Nov. 14, 1939. A. H. OELKERS 2,180,092

RAILWAY BRAKE

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Fig. 1.

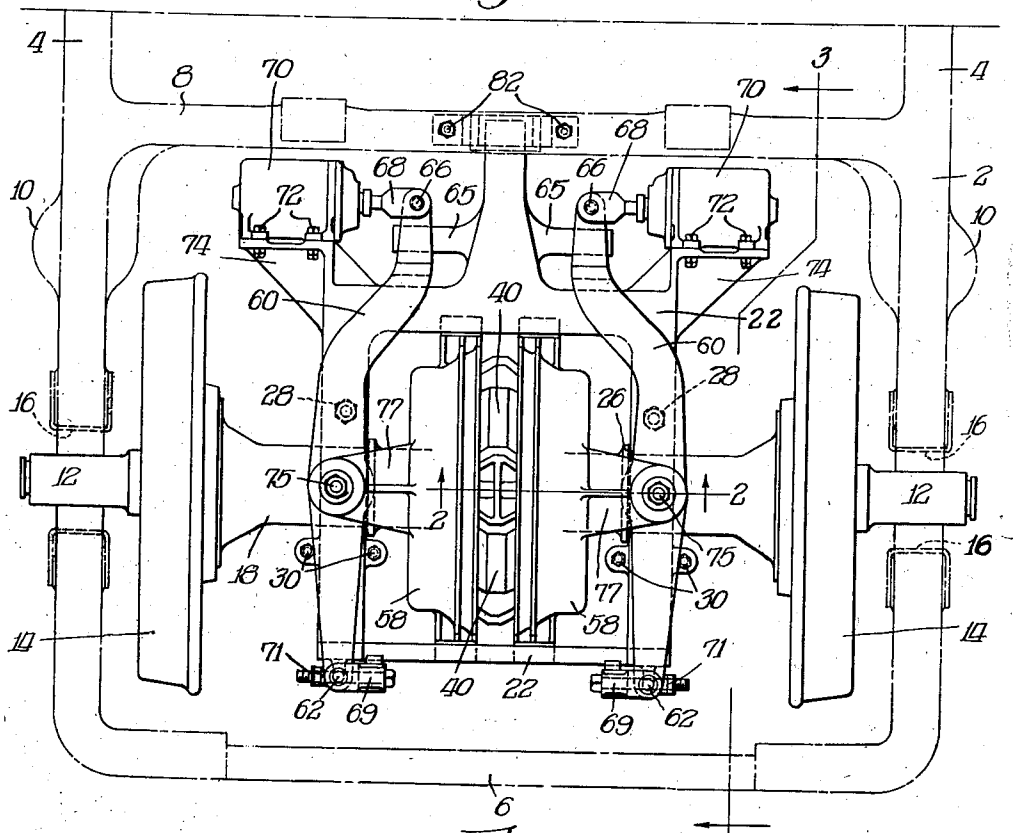
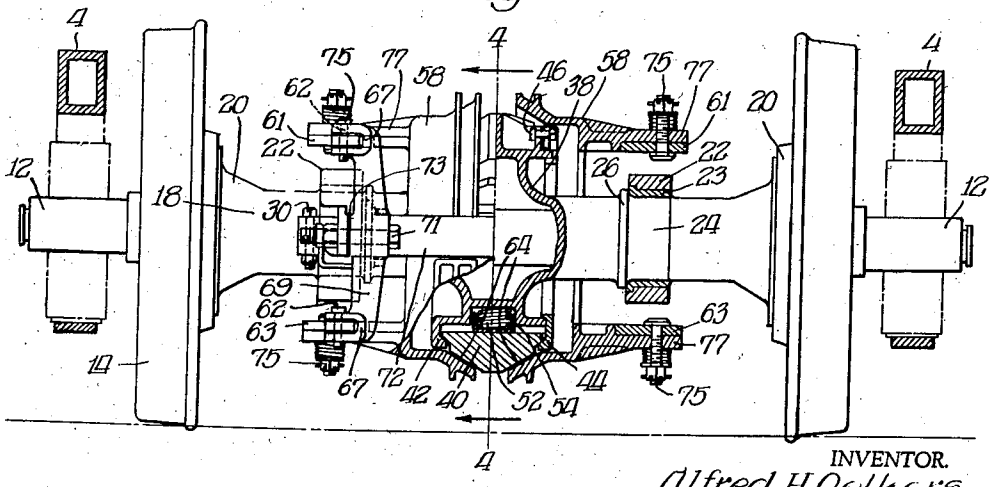


Fig. 2.



INVENTOR.
Alfred H. Oelkers,
BY Brim O. B. Garner
ATTORNEY.

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Fig. 3.

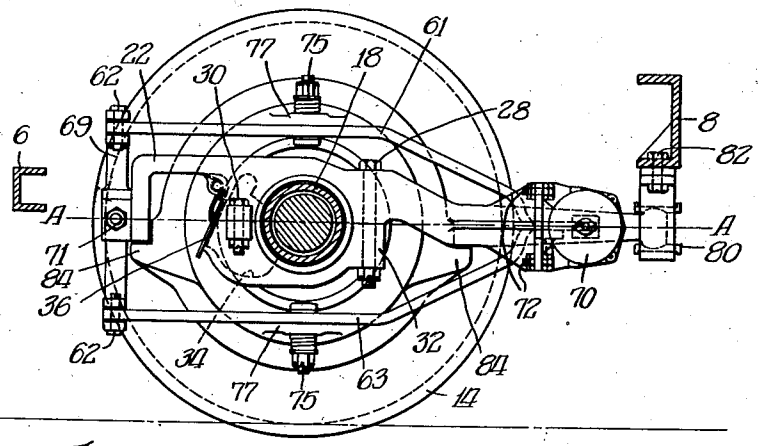


Fig. 4

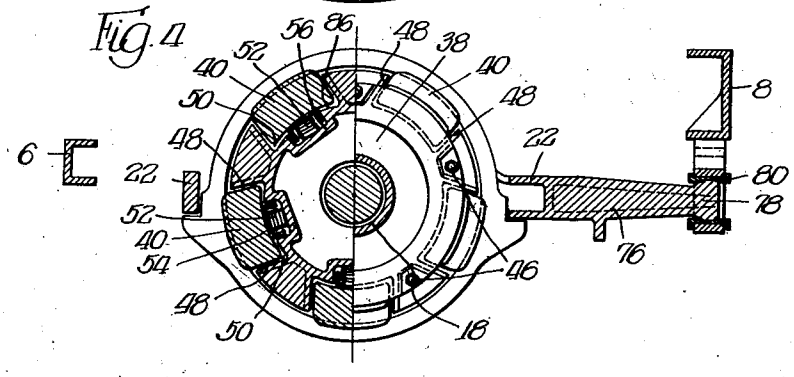
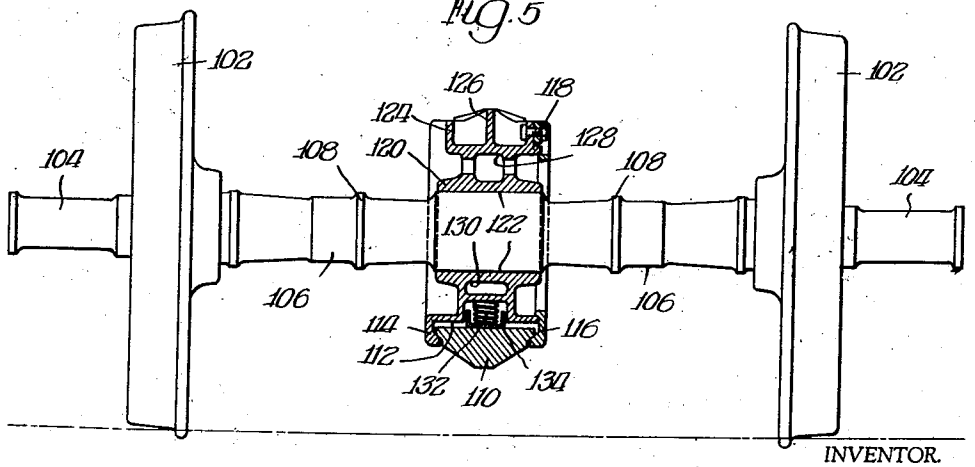


Fig. 5



INVENTOR.
Alfred H. Oelkers,
BY Orin O. B. Barner
ATTORNEY.

Patented Nov. 14, 1939 2,180,092

UNITED STATES PATENT OFFICE

2,180,092

RAILWAY BRAKE

Alfred H. Oelkers, Chicago, Ill., assignor to American Steel Foundries, Chicago, Ill., a corporation of New Jersey

Application February 10, 1939, Serial No. 255,599

29 Claims. (Cl. 188—59)

My invention relates to railway brake rigging and more particularly to a type of brake rigging wherein the braking means is designed to operate independently of the treads of the wheels.

In present day practice railway trains are decelerated and stopped by brakes consisting of metal shoes forced against the rims or tires of the wheels which carry the cars on the rails. The brakes required for the late higher speed train operations cause excessive heating of the wheels, tires and rims, often resulting in short life and occasionally the sudden failure of a wheel. For greater safety and economy it is desirable to eliminate the use of brake shoes having frictional contact directly on the wheel rims.

When a railway train is operating at high speed the potential or kinetic energy that must be dissipated in stopping it is in two forms. One is the linear movement of the entire mass of the train over the ground, and the other is the revolving movement of the wheel units about the center of the axle. In emergency, and under some other operating conditions, it is desirable to bring a speeding train to a stop in the shortest possible distance. To accomplish this a very large braking force is initially applied to the wheels and this is gradually reduced as the speed of the train decreases. The braking force that may be used to bring a train to a stop in the minimum space depends upon the centrifugal momentum of the wheels and the linear momentum of the train, but it must not be great enough to stop the wheels and slide them on the rails.

A principal object of my invention is to devise a braking arrangement wherein a maximum braking force may be developed at maximum speed and wherein the braking force may be automatically reduced in proportion as the speed is lowered.

A further object of my invention is a braking arrangement for a railway truck wherein the brakes may be applied with a varying intensity at the convenience of the operator in controlling train speeds, but which under normal conditions automatically controls the maximum force developed so that rotation of the wheels is not stopped until the vehicle comes to rest.

My invention also contemplates such a braking arrangement wherein a series of shoes are so mounted as to utilize centrifugal forces when the train is in operation and the brakes are applied.

A further object is to devise a railway car brake having braking shoes revolving with the wheel and axle assembly and acting against stationary friction surfaces in such manner that the maximum braking force for a service brake application is limited in proportion to the speed of the train.

My invention also comprehends a braking arrangement wherein a series of shoes is mounted on the axle independently of the wheels and arranged to have braking cooperation with brake drums supported on the axle.

Another object of my invention is such an arrangement as that above described wherein the brake drums will be operable by power means mounted on the truck frame to bring said drums into cooperative engagement with the braking shoes.

A still further object of my invention is to devise such a braking arrangement wherein the brake shoes are resiliently mounted, but in operation may be urged against such resilience and brought into engagement with a fixed seat permitting maximum application of the brake power.

My invention also contemplates other novel features of detail and operation which will be apparent from a consideration of the attached drawings and description thereof together with the appended claims.

Figure 1 is a top plan view of a centrifugal braking arrangement constructed in accordance with my invention as applied to a roller bearing type of wheel and axle assembly of a railway car truck;

Figure 2 is an end elevation, partly in section, of the structure shown in Figure 1, the section being taken substantially in the transverse vertical plane indicated by the line 2—2 of Figure 1;

Figure 3 is a sectional view through the structure shown in Figures 1 and 2 and substantially in the longitudinal vertical planes indicated by the line 3—3 of Figure 1, the view being such as to show a side elevation of the braking device;

Figure 4 is another sectional view taken through the braking device substantially in the longitudinal vertical plane bisecting the truck structure and as indicated by the line 4—4 of Figure 2, one half of the braking unit being shown in elevation; and

Figure 5 is a fragmentary view of a friction type wheel and axle assembly showing a manner of application thereto of a braking device similar to that shown in the modification of Figures 1 to 4.

Describing the structure in greater detail and referring particularly to the embodiment shown

in Figures 1 to 4, the truck frame 2 comprises the side members 4, 4 joined by the end rails 6 and the transom 8, said side members being arranged to accommodate supporting springs as at 10, 10, said springs being carried in the usual manner by equalizers (not shown) and said equalizers may be supported, as is commonly the case, by journal boxes carried on the journal ends 12, 12 of the wheel and axle assembly 14, said journal box being designed to have engagement with the column guides 16, 16 on either side of said journals. The wheel and axle assembly is of a well known anti-friction type comprising the inner stationary axle indicated at 12 and an outer axle or housing 18 expanded at the ends in bell-like formations 20, 20 upon which are pressed the wheels and within which may be received roller bearings having cooperation with the before mentioned stationary axle 12. In this arrangement the wheels and the housing 18 revolve as a unit about the stationary axle indicated at 12.

The assembly of the braking mechanism is carried on the frame 22 which rests on anti-friction sleeves 23 mounted on the journals 24 (Figure 2) in abutment with the flanges 26 integrally formed with the housing 18. The bearing sleeve 23 permits the wheel and axle housing assembly to revolve while the brake carrier frame 22 remains stationary. To facilitate assembly with the axle housing 18, the brake carrier frame 22 is made in two pieces joined on the horizontal center plane indicated at A—A in Figure 3 by the vertically arranged bolt and nut assemblies on opposite sides of the axle as indicated at 28 and 30 (Figure 3). The lower portion 32 of the brake carrier frame is formed with the oil pocket or sump 34 having an opening closed by the lid 36 to facilitate lubrication of the journal 24 and the bearing 23.

The outer axle or housing 18 has at the middle an enlarged drum portion 38 (Figure 2) which carries a series of brake shoes 40, 40. The brake shoes are engaged and retained in position by the integral annular flange 42 formed at one side of said drum portion and by a similar removable flange 44 at the opposite side thereof, said removable flange being secured to said drum portion by the bolt and nut assemblies 46, 46. Each of the brake shoes is held against circumferential movement within the said drum portion by walls 48, 48 (Figure 4) defining the ends of the pockets 50 within which the shoes are carried. Within each of the pockets 50 and under the brake shoe carried therein is mounted a coil spring 52 having the spring cap 54, said spring being seated in the socket 56 centrally formed in the shoe pocket. The said spring is mounted under considerable initial tension as assembled, thereby holding the associated brake shoe tightly against the before mentioned retaining annular flanges 42 and 44 at the opposite ends of the shoe. With this means of holding, it may be noted that the shoe may be urged radially inward by a force greater than the tension of the coil spring 52. It will further be noted that as the wheels and axle housing revolve each of the brake shoes has a tendency to fly radially outward as a result of the centrifugal force developed by the mass of said shoe.

At each end of the brake shoe assembly is mounted a cup-shaped drum 58 supported by horizontal brake levers 60, 60, each lever being of bifurcated form with a top leg 61 and a bottom leg 63 as best seen in the view of Figure 3. The said levers are fulcrumed as at 62, 62 from top and bottom jaws 67, 67 formed on the hinge member 69 (Figure 2). To facilitate removal of the brake shoes each hinged member 69 is carried on the frame 22 by a bolted connection as at 71 in order that adjusting shims may be interposed between the hinged members 69 and the carrier frame 22 as at 73 (Figure 2) to alter the position of the fulcrum 62 and compensate for wear of braking parts. The drums 58 are pivotally supported as at 75 on the top and bottom arms 61 and 63 of the brake levers 60 through the medium of large lugs 77, 77 integrally formed with said drums. The braking drums 58 have opposed conically shaped inner friction surfaces 64, 64 for engagement with the opposite friction ends of the brake shoes 40, 40 and when the said drums are moved axially toward each other they are brought into contact with the brake shoes for braking application. The brake actuating levers 60, 60 are fulcrumed at their outer ends as at 62, 62 and are supported adjacent their opposite ends by brackets 65, 65 on the frame 22, said levers being pivotally connected at their opposite ends as at 66, 66 to the pistons 68, 68 of the power means 70, 70 mounted as at 72, 72 on the brackets 74, 74 integrally formed with the frame 22. The frame 22 also has the torque arm 76 (Figure 4) integrally formed therewith having the ball end 78 fulcrumed in the sockets 80 which may be integrally formed on the transom 8 or bolted thereto as indicated at 82, 82. The pivotal connection of the torque arm 76 with the said socket prevents rotation of the brake carrier frame as the axle housing rotates in engagement therewith and the torque resulting from the application of braking forces is therefore transmitted through the frame 22 to the transom 8 of the truck frame proper by the said ball and socket connection.

The brake drums 58 have at their opposite ends positioning lugs 84, 84 (Figure 3) abutting the under side of the frame 22, said lugs holding the drums against rotation and transmitting to the frame 22 the torque resulting from the braking action.

The application of power causes the pistons 68 to move toward each other thus rotating the brake levers 60, 60 about the fulcrums 62, 62 at their outer ends and moving the brake drums 58, 58 toward each other until they engage the friction surfaces of the brake shoes 40, 40 along the conical surfaces 64, 64 as previously described. When the said pressure is sufficiently great to force the brake shoes 40, 40 inwardly against the reaction of the coil springs 52, 52, the brake shoes may be forced downwardly in their pockets 50 until they reach a fixed position against the bottoms of said pockets as at 86 (Figure 4). Any additional force applied by the cylinder will force the brake drums 58 more tightly against the shoes thus resulting in a higher braking pressure than would be afforded by reaction against the coil springs 52, 52. If the car is traveling at a high speed centrifugal force acts to augment the pressure of the springs 52, 52 in holding the brake shoes 40, 40 radially outward. For example, at a speed of about 85 miles per hour the centrifugal force exerted by each shoe is about 140 times the weight of the shoe itself, a force 5 or 6 times as great as the pressure exerted by the spring 52 as herein constructed. At high speeds, therefore, a comparatively great force is required to move the brake shoe radially inward against the combined spring pressure and centrifugal force. The centrifugal force, however,

is directly in proportion to the square of the speed of the car and, therefore, the force exerted by the brake shoes against the inner surface of the braking drums automatically diminishes as the speed is reduced. This automatic reduction of pressure in proportion to speed prevails under all normal braking conditions when the shoes are not tightly seated against the bottoms of their pockets. As designed, the shoes are expected to be seated against the bottoms of the pockets only when emergency applications of the brakes are required.

From the above description it will be apparent that the braking force exerted between the revolving shoes and the stationary conical drums is controlled by the power means or brake cylinder actuated by compressed air in the conventional manner. A high pressure will cause a correspondingly high force acting through the conical drum to push each brake shoe radially inward. The angularity of the inner conical surface of the braking drum and the relative volumetric capacity of the air reservoirs and brake cylinders must be designed to suit the maximum speeds desired and the weight or momentum to be developed. The proportions selected should be such that a heavy service application of the brakes will not operate to seat the shoes in the bottoms of their pockets before the speed is materially reduced. Under such conditions a high braking force will be maintained until the speed is reduced to a point where the centrifugal force added to the force of the compressed springs **52** is insufficient to hold the brake shoes out against the flanges of the brake drums, thus the effective braking force will automatically reduce with the speed. In an emergency brake application a higher braking force applied from the power means or cylinders forces the brake shoes radially inward until they are seated against the bottoms of their pockets under which condition the brake shoe pressure against the stationary drums must be equal to or greater than the centrifugal force plus the force of the compressed spring **52** and may exceed such forces in accordance with the pressure applied by the power means.

In the modification shown in Figure 5 I have illustrated in a fragmentary manner a friction type wheel and axle assembly comprising the wheels **102, 102** fixed upon the normally rotative axle **104**, said axle having intermediate the wheels the spaced journals **106, 106** defined by inboard flanges **108, 108** forming seats upon which may be carried the framework and non-rotating braking drums similar to those shown in the previous modification. In this modification the rotating shoes **110, 110** may be supported in pockets **112** defined at one end by the integral flange **114** and at the opposite end by the removable flange **116** secured as at **118** to the unitary casting **120** which may be pressed upon the axle as at **122** prior to the pressing of the wheels thereon. The pockets **112** may be spaced apart similarly to those of the previous modification by radial walls **124** and reinforcing center ribs **126**, and the said casting may be cored out as indicated at **128** and **130** to facilitate dissipation of heat and to reduce weight. Each of the brake shoes **110** may be supported in position against its retaining flanges **114** and **116** by the pre-compressed spring **132**, partially housed in the spring cap **134**.

In this modification the unitary casting **120** is mounted by a press fit upon the friction type axle **104** and thus differs from the modification previously described but the general structure and functioning of the parts would be otherwise the same and the application of the power forces and the torque reaction against the frame would be similarly provided for.

It is to be understood that I do not wish to be limited by the exact embodiments of the device shown which are merely by way of illustration and not limitation as various and other forms of the device will of course be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

I claim:

1. In a railway car truck, a frame, a wheel and axle assembly journaled therein, said assembly comprising a normally non-rotatable inner axle, a normally rotatable outer axle, anti-friction bearings between said axles, wheels fixed on said rotatable axle, means on said rotatable axle supporting brake shoes intermediate the wheels, said brake shoes being positioned around said axle and radially movable, a framework journaled on said rotatable axle, braking drums pivotally supported from said framework, and means on said framework operable to move said drums into braking engagement with said shoes, said operable means comprising brake levers fulcrumed at their outer ends from said framework, power means mounted on said framework and connected to the inner ends of said levers, and a pivotal connection with the adjacent brake drum intermediate the ends of each lever.

2. In a railway car truck, a frame having a transverse member, an anti-friction wheel and axle assembly journaled in said frame and comprising an outer axle, wheels fixed on the ends of said outer axle, means supporting brake shoes on said outer axle intermediate the wheels, a compression spring under each brake shoe urging said shoe outwardly against retaining means, a framework journaled on said outer axle, braking drums supported on said framework and presenting braking surfaces for engagement with said shoes, and means on said framework operable to move said drums into engagement with said shoes, said operable means comprising a braking lever pivotally connected intermediate its ends to each drum, said braking lever having its outer end fulcrumed from said framework and its inner end connected to power means mounted thereon.

3. In a railway car truck, a frame having a transverse member, a wheel and axle assembly journaled therein and comprising an outer normally rotatable axle with wheels fixed thereon, a framework journaled on said axle with a torque arm engaging said transverse member, means on said axle supporting brake shoes for radial movement therein, a framework journaled on said axle and supporting brake drums for engagement with said shoes, and power means mounted on said framework and operable to move said drums into engagement with said shoes, movement of said drums against said shoes urging said shoes radially inwardly into positions where said shoes are out of engagement with other radial retaining means thus permitting centrifugal force to urge said shoes against said drums.

4. In a railway car truck, a frame having a transverse member, a wheel and axle assembly journaled therein and comprising an outer normally rotatable axle with wheels fixed thereon, a framework journaled on said axle with a torque arm engaging said transverse member, means on said axle resiliently supporting brake shoes for radial movement therein, a framework journaled

on said axle and supporting brake drums for engagement with said shoes, and power means mounted on said framework and operable to move said drums into engagement with said shoes, engagement of said drums with said shoes urging said shoes radially inwardly against resilient means thereunder.

5. In a railway car truck, a frame, a wheel and axle assembly journaled therein, said assembly comprising a normally non-rotatable inner axle, a normally rotatable outer axle, anti-friction bearings between said axles, wheels fixed on said rotatable axle, means on said rotatable axle supporting brake shoes intermediate the wheels, said brake shoes being positioned around said axle and radially movable, a framework journaled on said rotatable axle, braking drums supported from said framework, and means on said framework operable to move said drums into braking engagement with said shoes.

6. In a railway car truck, a frame having a transverse member, a wheel and axle assembly journaled therein, means fixed on said axle and resiliently supporting brake shoes, a framework journaled on said axle and supporting a brake drum for axial movement, said framework having a torque arm engaging said transverse member, and means operable to move said drum into engagement with said shoes, said operable means comprising a bifurcated lever straddling said axle and pivotally connected to said drum above and below said axle, said lever being fulcrumed from its outer end to said framework and connected at its inner end to said power means.

7. In a railway car truck, a frame having a transverse member, a wheel and axle assembly journaled therein, means fixed on said axle intermediate the wheels, radial shoes resiliently supported in said means, means on said axle supporting a brake drum for axial movement, said drum supporting means having a torque arm engaging said transverse member, and means operable to move said drum into engagement with said shoes, said operable means comprising a lever fulcrumed at its outer end from certain of said means, pivotally connected intermediate its ends to said drum and connected at its outer end to power means.

8. In a railway car truck, a frame having a transverse member, a wheel and axle assembly journaled in said frame and comprising an outer axle, wheels fixed thereon, means supporting brake shoes for radial movement, a framework journaled on said axle with a torque arm connected to said transverse member, brake drums supported on said framework, and means for moving said drums axially into engagement with said shoes, said operating means comprising bifurcated levers fulcrumed at their outer open ends from said framework, pivotally connected intermediate their ends to said drums and connected at their inner ends to power means.

9. In a railway car truck, a frame having a transverse member, a wheel and axle assembly journaled in said frame, means fixed on said axle intermediate the wheels and supporting brake shoes for radial movement therein, a framework journaled on said axle outwardly of said means with a torque arm engaging said transverse member, brake drums supported around said axle for engagement with said shoes, and means for operating said drums axially of said assembly, said operating means comprising levers fulcrumed at their outer ends and connected to power means at their inner ends.

10. In a railway car truck, a frame, a wheel and axle assembly journaled therein, brake shoe carrying means fixed on said axle intermediate said wheels, brake shoes, a compression spring under each brake shoe, retaining flanges for said shoes, a framework journaled on said axle around said brake shoe carrying means, brake drums supported on said framework and presenting annular frictional areas for engagement with said shoes, and power means mounted on said framework and operable to move said drums into engagement with said brake shoes.

11. In a railway car truck, a frame, a wheel and axle assembly journaled therein, brake shoe carrying means fixed on said axle intermediate said wheels, brake shoes, a compression spring under each brake shoe, retaining flanges for said shoes, a framework journaled on said axle around said brake shoe carrying means, brake drums supported on said framework and presenting frictional areas for engagement with said shoes, and power means mounted on said framework and operable to move said drums axially of said assembly and into engagement with said brake shoes.

12. In a railway car truck, a frame having journal openings, a wheel and axle assembly journaled therein, brake shoe supporting means fixed on said axle intermediate the wheels, brake shoes therein, a framework journaled on said axle, brake drums supported on said framework around said axle and having braking surfaces arranged for engagement with said brake shoes, said framework having means engaging said frame for transmitting torque thereto, and power means mounted on said framework and operable to move said brake drums into engagement with said shoes.

13. In a railway car truck, a frame having a transverse member, an anti-friction wheel and axle assembly journaled in said frame and comprising an outer axle, wheels fixed on the ends of said outer axle, means supporting brake shoes on said outer axle intermediate the wheels, a compression spring under each brake shoe urging said shoe outwardly against retaining means, a framework journaled on said outer axle, brake drums pivotally supported from said framework, and means on said framework operable to move said drums into engagement with said shoes.

14. In a railway car truck, a frame having a transverse member, a wheel and axle assembly journaled in said frame and comprising an outer normally rotatable axle with wheels fixed thereon, a framework journaled on said axle with a torque arm engaging said transverse member, means on said axle supporting brake shoes for radial movement therein, a framework journaled on said axle and supporting brake drums for engagement with said shoes, and power means mounted on said framework and operable to move said drums into engagement with said shoes.

15. In a railway car truck, a frame having journal openings, a wheel and axle assembly journal in said openings, means fixed on said axle intermediate said wheels, brake shoes mounted on said means at the perimeter thereof and radially movable therein, a framework journaled on said axle with a torque arm engaging said frame, brake drums pivotally supported on said framework, and power means operable to move said brake drums into engagement with said shoes.

16. In a railway car truck, a frame, an anti-friction wheel and axle assembly journaled therein and comprising a normally rotatable outer

axle, wheels fixed on the ends of said axle, brake shoe carrying means on said axle intermediate the wheels, brake shoes being movable radially of said assembly, a framework journaled on said axle with a torque arm engaging said frame, and power means supported on said framework and operable to move said drums into engagement with said shoes.

17. In a railway car truck, a frame having a transverse member, a wheel and axle assembly journaled therein, means fixed on said axle intermediate the wheels, radial shoes resiliently supported in said means against retaining means, a framework journaled on said axle and supporting a brake drum for axial movement, said framework having a torque arm engaging said transverse member, and power means operable to move said drum into engagement with said shoes.

18. In a railway car truck, a frame having a transverse member, a wheel and axle assembly journaled therein, means fixed on said axle intermediate the wheels, radial shoes resiliently supported in said means, a brake drum supported from said axle for axial movement, and means operable to move said drum into engagement with said shoes.

19. In a railway car truck, a frame having a transverse member, a wheel and axle assembly journaled therein, means fixed on said axle intermediate the wheels, radial shoes resiliently supported in said means, means on said axle supporting a brake drum for axial movement, said drum supporting means having a torque arm engaging said transverse member, and means operable to move said drum into engagement with said shoes.

20. In a railway car truck, a frame having a transverse member, a wheel and axle assembly journaled in said frame, means on said axle supporting brake shoes for radial movement therein, a framework journaled on said axle outwardly of said means with a torque arm connected to said transverse member, and brake drum supported around said axle for engagement with said shoes.

21. In a railway car truck, a frame having a transverse member, a wheel and axle assembly journaled in said frame, means on said axle supporting brake shoes for radial movement therein, a framework journaled on said axle with a torque arm engaging said transverse member, brake drums supported around said axle for engagement with said shoes, and means for operating said drums axially of said assembly.

22. In a railway car truck, a frame having a transverse member, a wheel and axle assembly journaled in said frame and comprising an outer axle, wheels fixed thereon, means supporting brake shoes for radial movement, a framework journaled on said axle with a torque arm connected to said transverse member, and brake drums supported on said framework for engagement with said shoes.

23. In a vehicle, a frame, a wheel and axle, means on said axle supporting brake shoes for radial movement with respect thereto, torque transmitting means hung from said axle and connected to said frame and comprising brake drums supported adjacent said shoes, and power means for moving said drums into engagement with said shoes.

24. In a vehicle, a frame, a wheel and axle, means on said axle supporting brake shoes for radial movement with respect thereto, torque transmitting means supported from said axle and connected to said frame and comprising brake elements supported adjacent said shoes, power means for moving said elements into engagement with said shoes, and an operating member supported on said torque means for moving said brake elements into engagement with said shoes.

25. In a vehicle, a frame, a wheel and axle assembly, brake shoes supported from said assembly for radial movement, torque transmitting means supported from said assembly and connected to said frame and comprising brake drums supported adjacent said shoes, and means for moving said drums into engagement with said shoes.

26. In a vehicle, a frame, a wheel and axle, brake shoes supported around said axle for radial movement, torque transmitting means supported from said axle and connected to said frame and including brake drums supported adjacent said shoes, and power means on said torque transmitting means operable to move said drum into engagement with said shoes.

27. In a vehicle, a frame, a wheel and axle, brake shoes resiliently supported for radial movement about said axle, torque transmitting means supported from said axle, connected to said frame and including braking means carried adjacent said shoes, and means for bringing said braking means into engagement with said shoes.

28. In a brake arrangement for a railway car truck, a frame, a wheel and axle assembly, braking elements rotatable with said assembly and radially movable with respect thereto, brake drums supported from said assembly and frame, and means for moving said drums into engagement with said elements.

29. In a brake arrangement for a vehicle, a frame, a wheel and axle assembly, braking elements resiliently supported around said axle for rotational and radial movement, a brake drum supported from said frame and assembly, and means for bringing said drum into engagement with said elements, whereby said elements may be urged radially inward against the centrifugal force generated by their rotation.

ALFRED H. OELKERS.