

W. F. Goodwin

Automatic Toy.

Patented Jan. 22, 1867.

N<sup>o</sup> 61416.

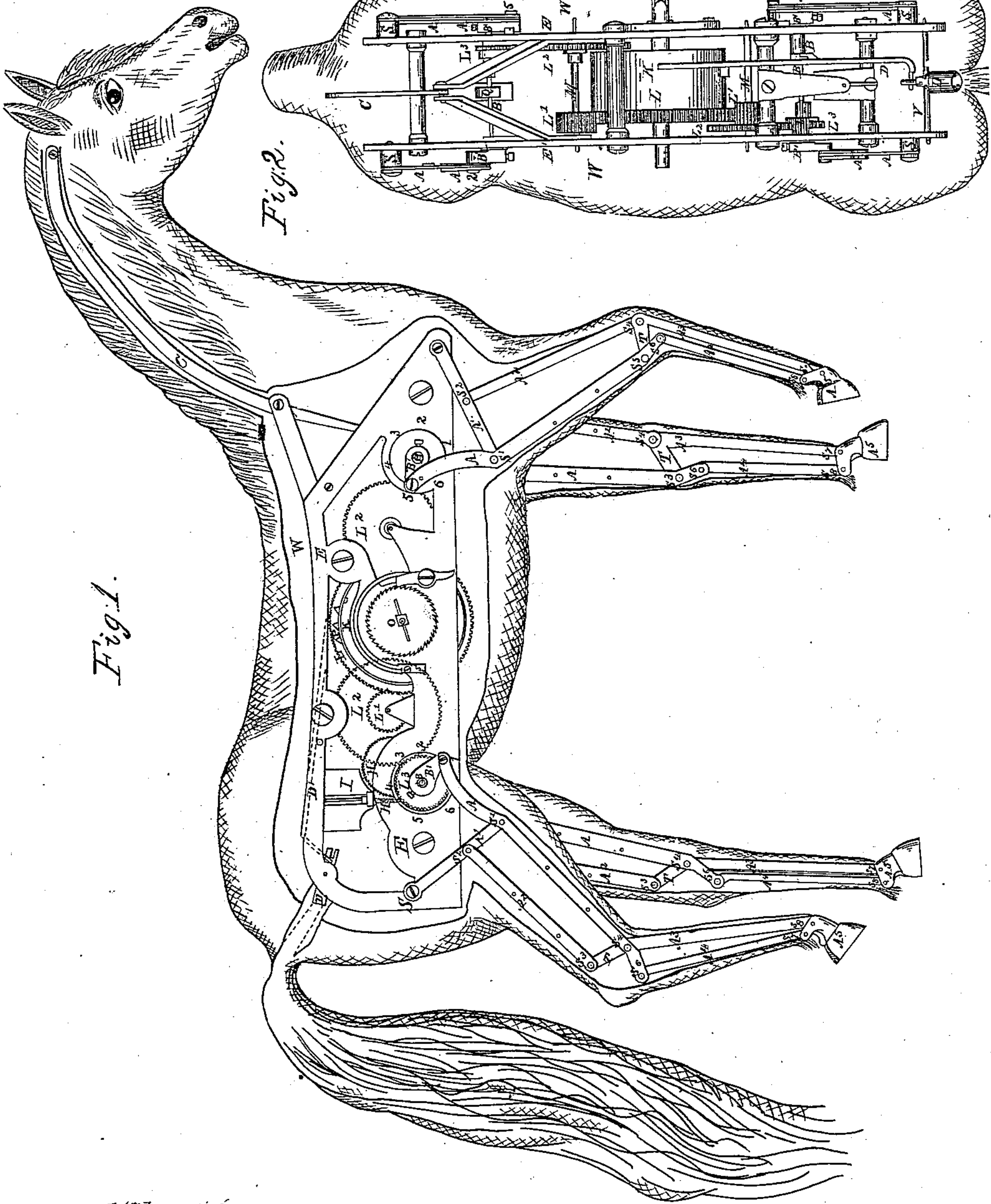


Fig. 1.

Fig. 2.

Witnesses

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WILLIAM F. GOODWIN, OF WASHINGTON, DISTRICT OF COLUMBIA.

*Letters Patent No. 61,416, dated January 22, 1867.*

## AUTOMATIC TOY.

*The Schedule referred to in these Letters Patent and making part of the same.*

### TO ALL WHOM IT MAY CONCERN :

Be it known that I, WILLIAM F. GOODWIN, of the city and county of Washington, and District of Columbia, have invented a new improvement in mechanical movements to be applied to Automaton Toys and Hobby Horses; and I do hereby declare the following to be a full and exact description of the same, reference being had to the accompanying drawings, which are made part of this specification, and in which—

Figure 1 may represent a toy or hobby horse embodying my improvement, showing a vertical longitudinal section through the side and legs of the toy, and showing a side view of the apparatus by which it is operated.

Figure 2 is a top view of the same, showing a vertical longitudinal section through the top of the body, the back being removed to show a top view of the driving apparatus as arranged in the body of the toy, and by which motion is imparted to the legs, head, and tail of the same.

My invention consists in a novel method of applying mechanical movements to automaton toys, made in the image of various animals, whereby the toy is caused to move the legs, head, and tail in the act of walking and trotting, after the manner of the animal which the toy is made to imitate.

To enable others skilled in the art to which my invention appertains to fully understand and use the same, I will proceed to describe it in connection with the accompanying drawings.

The letter W may represent the covering by which the toy is formed into proper shape, which may be made of wood or other suitable material. Letter E may represent metal plates or pieces of sheet brass or iron placed in each side of the body to afford journal bearing for the moving apparatus. Letter K may represent the box which contains the springs. Letter O may represent the key-post on which the spring is wound up. Letter L may represent a gear-wheel, attached to the box K, and turned by the spring, which is enclosed in the box. Letter L, L<sup>1</sup>, L<sup>2</sup>, and L<sup>3</sup>, may represent gear-wheels, by the means of which the motion is multiplied and imparted to the shafts B and cranks B', the rotating of which imparts motion to the legs. Letters A, A<sup>1</sup>, A<sup>2</sup>, A<sup>3</sup>, A<sup>4</sup>, and A<sup>5</sup>, may represent the bars of the leg and the foot.

Similar letters of reference may represent corresponding parts in the two figures.

This invention can be applied to toys made in the image of a variety of animals, either quadruped or biped. I have selected the horse as the animal most appropriate by which to illustrate my invention, supposing that it will be most generally used in toy and hobby horses made for children to play with. The body of the toy may be made of wood, or papier maché, or India rubber, or any other suitable material. The legs may be made of rubber, cloth, or wood, jointed at the joints, or leather, or any flexible material, or any material made flexible by making the leg in pieces and joining it together by hinge joints. The plates E and E' are shaped to adapt them to the shape of the toy, and to afford bearings and points of attachment for the several parts of the apparatus attached to them. The box K is placed between the plates E E' near the centre, and is held in position by the shaft O, on which it is mounted. The shaft O has journals on its ends, which are fitted into suitable holes in the plates E and E'. One end of the shaft O projects through the plate, and is squared to receive a key. The spring is attached or locked to the shaft O and box K in the usual manner of attaching a clock-spring, and is wound up by a key, and held by a ratchet; and the operation of the spring is the same as the spring of a clock. The gear-wheel L is mounted on the end of the box K, and rotates with the same. The pinion-wheel L<sup>1</sup> is mounted on the shaft M, and in gears with the wheel L. The gear-wheel L<sup>2</sup> is also mounted on the shaft M, and rotates with the same. The wheel L<sup>3</sup> is mounted on the shaft B, in gear with the wheel L<sup>2</sup>. The shaft B is provided with cranks marked B', one on each end of the shaft. The cranks are placed on each end of the shaft B, in reversed positions to each other, for the purpose of giving to the legs the proper alternating movements. By the arrangement of gear-wheels of different diameter, through which motion is imparted from the wheel L to the shaft B, the number of revolutions are multiplied, causing the shaft B, with its cranks B', to make a greater number of revolutions in the same time than is made by the wheel L, this arrangement being necessary in order to make the toy operate as long as possible at each winding of the spring.

Similar arrangements of gear-wheels and shafts are employed to operate both the front and the rear legs; and I have therefore used the same letters to indicate similar parts in the front and rear apparatus, the description of each being the same.



The bars A, A<sup>1</sup>, A<sup>2</sup>, A<sup>3</sup>, and A<sup>4</sup>, when joined together by hinge joints, form the frame of the leg. A<sup>5</sup> represents the foot hinged to the lower extremities of the bars A<sup>3</sup> and A<sup>4</sup>. The top end of the short bar A<sup>1</sup> is pivoted to the stud S, which represents the shoulder and stifle joints. The bar A is pivoted or journalled at its top end on the wrist of the crank B', and to the swinging end of the bar A<sup>1</sup>, at a point near two-fifths of its length, measuring from the top; and at its elbow, near its lower end, to the projection on the end of the bar A<sup>3</sup>, at the knee joint on the front leg; and to the bend or elbow of the bar A<sup>3</sup>, at the knee joint in the rear leg; and at its lower extremity, to the top of the bar A<sup>4</sup>, in both front and rear legs. The top end of the bar A<sup>2</sup> is attached to the bar A<sup>1</sup> by a hinge joint; and at its lower extremity to the bend or elbow at the top of the bar A<sup>3</sup> in the front leg; and in the rear leg the lower end of the bar A<sup>2</sup> is attached to the top end of the bar A<sup>3</sup>. The lower ends of the bars A<sup>3</sup> and A<sup>4</sup> are pivoted or hinged to the foot A<sup>5</sup>, which represents the pastern joint. The positions of the front and rear legs are reversed to each other, the top end of the bar A<sup>1</sup> of the front leg being pivoted on the stud S on the point of the shoulder in front of its crank B', and the bar A<sup>1</sup> of the rear leg being pivoted to the stud S on the stifle in rear of its crank B'. The bars A and A<sup>3</sup> of the front and rear legs differ in form and manner of attachment at the knee joints; the bar A of the front leg is the rear bar of the leg, having its lower end bent forward, and attached at its bend to the end of the projection T, on the top of the bar A<sup>3</sup>; the bend of the bar A<sup>3</sup> is attached to the lower end of the bar A<sup>2</sup>, which arrangement causes the knee to bend forward when the bar A is operated by its crank B', the rotating of which imparts to the leg its reciprocating and vibrating motions. The bar A of the rear leg is the front bar of the leg, having its lower end bent backward and attached at its bend to the bend near the top of the bar A<sup>3</sup>; the top or projecting end of the bar A<sup>3</sup> is attached to the lower end of the bar A<sup>2</sup>, by which arrangement the knee joint of the rear leg is caused to bend backward when operated by its crank B', the rotating of which imparts to the rear leg its reciprocating and vibrating movements. C is a bar, bent to adapt it to the curve of the neck, which serves to support and operate the head and neck. The bar C is pivoted or jointed at a point in front of the withers, marked V, making the joint of the neck. The lower end of the bar C is operated by the cam q on the shaft B, which causes the neck and head to vibrate. D is a lever, pivoted on the shaft or pin Y, having a hole in its outer end to receive the tail, and a slot in its inner end to receive the end of the lever D', by which it is operated. The lever D' is pivoted on the stud J, and is operated by the projections P on the box K, serving to vibrate the tail. I is a fan, operated by the toothed wheel H, operating in the screw H', and serves to regulate the movements of the apparatus.

Having thus described the construction of the apparatus, I will proceed to describe the movements of the same. When the spring is wound up, the wheel L rotates, turning backwards; the wheel L, being in gear with the wheels L<sup>1</sup> on the shafts M, causes the latter to turn forward; the wheels L<sup>2</sup>, being mounted on the shafts M, rotate with the shafts, also turning forward; the wheels L<sup>2</sup>, being in gear with the wheels L<sup>3</sup> on the shaft B, cause the latter to turn backward; the wheels L<sup>3</sup>, being mounted on the shafts B, cause the shafts to turn on their journals; the cranks B', being mounted on the ends of the shafts B, are rotated by the shafts, the swinging ends of the cranks, in their overturn, turning toward the rear of the toy, as indicated by figures 1, 2, 3, 4, 5, and 6, arranged around the circle of rotation of the wrists of the cranks, the movement commencing at figure 1. The rotating of the cranks B' serves to impart the vibrating and reciprocating motions to the leg and foot.

I will now describe the movements of the front leg and foot, and afterwards I will describe the movements of the rear leg and foot. The top end of the bar A of the front leg is pivoted or journalled on the wrists of the crank B', and is carried around by the rotating of the crank, which causes the top end of the bar to move to and from the pivot S, which latter is the centre of motion for the leg. In fig. 1 the right leg is represented as in the act of stepping forward, the knee being bent, having finished its forward movement, and the foot elevated to its highest point, the top end of the bar A having reached its furthest point from the pivot S, the wrist of the crank having reached figure 5 in its circle, and the knee joints S<sup>3</sup> and S<sup>4</sup> having reached their highest and nearest point to the pivot S; (the crank of the left leg is at figure 2.) When the wrist of the crank is moving from 5 to 6, carrying the top of the bar downward and forward toward the pivot S, the bar A being hinged or pivoted to the swinging end of the bar A<sup>1</sup>, the pivot marked S<sup>1</sup> swings on the pivot S<sup>1</sup>, pushing the swinging end of the bar A<sup>1</sup>, on which is the pivot S<sup>1</sup>, down from the centre of the shaft B, which is the centre around which the top of the bar A moves, causing the lower end of the bar A to move downward from the pivot S, pushing the swinging end of the projection T, and the bar A<sup>4</sup>, and projection from the foot-pivot marked S<sup>3</sup> down with it. The bar A<sup>1</sup>, being pivoted on the stud S at one end, and to the bar A at the other end, vibrates with the bar A, and serves to hold the pivots S<sup>1</sup> and S<sup>2</sup> always at the same distance from the pivot S or centre of motion. The bar A<sup>2</sup> being pivoted to the bar A<sup>1</sup> at a point nearer the pivot S, the pivot marked S<sup>2</sup> does not move so fast or so far as the bar A; the lower end of the bar A<sup>2</sup> being pivoted to the bend or elbow of the bar A<sup>3</sup>, the pivot marked S<sup>4</sup> serves to hold up the bar A<sup>3</sup>; the pivot or joint S<sup>4</sup>, not moving so fast or so far from the pivot S as the pivot S<sup>3</sup> on the end of the projection T, causes the bar A<sup>3</sup> to swing on the pivot S<sup>4</sup>; the end of the projection T, being pushed down by the bar A, moves faster and farther from the centre of motion than the bend or pivot S<sup>4</sup>, causing the lower end of the bar A<sup>3</sup> to move forward, straightening the leg, and causing the foot to descend to the ground. When the top end of the bar A has reached figure 6, the toe of the foot has reached the ground, (and the top of the bar A of the left leg is at figure 3.) The weight of the fore parts of the toy changes from the left to the right foot. When the top of the bar A is moving from 6 to 1, swinging on its pivot S<sup>1</sup>, the lower end swings back, drawing with it the knee joint, straightening the joint or pivot S<sup>6</sup>, pushing down the bar A<sup>4</sup>, which pushes down the end of the projection S<sup>3</sup>, and causes the foot to swing on its pivot S<sup>7</sup>, thus straightening the leg and levelling the foot, (the top of the bar A of the left leg having reached figure 4;) in this position the weight of the fore part of the body is on the right foot, the left having raised from the ground,



and moving forward. When the top of the bar A of the right leg is at figure 2, the top of the bar A of the left leg is at figure 5, and the positions of the legs are reversed, the right leg occupying the position of the left, as represented in fig. 1, and the left leg assuming the position of the right leg, as shown in fig. 1. When the top of the bar A of the right leg has reached figure 3, and the top of the bar A of the left leg having reached figure 6, the step is finished, and the weight changes to the left foot. When the top of the bar A of the right leg reaches figure 5, the top of the bar A of the left leg having reached figure 2, the legs are in the position represented in the drawings. When the knee is bending, the joint  $S^3$  moves toward the joint  $S^4$ , drawing up the rod  $A^4$ , which draws up the end of the projection from the foot or joint  $S^3$ , causing the foot to swing on its pivot or pastern joint  $S^7$ , thus turning the foot back, and holding it up in the act of stepping forward. The movements of the rear or hind legs are similar to those of the fore legs, with this exception: the positions of the legs being reversed, the pivot S of the hind leg being situated in the rear of its crank  $B'$ , the gambrel or elbow joint bends back instead of forward, in imitation of the hind leg of a horse, while in the fore leg the knee joint bends forward, imitating the fore leg of a horse, the only difference in the form of the bars and manner of putting them together between the front and hind leg being at the gambrel or elbow joint. The bars A and  $A^3$  of the hind leg cross each other, and are pivoted or jointed together, forming the gambrel joint; the bar  $A^3$ , being pivoted to the top end of the bar  $A^3$ , or projection T, serves to hold the projecting end of the bar  $A^3$ , serving as a pivot for the same; the bar A, being operated by the crank  $B'$ , moves faster and further than the bar  $A^2$ , which serves to bend and straighten the leg, the bar  $A^4$  being in the rear of the bar  $A^3$ , the same as in the fore leg, and being attached to the projecting end of the bar A, which crosses the bar  $A^3$ , projecting backward instead of forward, thus differing from the fore leg; the lower end of the bar  $A^4$ , being attached to the foot in the same manner as in the fore leg, serves to turn the foot back, and to hold it up in the act of stepping forward, operating it in the same manner as the fore foot. By these differences of arrangements in the fore and hind legs of the toy, it is made to walk with all four of its legs, imitating the movements of the legs of the horse when the bars A are acted upon by the rotation of the cranks  $B'$ , as described and shown. The cam projections on the shaft B operating on the end of the bar C causes the neck and head to vibrate up and down at every step. The projections P on the box K operate on the end of the lever  $D'$ , and serve to vibrate the tail, causing it to move up and down three times in every revolution of the box K.

In different sizes and kinds of toys, various means will be employed to impart the rotary movements to the cranks  $B'$ . In hobby horses of large size, the spring or driving power will be mounted on the axle of a wagon or cart, and the rotating motions imparted to the cranks  $B'$  by means of a chain or belt passing over a pulley on the wagon, and over a pulley on the shaft B in the hobby horse. This means of operating the cranks may also be used in small toys, when wagons are attached to them, as it would be cheaper, there being no machinery in the toy but the shafts B, and cranks  $B'$ , and the pulleys and connecting-chain or rod, by which the cranks are operated, and the means by which the head and tail are operated, all the driving apparatus used to impart the rotary motion to the shafts B and cranks  $B'$  being mounted on the wagon, the rotary motion being communicated to the pulleys in the toy by means of chains or belts, as before described.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. Constructing the legs of toys or hobby horses with bars or pieces, joining them together, making hinged or vibrating joints at the several points where the legs are required to bend, so that when attached or pivoted on the studs S, or their equivalents, on the shoulders and hips, and acted upon by the rotating of the cranks  $B'$ , the legs are made to move, bending all the joints, raising and turning the foot, stepping, walking, and trotting with both the fore and hind legs and feet, in imitation of the movements of the horse or animal which the toy is made to represent, in the manner and for the purpose substantially as described.

2. The cranks  $B'$ , or their equivalents, operated in any manner or by any means whereby they can be made to rotate, the rotating of which imparts to the legs their vibrating and reciprocating motions, arranged to operate in the manner and for the purpose substantially as described.

WM. F. GOODWIN.

Witnesses:

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ADD'N M. SMITH.