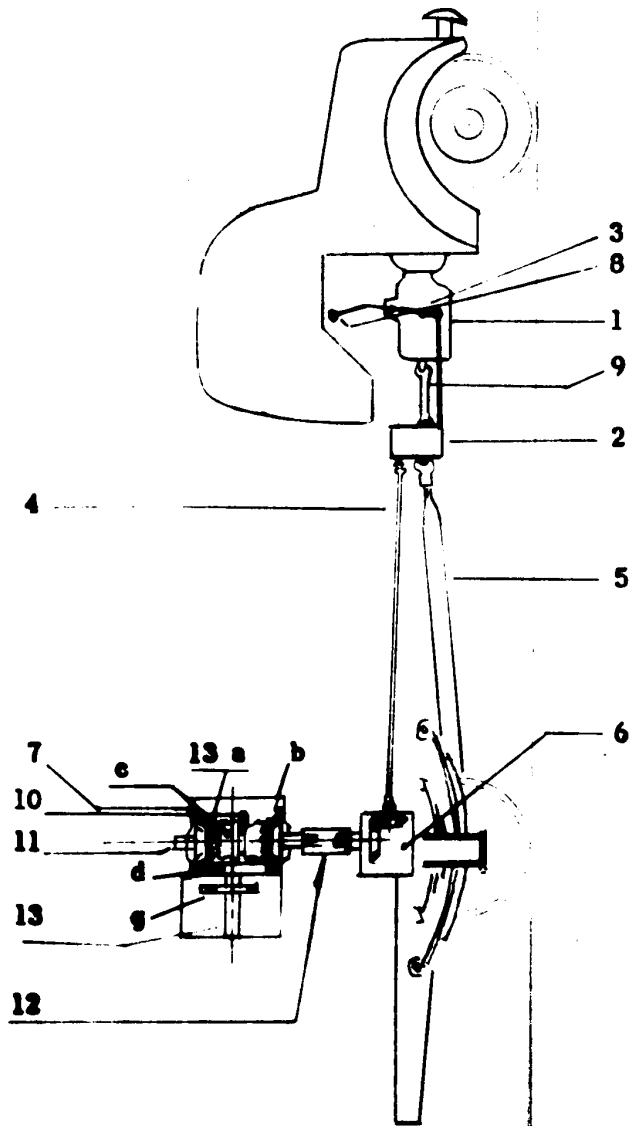
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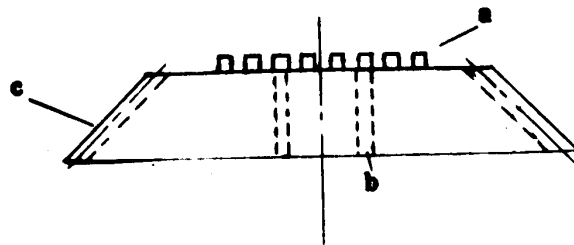
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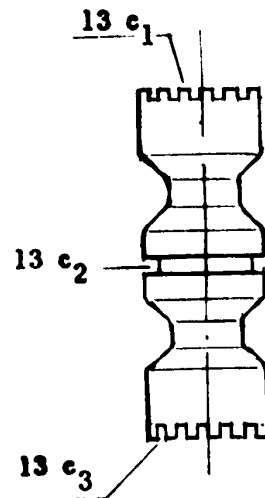
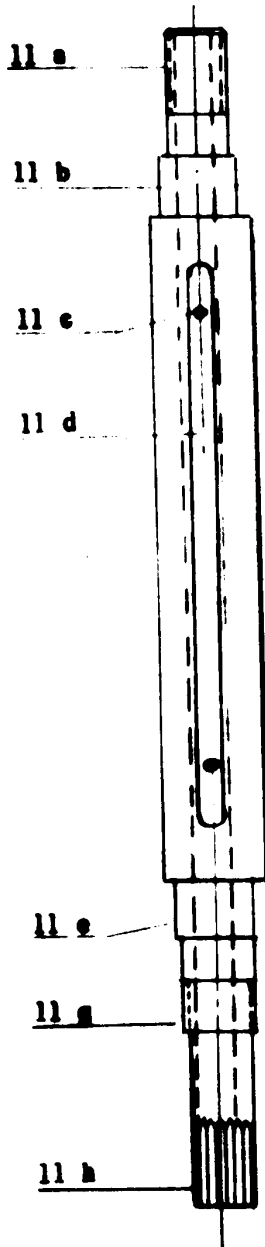
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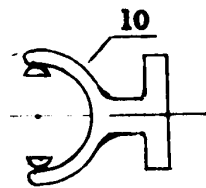
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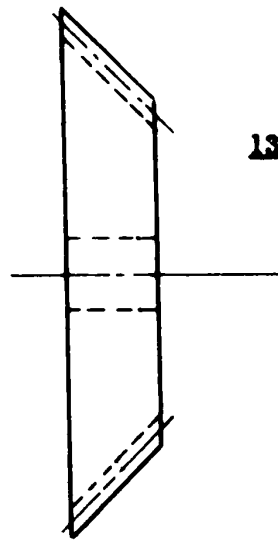
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13 e



13 d



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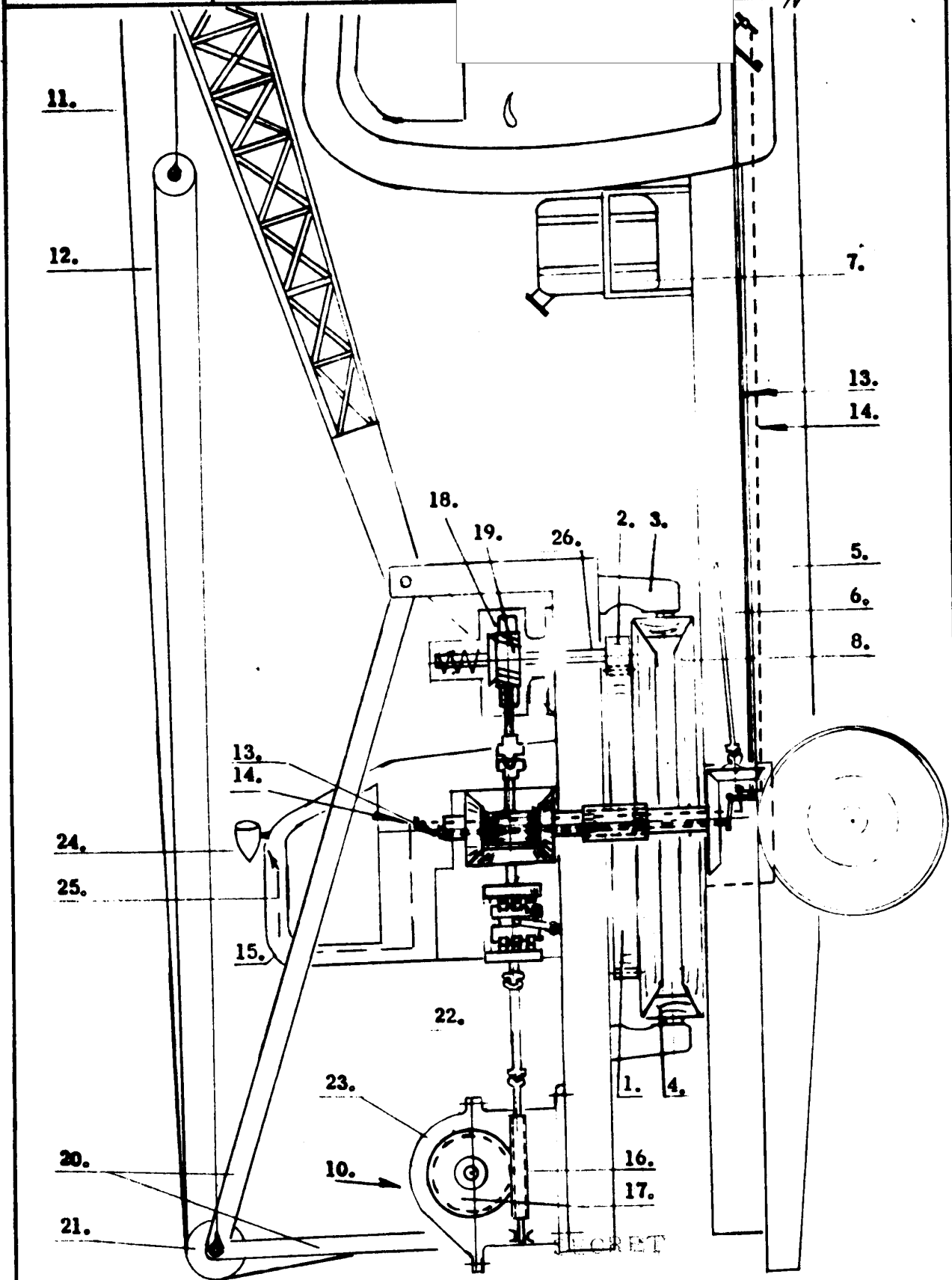
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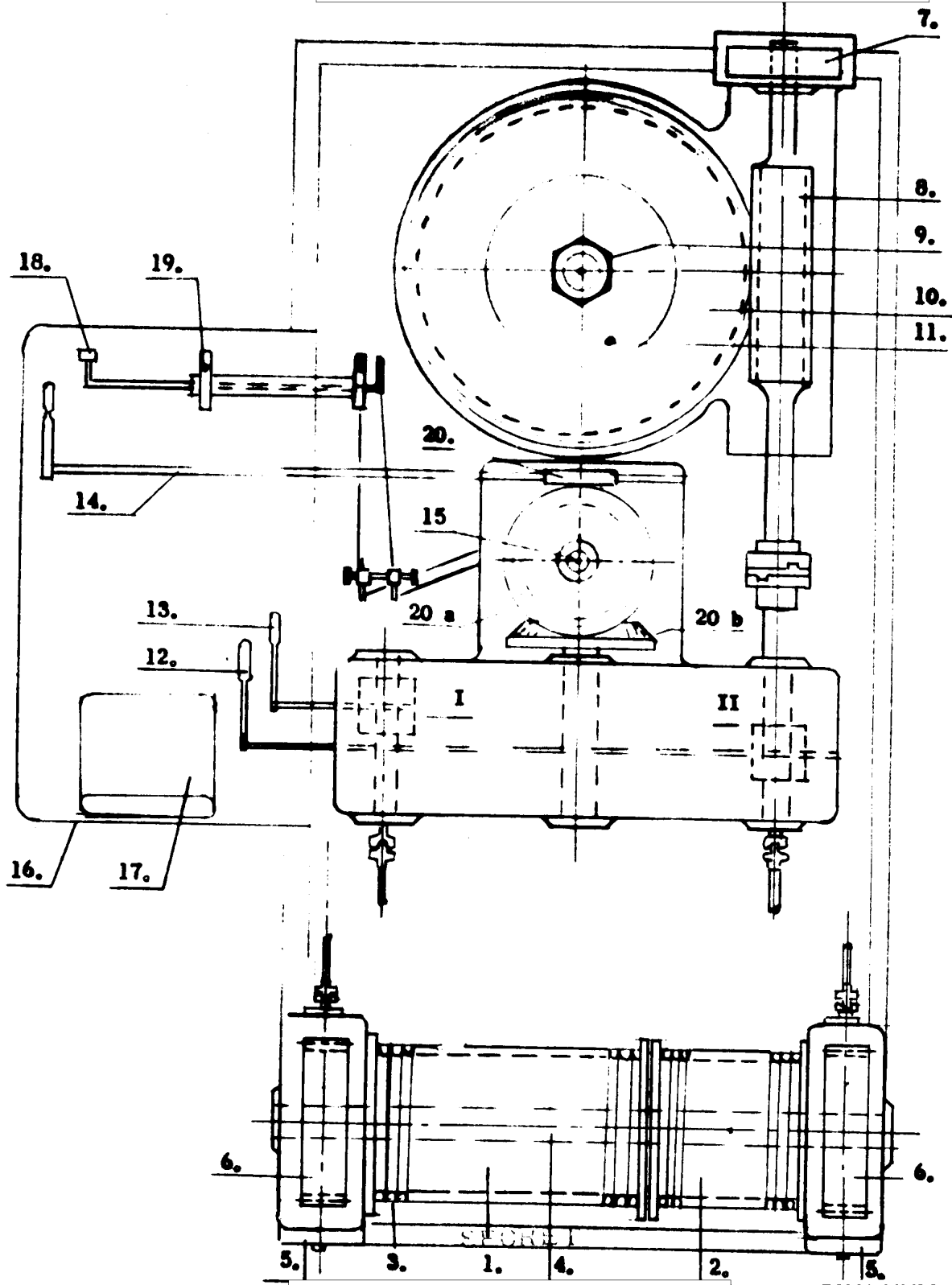
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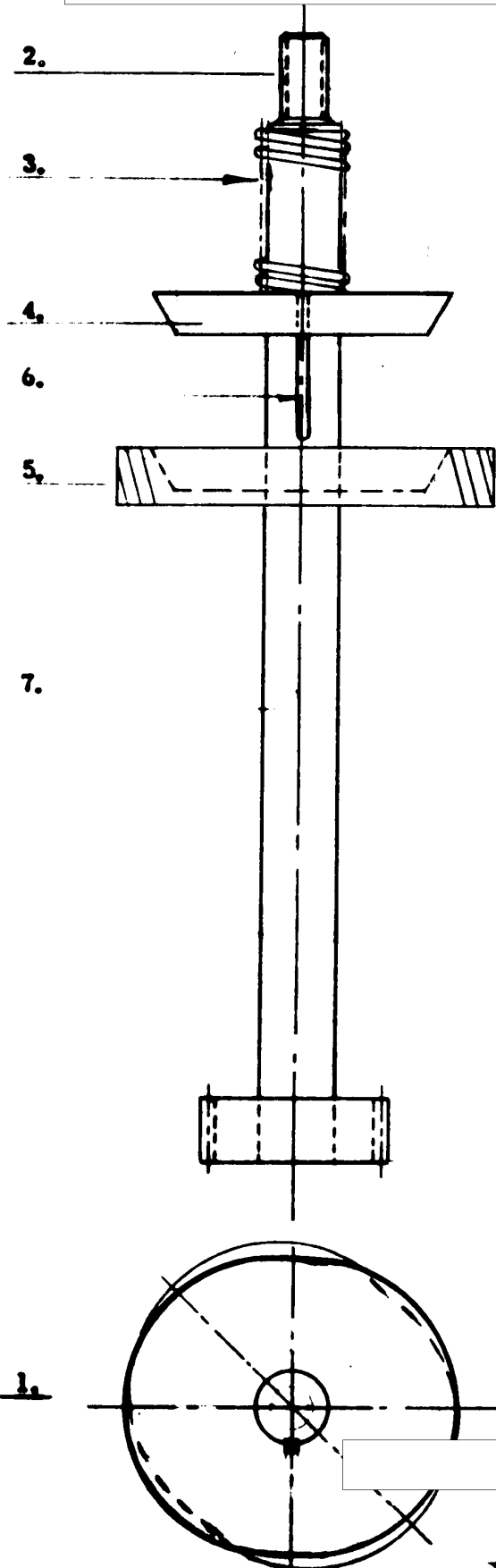
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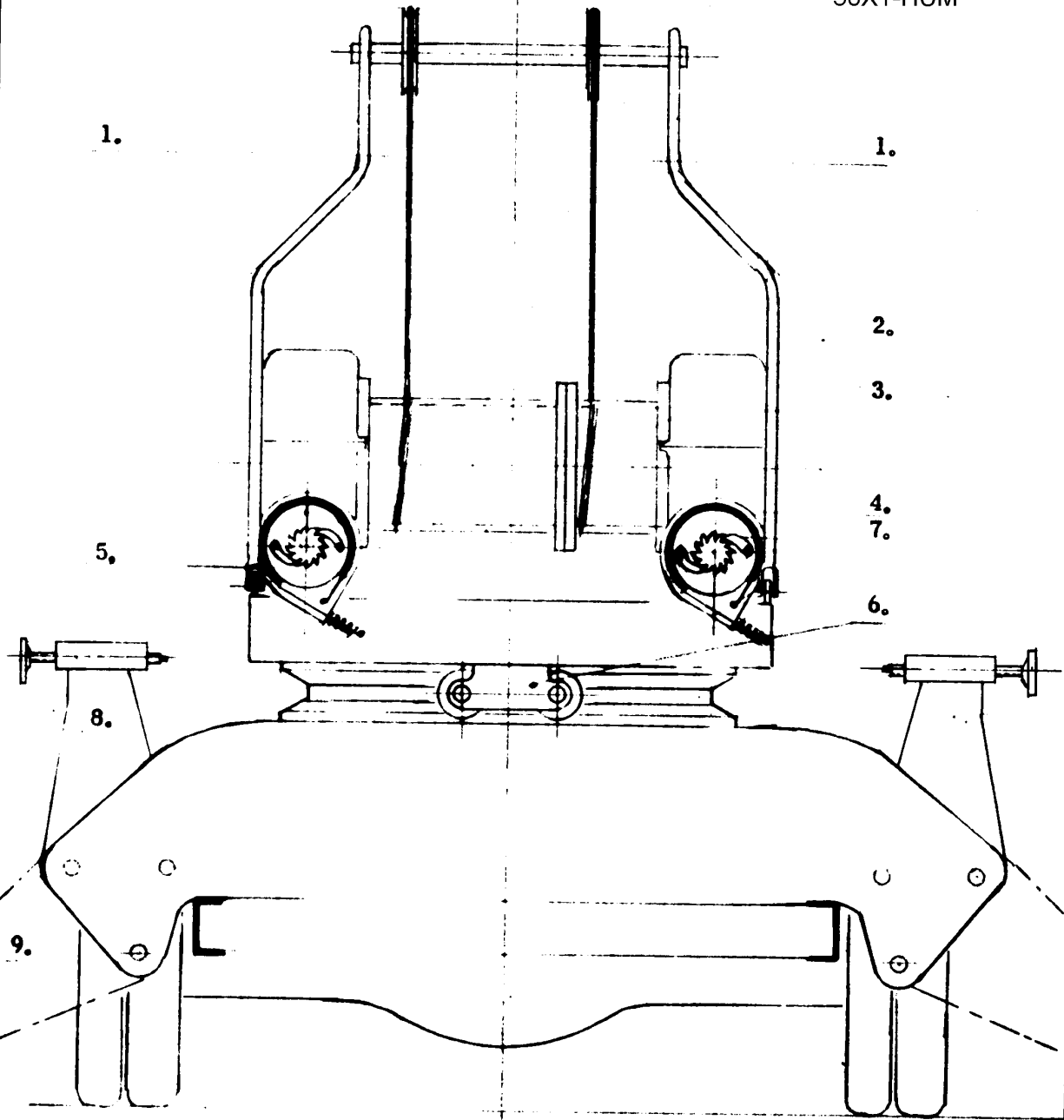
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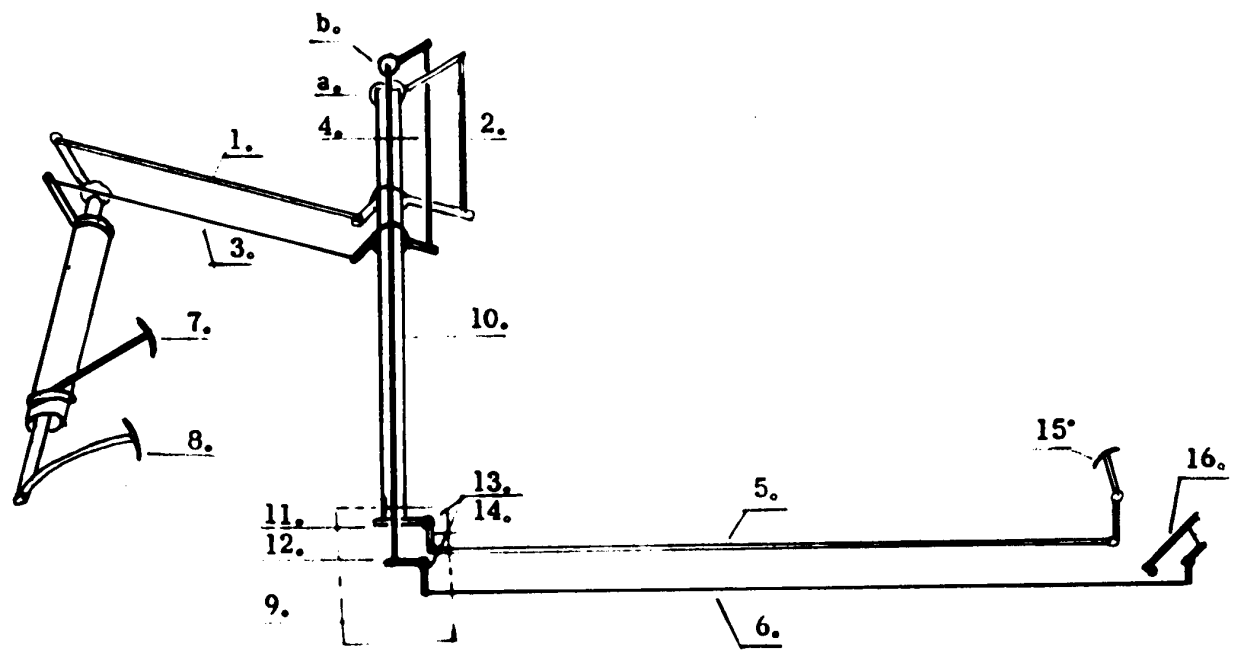
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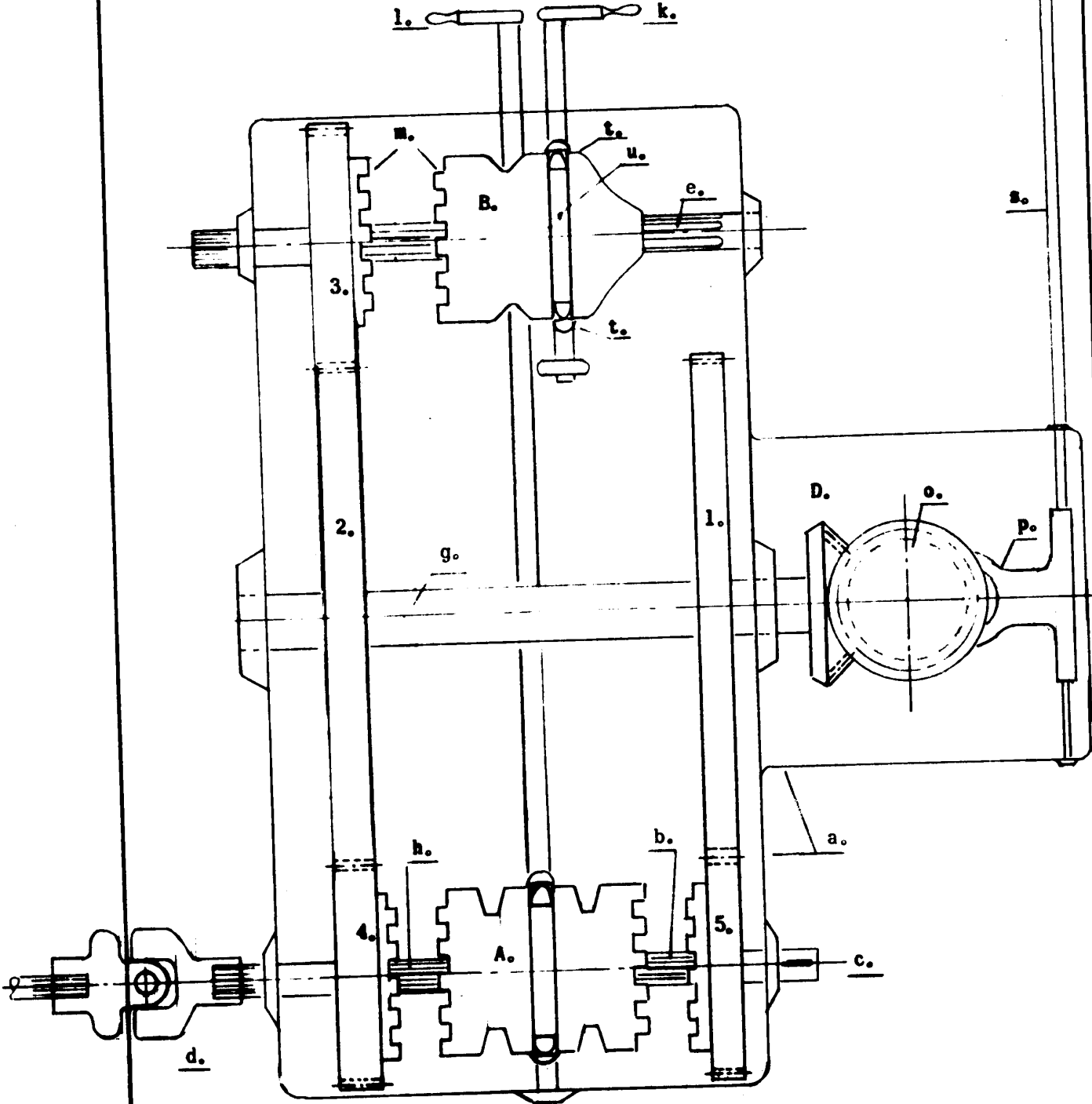
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