



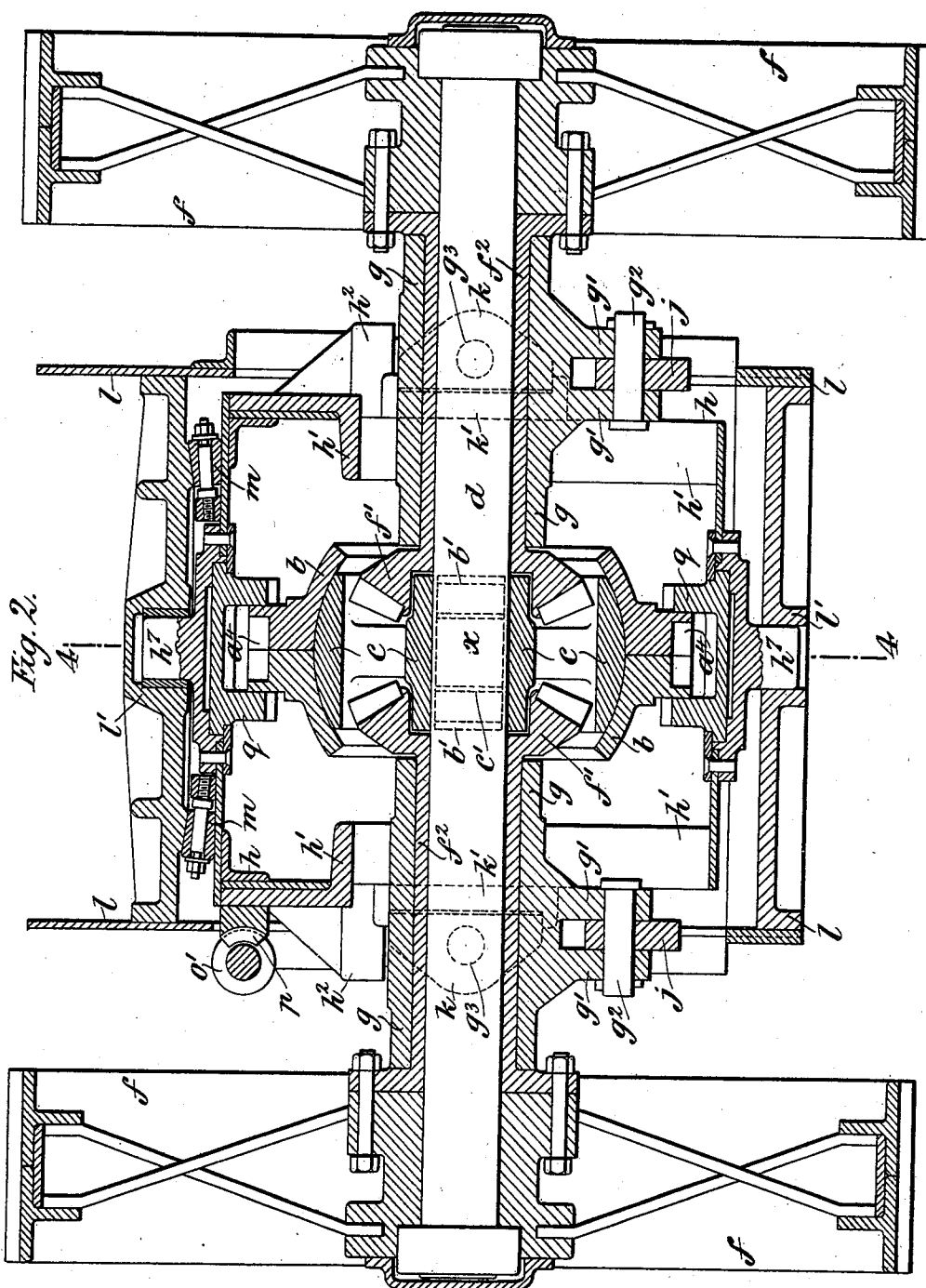
(No Model.)

B. J. DIPLOCK.  
LOCOMOTIVE.

4 Sheets—Sheet 2.

No. 602,310.

Patented Apr. 12, 1898.



Witnesses.  
E. J. Ballou  
A. M. Perkins.

Inventor.  
B. J. Diplock  
By his attorneys  
Pashon, Davidson & Wright

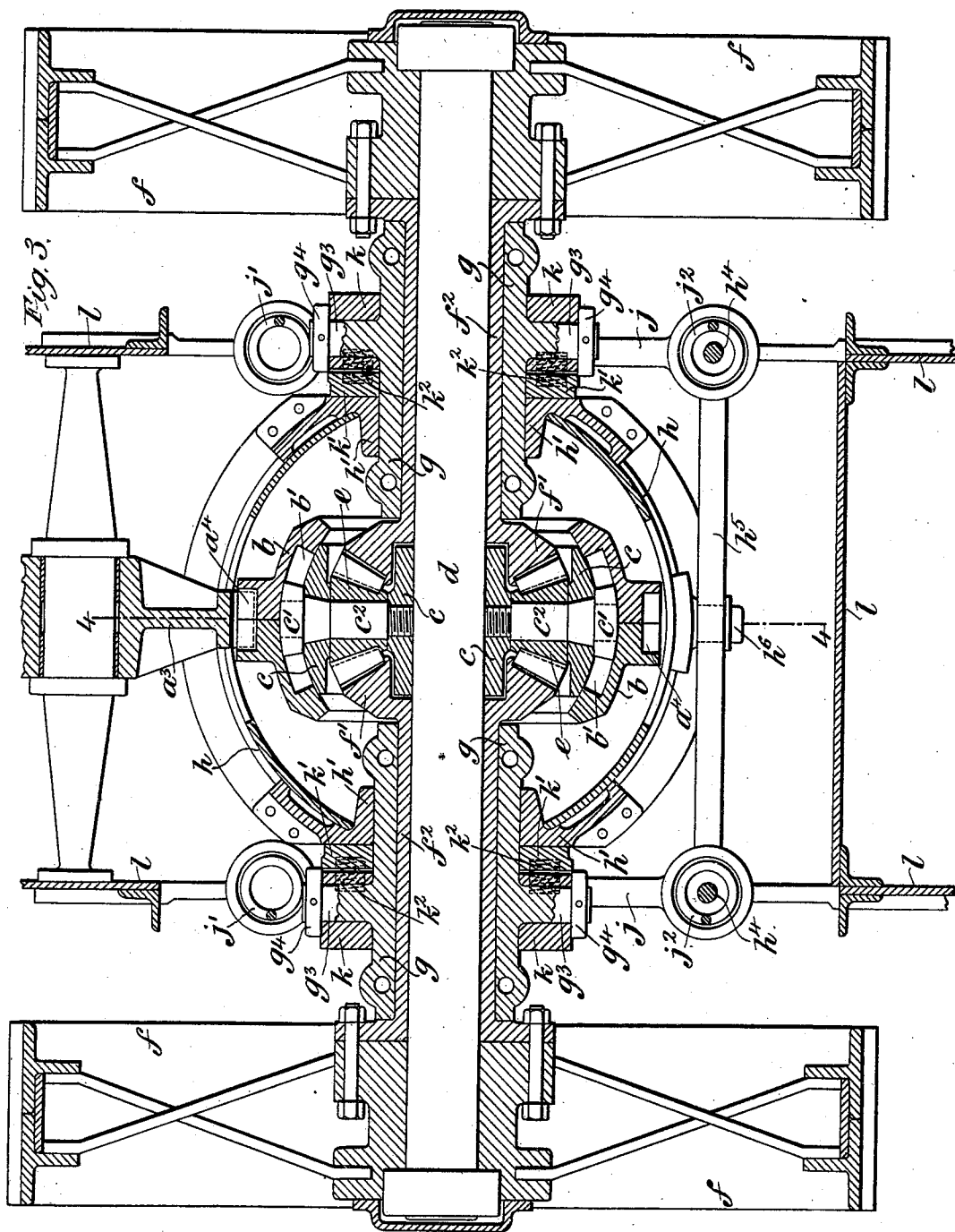
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B. J. DIPLOCK.  
LOCOMOTIVE.

4 Sheets—Sheet 3.

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A. M. Perkins.

Inventor.  
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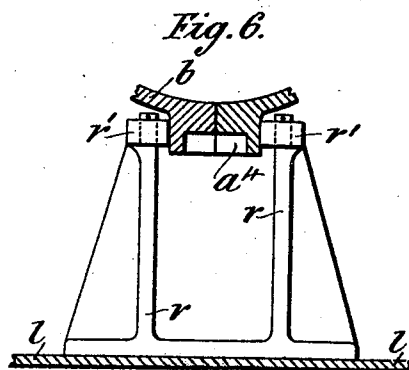
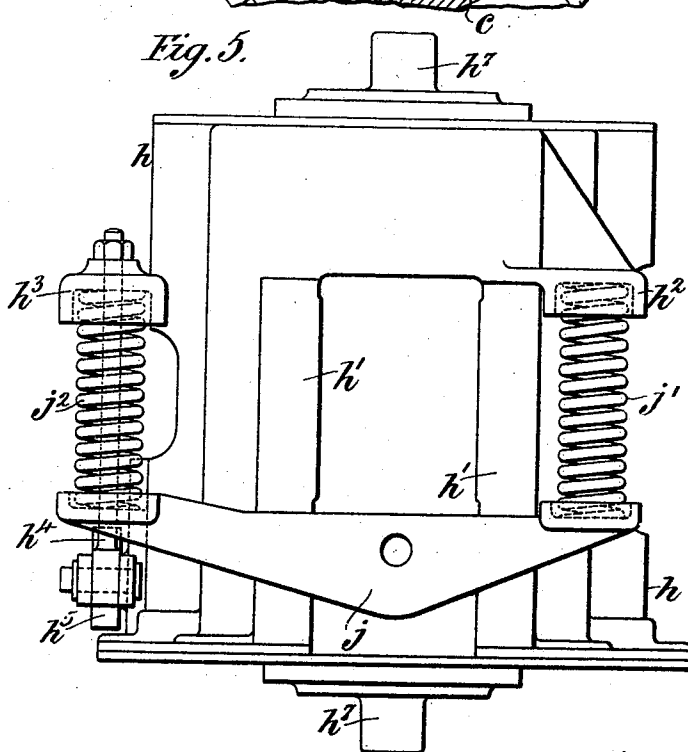
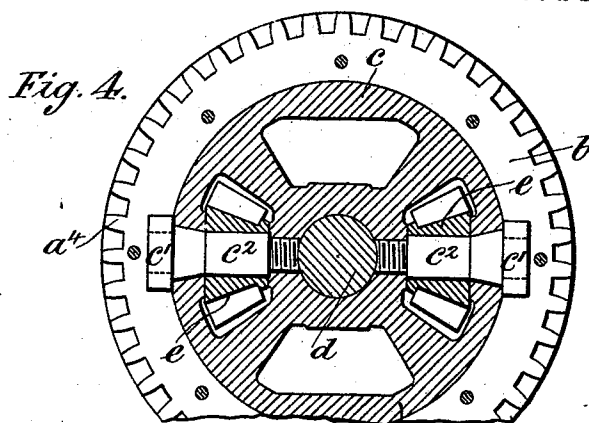
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4 Sheets—Sheet 4.

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LOCOMOTIVE.

No. 602,310.

Patented Apr. 12, 1898.



Witnesses.  
C. A. Bullock.  
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# UNITED STATES PATENT OFFICE.

BRAMAH J. DIPLOCK, OF LONDON, ENGLAND.

## LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 602,310, dated April 12, 1898.

Application filed December 20, 1897. Serial No. 662,619. (No model.) Patented in England October 19, 1893, No. 19,682.

*To all whom it may concern:*

Be it known that I, BRAMAH JOSEPH DIPLOCK, engineer, a subject of the Queen of Great Britain, residing at 53 Ashley Gardens, Westminster, London, in the county of Middlesex, England, have invented certain new and useful Improvements in Locomotives, (for which I have obtained Letters Patent in Great Britain, No. 19,682, dated October 19, 1893,) of which the following is a specification.

This invention relates to locomotives mounted on springs, whether intended for running on rails or on roads, but more particularly to the latter; and it has for its object arrangements whereby both pairs of wheels can be driven and also turned for going around curves or steering, as the case may be. For this purpose each pair of wheels is mounted on a swiveling undercarriage, and their axles are connected by universal joints to central wheels driven by a lost-motion pinion or pinions or the like on a shaft or shafts at the same level, or nearly so, with the axles, so that the distance between the axles and the shafts is substantially constant, although the engine rises and falls on its springs.

The drawings show a road-locomotive constructed according to this invention.

Figure 1 is a diagram side elevation showing the central gearing. Fig. 2 is a vertical section on either of the lines 2 2, Fig. 1, the two undercarriages being identical the one to the other. Fig. 3 is a horizontal section on the line 3 3, Fig. 1. Fig. 4 is a part longitudinal central section on the lines 4 4, Figs. 2 and 3. Fig. 5 is a detached side elevation of one of the drums with its springs. Fig. 6 is a part horizontal central section showing a modification.

In Fig. 1,  $a$  is a pinion on the crank or driving shaft, gearing with the wheel  $a'$ , to which a pinion  $a^2$  is fixed. The pinion  $a^2$  gears with the two lost-motion pinions  $a^3$ , each of which gears with a ring of teeth  $a^4$  on the wheels  $b$ , Figs. 2 and 3. There may be only one lost-motion pinion  $a^3$ , but not so conveniently, or the lost-motion pinion or pinions instead of gearing directly with the teeth  $a^4$  may do so by means of chains or otherwise. Each wheel  $b$  is spherical inside and fits upon a spherical wheel  $c$ , Figs. 2 and 3, whose hub is free to turn on the through-axle  $d$ . The inside of the

wheel  $b$  is slotted at  $b'$  with parallel-sided horizontal slots to receive the square or oblong nuts or heads  $c'$ , free to turn on radial spindles  $c^2$ , fixed in the wheel  $c$  and projecting outward beyond the latter, or the heads  $c'$  might be fixed to the spindles  $c^2$ , the latter being free to turn.

$e$ , Figs. 3 and 4, are beveled pinions free to turn on the spindles  $c^2$  and gearing with the beveled pinions  $f'$ , fixed to the sleeves  $f^2$ , forming the axles of the road or carrying wheels  $f$ . The beveled pinions form the ordinary compensating gear and may be omitted, but not advantageously. The sleeves  $f^2$  work in bearings or axle-boxes  $g$ , which are rectangular on the outside and free to work up and down between horn-plates  $h'$ , forming part of the vertical drum  $h$ , Fig. 5, which serves as a swiveling undercarriage. The bearings  $g$  have downward extensions  $g'$ , Fig. 2, pivoted by pins  $g^2$  to the levers  $j$ , Figs. 2, 3, and 5. The ends of the levers  $j$  support springs  $j'$  and  $j^2$ , Fig. 5. Caps  $h^2$ , forming part of the drum  $h$ , rest on the tops of the springs  $j'$ , and caps  $h^3$ , connected by rods  $h^4$  to the ends of the lever  $h^5$ , pivoted at  $h^6$ , Fig. 3, to the drum  $h$ , rest on the tops of the springs  $j^2$ . The whole weight therefore of the drums  $h$  and the parts carried by them is supported by the springs  $j'$  and  $j^2$ .

Excessive sideway play of the bearings  $g$  in the horn-plates  $h'$  is prevented by buffers bearing against the side faces of the horn-plates. These buffers consist of pairs of vertical plates  $k$  and  $k'$ , one pair of plates being on each side of each bearing  $g$ . The plates  $k$  are mounted on trunnions  $g^3$ , fixed to the bearings  $g$ , and are held against the flat side of the latter by caps or nuts  $g^4$ . The plates  $k'$  overhang the plates  $k$  at the top and bottom or may be connected thereto by dowels or the like. Springs  $k^2$  normally keep the vertical faces of the plates  $k$  and  $k'$  a small distance apart and serve to lessen shocks, while also allowing the axle to tilt diagonally to the horn-plates when a sudden jolt of one wheel compresses the carrying-springs  $j'$   $j^2$  more on one side than on the other.

The surfaces of the plates  $k$  and  $k'$  may be in contact with each other, the springs  $k^2$ , the trunnions  $g^3$ , the caps  $g^4$ , and the overhanging ends of the plates  $k'$  being all dispensed

with, the plate  $k$  being fixed to the bearing  $g$  and  $k'$  loose. In this case the surfaces between  $k$  and  $k'$  must be curved to a radius struck from point  $x$ , Fig. 2, so that the curved inner surfaces of the plates  $k$ , sliding on the curved outer surfaces of  $k'$ , can come nearer to the horn-plates when the engine tilts to compensate for the axle being diagonal to the horn-plates.

The loose plates  $k'$  are kept in place vertically by the curved surfaces, as described, and horizontally by any suitable form of guide or guides or other connections.

The drums  $h$  carry trunnions  $h'$ , working in bearings  $l'$  in the frame  $l$  of the engine.

The weight of the engine-body and boiler is carried by live rings or rollers  $m$ , fitting loosely outside the bosses of the trunnions. The engine is steered by the hand-wheel  $n$ , Fig. 1, actuating, by means of beveled gear, the shaft  $o$ , carrying right and left hand worms  $o'$ , gearing with short worm-segments  $p$ , Fig. 2, fixed on the tops of the drums  $h$ .

$q$ , Fig. 2, are guides pivoted in the top and bottom of the drum  $h$  and serve to prevent the wheel  $b$  from turning in a transverse plane. Preferably three guides are employed, the third,  $r$ , being horizontal and fixed to the frame  $l$  and carrying rollers  $r'$  at its end, as shown in Fig. 6.

If the locomotive be intended for running on rails, the steering-gear is omitted and each undercarriage is provided with two pairs of wheels.

I claim—

1. The combination of the engine-body, an undercarriage pivoted to the body, a pair of wheels supporting the undercarriage, an axle fixed to each wheel, springs between the axles and undercarriage, a wheel at the center of the undercarriage, a universal joint connecting the central wheel to the axles, a lost-motion pinion at approximately the same level as the central wheel, and means for driving the central wheel from the lost-motion pinion.

2. The combination of the engine-body, an undercarriage pivoted to the body, a pair of wheels supporting the undercarriage, an axle fixed to each wheel, springs between the axles and undercarriage, a wheel at the center of the undercarriage, a universal joint connecting the central wheel to the axle, a lost-motion pinion at approximately the same level as the central wheel, means for driving the central wheel from the lost-motion pinion, and buffers carried by the axle-boxes and bearing against the undercarriage.

3. The combination of the engine-body, an undercarriage pivoted to the body, a pair of wheels supporting the undercarriage, an axle fixed to each wheel, springs between the axles and undercarriage, a wheel at the center of the undercarriage, a universal joint connecting the central wheel to the axle, a lost-motion pinion at approximately the same level as the central wheel, means for driving the central wheel from the lost-motion pinion,

and spring-buffers pivoted to the axle-boxes and bearing against the undercarriages.

4. The combination of the engine-body, an undercarriage pivoted to the body, a pair of wheels supporting the undercarriage, an axle fixed to the wheels, springs between the axle and the undercarriage, a wheel spherical on its outside fixed to the center of the axle, a wheel spherical on the inside and mounted on the other, a parallel-sided slot in one wheel, a rectangular head pivoted to the other and working in the slot, and means for driving the outer wheel.

5. The combination of the engine-body, an undercarriage pivoted to the body, a pair of wheels supporting the undercarriage, an axle fixed to each wheel, a beveled pinion fixed to each axle, springs between the axles and undercarriage, a wheel spherical on its outside free to turn on the axles, beveled pinions pivoted to the wheel and gearing with the pinions on the axles, a wheel spherical on the inside and mounted on the other, a parallel-sided slot in one wheel, a rectangular head pivoted to the other and working in the slot, and means for driving the outer wheel.

6. The combination of the engine-body, an undercarriage pivoted to the body, a pair of wheels supporting the undercarriage, an axle fixed to the wheels, springs between the axle and the undercarriage, a wheel spherical on its outside fixed to the center of the axle, a wheel spherical on the inside and mounted on the other, a parallel-sided slot in one wheel, a rectangular head pivoted to the other and working in the slot, means for driving the outer wheel, and buffers carried by the axle-boxes and bearing against the undercarriage.

7. The combination of the engine-body, an undercarriage pivoted to the body, a pair of wheels supporting the undercarriage, an axle fixed to each wheel, a beveled pinion fixed to each axle, springs between the axles and undercarriage, a wheel spherical on its outside free to turn on the axles, beveled pinions pivoted to the wheel and gearing with the pinions on the axles, a wheel spherical on the inside and mounted on the other, a parallel-sided slot in one wheel, a rectangular head pivoted to the other and working in the slot, means for driving the outer wheel, and buffers carried by the axle-boxes and bearing against the undercarriage.

8. The combination of the engine-body, an undercarriage pivoted to the body, a pair of wheels supporting the undercarriage, an axle fixed to the wheels, springs between the axle and the undercarriage, a wheel spherical on its outside fixed to the center of the axle, a wheel spherical on the inside and mounted on the other, a parallel-sided slot in one wheel, a rectangular head pivoted to the other and working in the slot, means for driving the outer wheel, and spring-buffers pivoted to the axle-boxes and bearing against the undercarriage.

9. The combination of the engine-body, an

slot, guides pivoted to the undercarriage and embracing the outer wheel, means for driving the outer wheel, and buffers carried by the axle-boxes and bearing against the undercarriage. 70

14. The combination of the engine-body, an undercarriage pivoted to the body, a pair of wheels supporting the undercarriage, an axle fixed to the wheels, springs between the axle and the undercarriage, a wheel spherical on its outside fixed to the center of the axle, a wheel spherical on the inside and mounted on the other, a parallel-sided slot in one wheel, a rectangular head pivoted to the other and working in the slot, guides pivoted to the undercarriage and embracing the outer wheel, means for driving the outer wheel, and spring-buffers pivoted to the axle-boxes and bearing against the undercarriage.

15. The combination of the engine-body, an undercarriage pivoted to the body, a pair of wheels supporting the undercarriage, an axle fixed to each wheel, a beveled pinion fixed to each axle, springs between the axles and undercarriage, a wheel spherical on its outside free to turn on the axles, beveled pinions pivoted to the wheel and gearing with the pinions on the axles, a wheel spherical on the inside and mounted on the other, a parallel-sided slot in one wheel, a rectangular head pivoted to the other and working in the slot, guides pivoted to the undercarriage and embracing the outer wheel, means for driving the outer wheel, and spring-buffers pivoted to the axle-boxes and bearing against the undercarriage.

16. The combination of the engine-body, an undercarriage pivoted to the body, a pair of wheels supporting the undercarriage, an axle fixed to the wheels, springs between the axle and the undercarriage, a wheel spherical on its outside fixed to the center of the axle, a wheel spherical on the inside and mounted on the other, means for driving the inner wheel from the outer wheel, guides pivoted to the undercarriage and embracing the outer wheel, and means for driving the outer wheel.

17. The combination of the engine-body, an undercarriage pivoted to the body, a pair of wheels supporting the undercarriage, an axle fixed to each wheel, a beveled pinion fixed to each axle, springs between the axles and undercarriage, a wheel spherical on its outside free to turn on the axles, beveled pinions pivoted to the wheel and gearing with the pinions on the axles, a wheel spherical on the inside and mounted on the other, means for driving the inner wheel from the outer wheel, guides pivoted to the undercarriage and embracing the outer wheel, and means for driving the outer wheel.

18. The combination of the engine-body, an undercarriage pivoted to the body, a pair of wheels supporting the undercarriage, an axle fixed to the wheels, springs between the axle and the undercarriage, a wheel spherical on its outside fixed to the center of the axle, a

wheel spherical on the inside and mounted on the other, means for driving the inner wheel from the outer wheel, guides pivoted to the undercarriage and embracing the outer wheel, means for driving the outer wheel, and buffers carried by the axle boxes and bearing against the undercarriage.

19. The combination of the engine-body, an undercarriage pivoted to the body, a pair of wheels supporting the undercarriage, an axle fixed to each wheel, a beveled pinion fixed to each axle, springs between the axles and undercarriage, a wheel spherical on its outside free to turn on the axles, beveled pinions pivoted to the wheel and gearing with the pinions on the axles, a wheel spherical on the inside and mounted on the other, means for driving the inner wheel from the outer wheel, guides pivoted to the undercarriage and embracing the outer wheel, means for driving the outer wheel, and buffers carried by the axle-boxes and bearing against the undercarriage.

20. The combination of the engine-body, an undercarriage pivoted to the body, a pair of wheels supporting the undercarriage, an axle fixed to the wheels, springs between the axle and the undercarriage, a wheel spherical on

its outside fixed to the center of the axle, a wheel spherical on the inside and mounted on the other, means for driving the inner wheel from the outer wheel, guides pivoted to the undercarriage and embracing the outer wheel, means for driving the outer wheel, and spring-buffers pivoted to the axle-boxes and bearing against the undercarriage.

21. The combination of the engine-body, an undercarriage pivoted to the body, a pair of wheels supporting the undercarriage, an axle fixed to each wheel, a beveled pinion fixed to each axle, springs between the axles and undercarriage, a wheel spherical on its outside free to turn on the axles, beveled pinions pivoted to the wheel and gearing with the pinions on the axles, a wheel spherical on the inside and mounted on the other, means for driving the inner wheel from the outer wheel, guides pivoted to the undercarriage and embracing the outer wheel, means for driving the outer wheel, and spring-buffers pivoted to the axle-boxes and bearing against the undercarriage.

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