May 10, 1938. W. S. H. HAMILTON ET AL 2,116,944

CENTERING DEVICE FOR ARTICULATED TRUCKS

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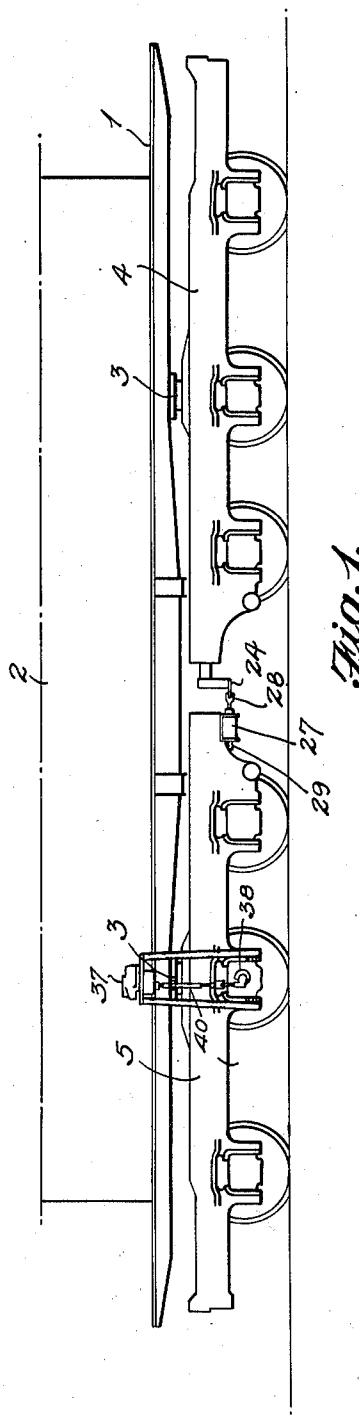


Fig. 1.

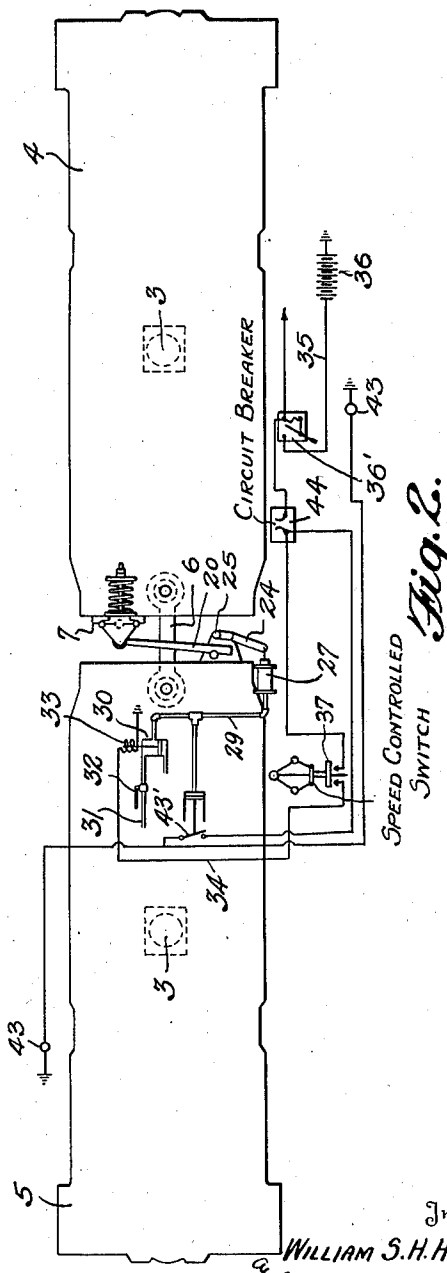


Fig. 2.

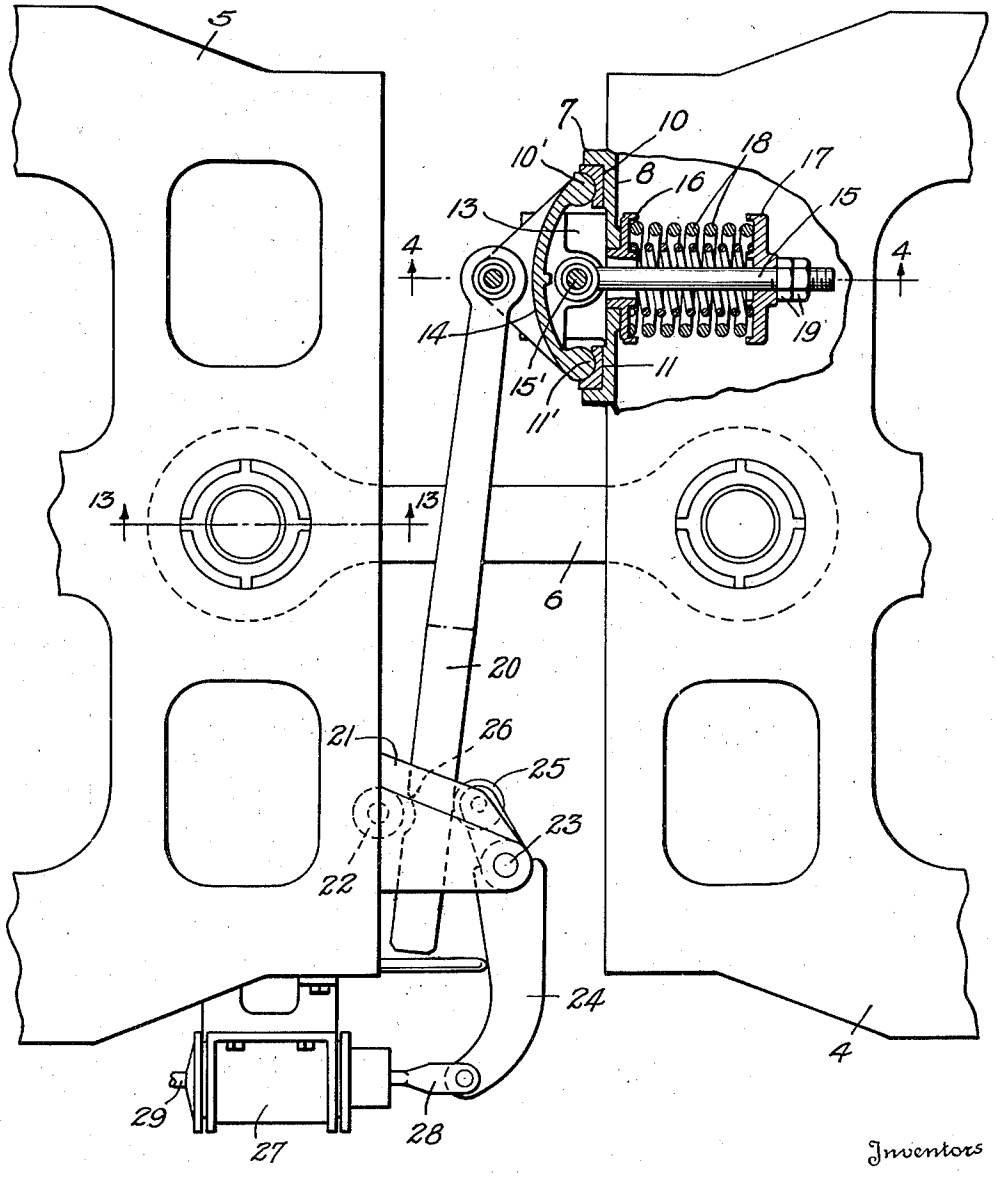
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CENTERING DEVICE FOR ARTICULATED TRUCKS

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Fig. 3.



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CENTERING DEVICE FOR ARTICULATED TRUCKS

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Fig. 5.

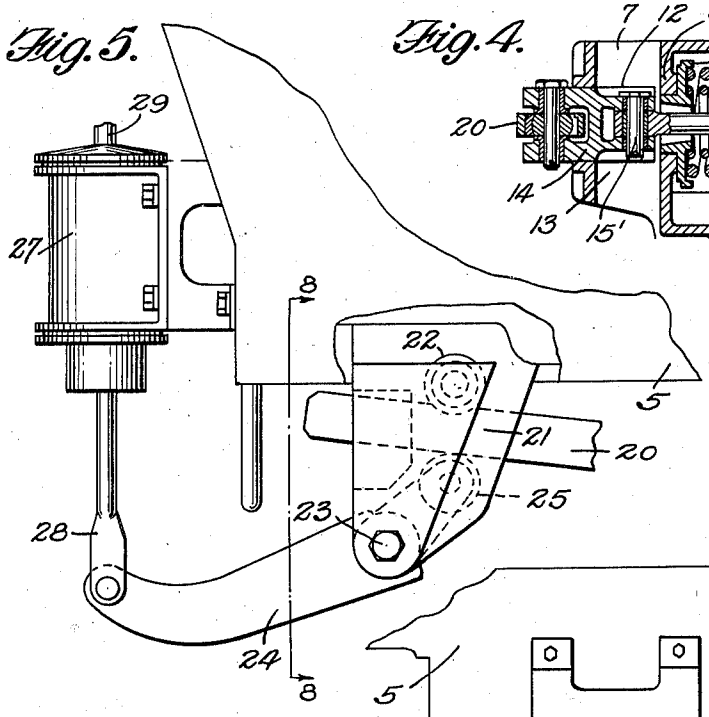
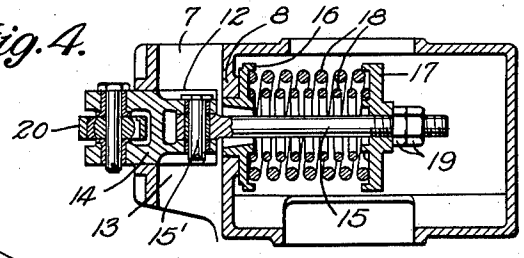


Fig. 4.



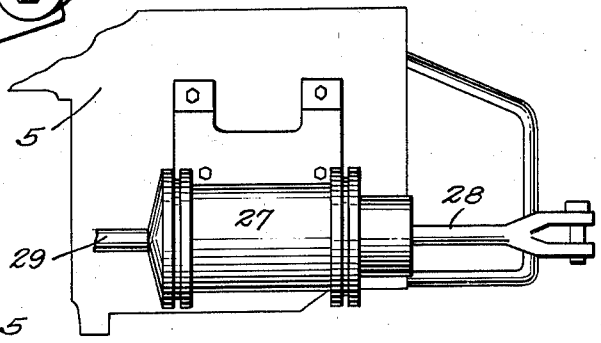


Fig. 7.

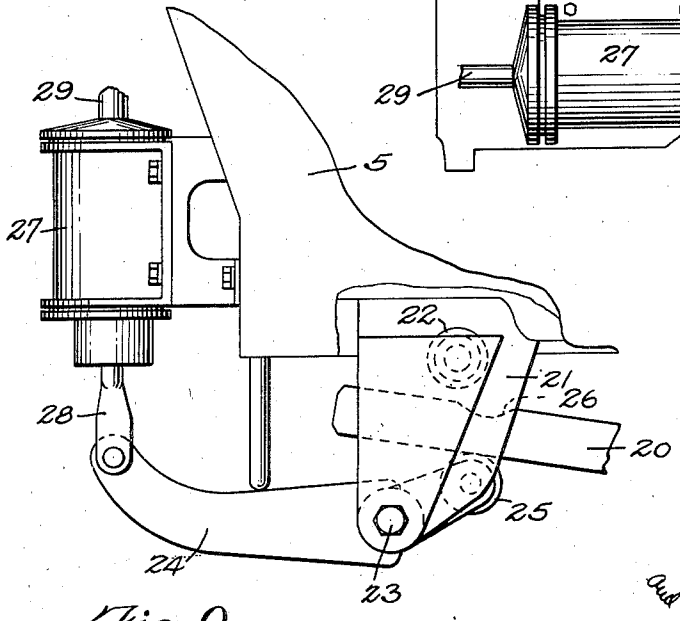


Fig. 9.

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CENTERING DEVICE FOR ARTICULATED TRUCKS

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Fig. 13.

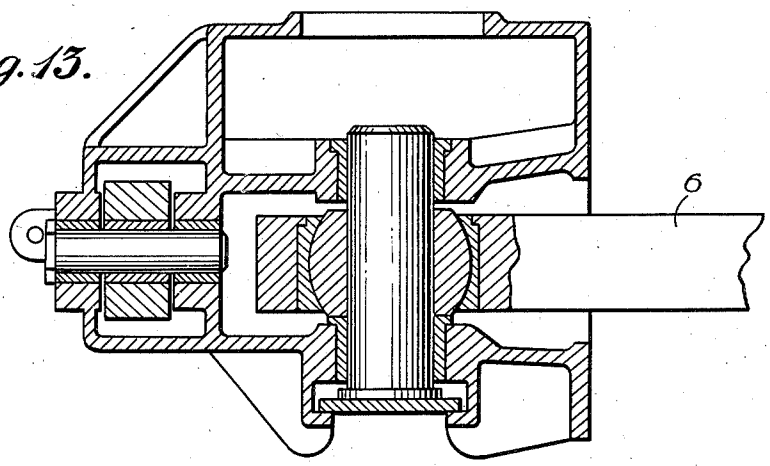
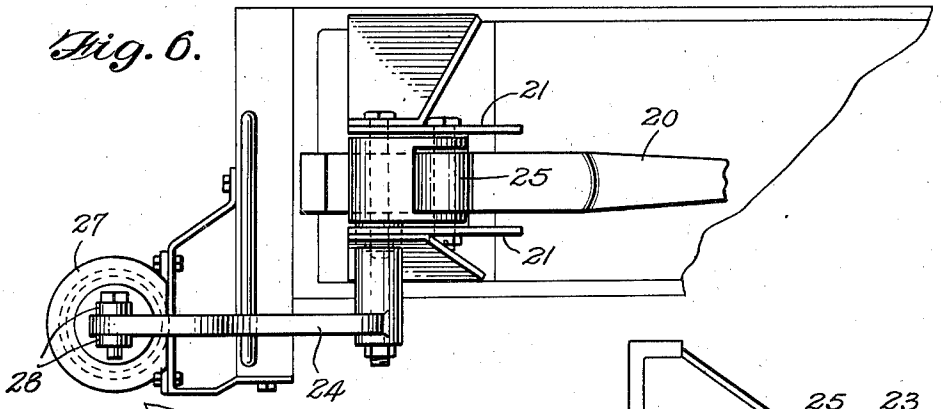


Fig. 6.



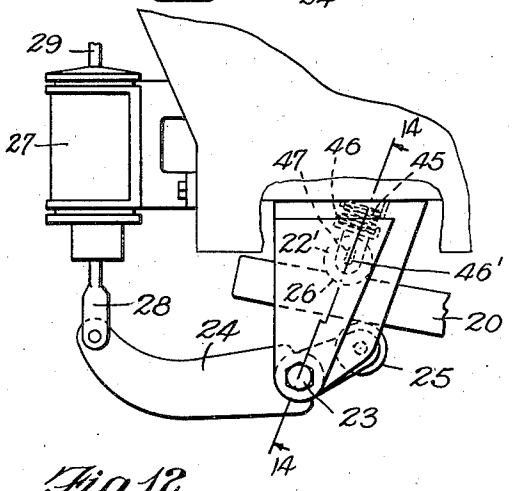


Fig. 12.

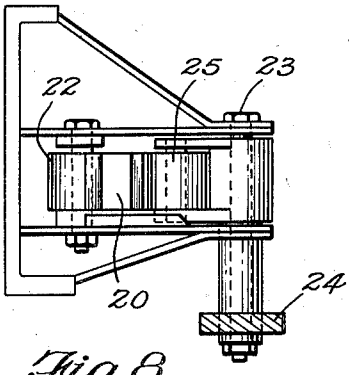


Fig. 8.

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CENTERING DEVICE FOR ARTICULATED TRUCKS

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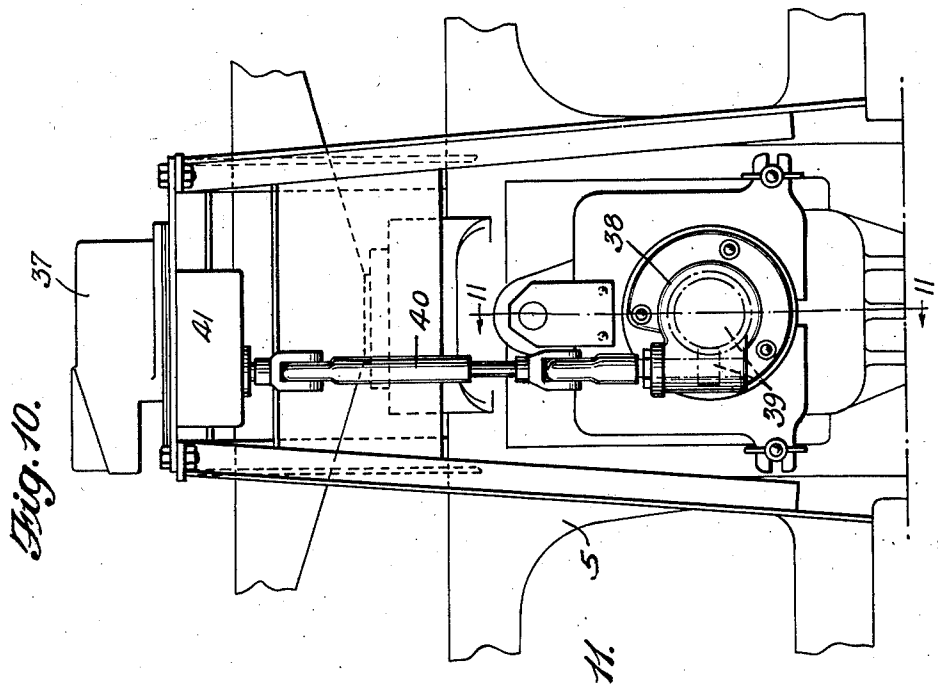


Fig. 10.

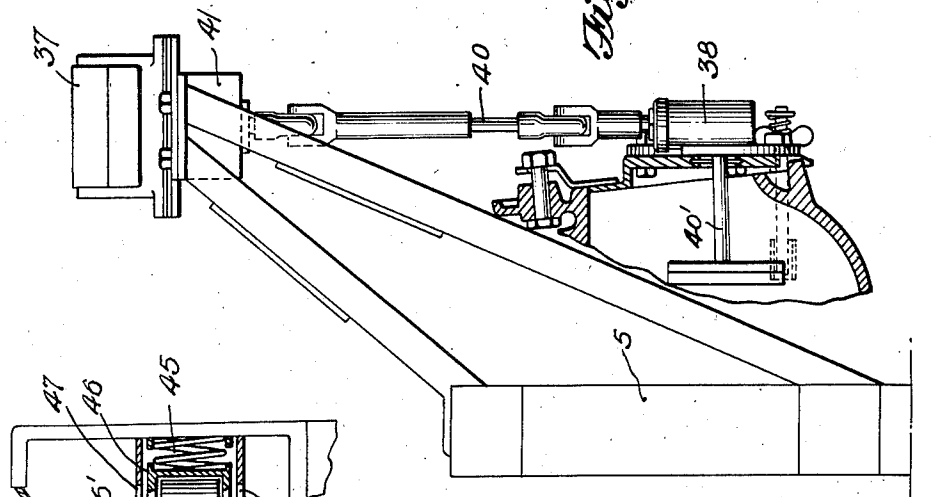


Fig. 11.

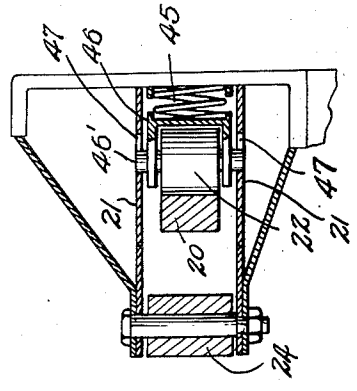


Fig. 14.

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Patented May 10, 1938

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UNITED STATES PATENT OFFICE

2,116,944

CENTERING DEVICE FOR ARTICULATED TRUCKS

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Application September 4, 1936, Serial No. 99,490

25 Claims. (Cl. 105—175)

This invention relates to centering devices for the articulated trucks of locomotives provided with such type of trucks, and particularly to controlling means for governing the action of an articulated truck centering device to regulate and variably govern its action in the travel of the locomotive at different speeds and about curves and along straight portions of a track so as to secure a greater range of flexibility and more efficiently controlled action of the centering device with regard to its degrees of restraining action as required according to varying track conditions and varying speeds of travel of the locomotive.

The spring centering devices commonly employed in connection with swivel trucks exert forces tending to hold their swivel trucks in line with the other trucks and resisting swiveling. These forces are adjustable but do not vary with the speed of the locomotive. Such devices, however, if designed with sufficient flexibility for swiveling action of the swivel truck to allow easy travel of the locomotive about sharp curves at slow speed, at and below, for example, twenty miles per hour, do not offer sufficient resistance against undesirable swiveling or nosing of the truck when the train is traveling on straight or comparatively straight portions of the track at higher speeds and particularly at very high running speeds, when, as a safety measure, nosing should be prevented.

One object of our invention is to provide simple, reliable and efficient means for controlling a centering device governing the swiveling action of articulated trucks in such a way as to allow free swiveling motion of the trucks relative to each other when traveling about curves at or below a predetermined speed and to give positive restriction to the centering device, with maximum resistance to truck swiveling motions, when traveling at speeds above such predetermined speed, thereby preventing nosing of the locomotive.

A further object of our invention is to provide means for automatically locking the centering device at or above a predetermined speed and releasing it below that speed, to provide maximum resistance to swiveling movement of the trucks when locked and when released to allow free swiveling movement.

A still further object of the invention is to provide centering means on one truck of a pair of articulated trucks or on each truck of a locomotive to cooperate with automatic locking and releasing means therefor on the other truck of a pair in such a way that when the automatic device is locked there will be sufficient freedom of swiveling action and of relative movement between the trucks for easy travel with maximum safety at high speeds; and that when released there will be enough additional freedom of swiveling action and relative motion of the trucks to permit the locomotive to pass easily and freely around sharp curves at low speeds.

A still further object of the invention is to provide means for holding two articulated trucks in a certain elastic relationship to each other above a predetermined locomotive speed and in a different elastic relationship at a locomotive speed below said predetermined speed.

With these and other objects in view, the invention consists of the features of construction, combination and arrangement of parts, hereinafter fully described and claimed, reference being had to the accompanying drawings, in which:—

Fig. 1 is a side elevation showing the application of the invention, for exemplification, to a double ended electric locomotive having articulated trucks.

Fig. 2 is a diagrammatic plan view showing the arrangement of the controlling means mounted on the locomotive.

Fig. 3 is a plan view of portions of the trucks on an enlarged scale showing in horizontal section the centering device.

Fig. 4 is a vertical section on line 4—4 of Fig. 3.

Figs. 5, 6 and 7 are respectively top plan and end and side elevations showing on an enlarged scale the link latch mechanism and its operating means.

Fig. 8 is a section on line 8—8 of Fig. 5.

Fig. 9 is a view similar to Fig. 5 showing the latch mechanism in link releasing position.

Fig. 10 is an enlarged side elevation of a portion of a frame showing the speed switch drive arrangement.

Fig. 11 is a transverse section taken substantially on line 11—11 of Fig. 10.

Fig. 12 is a view showing a modification.

Fig. 13 is a section on line 13—13 of Fig. 3.

Fig. 14 is a section on line 14—14 of Fig. 12.

In the embodiment of our invention as herein disclosed we have shown its application to a double ended type of electric locomotive 1 in which the double ended cab 2 is mounted by center bearings 3 on similar wheeled trucks 4 and 5 having an articulated coupling connection 6 at their inner ends to adapt said trucks to have relative swiveling movements, serving respectively as leading or pilot and trailing trucks in the travel of the locomotive in the direction in which either is

at the head of the other in the direction of travel.

Mounted upon the inner end of one of the trucks, as the truck 4, is a centering device comprising a casing 7 including an abutment head 8 which carries on its outer face spaced seat recesses 10 and 11. Mounted between projections 12 and 13 extending from the head 8, is a rocker arm or lever 14 having at opposite sides thereof fulcrum portions 10' and 11' normally engaging said seat recesses in the centered position of said arm or lever. A floating rod or bolt 15 is movable freely through openings in the head 8 and stationary and movable spring caps or washers 16 and 17 and is pivoted at its outer end, as at 15', to the rocker lever. Disposed about this rod between the spring washers 16 and 17 are coiled centering springs 18, the tension of which may be regulated by securing and tensioning nuts 19 on the rod 15, and which springs oppose a resistance to the endwise floating movement of the rod 15 and the rocking movements of the lever 14. The lever 14 is coupled to one end of a controlling bar or link 20, the opposite or free end of which is permitted to slide without restraint or is positively held from movement by the locking and releasing mechanism on the adjacent end of the truck frame 5, whereby the action of the centering device is controlled to regulate its degree of resistance to relative lateral motion of adjacent ends of the trucks 4 and 5. The centering device is mounted as shown on the truck 4 at one side of the center line of the locomotive.

The said locking and releasing mechanism comprises a suitable support 21 fixed to the frame of the truck 5 on the opposite side of the center line of the locomotive, which support forms a guide for the free end of the link 20. On the support is mounted a fixed guiding and clamping roller 22 against which one side of the link 20 bears, and pivotally mounted on the support is a shaft 23 carrying a clamping lever 24 and a pair of arms between which is journaled a clamping roller 25 bearing against the opposite side of the link, which roller 25 is placed opposite the roller 22 and is movable toward and away from the same by reverse swinging movements of the lever 24. In the side of the link facing the roller 22 is a locking notch or recess 26 adapted to be positioned in line with said roller when the centering device is in centered position so that when the notch is in such position and lever 24 is operated to force the roller 25 toward the roller 22 the link 20 will be clamped between the rollers and locked from movement by engagement of the notch 26 with the roller 22. The lever 24 is movable to a sufficient degree in the opposite direction to withdraw the roller 25 to a degree to allow the link 20 to release itself from engagement with the roller 22, while maintaining the rollers 22—25 in position to form guides and retainers allowing the link 20 when released to have limited pivotal movements.

When the link 20 is in the released position the articulated trucks can swing freely independently or conjointly to the maximum extent allowed by permanent stops, permitting the trucks to guide the locomotive freely about sharp curves in the track. Since the link is released at speeds below a predetermined value, for example twenty miles an hour, the locomotive is free to travel about sharp curves at any speed below the predetermined value. We provide a means dependent upon the speed of the locomotive for automatically causing the link locking mechanism to lock or release the link 20; that is, at or below a predetermined speed the centering device is freed, while at any speed above the predetermined value the link 20 will be locked to allow only a limited range of motion of the centering device, thereby giving maximum elastic resistance to the relative lateral motion of adjacent ends of the trucks and not allowing the leading truck to "nose" at high speeds.

The automatic means provided for controlling the locking and releasing mechanism comprises a servo-motor in the form of an air cylinder and piston 27, which piston is coupled to the clamping or locking lever 24 by a connecting rod 28. The motor cylinder is connected, through a feed pipe 29 and an electro-pneumatic control valve 30, with an air supply pipe 31, which is in practice a part of the main reservoir system or other source of compressed air on the locomotive. A hand valve 32 is provided in the pipe whereby the air feed connection may be cut out when desired. The magnet coil 33 of the electro-pneumatic valve 30 is arranged in a conductor 34 normally connected to a supply circuit 35 including a battery 36 or other source of electric energy and battery cut in and out switch 36', which circuit may form part of the lighting system of the locomotive, and said conductor is adapted to be thrown into and out of connection with the supply circuit by means of a speed controlled switch 37. At all times in the open condition of the switch 37, the pipe 29 is open to the feed pipe 31 through the valve 30, so that air is supplied to the cylinder 27 to hold the locking mechanism in engagement with the control link 20. The switch 37 when closed supplies current to energize the magnet coil 33 whereby the valve 30 opens communication between the atmosphere and the cylinder and air is released from the cylinder to retract the locking and releasing mechanism and release the link 20. The switch 37 is open and the valve 30 admits air to pipe 29 at all speeds above the predetermined speed, but the switch 37 is closed by its speed controlling mechanism when the speed of the locomotive falls below the predetermined speed, whereupon the coil 33 is energized to cut off the air supply to the motor cylinder for the link releasing action. Thus in the event of any failure in the electrical control part of the apparatus air will be supplied to the motor cylinder to lock the connecting link 20, making it safe to operate the locomotive at high speed.

As stated, the switch 37 is closed at speeds below twenty miles per hour, but opens at higher speeds so that the locking mechanism will always be in action to lock the link 20 in maximum resistance position in the event of failure of the electrical part of the control means to perform its releasing action, and so that the link 20 will be released only in the travel of the locomotive at slow speed. The means for controlling the switch 37 in this manner comprises a gear box 38 secured to the lid or cover of one of the journal boxes, in which box are enclosed gears 39 driven through a suitable connection 40' from the axle and coupled by a flexible shaft 40, i. e., a shaft formed of universally jointed sections, with a switch operating device 41 active at speeds above twenty miles per hour to open the switch but inactive at speeds below twenty miles per hour which allows the switch 37 to close again.

A pressure controlled switch 43' may be provided for controlling the supply of current to pilot or signal lamps 43 positioned at opposite ends of the cab. This switch 42 communicates with pipe 29 so as to be normally subjected to

air pressure from line 29 to move a switch member 43', against the resistance of a switch opening spring (not shown) forming part of said switch, to connect the lamps 43 with the current supply circuit so long as valve 30 admits air to the cylinder 27, thus indicating that the electrical control part of the system is working and the system in condition for full control actions. When the switch 37 closes at a speed of the locomotive below the predetermined speed and coil 33 is energized to move valve 30 to air vent position the switch 43' is relieved from air pressure and actuated by its spring to open switch member 43', thus cutting off the supply of current to the lamps 43, indicating that link 20 is in released position and that the locomotive should not be operated at high speeds. Similarly in the event of failure of the electrical part of the system the lamps, through their failure to glow, will give warning of this condition. The current supply circuit may also include a circuit breaker 44 of suitable type.

While the construction above described is designed to allow relatively free shifting movements of the link 20 when in released condition, so as to set up practically no restraint to the relative sidewise movement of the ends of the trucks 4 and 5 at low speeds, our invention also contemplates the use of means for imposing a desired degree of restraint to the movement of the link from its centered position at low speeds and so that a predetermined force is required to be exerted by link 20 against the sides of recess 26 before movement of link 20 from its centered position can take place. A modified form of the device is shown in Fig. 12 for this purpose. In the modified form of the device illustrated in Fig. 12, which shows the link 20 in released position, inner roller 22' is forced into notch 26 in link 20 by a helical spring 45, bearing at one end on a bracket 46 carrying the roller 22', the journal pin 46' of which slides in slots 47 in the bracket plates 21, the other end of the spring being carried in a pocket on the truck frame 5. The characteristics of the notch 26 and the helical spring 45 are such that when relative sidewise motion of ends of trucks 4 and 5 occurs, roller 22' rolls out of notch 26, further compressing spring 45, without compression of spring 18 and movement of lever 14 with respect to seats 10 and 11. Therefore, a certain restraint is imposed upon the relative movement of the trucks 4 and 5 even in the released condition of the device.

In the locked condition of the device, roller 22' is forced back by the action of air pressure in cylinder 27 and pressure of roller 25 against link 20, until pin 46' reaches the inner end of slots 47, in horizontal bracket 21, whereupon a pressure is brought to bear between notch 26 and roller 22' high enough to prevent relative movement between them and the effect is the same as is shown in Fig. 5.

From the foregoing description, taken in connection with the drawings, the construction and mode of operation of our improved means for controlling a centering device or devices to regulate the resistance thereof to independent or conjointed swiveling movements of the oscillating trucks of a locomotive will be readily understood without a further and extended description, and it will be seen that the invention provides means for automatically controlling the action of the centering device at speeds below and above a predetermined speed of the locomotive to release the centering device at low and safe speeds, while locking it at high speeds so that the centering device will exert its maximum restraining action against the movements of the truck or trucks to prevent nosing of the leading truck and undue swiveling of the following truck at high speeds, so that maximum flexibility of truck action is permitted at low speeds and safety against undue swiveling or nosing secured at high speeds. Also it will be seen that the invention provides a means whereby, in the event of failure of the means provided for energizing the magnet coil 33 to function from any cause, the centering device will be locked in its maximum restraining position so that the locomotive may be driven at high speeds with absolute safety. By providing a centering device for trucks whereby the trucks are held in a certain elastic relationship to each other above a predetermined locomotive speed and in a different elastic relationship to each other below such predetermined locomotive speed, a wide range of truck restraint is permitted for safe travel on straight and sharply curved tracks at highest speed suitable for the portions of the track being traveled, both trucks being controlled by placing them under proper elastic restraint suitable for the speed at which they are traveling.

It is to be understood, of course, that the invention may be employed in either of the ways described or in any other possible ways for controlling the articulated trucks of a locomotive of the type employing two or more trucks.

While the structures herein disclosed, and shown for exemplification are preferred, it will, of course, be understood that changes in the form, proportion and details of construction of the parts may be made within the scope of the appended claims, without departing from the spirit or sacrificing any of the advantages of the invention.

What we claim is:—

1. A locomotive with two articulated trucks, in combination with restraining means connected to said trucks and adapted to be set into action for holding them in an elastic relation with each other above a predetermined locomotive speed, and speed responsive means for throwing said restraining device into action at a predetermined locomotive speed.

2. A locomotive comprising two articulated trucks, in combination with an elastic restraining device mounted on one of the trucks and a speed responsive controlling means for said restraining device mounted on the other truck and governing the centering device to hold the trucks in elastic relation above a predetermined locomotive speed.

3. A locomotive having two articulated trucks, a spring centering device mounted on one of the trucks, and speed responsive controlling means mounted on the other truck and governing the centering device to hold the two articulated trucks in a predetermined elastic relationship with each other above a predetermined locomotive speed and in a different elastic relationship with each other at a locomotive speed below said predetermined speed.

4. A locomotive having two articulated trucks, centering devices controlling the swinging movements of the trucks, and automatic means, governed by the speed of the locomotive, for rendering said centering devices effective or ineffective for action.

5. A locomotive having two articulated trucks, a centering device operatively mounted on the locomotive for controlling the relative lateral

movements of adjacent ends of the trucks, a locking and releasing means for rendering the centering device effective or ineffective for action, and means governed by the speed of the locomotive for controlling said locking and releasing means.

6. A locomotive having two articulated trucks, a centering device operatively mounted on the locomotive for controlling the relative lateral movements of adjacent ends of the trucks, said device including a pivotally mounted element lockable and releasable for rendering said device effective or ineffective for action, and automatic means governed by the speed of the locomotive for locking and releasing said element.

7. A locomotive having two articulated trucks, a centering device carried by one of the trucks for elastically controlling the relative lateral movements of adjacent ends of the trucks and including a control member for rendering said device operative or inoperative for opposing maximum elastic resistance to such truck movements, and means on the other truck for engagement with said control member to hold it in position for maintaining the centering device in centering position or releasing it to permit relatively free truck movements.

8. A locomotive having two articulated trucks, a centering device on one of the trucks for elastically controlling the relative swinging movements of the trucks, said centering device including a control element, locking and releasing means on the other truck for engagement with said element to hold the centering device in centering position or for releasing said element, and speed controlled means governing said locking and releasing means for automatic locking and releasing actions.

9. A locomotive having two articulated trucks, a centering device on one of the trucks for elastically controlling the relative lateral movements of adjacent ends of said trucks, and speed controlled means on the other truck coupled to and governing the centering device to cause it to oppose a predetermined resistance to such truck movements at and above a predetermined speed of the locomotive.

10. A locomotive having two articulated trucks, a centering device on one of the trucks for elastically controlling the relative lateral movements of adjacent ends of the trucks, a link connected with the centering device whereby its controlling actions may be controlled, and means on the other truck and governed by locomotive speeds for automatically locking and releasing said link.

11. A locomotive having two articulated trucks, a centering device on one of the trucks including a centering spring and a lever mechanism through which the resistance of the spring is transmitted to said truck, a connecting link for connecting said lever with and disconnecting it from the other truck, locking means on the latter-named truck cooperating with said link for effecting such connection and disconnection, and means governed by locomotive speeds for throwing said locking means into and out of action.

12. A locomotive having two articulated trucks, a centering device on one of the trucks including a centering spring and a lever mechanism through which the resistance of the spring is transmitted to said truck, a connecting link for connecting said lever with and disconnecting it from the other truck, means on the latter-named truck normally engaging and locking said link to maintain the centering device in maximum resistance position, and speed controlled means controlling said locking means to lock said link to maintain the centering device in maximum resistance position at and above a predetermined locomotive speed and to release said link to permit less restrained movement of the trucks at lower locomotive speeds.

13. A locomotive having two articulated trucks, a centering device on one of the trucks including a centering spring and a lever mechanism through which the resistance of the spring is transmitted to said truck, a connecting link for connecting said lever with and disconnecting it from the other truck, locking means on the latter-named truck including a locking member engageable with the link to hold the centering device in maximum resistance position, and locomotive speed controlled means for moving said member into and out of locking position and releasing said locking means at and below a predetermined locomotive speed.

14. A locomotive having two articulated trucks, a centering device coupled to both trucks for opposing an elastic resistance to the relative lateral movements of adjacent ends of the trucks, a device for locking said centering device in its position for establishing a maximum resistance to such truck movements or releasing it to allow free truck movements, actuating means for the locking device normally effective for maintaining the locking device in action at all locomotive speeds above a predetermined speed, and means effective for influencing said actuating means at locomotive speeds below said predetermined speed to release said locking device.

15. A locomotive having two articulated trucks, a centering device on one of the trucks for opposing an elastic resistance to the relative lateral movements of adjacent ends of the trucks, a coupling member associated with the centering device, a device on the other truck for coaction with said coupling member for locking the centering device in its position for establishing a maximum resistance to such truck movements or releasing it to allow free truck movements, actuating means for the locking device effective for maintaining the locking device in action at all locomotive speeds above a predetermined low speed, and means effective for influencing said actuating means at the predetermined low speed of the locomotive to release said locking device.

16. A locomotive having two articulated trucks, a centering device on one of the trucks for opposing a variable elastic resistance to the relative lateral movements of the adjacent ends of the trucks, a locking device for connecting the centering device with or disconnecting it from the other truck for holding said centering device in its maximum resistance position or releasing it to allow free truck movements, pneumatic means for moving the locking device into locking position, electrical control means effective for action on said pneumatic means when set into action to release the locking means, and locomotive speed governed means operative on said electrical control means to release the locking device at a predetermined low locomotive speed.

17. A locomotive having articulated trucks, in combination with elastic centering devices operatively mounted to exert elastic forces on the trucks for holding the trucks in an elastic relationship against relative lateral movements of adjacent ends thereof above a predetermined locomotive speed, and speed controlled means for rendering said centering means ineffective at speeds below the predetermined speed.

18. The combination with a locomotive having articulated trucks, of elastic centering means operatively mounted to exert elastic forces on the trucks for establishing an elastic resistance to relative lateral movements of adjacent ends of the trucks, and means dependent on locomotive speed and controlling the said elastic centering means to render said centering means effective at or above a predetermined locomotive speed.

19. In a railway vehicle, the combination with a vehicle frame and a pair of articulated trucks swiveled thereto to swing laterally thereof, of vehicle speed controlled elastic restraint means interposed between and acting on said trucks for opposing an elastic resistance to the swinging movements of the trucks at and above a predetermined vehicle speed.

20. A locomotive having two articulated trucks in combination with elastic centering means and coacting locking and releasing means for holding the two articulated trucks in an elastic relationship with each other at and above a predetermined speed of the locomotive, and speed controlled means for locking and releasing said locking and releasing means.

21. A locomotive having two swiveled trucks, a centering device operatively coupled to and controlling the relative swinging movements of the trucks, and automatic means, governed by the speed of the locomotive, for rendering said centering device effective or ineffective in action.

22. A locomotive having two swiveled trucks, a centering device coupled to and controlling the swinging movements of the trucks, a locking and releasing means associated with said centering device for throwing the same into and out of action, and means governed by the speed of the locomotive for controlling said locking and releasing means.

23. A locomotive having two swiveled trucks, a centering device coupled to and controlling the swiveling movements of the trucks, said device including a pivotally mounted element lockable and releasable for throwing the centering device into and out of action, and automatic means governed by the speed of the locomotive for locking and releasing said element.

24. A double ended locomotive having two articulated trucks swiveled thereto, restraining means operatively connecting the trucks with each other for elastically controlling the oscillations of the trucks, said means being operative below a predetermined speed of the locomotive to allow free swinging movements of the trucks, and means governing said restraining means for causing the same to establish an elastic resistance to the swinging movements of the trucks at and above such predetermined speed of the locomotive.

25. A locomotive having a frame and two articulated trucks swiveled thereto, in combination with speed controlled means operatively connecting the trucks for holding the trucks elastically resistant to swinging movements at and above a predetermined speed of the locomotive.

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