# Atlante di Artobolewsky LW

Classificazione con esempi
Parte Terza

## Meccanismi con più membri (n>2) - LW

1. M. 4 membri uso generale (539 - 581) 4L
2. M. 5 membri uso generale (582 - 589) 5L
3. M. 6 membri uso generale (590 - 608) 6L
4. M. membri multipli uso gen. (609 - 622) ML
5. M. parallelogramma (623-640) PC
6. M. antiparallelogramma (641-643) CC
7. M. guida ed inversori (644-740) GI
8. M. p. operaz. matematiche (741-745) MO



| 743 | MULTIPLE-BAR MECHANISM FOR ADDING TWO LENGTHS HAVING A COMMON DIRECTION | LW MO |
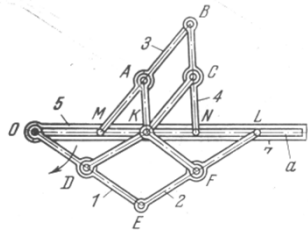
The lengths of the links comply with the conditions: $\overline{OD} = \overline{DE} = \overline{KF}$, $\overline{LF} = \overline{FE} = \overline{KD}$, $\overline{MA} = \overline{AB} = \overline{KC}$ and $\overline{NC} = \overline{CB} = \overline{KA}$. Figures $ABCK$ and $FEDK$ are parallel-crank linkages. Pins $M$, $K$, $N$ and $L$ slide along fixed guide $a$. When link $1$ turns about fixed axis $O$, the condition $\overline{OL} = \overline{OM} + \overline{ON}$ is always complied with. Thus, the mechanism adds two lengths: $\overline{OM}$ and $\overline{ON}$.

## Meccanismi con più membri (n>2) - LW

9. M. con indugio (dwell) (746 - 762) D

**749    MULTIPLE-BAR DWELL MECHANISM    LW / D**

The lengths of the links comply with the conditions: $\overline{BC} = 3.75\overline{AB}$, $\overline{BE} = 1.5\overline{AB}$, $\overline{EF} = 2.12\overline{AB}$, $\overline{GF} = 2.8\overline{AB}$, $\overline{GD} = 6.65\overline{AB}$ and $\overline{GA} = \overline{AD} = 4\overline{AB}$. Link 4 is connected by turning pairs E and F to connecting rod 2 of four-bar linkage ABCD and to link 3 which oscillates about fixed axis G. When point B of crank 1 travels along the part of the circle indicated by a heavy continuous line, point E of connecting rod 2 describes a path of which portion a-a approximates a circular arc with its centre at point F. During this period link 3 almost ceases to oscillate, i.e. it practically has a dwell.



**753    MULTIPLE-BAR TWO-DWELL MECHANISM    LW / D**

The lengths of the links comply with the conditions: $\overline{BC} = 2.52\overline{AB}$, $\overline{DC} = 1.44\overline{AB}$, $\overline{BE} = 4.44\overline{AB}$, $\overline{CE} = 4.23\overline{AB}$, $\overline{EF} = 8.45\overline{AB}$, $\overline{GF} = 2.52\overline{AB}$, $\overline{AD} = 2.35\overline{AB}$, $\overline{AG} = 2.77\overline{AB}$ and $\overline{DG} = 2.48\overline{AB}$. When point B of crank 1 travels along the portions of the circle indicated by heavy continuous lines, point E of connecting rod 2 describes a path of which the portions shown by heavy continuous lines approximate circular arcs of radius $\overline{FE}$ with centres at points F and $F_1$. When crank 1 rotates, link 3 oscillates about fixed axis G and has two dwells when point E is on the portions of its path indicated by heavy continuous lines.

## Meccanismi con più membri (n>2) - LW

9. M. con indugio (dwell) (746 - 762) D
10. M. generatori di traiettoria (763 - 771) Ge



**763    KLEIBER MULTIPLE-BAR MECHANISM FOR DRAWING ELLIPSES    LW / Ge**

The lengths of the links comply with the conditions: $\overline{OE} = \overline{OF} = n$, $\overline{CG} = \overline{GB}$, $\overline{AB} = \overline{DC} = a$, $\overline{CB} = \overline{AD} = b$ and $\overline{EG} = \overline{GF} = \overline{FK} = \overline{KE} = m$. Figure EGFK is a rhombus linkage and figure ABCD is a crossed-crank linkage. Links 1 and 2 turn about fixed axes A and D. Links 3 and 4 turn about fixed axis O. If $a > b$ then, when link 1 turns about axis A, point K describes an ellipse with the equation

$$\frac{x^2}{m^2 - n^2} \cdot \frac{1}{a^2} + \frac{y^2}{m^2 - n^2} \cdot \frac{1}{a^2 - b^2} = 1.$$

## Meccanismi con più membri (n>2) - LW

9. M. con indugio (dwell) (746 - 762) D
10. M. generatori di traiettoria (763 - 771) Ge
11. M. artiglio per films (772 - 780) OC

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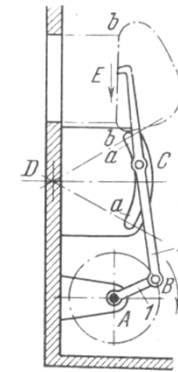
When crank *1* of four-bar linkage *ABCD* rotates about fixed axis *A*, the tip of claw, or hook, *E*, mounted on connecting rod *2*, describes a connecting-rod curve. At portion *b-b* of this curve, claw *E* engages a perforation of the film which it moves. At another portion of the connecting-rod curve, claw *E* is withdrawn from the perforation. Pin *C* of connecting rod *2* slides along arc-shaped guide *a-a* whose centre is at point *D*.

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## Meccanismi con più membri (n>2) - LW

9. M. con indugio (dwell) (746 - 762) D
10. M. generatori di traiettoria (763 - 771) Ge
11. M. artiglio per films (772 - 780) OC
12. Bilance (781 - 795) B

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784  MULTIPLE-BAR DIAL BALANCE  LW B
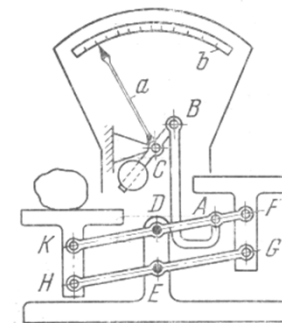


The lengths of the links comply with the conditions: $\overline{DE} = \overline{FG} = \overline{KH}$ and $\overline{DF} = \overline{EG} = \overline{EH} = \overline{DK}$. Thus, the right- and left-hand parts of the mechanism are parallel-crank linkages. Weighing can be done either directly on the pans or by means of supplementary indicating mechanism *ABC* having hand *a* and dial scale *b*.

## Panel 1 (top-left)

| 787 | DIFFERENTIAL STEELYARD | LW |
|---|---|---|
| | | B |

*Suspending hook*
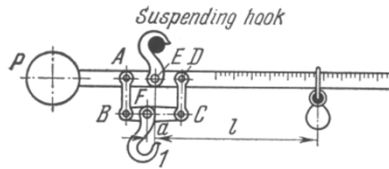
The lengths of the links comply with the conditions: $\overline{AB} = \overline{DC}$, $\overline{AD} = \overline{BC}$ and $\overline{AE} = \overline{ED}$. Hook $1$ is connected by turning pair $F$ to link $BC$ of parallel-crank linkage $ABCD$. Point $F$ of the hook suspension is displaced by the distance $a$ from point $E$.

Weight $Q$ of the load being weighed equals $Q = G \frac{l}{a}$, where $G$ is the sliding weight and $l$ is the arm of the sliding weight with respect to point $E$. Arm $a$ can be very small so that the length of the beam need be relatively short. Weight $P$ counterbalances the dead weight of the beam.

## Panel 2 (top-right)

### Meccanismi con più membri (n>2) - LW

9. M. con indugio (dwell) (746 - 762) D
10. M. generatori di traiettoria (763 - 771) Ge
11. M. artiglio per films (772 - 780) OC
12. Bilance (781 - 795) B
13. M. innesto e collegamento (796 - 801) C

## Panel 3 (bottom-left)

| 799 | MULTIPLE-BAR SPATIAL COUPLING | LW |
|---|---|---|
| | | C |
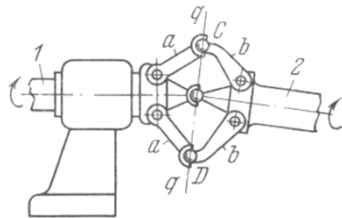
Link $1$ is connected by a spherical pair to link $2$. Links $1$ and $2$ have levers $a$ and $b$ which are connected together by spherical pairs $C$ and $D$. Owing to the symmetrical arrangement of levers $a$ and $b$, links $1$ and $2$ may be angularly misaligned about axis $q$-$q$ with respect to each other.

## Panel 4 (bottom-right)

### Meccanismi con più membri (n>2) - LW

9. M. con indugio (dwell) (746 - 762) D
10. M. generatori di traiettoria (763 - 771) Ge
11. M. artiglio per films (772 - 780) OC
12. Bilance (781 - 795) B
13. M. innesto e collegamento (796 - 801) C
14. M. ordinam. e alimentazione (802-808) SF

806  MULTIPLE-BAR FEEDING MECHANISM  LW SF

The lengths of the links comply with the conditions: $\overline{CB} = 2\overline{AC}$, $\overline{CD} = 2.4\overline{AC}$, $\overline{BD} = 0.9\overline{AC}$, $\overline{BE} = 2\overline{AC}$, $\overline{FD} = 3\overline{AC}$ and $\overline{AE} = 1.6\overline{AC}$. Sliding member 7 is reciprocated along guide c-c by link 4 which is connected by turning pair D to connecting rod 2. Sliding member 7 has two dwells when point D is on portions x-x and y-y of its path, since these portions approximate circular arcs described from the corresponding positions of point E. Link 5 actuates link 6 for periodically clamping and unclamping the workpiece (or stock) between jaws a and b.

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## Meccanismi con più membri (n>2) - LW

9. M. con indugio (dwell) (746 - 762) D
10. M. generatori di traiettoria (763 - 771) Ge
11. M. artiglio per films (772 - 780) OC
12. Bilance (781 - 795) B
13. M. innesto e collegamento (796 - 801) C
14. M. ordinam. e alimentazione (802-808) SF
15. M. sicurezza (809-811) S

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809  FOUR-BAR SAFETY MECHANISM  LW S

The mechanism consists of four-bar linkage ABCD. When the level in the tank rises, liquid flows along pipe 4 into bucket 5. Lever 1, rigidly secured to the bucket, turns about fixed axis A and flap 3 is opened so that it rapidly lets out excess liquid from the tank. When bucket 5 empties, lever 1 is returned to its initial position by weight 6 which can be adjusted along the axis of lever 1 to regulate the device.

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## Meccanismi con più membri (n>2) - LW

9. M. con indugio (dwell) (746 - 762) D
10. M. generatori di traiettoria (763 - 771) Ge
11. M. artiglio per films (772 - 780) OC
12. Bilance (781 - 795) B
13. M. innesto e collegamento (796 - 801) C
14. M. ordinam. e alimentazione (802-808) SF
15. M. sicurezza (809-811) S
16. M. di governo (812 - 815) G

### 812 – MULTIPLE BAR CENTRIFUGAL GOVERNOR – LW - G
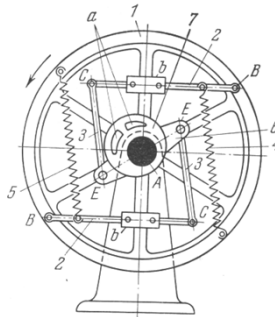
Disk *1* rotates about fixed axis *A*. Weights *b* are rigidly secured to links *2* which are connected by turning pairs *B* and *C* to disk *1* and links *3*. Lever *6*, rotating about axis *A*, is connected by turning pairs *E* to links *3*. Springs *4* and *5* pull links *2* toward the hub of disk *1*. When disk *1* rotates, weights *b* move outward by overcoming the resistance of springs *4* and *5*. This turns lever *6* to close ports *a* of eccentric *7*. The amount by which ports *a* are closed depends upon the speed of rotation of disk *1*. This regulates the admission of steam.

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## Meccanismi con più membri (n>2) - LW

17. M. misura e test (816 - 824) M

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| 820 | MULTIPLE-BAR MECHANISM WITH ADJUSTING DEVICES FOR DYNAMIC LEAF SPRING TESTS | LW M |
|---|---|---|

Rocker arm *3* of four-bar linkage *ABCD* oscillates about fixed axis *D*. Link *4* is connected by turning pairs *E* and *F* to rocker arm *3* and link *5*. Link *5* is connected by turning pairs *G* and *H* to link *6* and sliding member *7*. Link *6* turns about fixed axis *K*.
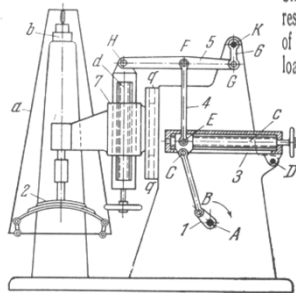
Sliding member *7* slides in fixed guide *q-q*. Tested leaf spring *2* rests on frame *a* which, in turn, rests on load cell *b*. The amplitude of oscillation of leaf spring *2* is varied by screw *c*, and the initial load by screw *d*. When crank *1* rotates, leaf spring *2* being tested is subjected to a dynamic load.

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| 821 | MULTIPLE-BAR MECHANISM FOR TORSION TESTS | LW M |
|---|---|---|
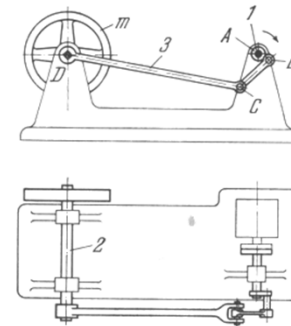
Rocker arm *3* of four-bar linkage *ABCD* oscillates about fixed axis *D*. Test-piece *2* is connected to fly-wheel *m* which has a large moment of inertia. Upon the rotation of crank *1*, elastic vibrations are set up by rocker arm *3* in the elastic system consisting of test-piece *2* and mass *m*. The test-piece is subjected to the action of an alternating inertia torque.

822 — MULTIPLE-BAR RECORDING STRAIN GAUGE — LW M

Lever 3 turns about fixed axis A. Lever 4 turns about fixed axis B. Knife-edges C and D of link 5 enter corresponding notches in levers 4 and 3. Any changes in the distance between points 1 and 2 upon strain of test-piece 6 turns lever 3 and lever 4 with stylus a.



823 — MULTIPLE-BAR APPROXIMATE STRAIGHT-LINE MECHANISM OF AN ENGINE INDICATOR — LW M

$p = p(s)$

The lengths of the links comply with the conditions: $\overline{AB} = 1$, $\overline{BC} = \overline{CE} = \overline{CD} = 1.4$ and $\overline{AE} = 2.58$. Point D of the Chebyshev-type four-bar linkage ABCD has approximate straight-line motion. The mechanism is driven by link 3 which is connected by turning pair F to link 2 and by spherical pair G to link 1. Link 1 is connected by a system of links, not shown in the drawing, to the indicator which measures the pressure in the engine cylinder. The motion of link 1 is transformed into approximately rectilinear motion of the tracer, or pencil, which is at point D of link 2. Paper strip 4 is moved a distance proportional to travel s of the piston in the engine cylinder. At this, the pencil traces the curve $p = p(s)$, where p is a quantity proportional to the steam or gas pressure in the cylinder.

## Meccanismi con più membri (n>2) - LW

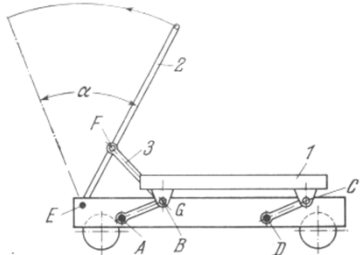17. M. misura e test (816 - 824) M
18. M. indicatori (825) I



825 — MULTIPLE-BAR INDEXING LEVER — LW I

In the first clockwise swing of lever 1, connecting rod 2 shifts indexing lever 3 clockwise until lug A of this lever drops into the slot of link 4. Lever 3 is indexed in this position, shown in the right-hand drawing, when lever 1 is returned to its initial position. In the second clockwise swing of lever 1, connecting rod 2, sliding with its curvilinear surface between projections B and C of links 5 and 4, disengages link 4 from lever 3 which is returned by the spring to its initial position shown in the left-hand drawing.

## Meccanismi con più membri (n>2) - LW

17. M. misura e test (816 - 824) M
18. M. indicatori (825) I
19. M. manipolazione materiale (826-830) MH



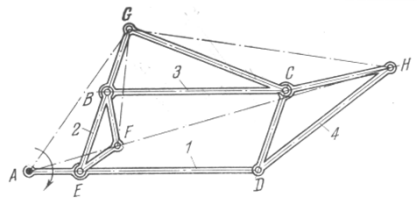828 | MULTIPLE-BAR HAND LIFT TRUCK MECHANISM | LW MH

The lengths of the links comply with the conditions: $\overline{AB} = \overline{DC}$ and $\overline{BC} = \overline{AD}$. For the specified dimensions, platform 1 has translational motion when it is lifted. Lever 2 turns about fixed axis E and is connected by intermediate link 3 to platform 1. Platform 1 is lifted to its full height by turning lever 2 through angle $\alpha$.

## Meccanismi con più membri (n>2) - LW

17. M. misura e test (816 - 824) M
18. M. indicatori (825) I
19. M. manipolazione materiale (826-830) MH
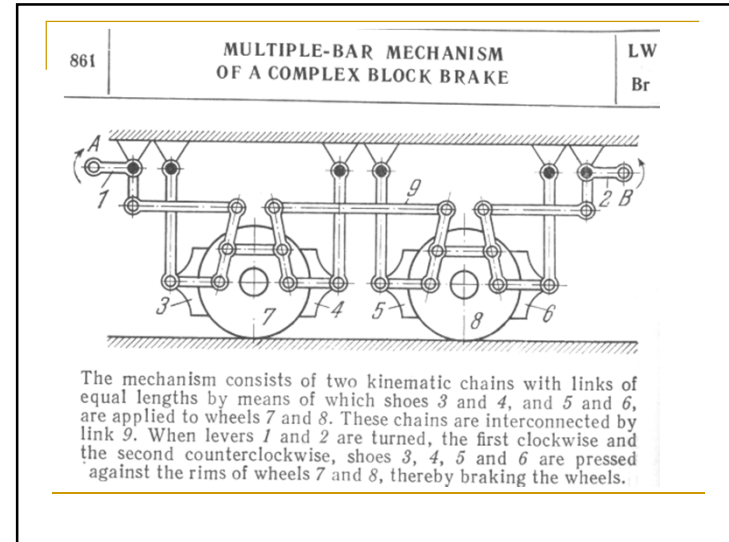20. M. pantografo (831-857) P



855 | MULTIPLE-BAR PANTOGRAPH MECHANISM | LW P

The lengths of the links comply with the conditions: $\overline{EB} = \overline{DC}$ and $\overline{BC} = \overline{ED}$, i.e. figure EBCD is a parallelogram linkage. Rigid triangles FBE, GCB and HCD are respectively similar to triangles FGA, GHF and HGA. For any configuration of parallelogram linkage EBCD, triangle AGH retains constant angles at its vertices. When link 1 turns about fixed axis A, selected as the centre of similarity, and one of the points, G, H or F, is traced along any arbitrary path, the other two points describe similar paths turned through constant angles. The mechanism has reversibility since any point, A, G, H or F, can be selected as the centre of similarity.
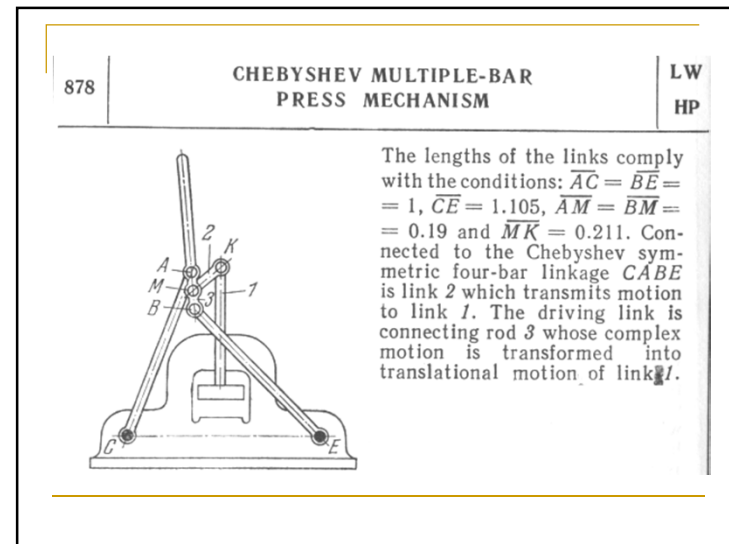
## Meccanismi con più membri (n>2) - LW

17. M. misura e test (816 - 824) M
18. M. indicatori (825) I
19. M. manipolazione materiale (826-830) MH
20. M. pantografo (831-857) P
21. Freni (858 – 876) Br

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| 861 | MULTIPLE-BAR MECHANISM OF A COMPLEX BLOCK BRAKE | LW Br |



The mechanism consists of two kinematic chains with links of equal lengths by means of which shoes 3 and 4, and 5 and 6, are applied to wheels 7 and 8. These chains are interconnected by link 9. When levers 1 and 2 are turned, the first clockwise and the second counterclockwise, shoes 3, 4, 5 and 6 are pressed against the rims of wheels 7 and 8, thereby braking the wheels.

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## Meccanismi con più membri (n>2) - LW

17. M. misura e test (816 - 824) M
18. M. indicatori (825) I
19. M. manipolazione materiale (826-830) MH
20. M. pantografo (831-857) P
21. Freni (858 – 876) Br
22. M. martello, presse e stamp. (877-878) HP

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| 878 | CHEBYSHEV MULTIPLE-BAR PRESS MECHANISM | LW HP |



The lengths of the links comply with the conditions: $\overline{AC} = \overline{BE} = 1$, $\overline{CE} = 1.105$, $\overline{AM} = \overline{BM} = 0.19$ and $\overline{MK} = 0.211$. Connected to the Chebyshev symmetric four-bar linkage $CABE$ is link 2 which transmits motion to link 1. The driving link is connecting rod 3 whose complex motion is transformed into translational motion of link 1.

## Meccanismi con più membri (n>2) - LW

17. M. misura e test (816 - 824) M
18. M. indicatori (825) I
19. M. manipolazione materiale (826-830) MH
20. M. pantografo (831-857) P
21. Freni (858 – 876) Br
22. M. martello, presse e stamp. (877-878) HP
23. M. per altre funzioni (879-912) FD

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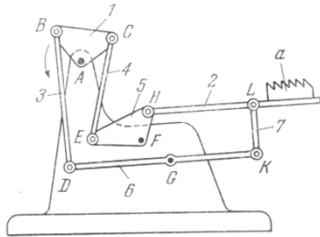
| 880 | FOUR-BAR MECHANISM FOR OPENING DOORS | LW FD |
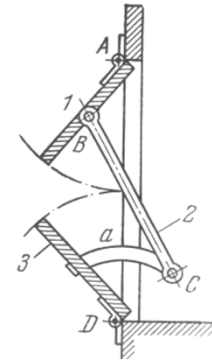
Door wings *1* and *3*, together with link *2*, form four-bar linkage *ABCD*. Wing *3* can be fastened at various positions along quadrant *a*. This enables it to be adjusted so that both door wings close together.

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| 889 | MULTIPLE-BAR MECHANISM FOR THE CLOTH ADVANCER OF A SEWING MACHINE | LW FD |

Connecting rods *3* and *4* are connected by turning pairs *B* and *C* to crank *I*, turning about fixed axis *A*, and by turning pairs *D* and *E* to rocker arms *6* and *5* which turn about fixed axes *G* and *F*. Link *2* is connected by turning pair *H* to rocker arm *5* and by turning pair *L* to link *7* which, in turn, is connected by turning pair *K* to rocker arm *6*. When crank *I* turns about axis *A*, serrated member *a* has a complex motion in which it grips and advances the cloth being sewn.

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| 904 | CROSSED-CRANK MECHANISM FOR A WAGON STEERING GEAR | LW FD |
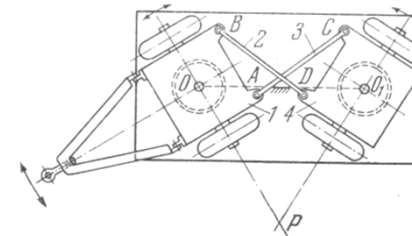
The lengths of the links comply with the conditions: $\overline{AB} = \overline{CD}$ and $\overline{BD} = \overline{AC}$. Thus, links *1*, *2*, *3* and *4* form crossed-crank linkage *ABDC*. When link *1* is turned about fixed axis *O*, link *4* is turned in the opposite direction about fixed axis $O_1$. The whole wagon turns about point *P* which is the instantaneous centre of rotation.

**912** | **TRIPLE PARALLELOGRAM MECHANISM OF A POTATO DIGGER** | LW / FD
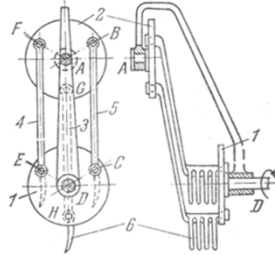
The lengths of the links comply with the conditions: $\overline{AB} = \overline{DC}$, $\overline{AF} = \overline{DE}$, $\overline{AG} = \overline{DH}$ and $\overline{AD} = \overline{BC} = \overline{FE} = \overline{GH}$. Links *1* and *2* rotate about fixed axes *D* and *A*. Connected to these disks by turning pairs are links *3, 4* and *5* which form parallelogram linkages together with the disks. Digging members *6* are rigidly secured to links *3, 4* and *5*. When link *1* rotates the mechanism holds the digging members in the vertical position.