Feb. 9, 1960 A. M. BYRTUS 2,924,042

WALKING MECHANISMS

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FIG. 7

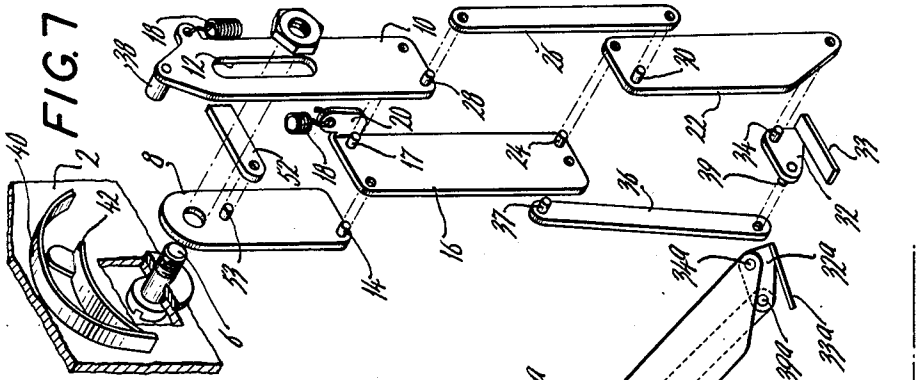
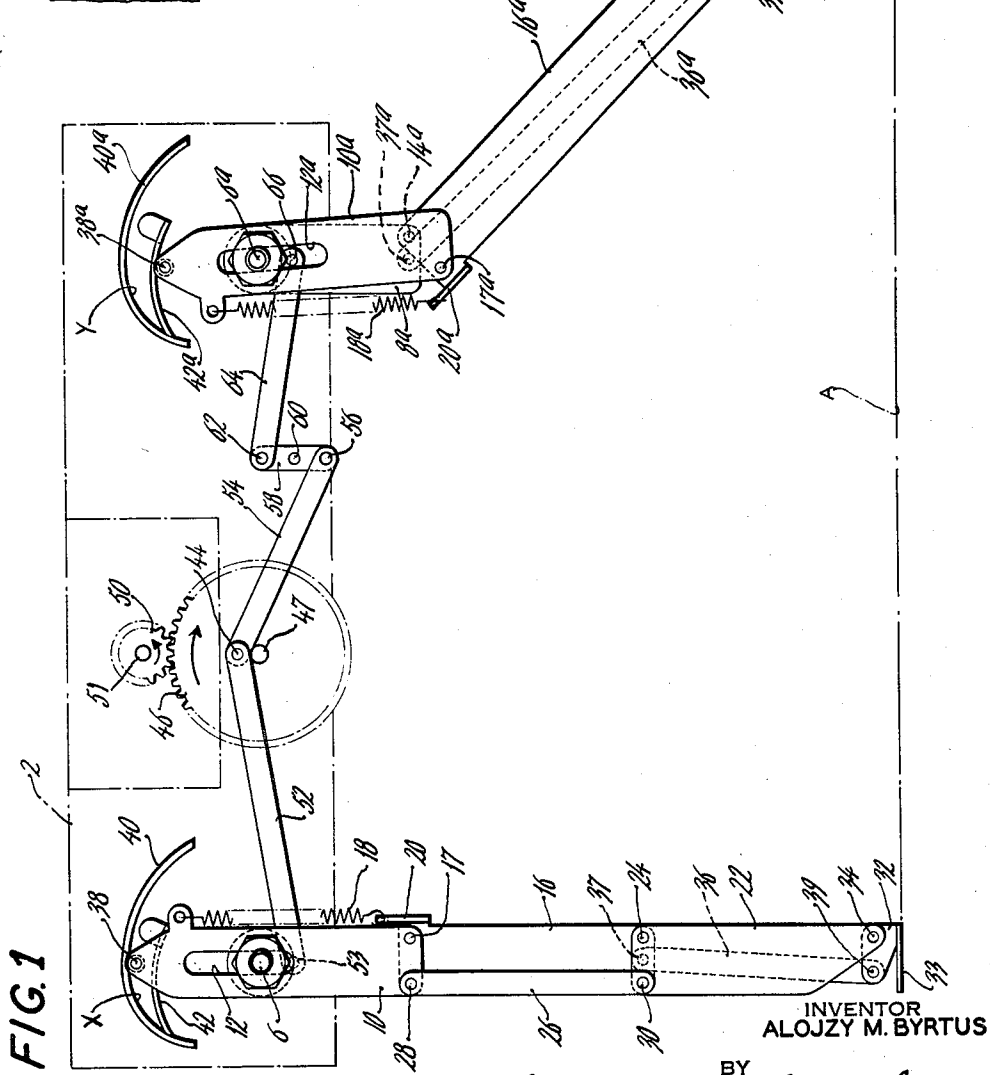


FIG. 1



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WALKING MECHANISMS

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FIG. 3

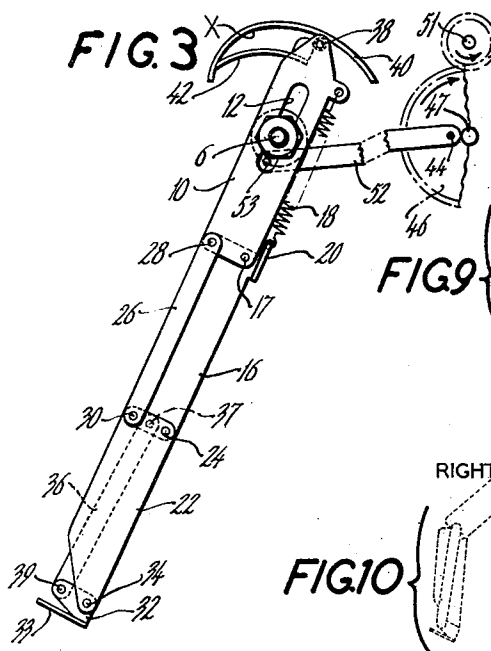


FIG9

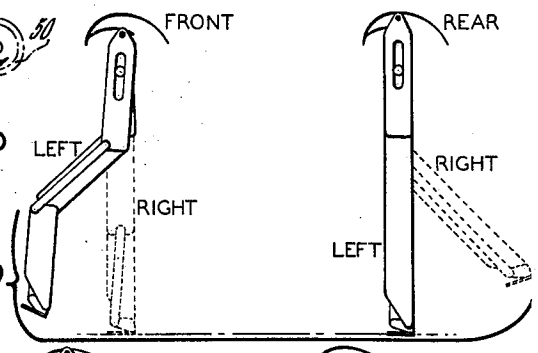


FIG10

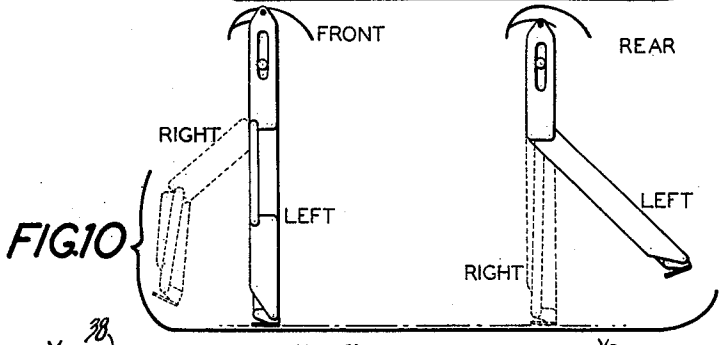


FIG. 8

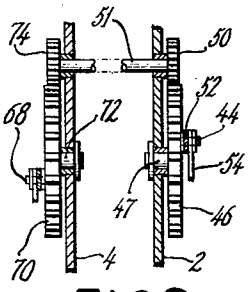


FIG. 2

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WALKING MECHANISMS

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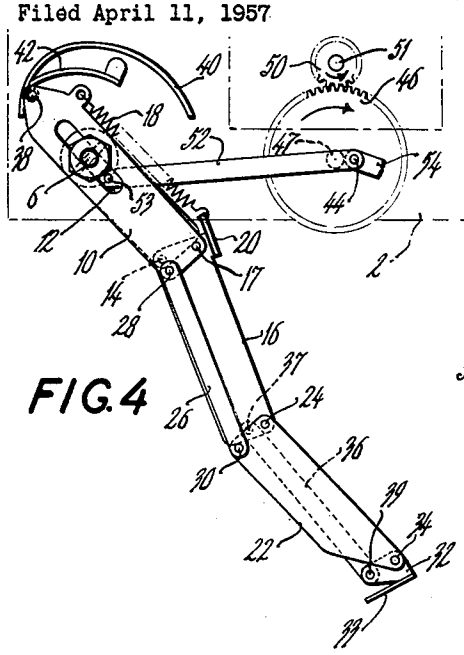


FIG. 4

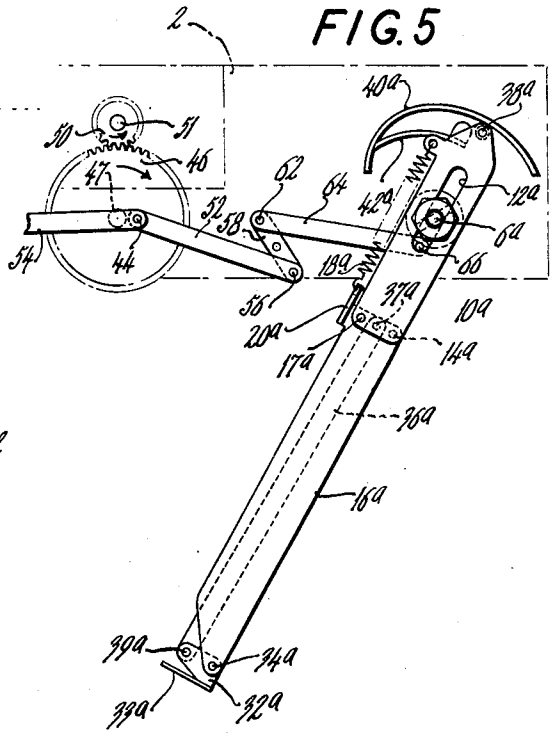


FIG. 5

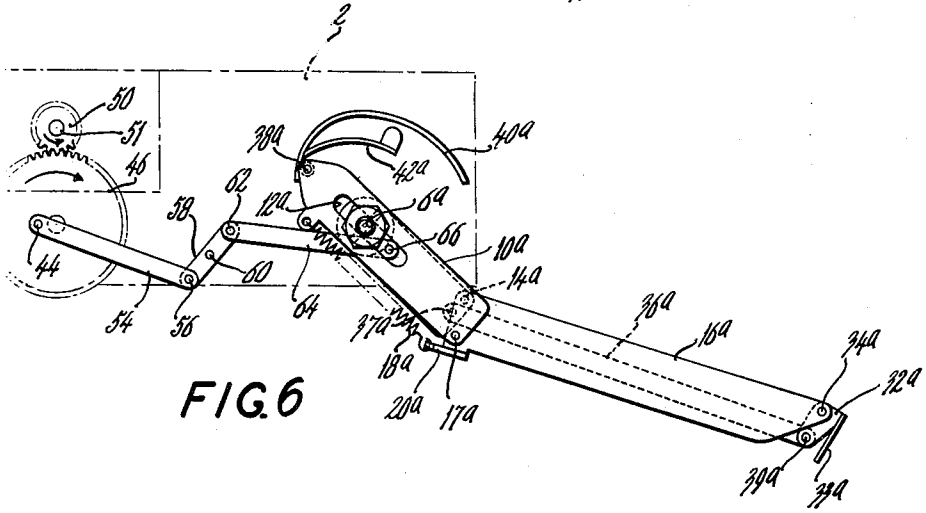


FIG. 6

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2,924,042

WALKING MECHANISMS

Alojzy M. Byrtus, New Britain, Conn.

Application April 11, 1957, Serial No. 652,264

17 Claims. (Cl. 46—150)

This invention relates to walking mechanisms for animals. The invention is shown as embodied in a walking mechanism for four-footed toy animals. Certain features of the invention, however, may be embodied with advantage in walking mechanisms for two-legged toy animals such as toy men. Certain features of the invention also may be applied to artificial walking mechanisms for crippled persons.

One object of the invention is to improve the construction and mode of operation of walking mechanisms of the character referred to above.

Another object of the invention is to provide a walking mechanism for toy animals which will enable much more natural and lifelike movements of the legs and feet to be produced than can be obtained with the walking mechanisms of this character heretofore produced.

The invention will be clearly understood from the accompanying drawings illustrating the invention in its preferred form and the following detailed description of the constructions therein shown.

In the drawings, Fig. 1 is a view in side elevation showing a front leg mechanism and a rear leg mechanism and the connecting mechanism between these two leg mechanisms all constructed and arranged in accordance with the present invention, with the parts located in the positions that they assume at one point in the walking operation of the mechanisms.

Fig. 2 is a view in side elevation illustrating the mechanisms shown in Fig. 1 with the parts in the positions which they assume at another point in the walking operation of the mechanisms.

Figs. 3 and 4 are views in side elevation of the front leg mechanism showing respectively the parts in other different positions assumed in a walking operation.

Figs. 5 and 6 views in side elevation of the rear leg mechanism showing respectively the parts in other different positions assumed in a walking operation.

Fig. 7 is a partially disassembled or exploded view illustrating, in prospective, the parts embodied in the front leg mechanism.

Fig. 8 is a view partly in elevation and partly in vertical section illustrating a driving mechanism for the leg mechanisms located respectively on opposite sides of a toy animal.

Fig. 9 is a diagrammatic view illustrating the positions, at one point in the walking operation, of the parts of the leg mechanisms of a four-legged toy having a walking mechanism embodying the present invention.

And Fig. 10 is a similar diagrammatic view of the leg mechanism shown in Fig. 9 with the parts in the positions which they assume at another point in a walking operation.

The walking mechanism embodying the invention is shown in the present application as applied to frame plates indicated at 2 and 4 secured together in spaced relation by any suitable frame elements, not shown, extending between them. The additional structure required to represent an animal (a bear, for example) may be attached

to these frame plates. This additional structure is not shown in this application since a disclosure of the same is not necessary for an understanding of the present invention. Also, only the leg mechanism applied to the outer side of plate 2 of the frame is shown in this application. This is all that is necessary for an understanding of the invention. The leg mechanism applied to the outer side of the frame plate 4 consists of a reversal of the structure applied to the outer side of the frame plate 2 such as would be seen by an observer looking into a plane mirror held in front of the plate 2, spaced from said plate and in a position parallel with said plate with its reflecting surface facing said plate. This mechanism has the same construction in a reversed sense and the same mode of operation as the mechanism applied to the outer side of the frame plate 2.

The front leg mechanism applied to the outer side of the frame plate 2 comprises a stud 6 secured rigidly in said frame plate and extending outwardly from said plate. Pivoted at its upper end on the studs to swing about the axis of the stud is an inner leg bar 8. An outer leg bar 10 also is pivoted to swing about the axis of the stud 6, the leg bar 10 having a slot 12 extending longitudinally of the latter bar through which the stud extends so that the bar is also movable longitudinally on the stud.

To the lower end of the inner leg bar 8 is pivoted, by means of a pin 14, the upper end of a leg bar 16 to swing with relation to the leg bar 8 about a horizontal axis. The leg bar 16 is also pivoted at its upper end to the lower end of leg bar 10 by means of a pin 17. The leg bar 16 is acted upon by a coiled spring 18 connecting the latter bar with the bar 10, which tends to swing bar 16 in a counter clockwise direction, Fig. 2, about the axis of pin 17. The movement of the leg bar 16 in a counter clockwise direction about said point under the action of the spring is limited by a stop arm or projection 20 formed on the bar 16 and arranged to engage the bar 10. This stop arm is located so that, when said stop arm engages the bar 10, the bar 16 will be located substantially in alignment with the bars 10 and 8. The bar 16 is shown in substantially this position with relation to the bar 8 in Figs. 1 and 3.

A fourth leg bar 22 is pivotally suspended on the leg bar 16. The leg bar 22 is pivoted at its upper end by means of pin 24 to the lower end of leg bar 16 to swing about a horizontal axis. The leg bar 10 is connected with the leg bar 22 by a link 26. The upper end of the link is pivotally connected by pin 28 with the lower end of the leg bar 10 and the lower end of the link is pivotally connected by pin 30 with the upper end of the leg bar 22. The location of the link and the distance between the pivotal connections 28 and 30 are preferably such that when the leg bar 16 is located in alignment with the leg bar 10, the leg bar 22 will be located substantially in alignment with the leg bar 16 as shown in Figs. 1 and 3 and that when the bar 16 is swung about the axis of pin 17 to locate the same at an angle to the bar 10 as shown in Fig. 2, the bar 22 will be swung about the axis of pin 24 to locate the same at an angle to the bar 16 as shown in said figure.

A foot member 32 having a sole portion 33 is pivotally supported by a pin 34 on the lower end of the leg bar 22. The angular position of the foot member 32 about the axis of pin 34 during the operation of the leg mechanism is controlled by a link 36. The upper end of this link is pivoted by a pin 37 to the lower end portion of the leg bar 16 and the lower end of the link is pivoted by a pin 39 to the forward upper portion of the foot member 32.

With the construction above described, the angular position of the leg bar 16 with relation to the leg bar 10, the angular position of the leg bar 22 with relation to the leg bar 16 and the angular position of the foot mem-

ber 32 with relation to the leg bar 22 are all controlled by the longitudinal position of the leg bar 10 with relation to the leg bar 8. When the bar 10 is held in its limiting upper position with relation to the bar 8, the bar 16 is located in a substantially aligned position with relation to the bar 10, the bar 22 is located in substantially aligned position with relation to bar 16 and the foot member 32 is located in substantially a position such as that shown in Figs. 1 and 3 with the sole portion 33 substantially perpendicular to the length of the leg bar 22. When the bar 10 is forced longitudinally downward with relation to the bar 8, the leg bar 16 is swung to the left, Fig. 2 with relation to the bar 10 about the axis of pin 14, thereby swinging the link 26 therewith to the left about the axis of pin 28 as shown in Fig. 2 and the leg bar 22 is swung about the axis of pin 24 relatively to the leg bar 16, to the right, Fig. 2, thereby swinging the link 36 to the right therewith about the axis of pin 37. By this relative movement of the leg bars 16 and 22 and the cooperative action of the link 36, the foot member 32 is swung in a clockwise direction about the axis of pin 34 to turn the sole portion 33 of the foot upwardly into position such as that shown in Fig. 2.

The mechanism for moving the leg bar 10 longitudinally with relation to the leg bar 8 and for controlling the longitudinal position of the leg bar 10 comprises the coiled spring 18 which tends constantly to move the leg bar 10 upwardly. In order to control this upward movement of the bar 10, a pin or stud 38 is mounted upon said leg bar substantially at the upper end thereof and extends therefrom toward the frame plate 2. This pin is arranged to engage, at a certain period in the operation of the mechanism, a curved contact or cam plate 40 having one edge fixedly secured to the face of the frame plate 2 adjacent the bar 10 throughout the length of the plate. The coiled spring 18 is arranged to maintain the leg bar 10 in position longitudinally to hold the pin 38 yieldingly engaged with the curved plate 40 at a certain period in the operation of the mechanism. In order further to control the longitudinal upward movement of the leg bar 10, a second curved contact or cam plate 42 is secured to the face of the frame plate 2 adjacent the bar 10 inside the plate 40 and the pin 38 is arranged to engage the plate 42 at a certain period in the operation of the mechanism. The curved contact plate 40 has the shape shown clearly in Fig. 1. As shown in this figure, the right hand and intermediate portions of this plate are curved in the arc of a circle struck substantially about the axis of stud 6. From about the point x in said plate, to the left hand end of the plate, the plate is turned or bent inwardly with reference to this circular arc toward the axis of the stud as shown.

The contact plate 42 is preferably made of leaf spring material and is bent in a substantially circular arc as shown. In the embodiment of the invention illustrated, the radius of this arc is substantially the same as the distance from the right hand end of the plate to the axis of the stud 6. The center from which this arc is struck, however, is located to the left of the stud 6 so that the plate is located progressively nearer the stud from its left hand toward its right hand end. The right hand portion of the curved cam plate 42 is secured at its edge to the frame plate 2, leaving the left hand portion unattached. This cam plate is so formed and located on the frame plate 2 that the left hand end of the cam plate engages the plate 40 with a yielding pressure.

The front leg mechanism above described is operated from a crank 44 mounted on a spur gear 46 fixed to a stub shaft 47 journalled in a suitable bearing supported in the frame plate 2. With this gear meshes a spur gear 50 secured to a shaft 51 journalled in suitable bearings supported in the frame plates 2 and 4. This shaft may be rotated by any suitable mechanism driven by power such as a clock spring.

The crank 44 is connected by a link 52 with the leg bar 8, the link being pivoted to the leg bar by a pin 53. Starting with the parts of the front leg mechanism in the positions shown in Fig. 1, with the front leg straight, said mechanism will have the following mode of operation during the first quarter of a revolution of the gear 46 and the crank 44. The spring connected with the shaft 51 is arranged to rotate said shaft in a counter clockwise direction and this movement of the shaft 51 rotates the gear 46 in a clockwise direction through the connecting gear 50. The crank 44 mounted on the latter gear is thus driven in a clockwise direction. The link 52 is thereby moved longitudinally to the right, Fig. 1. This swings the leg bar 8 in a counter clockwise direction about the axis of the stud 6. The leg bar 8 is pivotally connected by pin 14 with the leg bar 16 and the bar 16 is pivotally connected by pin 17 with the leg bar 10. Because of this connection between the leg bar 8 and the leg bar 10, when the leg bar 8 is swung in a counter clockwise direction about the axis of the stud 6, the bar 10 is swung in the same direction about said axis therewith. During this movement of the bar 10, the said bar is held by the spring 18 in its limiting upper position with the pin 38 in engagement with the cam or contact plate 40 until said pin reaches substantially the point x in the plate. Since the bar 10 has no upward or downward movement with relation to the bar 8 during this swinging movement of the bar 10, the parts of the leg will be held in a substantially straight condition at this time and the foot member will be held substantially in the position shown in Fig. 1 with relation to leg bar 16. As above stated, the cam plate 40, from the point x to the left hand end of the plate is bent so that it extends toward the axis of the stud 6. After the point x is reached by the pin 38 in the swinging movement of the bar 10 in a counter clockwise direction, during the continued movement of said bar in said direction until the pin 38 passes the end of the plate 42, the bar 10 is forced downwardly along the stud 6 with relation to the bar 8 and the bar 16 is swung in a clockwise direction about the pin 14 with relation to the bar 10 to locate the same at a slight angle to said bar and the bar 22 is swung in a counter clockwise direction about the pin 24 with relation to the bar 16 to locate the same at a slight angle to said bar. By this movement of the bar 22, through the link 36, the foot member 32 is swung to a corresponding degree in a clockwise direction about the pin 34.

In a quarter of a revolution of the gear 46 and the crank 44 which produces these swinging movements, the entire system of bars 8, 10, 16 and 22 is swung about the stud 6 in a counter clockwise direction from the position shown in Fig. 1 to the position shown in Fig. 4 and the bar 16 is located with relation to the bar 10 and the bar 22 is located with relation to the bar 16 to give a relatively slight natural bend to the leg rearwardly. This bend gives natural positions to the parts of the leg as the leg is swung rearwardly.

In the latter part of the movement of the bar 10 about the stud 6 in a counter clockwise direction, the pin 38 engages the end of the resilient contact plate 42 which is held against the contact plate 40 with a resilient pressure and moves said end away from contact plate 40 sufficiently to allow the pin to pass beyond said end of plate 42. When the pin has passed beyond the end of contact plate 42, the said end snaps back into engagement with the plate 40. At the end of the first quarter of a revolution, the gear 46 and the crank 44, the bar 10 and the pin 38 on said bar will be substantially in the positions shown in Fig. 4.

During the next quarter of a revolution of the gear 46 and the crank 44, referring to Figs. 1 and 2, the link 52 is moved longitudinally forward or to the left, Fig. 1, the bar 10 is swung about the stud 6 in a clockwise direction and the entire front leg is swung forwardly. During the first part of this movement, the pin 38 is in engagement with the inner face of contact plate 40 for a brief

interval and then rides onto the inner face of the left hand end portion of contact plate 42 and, because of the formation of the plate 40, the slight bend in the leg is maintained until the pin 38 reaches the adjacent end of plate 42. Because of the curve along which this plate 42 is formed, and the position in which the plate is mounted with relation to the stud 6, the plate curves rapidly toward the axis of the stud from its left hand end to its right hand end. Therefore, as the bar 10 swings in a clockwise direction about the stud, the said bar is moved longitudinally downward along the stud 6 during the engagement of the pin 38 with the plate 42, thereby causing the bar 16 to swing in a clockwise direction about the pin 14, the bar 22 to swing in a counter clockwise direction about the pin 24 and the foot member 33 to swing in a clockwise direction about the pin 34, as the entire leg is swung forward to bend the leg in the manner shown in Fig. 2. This figure shows the parts of the leg mechanism in the positions which they assume just as the second quarter of a revolution of the gear 46 and the crank 44 is completed.

As the gear 46 and the crank 44 continue their revolution in a clockwise direction, thereby moving the link 52 further to the left, Fig. 1, the bar 10 is swung further in a clockwise direction about the axis of stud 6, the leg is swung farther forward about said axis and the leg is bent to a greater degree because of the formation of the curved plate 42 until the pin 38 reaches the end of said plate. As the pin rides off the rear end of said plate, the spring 18 acts to swing the bar 16 back into alignment with the bar 10 and to move the bar 10 upwardly until the pin 38 engages the curved contact plate 40. This swings the bar 16 with relation to the bar 10 about the pin 14 in a counter clockwise direction until the stop arm 20 engages the bar 10 to locate the bar 16 in substantial alignment with the bar 10. This movement of bar 16 with relation to bar 10 causes the bar 22 to swing in a clockwise direction about the pin 24 with relation to bar 16 into substantial alignment with the bar 16 and the bar 10. This movement of the bar 22 with relation to the bar 16 causes the foot member 32 to swing about the pivot pin 34 in a counter clockwise direction from the position shown in Fig. 2 to the position shown in Fig. 3. Thus immediately after the pin 38 rides off the curved plate 42, the parts 10, 16 and 22 are moved to straighten the leg and the member 32 is moved to locate the sole of the foot in a position substantially at right angles to the length of leg. Fig. 3 shows the position of the leg as a whole and the positions of the several parts of the leg mechanism when the leg has reached the end of its forward swinging movement. The gear 46 and the crank 44 at this time have come to the end of the third quarter of a revolution.

As the movement of the gear 46 and the crank 44 in a clockwise direction is continued from this point, thereby moving the link 52 to the right, Fig. 1, the bar 10 is held by the spring 18 in position longitudinally with the pin 38 in engagement with the plate 40 and said bar is swung in a counter clockwise direction about the axis of stud 6 to swing the leg rearwardly. The portion of the contact plate 40 engaged by the pin 38 during the greater part of this movement of the bar 10 is formed to conform substantially to an arc having its center in the axis of stud 6 and the radius of the arc is such that when the pin 38 engages said plate, the bar 10 will be located in substantially the longitudinal position shown in Fig. 3 to maintain the leg in straightened condition as the leg is swung rearwardly into the position shown in Fig. 1. This completes a cycle of operations of the front leg mechanism produced by rotating the gear 46 and the crank 44 through a complete revolution.

The rear leg mechanism is similar in construction and mode of operation to the front leg mechanism. Referring particularly to Figs. 1 and 2, the rear leg mechanism comprises a stud 6*a* secured in the frame plate 2 and extending outwardly from said plate. Pivoted at its upper end on said stud to swing about the axis of the stud is an inner leg bar 8*a*. An outer leg bar 10*a* is also pivoted to swing about the axis of the stud, the latter leg bar having a slot 12*a* extending longitudinally of the bar through which the stud extends so that the bar is movable longitudinally on the stud. To the lower end of the inner leg bar 8*a* is pivoted, on the pin 14*a*, the upper end of the leg bar 16*a* to swing with relation to the leg bar 8*a* about a horizontal axis. The leg bar 16*a* is also pivoted at its upper end of pin 17*a* to the lower end of the outer leg bar 10*a*. The bar 16*a* is acted upon by a coiled spring 18*a* connecting the latter bar with the bar 10*a* which tends to swing the bar 16*a* in a clockwise direction about the pin 14*a*. The movement of the leg bar 16*a* about said axis, under the action of the clock spring, is limited by a stop projection 20*a* formed on the bar 16*a* and arranged to enage the bar 10*a*.

A foot member 32*a* having a sole portion 33*a* is pivotally supported by means of a pin 34*a* on the lower end of the leg bar 16*a*. The angular position of the foot member 32*a* on the leg bar 16*a* during the operation of the leg mechanism is controlled by a link 36*a*. The upper end of the link 36*a* is pivoted by means of a pin 37*a* to the lower end of the bar 8*a* and the lower end of the link is pivoted by means of a pin 39*a* to the forward upper portion of the foot member. With the construction above described, the angular position of the leg bar 16*a* with relation to the leg bar 10*a* and the angular position of the foot member 32*a* with relation to the leg bar 16*a* are controlled by the longitudinal position of the leg bar 10*a* with relation to the leg bar 8*a*. When the bar 10*a* is held in its limiting upper position with relation to the bar 8*a*, the bar 16*a* will be located in a position substantially aligned with the bar 10*a* and the foot member 32*a* will be located in a position with its sole substantially perpendicular to the direction of the length of the leg bar 16*a* as shown in Fig. 2. When the bar 10*a* is forced longitudinally downward with relation to the bar 8*a*, the leg bar 16*a* is swung to the right about the pivot pin 14*a* with relation to the bar 10*a* at an angle to the latter bar as shown in Fig. 1 and the foot member 32*a* is swung in a clockwise direction about the pivot pin 34*a* to turn the sole portion with relation to the bar 16*a* into a position such as that shown in Fig. 1.

The mechanism for moving the leg bar 10*a* longitudinally with relation to the bar 8*a* and for controlling the longitudinal position of the leg bar 10*a* comprises the coiled spring 18*a* which tends constantly to move the leg bar 10*a* upwardly. In order to control the upward movement of the leg bar 10*a*, a pin or stud 38*a* is mounted on the upper end thereof and extends therefrom toward the frame plate 2. This pin is arranged to engage the inner face of a curved contact or cam plate 40*a* secured to the face of the frame plate 2 adjacent the bar 10*a*. This contact plate is arranged to be engaged by the pin 38*a* at a certain period in the operation of the mechanism. This contact plate, from the rear end thereof to the point *y* adjacent the forward end thereof, is curved in an arc of a circle having its center substantially in the axis of the stud 6*a*. The portion of said place extending downwardly and to the left from the point *y* is turned or bent from said circular arc formation toward the axis of stud 6*a*. The coiled spring 18*a* is arranged to maintain the bar 10*a* in position longitudinally to hold the pin 38*a* yieldingly engaged with the curved plate 40*a* during a predetermined interval in the movement of said bar about the axis of the stud 6*a*. In order further to control the longitudinal upward movement of the leg bar 10*a*, a second curved contact plate 42*a* is secured to the face of the frame plate 2 adjacent the bar 10*a* inside the plate 40*a* and the pin 38*a* is arranged to engage the plate 42*a* at a certain period in the operation of the mechanism. The right hand portion only of the contact plate 42*a* is attached to the frame plate 2 and the plate 42*a* is attached

to the frame plate **2** so that the left hand end thereof engages the plate **40***a* with a yielding pressure. The plate **42***a* is so constructed and located on the plate **2** that its distance from the axis of the stud **6***a* diminishes from the left hand to the right hand end of the plate.

The contact plate **40***a* has substantially the same shape and construction as the contact plate **40** and is mounted on the frame plate **2** in substantially the same position with relation to the axis of the stud **6***a* as the contact plate **40** is with relation to the axis of the stud **6**. The contact plate **42***a* has substantially the same construction and shape as the contact plate **42** and is mounted on the plate **2** in substantially the same position with relation to the axis of stud **6***a* and to the contact plate **40***a* as the contact plate **42** is to the axis of stud **6** and to the contact plate **40** and has the same mode of operation as plate **42**.

The rear leg mechanism above described is operated from the crank **44** mounted on the gear **46**. The mechanism connecting the crank with said rear leg mechanism comprises a link **54**, one end of which is pivoted to the crank and the other end of which is pivoted by a pin **56** to the lower arm of a reversing lever **58** pivoted on a stud **60** secured in the frame plate **2**. The upper arm of this lever is pivoted by means of a pin **62** to one end of a link **64** the other end of which is pivoted upon a pin **66** secured in the leg bar **8***a*.

With the parts of the mechanism in the positions shown in Fig. 1, the leg bars **8***a* and **10***a* then being in position with pin **38***a* in engagement with the contact plate **42***a*, and the leg bar **10***a* being partially depressed to locate the leg bar **16***a* in the rearwardly inclined position with relation to leg bar **10***a* as shown in said figure, during the next quarter of a revolution in a clockwise direction of the gear **46** and the crank **44**, the mechanism will operate as follows. During this period, the link **54** will be moved to the right, Fig. 1, the lever **58** will be swung in a counter clockwise direction about the stud **60**, the link **64** will be moved to the left and the leg bars **8***a* and **10***a* will be swung in a clockwise direction about the stud **6***a*. The rear leg will be thereby, as a whole, swung forwardly from the position shown in Fig. 1 by the swinging movements of the leg bars **8***a* and **10***a*. By the engagement of the pin **38***a* with the contact plate **42***a*, the leg bar **10***a* is moved downwardly with relation to the leg bar **8***a* thereby causing the leg bar **16***a* to swing further about the pin **14***a* in a counter clockwise direction. The swinging movement of the bar **10***a* about the stud **6***a*, at a predetermined point in this movement, carries the pin **38***a* out of engagement with the contact plate **42***a* and the spring **18***a* then moves the leg bar **10***a* upward to carry the pin **38***a* into contact with the contact plate **40***a* and at the same time swings the leg bars **16***a* forward with relation to the leg bars **8***a* and **10***a* about the pin **14***a* to straighten the rear leg. Fig. 5 shows the parts of the rear leg bar mechanism in the positions which they assume at the end of this quarter of a revolution of the crank **44**.

During the next quarter of a revolution of the gear **46** and the crank **44** in a clockwise direction, the link **54** is moved longitudinally to the left, the lever **58** is swung in a clockwise direction about the pin **60** and the link **64** is moved longitudinally to the right. By this movement of the link **64** the leg bars **10***a* and **8***a* are swung in a counter clockwise direction. During these movements of said leg bars, the rear leg, as a whole, is swung rearwardly, the leg bar **10***a* being maintained in its upper position with the pin **38***a* in engagement with the portion of the contact plate **40***a* which is struck on an arc having its center in the axis of the stud **6***a* so that the leg is maintained in a straight condition during its movement. At the end of the second quarter of a revolution of the crank **44**, the leg bars **8***a* and **10***a* are located substantially in the positions shown in Fig. 2 and the rear leg is in a substantially straight condition as shown in this figure.

During the third quarter of a revolution of the gear **46** and the crank **44**, in a clockwise direction from the position shown in Fig. 1, the link **54** is moved longitudinally farther to the left, the reversing lever **58** is rotated farther in a clockwise direction about the stud **60**, the link **64** is moved longitudinally farther to the right and the leg bars **8***a* and **10***a* are swung farther in a counterclockwise direction about the stud **6***a* from the positions shown in Fig. 2. During these movements of said leg bars, the pin **38***a* is maintained in engagement with the contact plate **40***a*. While said pin is engaged with the portion of said plate to the right of the point indicated at *y*, which portion is conformed to an arc having its center in the axis of the stud **6***a*, the rear leg is maintained in a substantially straight condition. When the pin **38***a* engages the portion of the plate **40** extending to the left of and below the point *y*, Fig. 2, the leg bar **10***a* is shifted downwardly with relation to leg bar **8***a* and the leg bar **16***a* is swung in a counterclockwise direction about the pin **14***a* to locate the same at an angle to the bar **10***a* as shown in Fig. 6. This movement of the leg bar **16***a* moves the foot member **32***a* in a clockwise direction with relation to the leg bar **16***a* about the pin **34***a* into a position such as that shown in the latter figure.

At a point in this third quarter of a revolution of the crank **44**, the pin **38***a* engages the upper face of the left hand end portion of the contact plate **42***a* and moves the same away from the plate **40***a* and then passes beyond the said end portion of contact plate **42***a* a relatively short distance to a position such as that shown in Fig. 6. Thus during this quarter of a revolution, the rear leg as a whole is swung rearwardly about the axis of the stud **6***a* from the position shown in Fig. 2 to the position shown in Fig. 6, the leg bar **16***a* is swung rearwardly with relation to the leg bar **10***a* and the foot member **32***a* is swung in a clockwise direction about the pin **34** from the position shown in Fig. 2 to the position shown in Fig. 6.

Thus during the third quarter of a revolution of the crank **44** the rear leg as a whole is swung rearwardly about the axis of stud **6***a* from the position shown in Fig. 2 to the position shown in Fig. 6. At the same time, the leg bar **16***a* is swung rearwardly with relation to the leg bar **10***a* about the pin **14***a* and the foot member **32** is swung in a clockwise direction with relation to the leg bar **16***a* from the positions shown in Fig. 2 to the position shown in Fig. 6.

During the last quarter of a revolution of the crank **44** in a clockwise direction, the link **54** is moved longitudinally to the right, Fig. 1, the reversing lever **58** is swung in a counter clockwise direction about the stud **60**, and the link **64** is moved longitudinally to the left. This movement of link **64** swings the leg bars **8***a* and **10***a* in a clockwise direction about the stud **6***a*. During the first part of the movement of the said leg bars in said direction, the pin **38***a* is in engagement with the contact plate **40***a* and then said pin is deflected onto the underside of the left hand end portion of the contact plate **42***a*. Thereafter the pin glides along the under surface of the contact plate **42***a* as shown in Fig. 1 until it reaches the right hand end portion of said plate. The contact plate **42***a* is so constructed and located with relation to the stud **6***a* that it approaches the axis of stud **6***a* from its left hand to its right hand end. Therefore, during the movement of the leg bar **10***a* in a clockwise direction while the pin **38***a* is engaged with the contact plate **42***a*, the said bar is forced downwardly to a greater and greater degree and the leg bar **16***a* is swung in a counter clockwise direction about the pin **14***a* with relation to the leg bar **10***a* until it reaches substantially the position shown in Fig. 1. During the swinging movement of the leg bar **16***a* the foot member **32***a* is swung about the pin **34***a* in a counter clockwise direction into the position shown in Fig. 1.

Fig. 1 shows the left front leg and Fig. 2 shows the left rear leg, each in a substantially straight condition extending from the body in a substantially vertical direction

with the corresponding foot resting on the ground, indicated at A.

Fig. 2 shows the left front leg bent to lift the leg bar 22 and the foot 32 as the leg is swung forwardly so that the foot clears the ground A as the lower portion of the leg bar 22 and the foot supported thereon sweep forwardly over the ground. This bending of the leg is produced primarily by the swinging of the leg bar 16 in a clockwise direction about the pin 14 with relation to the leg bars 8 and 10. Fig. 1 shows the left rear leg bent to lift the lower part of leg bar 16*a* and the foot 32*a* as the leg is swung forwardly so that the foot clears the ground A as the lower portion of the leg bar 16*a* and the foot supported thereon sweep forward over the ground. This bending of the rear leg is produced primarily by the swinging of the leg bar 16*a* in a counter-clockwise direction about the pin 14*a* with relation to the leg bars 8*a* and 10*a*.

From the above discussion of the swinging movements of the front and rear legs of the toy animal, the movements of the leg bar 16 of each front leg with relation to the leg bars 8 and 10 of the leg and the movements of the leg bar 16*a* of each rear leg with relation to the leg bars 8*a* and 10*a* of said leg, it will be understood that the legs all have their parts in alignment and their feet in positions on the leg bars 16 and 16*a* for engagement with the ground when the legs are swinging rearwardly so that when the feet contact with the ground or other support, the legs push the frame or body forwardly. Also when the legs are swung forwardly, the leg bar 16 of each front leg is located at an angle to the leg bars 8 and 10 of said leg and the leg bar 16*a* of each rear leg is located at an angle to the leg bars 8*a* and 10*a* of said leg to bend the legs and lift the lower portions of the legs and the feet supported thereby to allow these parts to sweep forward over the ground or other support.

With the above construction, the front leg, starting from a position such as that shown in Fig. 3, with the leg in a straight condition and with the foot in a position in which the sole is substantially perpendicular to the direction of the length of the leg as shown in said figure, has the following operation: The front leg is swung about the axis of the stud 6 in a counterclockwise direction with the leg in a straight condition by the swinging movements of the leg bars 8 and 10 in said direction about said axis until the pin 38 mounted on the leg bar 10 reaches the point X in the cam plate 40. During this swinging movement of the leg, said leg is maintained in a straight condition and the foot is maintained in the position with relation to the leg bar 22 shown in Fig. 3. During a part of this swinging movement of the leg, the foot 32 engages the ground or other support A as shown in Fig. 1 and pushes the body of the toy forward over the ground. The swinging movements of the leg bars 8 and 10 in a counter-clockwise direction is continued after the pin 38 reaches the point X on the cam plate 40 and the front leg is swung further in said direction about said axis. During this further swinging movement of the leg about the axis of the stud 6 in a counter-clockwise direction in which the pin 38 is carried beyond the point X on the cam plate 40, the leg is carried into the position shown in Fig. 4 and the leg is bent into the condition shown in this figure by the action of the cam controlled mechanism on the leg bar 10. During this movement of the leg, the foot 32 is swung slightly in a clockwise direction about the pivot pin 34.

Following the swinging of the front leg into the position shown in Fig. 4, the leg bars 8 and 10 are swung in a clockwise direction about the axis of the stud 6 and the leg is swung forwardly into the position shown in Fig. 2. During this forward movement of the leg, the leg is bent further into the condition shown in Fig. 2 by the action of the cam mechanism on the leg bar 10*a* to lift the path of movement of the lower part of the leg and that of the foot 32 supported thereon so that the foot will clear the ground or other support as it sweeps forward over said support. During this movement of the leg, the foot is moved further in a clockwise direction about the pivot pin 34 into the position shown in Fig. 2 to shift the forward portion of the sole 33 upwardly. After the leg reaches the position shown in Fig. 2, the clockwise swinging movements of the leg bars 8 and 10 are continued, thereby swinging the leg further forward and bending the same further until, at a predetermined point in the movement of the leg bar 10, through the action of the cam controlled mechanism on said leg bar when said leg bar has reached substanitally the angular position shown in Fig. 3 the leg is straightened as shown in this figure and the foot 32 is swung back in a counter-clockwise direction into the position shown in said figure. This completes the cycle of operations of the front leg mechanism.

Also, with the above construction, each rear leg, starting from a position such as that shown in Fig. 5 with the leg in a straight condition and with the foot 32*a* positioned about the pivot pin 34*a* to locate the sole substantially perpendicular to the direction of the length of the leg, as shown in said figure, has the following operation: Each rear leg is swung about the axis of the stud 6*a* in a counter-clockwise direction by the swinging movements of the leg bars 8*a* and 10*a* about said axis in said direction until the pin 38*a* mounted on the leg bar 10*a* reaches the point *y* in the cam plate 40*a*. During this movement, the leg is maintained in a straight condition and the foot is maintained in the angular position shown in Fig. 5 with relation to the direction of the length of the leg. During a part of this swinging movement of the leg, the foot 32*a* engages the ground A or other support as shown in Fig. 2 and pushes the body of the toy forward. The swinging movement of the leg bars 8*a* and 10*a* in a counter-clockwise direction is continued after the pin 38*a* reaches the point *y* on the cam plate 40*a* and the rear leg is swung further in said direction. During this further swinging movement of the leg about the axis of the stud in a counter-clockwise direction, the leg is carried into the position shown in Fig. 6. During this swinging movement of the leg, the leg is bent by the action of the cam mechanism on the leg bar 10*a* and the foot 32*a* is swung to a slight degree in a clockwise direction about the pivot pin 34*a*.

Following the swinging movement of the rear leg into the position shown in Fig. 6, the leg bars 8*a* and 10*a* are swung in a clockwise direction about the axis of the stud 6*a*, and the rear leg is thereby swung in a clockwise direction about said axis from the position shown in Fig. 6 into the position shown in Fig. 1. During this swinging movement of the leg, said leg is bent further to lift the paths of the lower portion of the leg and the foot 32*a* as shown in Fig. 1 to enable the foot to clear the ground as the leg is swung forward. During this swinging movement of the leg, the foot 32*a* is swung further in a clockwise direction about the pivot pin 34*a* into the angular position shown in Fig. 1 to lift the forward portion of the sole 33*a*.

The leg bars 8*a* and 10*a*, after the rear leg reaches the position shown in Fig. 1, are swung further in a clockwise direction about the axis of the stud 6*a*. As the leg bar 10*a* continues its swinging movement in a clockwise direction from the position shown in Fig. 1, at a predetermined point in the swinging movement of the leg bar when said leg bar reaches substantially the angular position shown in Fig. 5, through the action of the cam controlled mechanism on said leg bar, the leg is straightened and the foot 32*a* is restored to the position shown in Fig. 5 with relation to the direction of the length of the leg bar. This completes the cycle of operations of the rear leg mechanism.

In the above described mechanism, each leg is alternately bent and straightened in timed relation to the

swinging movements of the leg by a relatively simple, highly practical and efficient mechanism under control of the swinging movements imparted to the leg by the crank mechanism.

The walking mechanism applied to the outer side of the frame plate 4, as stated above, consists of a reversal of the structure applied to the outer side of the frame plate 2 such as would be seen by an observer looking into a plane mirror held in front of the plate 2, spaced from said plate and in a position substantially parallel with said plate with its reflecting surface facing said plate. This mechanism may be operated from a crank 68 fixed to the gear 70 mounted on a stub shaft 72 journalled in a bearing supported on the frame plate 4, the shaft 72 being located in axial alignment with the shaft 47. The crank 68 is located at the same distance from the axis of shaft 72 that the crank 44 is located from the axis of shaft 47. The gear 70 is a substantial duplicate of gear 46 and the gear 74 is a substantial duplicate of gear 50. This gear is driven from a gear 74 mounted on the end of the shaft 51 outside of the frame plate 4. The crank 68 is mounted on the gear 70 in a position diametrically opposite the position in which the crank 44 is mounted on the gear 46 so that the two front leg mechanisms respectively are operated to swing the front legs in opposite directions at the same time and the two rear leg mechanisms are operated to swing the rear legs in opposite directions at the same time.

The left hand portion of the frame shown in Figs. 1 and 2 is considered as representing the front of the animal and the leg mechanisms above described are the front and rear left leg mechanisms. The timing of the front and rear leg mechanisms on the left hand side of the frame with relation to each other has been fully explained above. The front and rear leg mechanisms on the right hand side of the frame have the same timing with relation to each other as the front and rear leg mechanisms on the left hand side of the frame.

Figures 9 and 10 illustrate diagrammatically the action of the present walking mechanisms as embodied in a four legged walking toy animal. Fig. 9 shows the positions assumed by the four legs of the walking mechanism at one point in the operation of said mechanism in simulating the walking operation of an animal. Fig. 10 shows the positions assumed by the four legs of the walking mechanism at another point in the operation of said mechanism in simulating the walking operation of an animal. These figures each show the front leg mechanisms at the left of the vertical center line of the figure and the rear leg mechanisms at the right of said center line. Fig. 9 shows in full lines the left front leg swung forward and bent at the knee, and the foot off the ground, the position in which said leg is shown in this figure corresponding with the position in which the left front leg is shown in Fig. 2. Fig. 9 also shows in dotted lines the lower portions of the right front leg with the leg straight and the foot resting on the ground, the position in which said leg is shown in this figure corresponding with the position of the left front leg as shown in Fig. 1. Fig. 9 also shows in full lines the left rear leg with the leg straight rearwardly and the foot resting on the ground, the position in which the leg is shown corresponding with the position of the left rear leg as shown in Fig. 1. Fig. 9 also shows in dotted lines the lower portions of the right rear leg with the leg bent rearwardly and the foot off the ground, the position of the said leg as shown in the figure corresponding with the showing of the left rear leg in Fig. 1.

Fig. 10 shows in full lines the left front leg, with the leg straight and the foot resting on the ground, the position of said leg as shown in this figure corresponding with the position of the left front leg as shown in Fig. 1. Fig. 10 shows in dotted lines, the lower portions of the right front leg, with the leg bent forwardly and the foot lifted off the ground, the position in which the leg is shown in this figure corresponding with the position in which the left front leg is shown in Fig. 2.

Fig. 10 shows in full lines the left rear leg with the leg swung rearwardly and the foot off the ground, the position of the said leg as shown in this figure corresponding with the position of the left rear leg as shown in Fig. 1. Fig. 10 also shows in dotted lines the lower portion of the right rear leg with the leg straight and the foot resting on the ground, the position of the said leg as shown in this figure corresponding with the position of the left rear leg as shown in Fig. 2.

In the above description, the pin 44 mounted on the gear 46 and the pin 68 mounted on the gear 70 are referred to as cranks for the sake of brevity. To give further definitions to the crank mechanisms, the pins 44 and 46 constitute crank pins and the gears 68 and 70 constitute crank disks upon which, respectively, the said crank pins are mounted.

It is to be understood that except as defined in the claims the invention is not limited to the particular construction and arrangement of parts of the illustrated embodiment of the invention but that the construction shown in the drawings is merely illustrative of the invention and that the invention may be embodied in other forms within the scope of the claims.

Having explained the nature and object of the invention and having specifically described a construction embodying the invention in its preferred form, what is claimed is:

1. A walking mechanism comprising a frame, a leg member pivoted to the frame to swing about a substantially horizontal axis fixed with relation to the frame, an upper leg bar pivoted to the frame to swing about said axis by the side of said member and also mounted for movement longitudinally with relation to said member, means for swinging said member and said leg bar together about said axis, means for moving said leg bar longitudinally with relation to said member during the swinging movements of said member and said leg bar, a second leg bar pivoted to said member to swing about a substantially horizontal axis and means controlled by the longitudinal movements of the first leg bar for swinging the second leg bar about its pivotal connection with said member.

2. A walking mechanism comprising a frame, a leg member pivoted to the frame to swing about a substantially horizontal axis fixed with relation to the frame, an upper leg bar pivoted to the frame to swing about said axis by the side of said member and also mounted for movement longitudinally with relation to said member, means for swinging said member and said leg bar together about said axis, means for moving the said leg bar longitudinally with relation to said member during the swinging movements of said member and said bar, a second leg bar pivoted to said member to swing about a substantially horizontal axis and means controlled by the longitudinal movements of the first mentioned leg bar for swinging the second leg bar about its pivotal connection with said member.

3. A walking mechanism comprising a frame, a leg member pivoted to the frame to swing about a substantially horizontal axis fixed with relation to the frame, an upper leg bar pivoted to the frame to swing about said axis by the side of said member and also mounted for movement longitudinally with relation to said member means for swinging said member and said leg bar together about said axis, means for moving said leg bar longitudinally with relation to said member including a spring acting on said leg bar and tending to move the same longitudinally with relation to said member, means for controlling the longitudinal movement of said leg bar under the action of the spring, a second leg bar pivoted to said member to swing about a substantially horizontal axis and means controlled by the longitudinal

movements of said first leg bar for swinging the second leg bar about its pivotal connection with said member.

4. A walking mechanism comprising a frame, a leg member pivoted to the frame to swing about a substantially horizontal axis fixed with relation to the frame, an upper leg bar pivoted to the frame to swing about said axis by the side of said member and also mounted for movement longitudinally with relation to said member, means for swinging said leg bar and said member together about said axis, means for moving said leg bar longitudinally with relation to said member including a spring acting on said leg bar and tending to move the same longitudinally in one direction with relation to said member, means controlled by the swinging of said leg bar into different positions for controlling the extent of longitudinal movements of said leg bar under the action of said spring, a second leg bar pivoted to said member to swing about a substantially horizontal axis and means controlled by the longitudinal movements of the first leg bar for swinging the second leg bar about its pivotal connection with said member.

5. A walking mechanism comprising a frame, a leg member pivoted to the frame to swing about a substantially horizontal axis fixed with relation to the frame, an upper leg bar pivoted to the frame to swing about said axis by the side of said leg member and also mounted for movement longitudinally with relation to said member, means for swinging said member and said leg bar together about said axis, means for moving said leg bar longitudinally with relation to said member during the swinging movements of said member and said leg bar, means for controlling the extent of said longitudinal movements of said leg bar, a second leg bar pivoted at its upper end to the lower end of said leg member to swing about a substantially horizontal axis and means controlled by the longitudinal movements of the first leg bar for swinging the second leg bar about its pivotal connection with said member.

6. A walking mechanism comprising a frame, a leg member pivoted to the frame to swing about a substantially horizontal axis fixed with relation to the frame, an upper leg bar pivoted to the frame to swing about said axis by the side of said leg member and also mounted for movement longitudinally with relation to said leg member, means for swinging said member and said leg bar together about said axis, means for moving said leg bar longitudinally with relation to said member during the swinging movements of said leg bar and said member, means for producing variations in the extent of the longitudinal movements imparted to said leg bar during the swinging movements of said member and said leg bar, a second leg bar pivoted at its upper end to the lower end of said member to swing about a substantially horizontal axis and means controlled by the longitudinal movements of the first leg bar for swinging the second leg bar to different extents about its pivotal connection with said member.

7. A walking mechanism comprising a frame, an upper leg bar pivoted to the frame to swing on a substantially horizontal axis fixed with relation to the frame, a second upper leg bar pivoted to the frame by the side of said first leg bar to swing about said axis and also mounted for movement longitudinally with relation to said first leg bar, means for swinging said leg bars about said axis, means for moving the second leg bar longitudinally with relation to said first leg bar during the swinging movements of said leg bars, means for producing variations in the extent of the longitudinal movements imparted to the second leg bar during the swinging movements of the latter bar including a member attached to the frame and having a cam face and a contact device carried by the second leg bar for engagement with said cam face during the swinging movements of said leg bar to limit the longitudinal movements of the leg bar, a third leg bar pivoted at its upper end to the lower end of said first leg bar to swing about a substantially horizontal axis and means controlled by the longitudinal movements of the second leg bar for swinging the third leg bar about its pivotal connection with the first leg bar.

8. A walking mechanism comprising a frame, an upper leg bar pivoted about the frame to swing on a substantially horizontal axis fixed with relation to the frame, a second upper leg bar pivoted on the frame to swing about said axis by the side of said first leg bar and also mounted for longitudinal movement with relation to said first bar, means for swinging said leg bars together about said axis, mechanism for shifting the second leg bar into different longitudinal positions during the swinging movements of said leg bars about said axis, a third leg bar pivoted at its upper end to the lower end of said first leg bar to swing with relation to said first bar on a substantially horizontal axis and means for pivoting the upper end of the third leg bar to the lower end of the second leg bar to swing with relation thereto about a substantially horizontal axis spaced laterally from the latter axis.

9. A walking mechanism comprising a frame, an upper leg bar pivoted on the frame to swing about a substantially horizontal axis fixed with relation to the frame, a second upper leg bar pivoted on the frame to swing about said axis by the side of said first bar and also mounted for longitudinal movement with relation to said first bar, means for swinging said bars together about said axis, mechanism for varying the longitudinal position of the second leg bar with relation to the first leg bar during the swinging movements of said bar including a cam mounted on said frame and a contact element mounted on said second leg bar for engaging said cam, a third leg bar pivoted to said first leg bar to swing with relation to the latter bar about a substantially horizontal axis, and means controlled by the longitudinal position of the second leg bar for swinging the third leg bar about the latter axis.

10. A walking mechanism comprising a frame, an upper leg bar pivoted on the frame to swing about a substantially horizontal axis fixed with relation to the frame, a second upper leg bar pivoted on the frame to swing about said axis by the side of said first bar and also mounted for longitudinal movement with relation to said first bar; means for swinging said bars together about said axis, mechanism for varying the longitudinal position of the second leg bar with relation to the first leg bar during the swinging movements of said bars including a cam mounted on said frame for controlling the longitudinal position of the second leg bar during a portion of the swinging movements of the leg bars and a second cam mounted on said frame for controlling the longitudinal position of the second leg bar during another portion of the swinging movements of the leg bars, a third leg bar pivoted to said second leg bar to swing about a substantially horizontal axis and means controlled by the longitudinal position of the second leg bar for swinging said third leg bar about said horizontal axis.

11. A walking mechanism comprising a frame, a single leg mechanism having an upper leg bar pivoted to the frame to swing on a substantially horizontal axis fixed with relation to the frame, a second upper leg bar pivoted to the frame to swing about said axis by the side of said first leg bar and also mounted for movement longitudinally with relation to said first leg bar, means for swinging said leg bars about said axis, means for moving the second leg bar longitudinally with relation to said first leg bar during the swinging movements of said leg bars, a third leg bar pivoted at its upper end to the lower end of said first leg bar to swing about a substantially horizontal axis, means controlled by the longitudinal movements of the second leg bar for swinging the third leg bar about its pivotal connection with the first leg bar, a fourth element pivotally supported on said third leg

bar and means for swinging said element about its pivotal connection with said third bar in accordance with the pivotal movement of the third bar.

12. A walking machanism comprising a frame, a single leg mechanism having an upper leg bar pivoted to the frame to swing on a substantially horizontal axis fixed with relation to the frame, a second upper leg bar pivoted to the frame to swing about said axis by the side of said first leg bar and also mounted for movement longitudinally with relation to said first leg bar, means for swinging said leg bars about said axis, means for moving the second leg bar longitudinally with relation to said first leg bar during the swinging movements of said leg bars, a third leg bar pivoted at its upper end to the lower end of said first leg bar to swing about a substantially horizontal axis, means controlled by the longitudinal movements of the second leg bar for swinging the third leg bar about its pivotal connection with the first leg bar, a fourth element pivotally supported on said third leg bar and a link pivotally connected at one end with said second leg bar and at its other end with said fourth element for swinging said fourth element about its pivotal connection with said third leg bar in accordance with the pivotal movement of said third bar.

13. A walking mechanism comprising a frame, a single leg mechanism having an upper leg bar pivoted to the frame to swing on a substantially horizontal axis fixed with relation to the frame, a second upper leg bar pivoted to the frame to swing about said axis by the side of said first leg bar and also mounted for movement longitudinally with relation to said first leg bar, means for swinging said leg bars about said axis, means for moving the second leg bar longitudinally with relation to said first leg bar during the swinging movements of said leg bars, a third leg bar pivoted at its upper end to the lower end of said first leg bar to swing about a substantially horizontal axis, means controlled by the longitudinal movements of the second leg bar for swinging the third leg bar about its pivotal connection with the first leg bar, a fourth leg bar pivotally supported on said third leg bar and means operated by the movement of said third bar about its pivotal connection with the first bar for swinging said fourth bar about its pivotal connection with said third bar.

14. A walking mechanism comprising a frame, a single leg mechanism having an upper leg bar pivoted to the frame to swing on a substantially horizontal axis fixed with relation to the frame, a second upper leg bar pivoted to the frame to swing about said axis by the side of said first leg bar and also mounted for movement longitudinally with relation to said first leg bar, means for swinging said leg bars about said axis, means for moving the second leg bar longitudinally with relation to said first leg bar during the swinging movements of said leg bars, a third leg bar pivoted at its upper end to the lower end of said first leg bar to swing about a substantially horizontal axis, means controlled by the longitudinal movements of the second leg bar for swinging the third leg bar about its pivotal connection with the first leg bar, a fourth leg bar pivotally connected, at its upper end, with the lower end of the third leg bar and means operated by the swinging movements of the third leg bar for swinging the fourth bar with relation to the third bar.

15. A walking mechanism comprising a frame, a single leg mechanism having an upper leg bar pivoted to the frame to swing on a substantially horizontal axis fixed with relation to the frame, a second upper leg bar pivoted to the frame to swing about said axis by the side of said first leg bar and also mounted for movement longitudinally with relation to said first leg bar, means for swinging said leg bars about said axis, means for moving the second leg bar longitudinally with relation to said first leg bar during the swinging movements of said leg bars, a third leg bar pivoted at its upper end to the lower end of said first leg bar to swing about a substantially horizontal axis, means controlled by the longitudinal movements of the second leg bar for swinging the third leg bar about its pivotal connection with the first leg bar, a fourth leg bar pivotally supported on said third leg bar, and a link connecting the second leg bar with the fourth leg bar for swinging the fourth bar about its pivotal connection with the third bar during the swinging movements of the third bar.

16. A walking mechanism comprising a frame, a single leg mechanism having an upper leg bar pivoted to the frame to swing on a substantially horizontal axis fixed with relation to the frame, a second upper leg bar pivoted to the frame to swing about said axis by the side of said first leg bar and also mounted for movement longitudinally with relation to said first leg bar, means for swinging said leg bars about said axis, means for moving the second leg bar longitudinally with relation to said first leg bar during the swinging movements of said leg bars, a third leg bar pivoted at its upper end to the lower end of said first leg bar to swing about a substantially horizontal axis, means controlled by the longitudinal movements of the second leg bar for swinging the third leg bar about its pivotal connection with the first leg bar, a foot pivotally supported on the lower end of said third leg bar and means for swinging the foot about its pivotal connection with the third leg bar as the third bar is swung about its pivotal connection with the first bar.

17. A walking mechanism comprising a frame, a single leg mechanism having an upper leg bar pivoted to the frame to swing on a substantially horizontal axis fixed with relation to the frame, a second upper bar pivoted to the frame to swing about said axis by the side of said first leg bar and also mounted for movement longitudinally with relation to said first leg bar, means for swinging said leg bars about said axis, means for moving the second leg bar longitudinally with relation to said first leg bar during the swinging movements of said leg bars, a third leg bar pivoted at its upper end to the lower end of said first leg bar to swing about a substantially horizontal axis, means controlled by the longitudinal movements of the second leg bar for swinging the third leg bar about its pivotal connection with the first leg bar, a foot pivotally supported on the lower end of said third leg bar and a link pivotally connected at one end with the first leg bar and at the other end with the foot for swinging the foot about its pivotal connection with the third leg bar as the third bar is swung about its pivotal connection with the first bar.

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