May 17, 1932. H. FUCHS 1,858,490

HAND BRAKE

Filed Oct. 15, 1930 2 Sheets-Sheet 1

Fig. 1

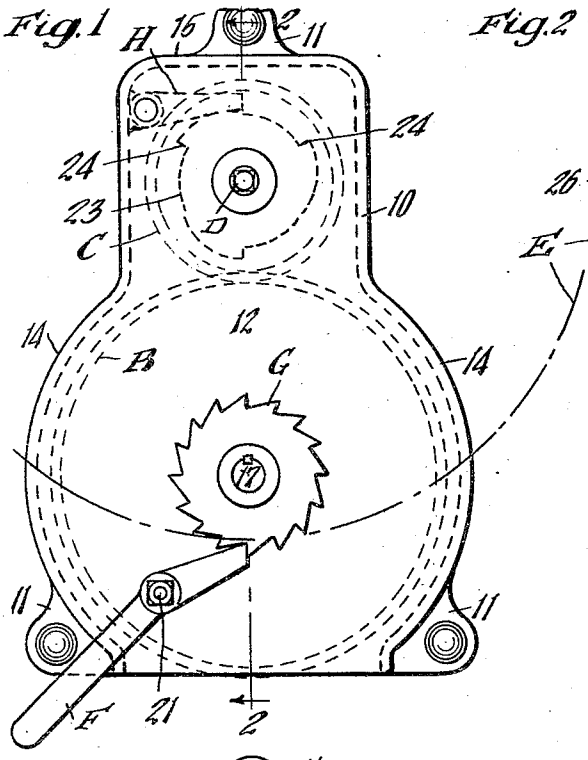


Fig. 2

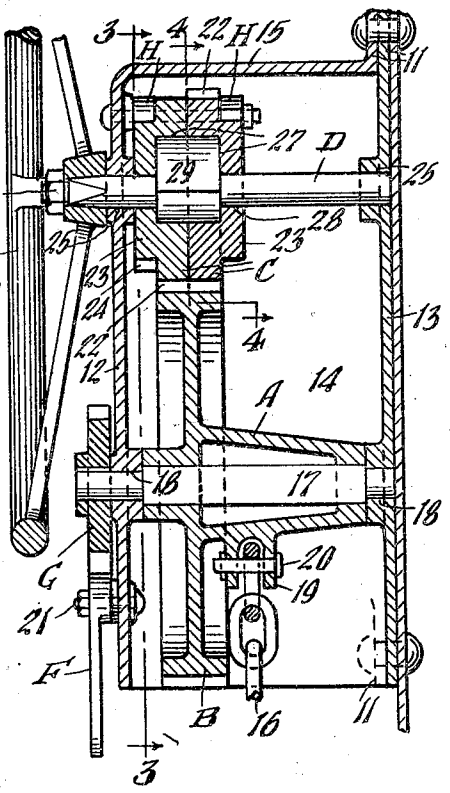


Fig. 3

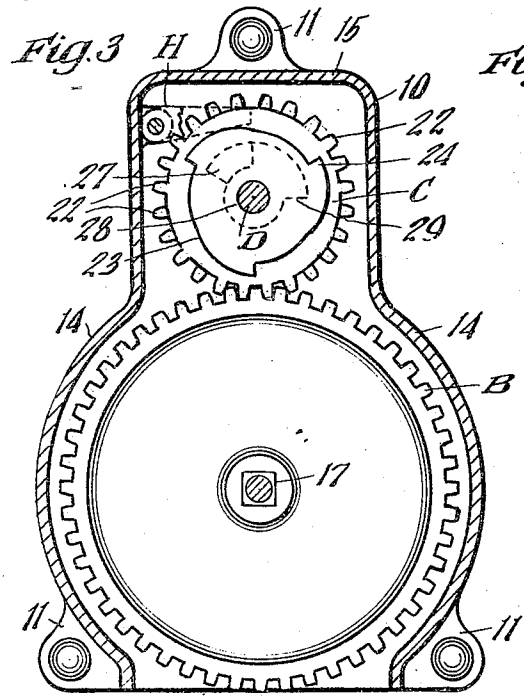
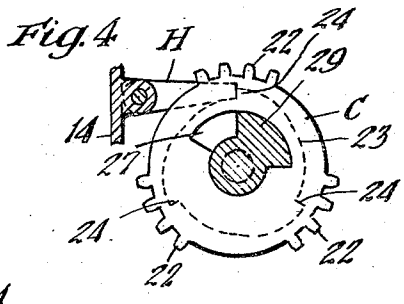


Fig. 4



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Fig.6

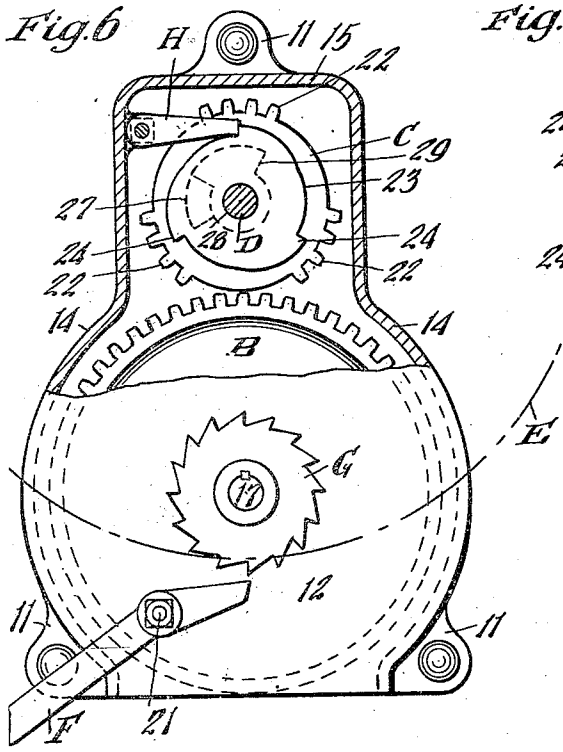


Fig.7

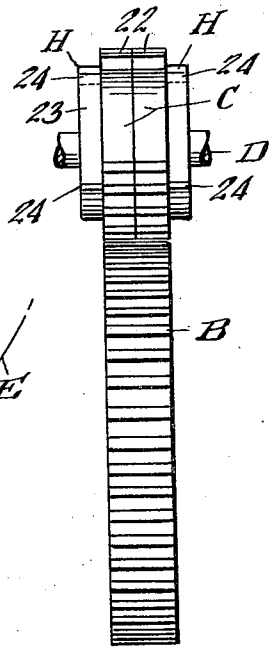
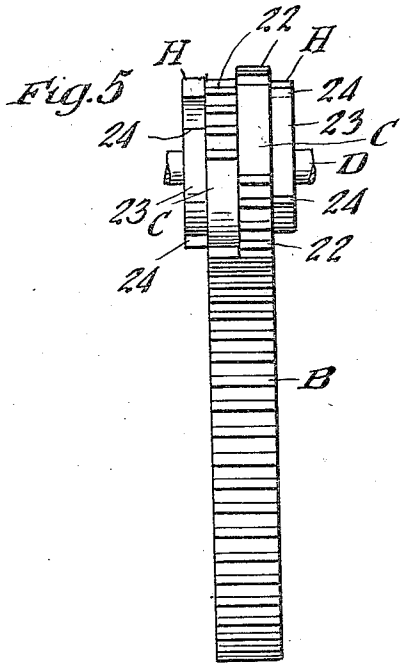


Fig.5



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UNITED STATES PATENT OFFICE

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HAND BRAKE

Application filed October 15, 1930. Serial No. 488,825.

This invention relates to improvements in hand brakes.

One object of the invention is to provide a simple and efficient hand brake mechanism of the hand wheel operated, power-multiplying gear type, wherein quick release is had with free running of the chain winding means with respect to the operating hand wheel, thereby preventing spinning of the latter and protecting the brakeman against injury.

A more specific object of the invention is to provide a hand brake mechanism of the character indicated in the preceding paragraph, wherein partial rotation only of the hand wheel in unison with the winding means during the releasing action of the brakes is had, the hand wheel remaining idle during the remainder of the releasing action, thus eliminating spinning of the same, the partial rotation of the hand wheel permitting easing off or backing up of the brakes during the initial portion of the releasing action.

A further object of the invention is to provide a power-multiplying hand brake mechanism of the gear operated type, wherein during release the intermeshing gear means is automatically disconnected after a predetermined initial partial rotation of the operating hand wheel with the winding means to allow rotation of the winding means in unwinding direction without imparting rotation to the hand wheel.

A more specific object of the invention is to provide a hand brake mechanism including a chain winding drum and means for rotating the drum, comprising a driving gear connected to the drum and a pair of gears having interrupted teeth normally meshing with the teeth of the drum gear, wherein the interrupted gears are relatively movable with respect to each other in release to bring the interrupted portions thereof in alinement and in opposed relation to the cooperating teeth of the drum gear, thereby destroying the operative connection and permitting free rotation of the drum gear and connected drum with respect to the interrupted gears, whereby the hand wheel remains idle during the major portion of the releasing action of the brakes, thus eliminating spinning and protecting the brakeman against injury.

In the drawings, forming a part of this specification, Figure 1 is a front, elevational view of my improved hand brake mechanism, illustrating the same as applied to the vertical end wall of a railway car. Figure 2 is a vertical, sectional view, corresponding substantially to the line 2—2 of Figure 1. Figure 3 is a transverse, vertical, sectional view corresponding substantially to the line 3—3 of Figure 2. Figure 4 is a vertical, sectional view, corresponding to the line 4—4 of Figure 2. Figure 5 is an elevational view of the intermeshing gear members, viewed from the right in Figure 3, the other parts of the brake mechanism being omitted. Figure 6 is a part vertical, sectional view and part elevational view of the hand brake mechanism illustrated in Figures 1, 2 and 3, showing the parts in a different position, the section being substantially the same as that indicated by the line 3—3 in Figure 2. And Figure 7 is an elevational view of the gears illustrated in Figure 6 and looking from the right in said figure.

The operating mechanism of the improved device is preferably mounted within a housing 10, which is secured to the vertical end wall of the car, the housing being preferably provided with a plurality of securing lugs 11—11, which are riveted to said end wall. In the present instance, the housing, as shown, is provided with two such lugs at the bottom and a third upstanding lug at the top. The housing is of the general outline, as shown in Figure 1, and has parallel, vertical front and rear walls 12 and 13, side walls 14—14 and a horizontal connecting top wall 15. The rear wall 13 is in the form of a flat plate and has three outstanding lugs thereon, corresponding to the lugs 11, hereinbefore described. The housing proper is secured to the wall 13 by means of rivets extending through the alined lugs of these members, the rivets also preferably extending through the end wall of the car so as to fix the housing to the same. The housing is open at the bottom, as clearly shown in Fig-

ure 2, thereby accommodating the brake chain 16 for movement. The chain 16 is connected to the brake mechanism proper of the car in a well known manner.

My improved hand brake mechanism proper comprises a chain winding drum A; a drum gear B; interrupted gears C—C; an operating shaft D; a hand wheel E; a releasable locking dog F; a ratchet member G; and stop members or dogs H—H.

The chain winding drum A is mounted on a shaft 17 having the major portion thereof of square cross section and fitting similar openings in the drum, so that the shaft will rotate in unison with the drum. At the opposite ends, the shaft 17 is provided with reduced bearing portions 18—18, which are journaled respectively in bearing openings provided in the front and rear walls of the housing. As clearly shown in Figure 2, the bearing openings of the housing walls are reinforced by inwardly projecting bosses surrounding the same, which bosses also engage the opposite ends of the drum member A to hold the same against endwise movement. The drum gear B is formed integral with the drum, and is located at the outer end thereof. The winding section of the drum is of conical form and has a pair of upstanding spaced lugs 19—19 thereon, to which the brake chain 16 is secured, a pin or bolt 20 being employed for this purpose and extending through alined openings in the lugs and through the end link of the chain. The shaft 17 has the bearing member 18 at the outer end thereof, extending outwardly beyond the front wall 12 of the housing. The ratchet member G is keyed to said projecting end portion of the shaft. The releasable locking dog F cooperates with the ratchet member G and is pivoted between its ends on a pivot member 21 fixed to the outer wall of the housing. At the inner end the member F is formed with a tooth engaging the teeth of the ratchet member G and at the outer end is provided with an operating hand lever for releasing the same. As will be clear upon reference to Figure 1, the release dog F is so disposed that the handle end thereof overbalances the tooth member, thereby holding the latter engaged with the ratchet teeth of the member G through the action of gravity.

The interrupted gear members C—C are of similar design but reversely arranged, as clearly shown in Figures 2, 3 and 4. Each of the gear members C has interrupted teeth 22—22 thereon. The teeth 22 are arranged in spaced sets, and as shown in the present instance each set comprises four teeth. The sets of teeth of each gear are spaced apart a distance equal to four teeth so that the interrupted portions of each gear correspond in length to the toothed sections thereof. As shown in Figures 3 and 4, each gear C has three sets of teeth 22. On the outer side, each gear C is reduced in diameter, as indicated at 23, said reduced section being provided with stop or ratchet teeth 24, which correspond in number to the sets of teeth 22 of said gear and are spaced apart equally. As clearly indicated in Figure 4, the teeth are so arranged that each tooth is located midway between the opposite ends of the corresponding set of gear teeth, and diametrically opposite the center of the interrupted section at the opposite side of the gear. The two gear members are freely rotatably supported on the operating shaft D, as clearly shown in Figure 2. The operating shaft D has its opposite ends journaled in bearing openings 25—25, provided in the front and rear walls of the housing, said openings being suitably reinforced by inwardly projecting bosses surrounding the same.

The shaft D projects outwardly of the front wall of the housing and has the hand wheel E fixed thereto. As shown, the outer end of the shaft D is tapered and of angular cross section and fits within a corresponding opening provided in the hub of the hand wheel E. The usual holding nut 26 is provided at the outer end of the shaft D for securing the hand wheel in position.

The gears C—C are provided with sector-shaped openings 27—27 at the inner sides thereof, which openings are concentric with alined openings 28—28, receiving the operating shaft D. The shaft D is also provided with a sector-shaped lug 29, which works in the openings 27—27 of the gears C—C. The lug 29, as clearly indicated in Figures 3 and 4, is of smaller size than the openings 27—27, so that a certain amount of lost motion is provided between said lug and the gears C—C. The openings of the two gears C—C are so disposed that when the lug is in shouldered engagement with the right hand end walls of said openings, as viewed in Figures 1, 3 and 4, the gear members will be maintained in the relative position shown in Figures 3 and 4, that is the sets of teeth of the gears C—C will be staggered or alternated, thereby presenting a continuous peripheral set of teeth which mesh with the teeth of the drum gear B. As will be evident, either gear C may be rotated in a contra-clockwise direction, as viewed in Figures 3 and 4, with respect to the other gear, thereby rotating the shaft D therewith and moving the lug 29 thereof out of engagement with the righthand end wall of the sector-shaped opening 27 of the other gear. The clearance between the lefthand end walls and the lug 29 is such that the gears may be displaced relatively to each other to such an extent that the teeth 22—22 of said gears may be brought into transverse alinement, thereby also bringing the interrupted portions into alinement.

In order to limit the backward rotation

of the gears C, a pair of stop members or dogs H—H are employed. As shown in Figures 1, 2 and 3, these dogs are located at the top of the housing and are pivotally supported on the side wall of the housing and are urged into engagement with the ratchet teeth of the gears C—C through the action of gravity. As most clearly shown in Figure 2, the stop dog H, which cooperates with the rear gear C, is so positioned that it engages the tooth 24 of said gear when the interrupted portion at the lower side of said gear is opposed to the tooth of the gear B. The dog H, which cooperates with the outer gear C, is also so disposed that it will stop backward rotation of said gear when the interrupted portion at the bottom side thereof is disposed opposite to the gear B, as clearly shown in Figure 6. As will be evident, when the interrupted portions of the two gears are in alinement and disposed opposite to the teeth of the gear B, the driving relation between the gears C—C and the gear B is broken, thereby permitting free rotation of the gear B with respect to the gears C—C and the means for operating the same.

In applying the brakes, the operation of my improved mechanism is as follows: The hand wheel E is rotated in a clockwise direction, thereby rotating the gears C—C in a clockwise direction also. Due to the relative arrangement of the lug 29 and the walls of the sector-shaped openings 27—27 of the gears C—C, the gears will be disposed with the tooth sections thereof staggered, whereby the two gears together present a continuous set of teeth meshing with the gear B. In case the two gears C—C are not positioned with the teeth staggered when the hand wheel is initially operated in a clockwise direction, the lug 29 of the shaft D will first engage with the right hand end wall of the opening 27 of one of the gears, thereby definitely positioning the same with respect to the shaft, and then engage the right hand end wall of the sector opening 27 of the other gear and dispose the same so that the teeth thereof will be alternated with the teeth of the first named gear. As the hand wheel E is further rotated in a clockwise direction, the two gears C—C acting together will effect continuous rotation of the drum gear B in a contra-clockwise direction, thereby imparting similar rotation of the drum A and winding the chain thereon. During the winding operation, the locking dog G prevents backward rotation of the chain winding drum and gear B, the dog holding the brakes tightened after the same have been applied.

In releasing the brakes, the locking dog F is disengaged from the ratchet member G, thereby permitting rotation of the chain winding drum A. Due to the pull of the chain, the drum A and gear B will be rotated in a clockwise direction, as viewed in Figures 1, 3 and 6. Inasmuch as the teeth of the gear B are in mesh with the teeth of the gears C, the latter will be rotated in a contra-clockwise direction until stopped by the locking dogs H—H. As shown in Figure 4, the locking dog H cooperating with the rear gear C will arrest movement of the same when the interrupted portion of said gear is opposed to the teeth of the gear B. Assuming that this gear has thus been arrested, the further rotation of the gear B in a clockwise direction will effect rotation of the front gear C only. This gear will be thus rotated in a contra-clockwise direction until the teeth thereof clear the teeth of the gear B, as shown in Figure 6, the dog H cooperating with the front gear C arresting movement of the latter so that the same will not be overthrown. As will be evident, when the two gears C—C are in the last named position, the gear B will be free to rotate with respect to these gears and the hand wheel, thereby permitting rotation of the chain winding drum in an unwinding direction without imparting rotation to the hand wheel, thereby avoiding spinning and protecting the brakeman against injury.

In case it is desired to back up or ease off the brakes, the operator manipulates the hand wheel in such a manner as to follow up the unwinding operation of the drum. During this action, the two gears C—C will be arrested in succession in the manner hereinbefore described, and when the teeth of both gears are disengaged from the drum gear B, the brakes will freely release, due to the rotation of the gear B without rotation of the driving gears C—C. As will be evident, the brake may thus be backed up or eased off to an extent corresponding at least to four teeth of the interrupted gears C.

The driving relation of the gears is clearly shown in Figure 5, wherein the teeth 22—22 of the two gears C—C are shown, as staggered, and arranged in series so as to properly mesh with the continuous set of teeth of the drum gear B. In Figure 7, the releasing position of the mechanism is shown, wherein the gears C—C have the sets of teeth thereof in transverse alinement and the interrupted portions thereof also in alinement. As will be evident, the gears C—C in the last named position entirely clear the teeth of the gear B, thereby permitting free rotation of the latter.

I have herein shown and described what I now consider the preferred manner of carrying out my invention, but the same is merely illustrative and I contemplate all changes and modifications that come within the scope of the claims appended hereto.

I claim:

1. In a hand brake mechanism, the combination with a rotary chain winding member; of intermeshing gear means for actuat-

ing said member, certain of said gear means having interrupted teeth, said interrupted gear means being rotatable to a position to completely disengage the teeth thereof from the cooperating gear means; and means for positioning said interrupted gear means with the teeth disengaged, thereby permitting rotation of the chain winding member in unwinding direction while said interrupted gear means remain idle.

2. In a hand brake mechanism, the combination with a rotary chain winding member; of intermeshing gear means for actuating said member, certain of said gear means having interrupted teeth, said interrupted gear means being rotatable to a position to completely disengage the teeth thereof from the cooperating gear means, said gear means being actuated by rotation of said winding member in unwinding direction for moving said interrupted gear means until the teeth are disengaged; and means for stopping said gear means in said last-named position, thereby permitting rotation of the chain winding member in unwinding direction while said interrupted gear means remains idle.

3. In a hand brake mechanism, the combination with a chain winding member; of a gear member rotatable with said winding member; gear means rotatable about a fixed axis having teeth meshing with said first named gear member; means for rotating said gear means in brake tightening direction and maintaining the teeth thereof engaged with said first named gear when so rotated, said teeth of the gear means being disengaged from said gear member upon rotation of said gear means in a reverse direction, permitting free running of the winding member in release of the brakes.

4. In a hand brake mechanism, the combination with a chain winding member; of a gear rotatable with said member; a pair of gears cooperating with said first named gear, each gear of said pair having interrupted teeth, the gears of said pair being relatively rotatable to aline the interrupted portions thereof and disengage the teeth from said first named gear to allow free rotation of the winding member in release of the brakes.

5. In a hand brake mechanism, the combination with a pair of gears rotatable about a common axis, each of said gears having interrupted teeth; means for rotating said gears in one direction and maintaining the teeth thereof in staggered relation, each gear being relatively movable with respect to said means when rotated in a reverse direction; a rotary chain winding member; a gear fixed to said member and normally meshing with the teeth of said pair of gears; releasable locking means for preventing backward rotation of said winding member, backward rotation of said member when said locking means is released effecting relative movement of said first named gears and disengagement thereof from the gear of the winding member.

6. In a hand brake mechanism, the combination with a rotary winding member; of a gear fixed thereto; releasable locking means for holding said winding member against rotation in unwinding direction; gear means cooperating with said gear member; operating means for rotating said gear means and providing constant engagement of the teeth thereof with said gear member to rotate the winding member in chain tightening direction, the teeth of said gear means being relatively displaceable circumferentially about the axis of rotation thereof to interrupt the engagement thereof with said gear member and permit free rotation of the latter and the chain winding member in release of the brakes.

7. In a hand brake mechanism, the combination with a rotary winding member; of a gear fixed thereto; releasable locking means for holding said winding member against rotation in unwinding direction; gear means cooperating with said gear member, said gear means having sets of relatively displaceable teeth; operating means for actuating said gear means and disposing the sets of teeth thereof in continuous series when actuated in brake tightening direction, said sets of teeth being movable with respect to each other to interrupt the continuity thereof; a rotary winding member; and a gear fixed to said member and having the teeth of the gear means meshing therewith when the operating means is actuated in said winding direction, said sets of gear teeth being moved relatively to each other by said gear member upon release of the locking means and rotation of the winding member in unwinding direction, thereby interrupting the continuity of the teeth and permitting free rotation of the winding member.

8. In a hand brake mechanism, the combination with relatively rotatable gear members, each having interrupted teeth, said gear members being rotatable about a common axis; a chain winding drum; a gear fixed to said drum, said gear having a continuous set of teeth normally meshing with the teeth of said first named gears; and a rotary actuating member coaxial with said first named gears and having shouldered engagement therewith when actuated in brake tightening direction, said shouldered engagement holding the teeth of the gear members staggered, thereby providing a continuous set of teeth meshing with said drum gear, each of said first named gear members being rotatable backwardly with respect to the actuating member to dispose the interrupted portions thereof in alinement, said first named gear

members being moved relatively to each other by backward rotation of the drum gear to disengage the teeth of all of said first named gear members and permit free rotation of the drum.

9. In a hand brake mechanism, the combination with a chain winding drum; of a gear fixed to the drum; relatively rotatable gear members having interrupted teeth meshing with said drum gear; means for rotating said gear members and maintaining the teeth thereof staggered to provide a continuous set of teeth meshing with said drum gear; locking means for arresting backward rotation of said gear members and positioning the interrupted teeth thereof in transverse alinement; and releasable means for locking the drum against backward rotation.

10. In a hand brake mechanism, the combination with a chain winding drum; of a gear fixed to said drum; relatively rotatable gear members having interrupted teeth meshing with said drum gear, said gear members being rotatable about a common axis; a rotary operating member having a lost motion connection with said gear member, said operating member when rotated in one direction driving said gear members and maintaining the teeth thereof staggered, said gear members each being rotatable backwardly with the operating member and with respect to the other gear through backward rotation of the drum gear; and stop means for limiting backward rotation of said gear members and bringing the interrupted portions thereof in alinement, thereby breaking the continuity of engagement with said drum gear and permitting free rotation of the latter in release.

11. In a hand brake mechanism, the combination with a rotary operating shaft; of a pair of gears having interrupted teeth, each rotatably mounted on said shaft; a lost motion driving connection between said shaft and each gear, having shouldered engagement therewith for maintaining the teeth of said gears respectively staggered when rotated in brake tightening direction; a chain winding drum; and a gear fixed to said drum and meshing with said interrupted gears.

12. In a hand brake mechanism, the combination with a rotary operating shaft; of a pair of gears on said shaft, each gear having an interrupted set of teeth, said gears being independently rotatable; a lost motion driving connection between said shaft and each gear, said connection maintaining the teeth of said gears staggered when rotated in brake tightening direction; a locking dog cooperating with each gear for limiting backward rotation of said gears, said dogs arresting backward movement of both gears when the interrupted sections of said sets of teeth thereof are transversely alined; a chain winding drum; and a gear fixed to said drum and meshing with said interrupted gears.

13. In a hand brake mechanism, the combination with a rotary operating shaft; of a pair of gears on said shaft, said gears being independently rotatable; a lost motion driving connection between said shaft and each gear, said connection maintaining the teeth of said gears staggered when rotated in brake tightening direction; a locking dog cooperating with each gear for limiting backward rotation of said gears, said dogs arresting backward movement of both gears when the interrupted teeth thereof are transversely alined; a chain winding drum; a gear fixed to said drum and meshing with said interrupted gears; and a releasable locking dog for normally holding said chain winding drum and drum gear against rotation in unwinding direction.

In witness that I claim the foregoing I have hereunto subscribed my name this 10th day of October, 1930.

HENRY FUCHS.