Dec. 30, 1941. E. E. VAN CLEAVE 2,268,228

HAND BRAKE

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Fig. 2

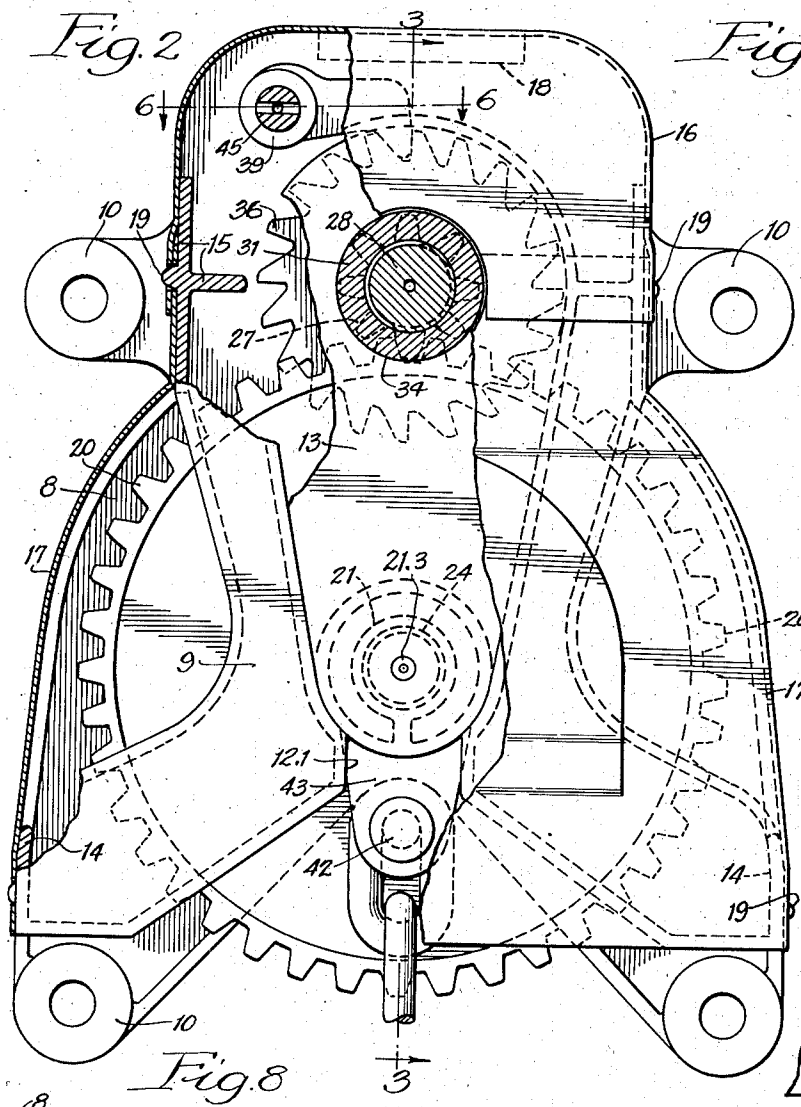


Fig. 1

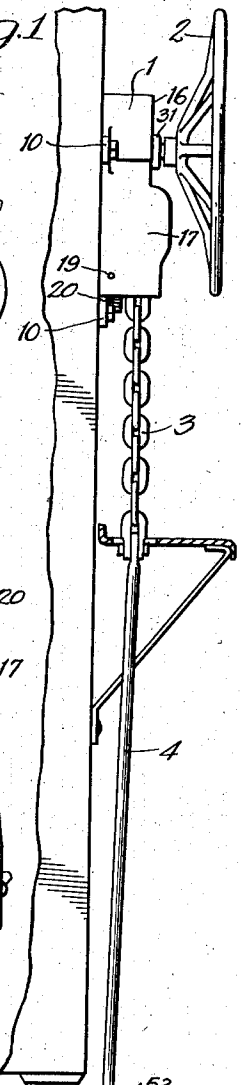


Fig. 8

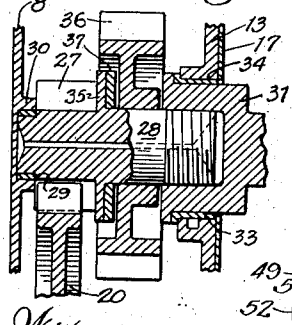
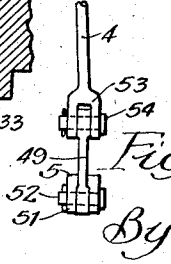


Fig. 7



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HAND BRAKE

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Fig. 3

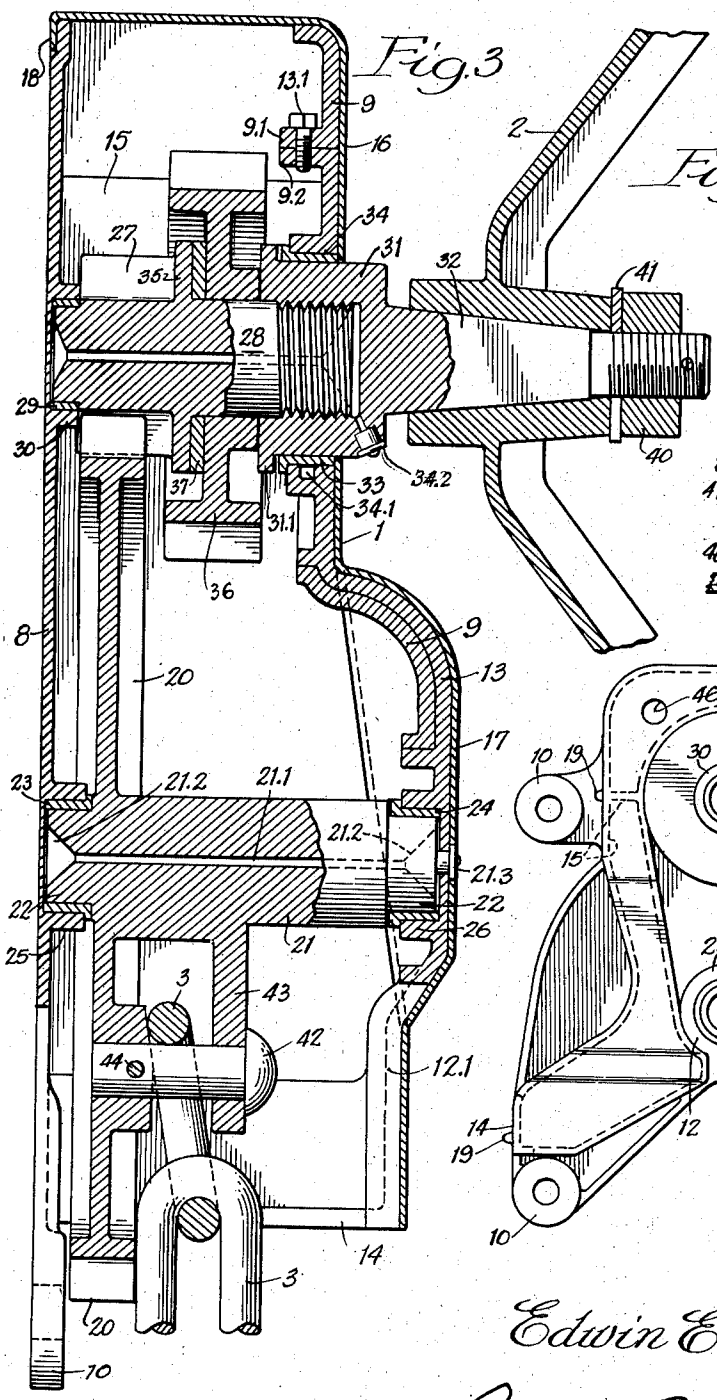


Fig. 5

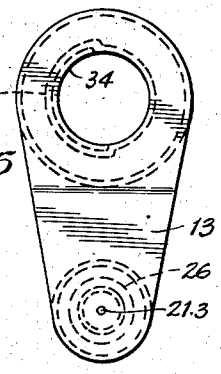


Fig. 6

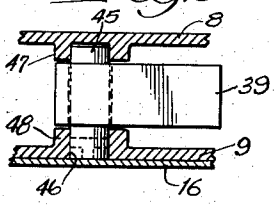
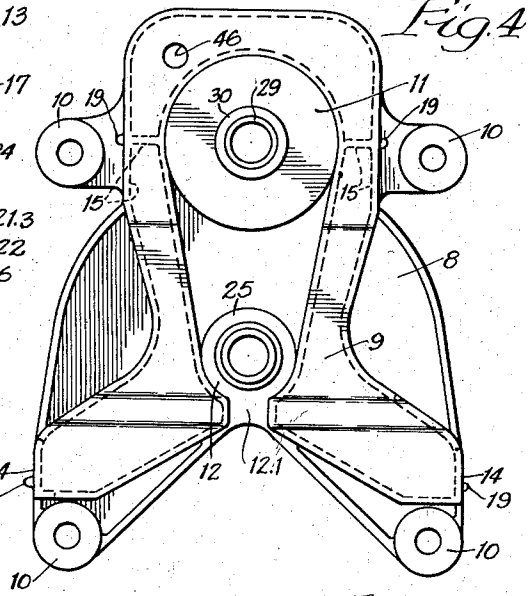


Fig. 4



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UNITED STATES PATENT OFFICE

2,268,228

HAND BRAKE

Edwin E. Van Cleave, Chicago, Ill.

Application January 28, 1939, Serial No. 253,276

5 Claims. (Cl. 74—505)

This invention relates to vehicle hand brakes, and particularly to such devices for use on railway cars, this invention being an improvement of the device and construction disclosed in my copending application, Serial No. 148,520, filed June 16, 1937, now Patent No. 2,207,500.

The main objects of this invention are to provide an improved hand brake construction and arrangement; to provide a simplified and improved construction of hand brake operating mechanism having greater strength in the principal operating parts; to provide such a mechanism with an improved and simplified clutch mechanism which provides for positive connection between the hand wheel and the winding wheel independently of the clutching parts in event of inoperativeness of the same; and to provide an improved and novel combination of hand brake, brake rigging and railway vehicle whereby more efficient brake operation and power application are obtained.

A specific embodiment of this invention is shown in the accompanying drawings, wherein:

Figure 1 is a fragmentary view in elevation of the end of a railway car showing the improved combination and arrangement of braking elements.

Fig. 2 is a partially sectioned view showing the hand brake in front elevation.

Fig. 3 is a vertical sectional view of the same, as taken on line 3—3 of Fig. 2.

Fig. 4 is a front view of the hand brake housing with the cover and front plate removed.

Fig. 5 is a front view of the hand brake housing front or journal plate.

Fig. 6 is a fragmentary sectional view as taken on line 6—6 of Fig. 2, showing the brake pawl.

Fig. 7 is a view of the bell crank and tension rod connecting link, as viewed from the line 7—7 of Fig. 1, and

Fig. 8 is a fragmentary sectional view showing the brake clutching mechanism in disengaged position.

As shown in the drawings, my improved hand brake operating mechanism is designed to embody the principles disclosed in my copending application, Serial No. 148,520, filed June 16, 1937, now Patent No. 2,207,500, but with simplification and improvement of the construction of the operating parts to provide greater strength and increased facility in assembly, together with improvement in the operation of the associated means for actuating the brake rigging of a railway car.

The hand brake operating mechanism is contained in a housing 1, mounted at a convenient place on the end of a railway car, and is actuated by means of a hand wheel 2 in the usual manner to effect tensioning or releasing of the brake operating chain and tension rod 3 and 4, which through a bell crank 5 and connecting means 6, operates the usual brake rigging 7 located underneath the car body.

The bell crank 5 is one of known construction particularly designed for greater strength and efficiency in transforming the vertical pull on the tension chain and rod 3 and 4 to a horizontally directed force aligned with the brake rigging power cylinder. This member is a segment-shaped element pivotally mounted for rocking movement on a horizontal transverse axis beneath the car body and at the end thereof on which the hand brake operating mechanism is located. In this form of bell-crank one end of the segment comprises the long leg of the crank and the arcuate surface of the segment comprises the short leg, the latter being described substantially by a radius whose length from the axis of segment rotation is less than the length of the long leg.

As shown in Figs. 2, 3, and 4, my improved hand brake operating mechanism is mounted in a housing comprising an open frame-like structure having a back plate 8 and a front member 9 spaced forwardly from the back plate and connected thereto by spaced webs or side-members all formed together as a unitary casting. The back plate 8 is a solid member, except for the perforated ears 10 which project from the sides thereof and by means of which the housing is bolted or otherwise secured onto the end of the railway car. The front member 9 is provided with two vertically-spaced apertures 11 and 12 together with a slot-like opening 12.1 at its bottom central portion for assembly of parts of the brake operating mechanism therethrough, and serves mainly as a support for a front cover or journal plate 13 which is designed to lie against the forward face of the front member 9 and which has integral portions arranged to fit into the openings 11 and 12, the journal plate 13 and the back plate 8 of the housing constituting the means by which and between which the hand brake operating mechanism is supported.

Thus, the hand brake housing is a one-piece frame construction in which the front portions and the back portion are connected merely by relatively narrow lateral webs or side members as at 14 and 15, thereby leaving large openings at the top, bottom and sides of the housing through

which certain of the mechanism contained in the housing can be readily inserted, assembled and inspected without necessitating removal of the journal plate 13.

As shown in Figs. 1, 2 and 3, the housing casting is enclosed by a removable two-piece sheet metal cover preferably of rust-resisting material and comprises an upper member 16 and a lower member 17 which, together, are arranged to surround and enclose the front and sides of the housing. The upper sheet metal member 16 is provided with a flange 18 which hooks over the rear face of the housing back plate 8 and this cover member extends over the upper portion of the housing in the manner of a cap, also overlapping the upper edge of the lower cover 17. As shown, particularly in Fig. 2, both the cover members 16 and 17 are removably secured to the housing casting by suitable means, such as by engagement with bosses or lugs 19 projecting from the lateral webs of the housing into suitable apertures in the sheet metal covers, and the overlapping portions of the covers are positioned on the horizontal center-line of the front member opening 11 where they serve as reinforcing bands to retain the journal plate 13 in position at the point of greatest strain, as will be apparent from the drawings.

This closure arrangement permits access to both the upper and lower portions of the housing by simply removing the respective sheet-metal covers and obviates any necessity for removing the hand wheel 2 for purposes of inspection. Also for disassembly of the hand brake mechanism, it is only necessary to loosen and pull forward, or remove, the journal plate 13 which can be done without disconnecting or removing the hand wheel 2, after the sheet metal covers are removed.

The brake operating mechanism comprises a chain winding wheel 20 having an integral hub 21 projecting from each side and the ends 22 of the hub 21 are turned down for mounting in suitable bearings in which the winding wheel 20 is journalled. Thus, the winding wheel hub provides the shaft on which the winding wheel is supported, which considerably simplifies assembly and minimizes points at which wear may occur. The ends 22 of the winding wheel hub 21, which are in the nature of integral stub shafts, are journalled in oil-impregnated bushings 23 and 24, set into and held by bosses 25 and 26 on the housing back plate 8 and the journal plate 13, respectively. As shown, the hub-shaft 21 is provided with an end-to-end axial bore 21.1 connecting counter-bored end pockets or reservoirs 21.2 in which additional or make-up lubricant is held and a grease fitting 21.3 is provided in the journal plate 13 at the intersection therewith of the hub-shaft axis to permit grease renewal, access to the fitting being had through an appropriate aperture in the sheet metal cover 17.

The winding wheel 20 is provided with gear teeth on its periphery and is rotated on its axis by means of a pinion 27 which meshes with the winding wheel teeth in the upper portion of the casing.

As shown in Fig. 3, the pinion 27 which rotates the winding wheel 20 is formed as an integral part of an operating shaft 28 one end of which is journalled in an oil-impregnated bushing 29 held in a boss 30 formed on the inner side of back plate 8 of the housing, and the other end of which is journalled and supported in the enlarged hollow end or hub 31 of a separate outwardly-projecting extension or hand wheel shaft 32. The hub 31 of the hand wheel shaft is provided with an annular radial flange 31.1 at its inner end to increase its end face area and is journalled in an oil-impregnated bushing 33 which is suitably supported in an aperture 34 in the journal plate 13, which journal plate is provided with an oil supply groove 34.1 opening radially into the aperture 34 and extending along the periphery of the same on the side opposite the side on which lateral thrust will normally occur.

As shown in Fig. 3 the shaft 28 is provided with an end to end axial bore connecting counter-bored end pockets in the same manner and arrangement as the shaft 21 beforementioned; also a grease fitting 34.2 is provided in the outer end of the hub 31 to supply grease to the adjacent end of the shaft 28, the fitting 34.2 communicating with the interior of the hub 31 and the end of the shaft 28 through an appropriate passageway in the hub wall. Similar means may also be employed to supply lubricant to the groove 34.1 which lubricates the bushing 34 for the hub 31.

This grease supply arrangement as applied to the shafts 21 and 28, is of extreme importance in the hereindescribed mechanism in that it provides a means for positive lubrication of the main bearings at both ends of the respective shafts, and particularly the inboard ends which are ordinarily inaccessible without removal of the covers. Also, with the grease fittings located at the front of the housing, the greasing operations can readily be performed without in any way dismanteling or disturbing the housing or mechanism.

The outward end of the operating shaft 28 is arranged for screw thread connection with the hub 31 of the extension or hand wheel shaft 32, so that by turning the hand wheel shaft in one direction, clockwise, as shown, the shaft 28 will be drawn into the hub 31 and by turning the hand wheel in the opposite direction the shaft 28 will tend to withdraw or loosen with respect to the hub 31. The purpose of this arrangement is to provide for relative longitudinal movement between the connected shafts to close and open a space between the inner or flanged end of the hub 31 and an annular flange 35 integral on the shaft 28 at the end of the pinion 27 nearest the hub 31; and in this space a ratchet wheel 36 is freely mounted for rotation on the shaft 28. Thus the outer face of the flange 35 and the inner face of the hub 31 provide clutching members between which the ratchet wheel 36 may be gripped upon drawing together of the hub 31 and the flange 35 through the threaded relation of the shaft 28 and the hub 31, a suitable clutch surface means or disc 37 being disposed at the inner side of the hub of the ratchet wheel 36 to effect strong frictional engagement of the flange 35 with the ratchet wheel 36.

The ratchet wheel 36 normally rotates in one direction only, and is prevented from rotation in the opposite direction by means of a pawl 39 located in the uppermost part of the housing as shown in Fig. 2.

The hand wheel 2 is mounted on the outwardly projecting end of the hand wheel shaft 32; which is squared or otherwise formed to prevent relative rotation between the hand wheel 2 and the shaft 32 and the hand wheel is held in place by a nut 40 threaded into the shaft 32 and engaging a spring washer 41 disposed against the end of the hub of the hand wheel 2.

Thus, upon rotation of the hand wheel shaft 32

together with its hub 31, by means of the hand wheel 2, the ratchet wheel 36 may be either clamped to rotate with the shaft 28 and the hub 31 or released so as to be independent of the shaft 28, depending merely upon the direction in which the hand wheel 2 is turned.

As will be noted, from Fig. 3, the chain 3 leading from the brake rigging is fastened to the winding wheel 20 by means of a pin 42, which extends in an axial direction through a lug or ear 43 projecting radially from the hub 31, the pin 42 being spaced radially from the hub 21 and extending into the winding wheel 20 where it is locked in place by a cotter 44. Thus, upon turning of the winding wheel 20 by means of pinion 27, the chain 3 will be caused to wind up on the hub of the winding wheel, thereby taking up or tensioning the chain 3 so as to actuate the brake rigging of the vehicle on which the mechanism is mounted.

From the foregoing it will be seen that my improved mechanism is particularly arranged for easy inspection and quick assembly, all of the internal parts being simply suspended on the back wall 8 of the housing and the removable journal plate 13. In the assembly the ratchet wheel 36, together with the clutch disc 37 is first mounted on the shaft 28 over the threaded end of the same and then the shaft 28 and the hub 31 of the hand wheel shaft are threaded together as shown in Fig. 3. The parts thus assembled are then passed through the opening 11 in the front portion of the housing, which opening is of sufficient size to pass the ratchet wheel 36, and the rearward end of the shaft 28 is inserted into the boss 30 on the housing back wall 8. Then the winding wheel 20 is placed within the housing through the bottom end of the same, the forward end of the hub-shaft 21 being passed through the front opening 12.1 and the rearward end of the hub-shaft being inserted into the boss 25. With the mechanism thus in place the front journal plate 13 is set into the front portion of the housing with the boss 26 at the lower end of the journal plate fitting over the forward portion 22 of the winding wheel hub-shaft 21 and the upper opening 34 of the journal plate together with the bushing 33 fitting over the hub 31 to rotatably support the same.

If desired the assembled drive mechanism may be placed in the journal plate before insertion into the housing and the drive assembly together with the journal plate held in one hand by the extension 32 while the winding means is held in position with the other hand. In this way the inner end of the shaft 28 and the outer end of the shaft 21 may be quickly and easily fitted into their respective bearings as the brake device is being assembled.

The pawl 39 for locking the ratchet wheel 36 is then placed in position, the pawl being carried on a shaft 45 which is passed through an opening 46 in the front wall 9 of the housing and extends into a boss 47 on the back wall 8 of the housing. As shown in Fig. 6, the pawl 39 is rotatably mounted on the shaft 45 and is held against displacement along the shaft 45 between boss 47 and an annular collar 48 surrounding the opening 46 on the inner side of the housing front member 9. The lower sheet metal cover 17 is then set over the housing to enclose the front and sides thereof and the upper portion or cap 16 is set over the top part of the housing, these sheet metal members being secured to the housing and coacting to hold the journal plate 13 in place. However, as shown in Fig. 3, additional securing means for the journal plate 13 may be employed, such as a bolt 13.1 passing through aligned lugs 9.1 and 9.2 formed on the inner sides of the housing front member 9 and the journal plate 13 respectively.

The device is finally made ready for operation by mounting the hand wheel 2 on the shaft 32 and connecting the chain 3 to the winding wheel by means of the pin 42, this last being accomplished through the open bottom of the housing through which the winding wheel and chain pin may be readily reached.

For purposes of inspection, particularly of the ratchet wheel 36, the hand wheel pinion 27 and the braking elements associated therewith, it is only necessary to remove the top sheet metal cap 16, since the top end of the housing casting is left completely open. Inspection of the winding wheel 20 and the chain connection thereto may be readily had through the open bottom of the housing.

Disassembly or the renewal of worn or broken parts is facilitated by the simple journal mounting of the rotating parts and the arrangement of the removable front journal plate 13 which, for example, when loosened or removed permits pulling the ratchet and pinion assembly through the opening 11 in the front member 9 of the housing casting or permits disengagement of the ends 22 of the winding wheel hub 21 from their respective bosses, so that the entire winding wheel may be dropped through the bottom opening of the housing casting. Thus for either inspection or renewal of parts, no tools or special manipulators are required and the back plate is not disturbed or otherwise moved from the car.

An outstanding and important feature of my invention is the simple and extremely rugged arrangement of parts comprising the drive unit assembly. Only three metal parts are required; namely, the integral pinion and shaft 27—28, the hand wheel shaft 32, and the ratchet wheel 36, the shafts being solid elements of maximum strength and the hand wheel shaft being a separate element extending from the pinion shaft 28. This arrangement greatly strengthens the operative mechanism of my device and furthermore, simplifies production in that considerable machine work is eliminated.

The operation of the clutching mechanism is the same as that described in my before-mentioned copending application, Serial No. 148,520, filed June 16, 1937, now Patent No. 2,207,500, particularly with regard to its automatic action in stopping reverse movement of the winding wheel in the absence of simultaneous reverse movement of the hand wheel 2. Turning of the hand wheel in a clockwise direction, when viewing the device from the front, causes the shaft 28 to draw into the hub 31 of the hand wheel shaft 32, clamping the ratchet wheel 36 and the clutch disc 37 between the flanges 31.1 and 35, so that the ratchet wheel will turn in a clockwise direction at the same time that the pinion 27 is rotating in a clockwise direction.

Thus, all the elements are locked together for the winding up operation and since the load on the chain 3 is constantly tending to unwind the winding wheel 20 or turn it in a reverse direction, the load simultaneously tends to turn the pinion 27 in the counterclockwise direction so that the shaft 28 will screw into the hollow hub

31, which action only clamps the ratchet wheel tighter between the clutch faces.

However, since the ratchet wheel 36 is locked against counterclockwise or reverse motion by the pawl 39, any counterclockwise movement of the hand wheel will tend to release the pinion 27 from engagement with the ratchet wheel and allow reverse movement of the pinion in exact accordance with the amount that the hand wheel is rotated in the reverse or counterclockwise direction. The moment that counterclockwise movement of the hand wheel is stopped, however, the clutch action between the pinion 27 and the ratchet 36 immediately takes place and prevents further reverse movement of the winding wheel 20 due to the ratchet being locked by the pawl 39.

Thus, the releasing action of the brake mechanism is under complete control of the operator, releasing being effected in step-by-step increments only as the operator turns the hand wheel in the reverse or counterclockwise direction. Since the device provides for an automatic take-up which holds and locks the braking mechanism whenever the hand wheel is stationary or is turned clockwise, rapid releasing of the wound-up chain 3 may be had by turning the hand wheel in the releasing or counterclockwise direction at the same rate as, or slightly faster than the reverse motion of the pinion 27.

The overall effect, however, is that the hand wheel has a positive driving connection with the brake mechanism except for a slight relative motion between the hand wheel shaft and the pinion shaft for the purpose of clutching and unclutching the shaft to the holding ratchet. Also in this arrangement the relative motion between the pinion shaft and the hand wheel shaft is sufficiently small so that, even if the clutching surfaces should become completely worn, the two shafts will turn together as a unit during the brake-setting operation, thus assuring positive action whenever needed. Further, with the pinion fixed to the pinion shaft, its drive is independent of the clutching means and hence the device will operate to set the brakes even though the threaded connection between the pinion shaft and the hand wheel shaft may become rusted together or otherwise frozen.

The bell crank 5, shown in Figs. 1 and 7, is arranged to permit the vertical rod or connection 4 to clear the end sill or other parts of the car when the brake apparatus is at released position. This is effected by providing a link connection 49 between the vertical rod 4 and the bell crank which link projects outwardly from the bell crank and, during the initial movement in the brake setting operation, bears against a projecting portion or shoulder 50, positioned on the long leg of the bell crank intermediate its axis of rotation and the point of link connection, so that the link 49 and bell crank 5 move as a unit until the end of the bell crank to which the link is attached has moved to a position substantially in alignment with the direction of pulling force on the rod 4. From this point on the link 49 swings outwardly relative to the bell crank so that the maximum effective radius of the bell crank may be utilized.

As shown, the bell-crank 5 is arranged so that the long leg of the bell-crank, to which the link 49 is attached, terminates in a jaw or clevis 51 into which the link 49, which is a bar-like member having an eye opening at each end, is set and held by a suitable pin 52. In this arrangement the lower end of the tension rod 4 is also provided with a jaw or clevis 53 arranged to receive the other end of the link 49 where it is held by a suitable pin 54. Thus the link 49 is a single rigid member which can be easily and cheaply manufactured and which considerably simplifies the bell-crank connection.

The main advantages of my improved hand brake lie in the simplified construction of the brake operating mechanism; and in its greater all over operating efficiency. The improved and simplified arrangement of the brake drive mechanism assures a positive connection between the hand wheel and the chain winding wheel and hence positive braking action though the clutching means may for any reason be inoperative, whereas other clutch arrangements require clutching action before the winding wheel can be driven. Also the improved device permits a smooth uniform application of power with comparatively little effort on the part of the operator.

Although but one specific embodiment of this invention is herein shown and described, it is to be understood that details of the construction shown may be altered or omitted without departing from the spirit of the invention as defined by the following claims.

I claim:

1. In a railway car hand brake mechanism comprising a housing having a winding means journalled therein and a driving gear fast on said winding means, an operating shaft journalled at one end at the rear of said housing and terminating adjacent the front side thereof, a pinion fast on said operating shaft and meshed with said gear, a separate extension for said drive shaft having one end journalled in the front side of said housing and its opposite end projecting therefrom to carry a hand wheel, a helical connection between said operating shaft and said one end of said extension for limited longitudinal movement of said extension through relative rotation of said extension and said drive shaft, a ratchet wheel free on said drive shaft, and means to clutch and unclutch said ratchet wheel and said drive shaft upon relative longitudinal movement of said extension and said drive shaft, said helical connection being substantially within said housing.

2. In a railway car hand brake mechanism comprising a housing having a winding means horizontally journalled therein and a driving gear fast on said winding means, an operating shaft journalled at one end at the rear of said housing and terminating adjacent the front side thereof, a pinion fast on said operating shaft and meshed with said gear, a separate extension for said operating shaft having one end journalled in the front side of said housing and its opposite end projecting therefrom to carry a hand wheel, a helical connection between said drive shaft and said one end of said extension for limited longitudinal movement of said extension through relative rotation of said extension and said operating shaft, and a ratchet wheel free on said operating shaft and arranged to be gripped between said pinion and said extension upon relative longitudinal movement of the same in one direction.

3. In a hand brake mechanism comprising a housing and a winding wheel having a gear-toothed periphery, a driving means comprising an operating shaft journalled at one end on the rear wall of said housing and having its

other end threaded and terminating adjacent the front wall of said housing, a separate solid shaft extension projecting outwardly from said housing and having a hollow internally-threaded hub at its inner end and arranged to receive said other end of said operating shaft, said hub being journalled in the front wall of said housing and said shaft extension having a hand wheel thereon, a pinion fast on said operating shaft and arranged to engage the gear teeth on said winding wheel, a ratchet wheel loose on said operating shaft between said pinion and said hub, and friction clutching means between said pinion and said ratchet wheel whereby said ratchet wheel will be gripped and ungripped by screwing and unscrewing movement of said hub on and relative to said operating shaft.

4. A railway car hand brake driving mechanism comprising a stud shaft with a pinion fast thereto, a ratchet wheel loose on said stud shaft, frictional surfaces between said pinion and ratchet wheel, a threaded end on said stud shaft, and a separable solid shaft extension arranged for the attachment of an operating hand wheel on one end and having an internally threaded sleeve-like portion integral on the other end and coacting with the said threaded end on said stud shaft, all arranged whereby limited relative movement of said stud shaft and said sleeve-like portion controls the degree of resistance between said frictional surfaces through coaction of said sleeve-like portion and said ratchet wheel, and means positively limiting said relative movement.

5. In a railway car hand brake mechanism comprising a rotary chain winding drum having a gear fixed thereto for rotation in unison therewith, and a housing for said drum and gear, a rotary operating shaft substantially wholly within said housing and having a pinion fixed thereto at one end and meshing with said gear, a holding means loose on said operating shaft and arranged for rotation in one direction only, a clutch means cooperating with said shaft and holding means, and a separable solid driving shaft projecting beyond said housing and having a threaded connection at one end with said rotary operating shaft and arranged to control said clutch means through limited relative movement of said driving shaft and operating shaft, said driving shaft having a hand wheel removably attached at its opposite end.

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