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LADDER EXTENSION

2,503,626

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2 Sheets-Sheet 1

Fig. 1.

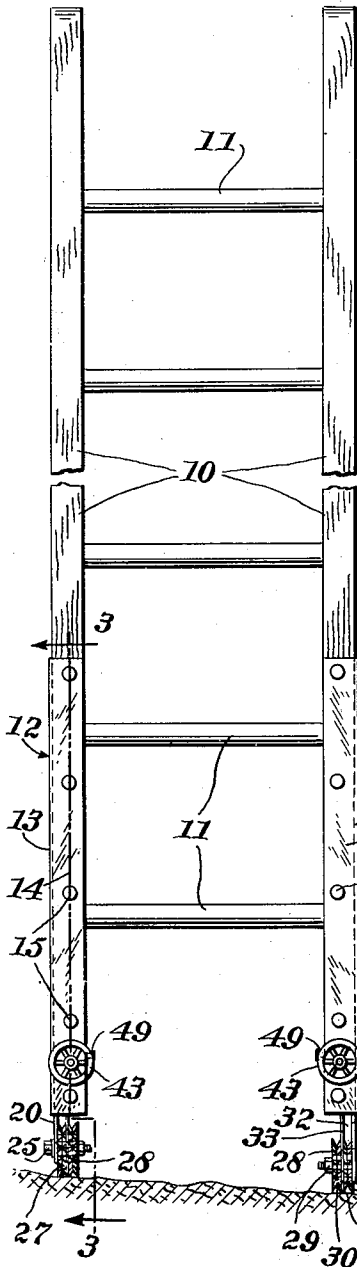


Fig. 2.

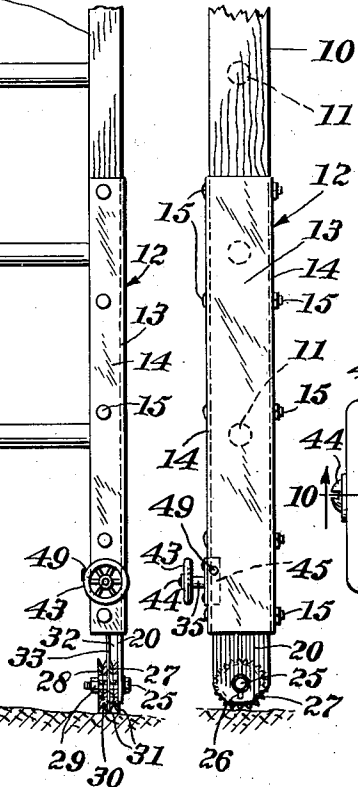


Fig. 3.

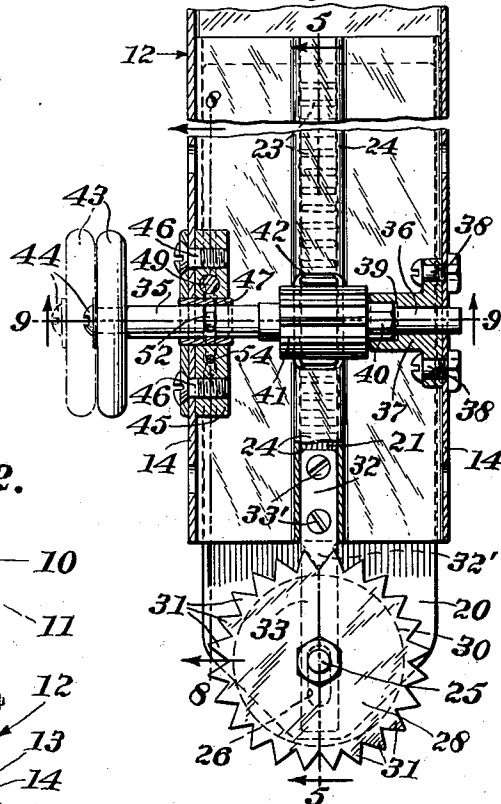
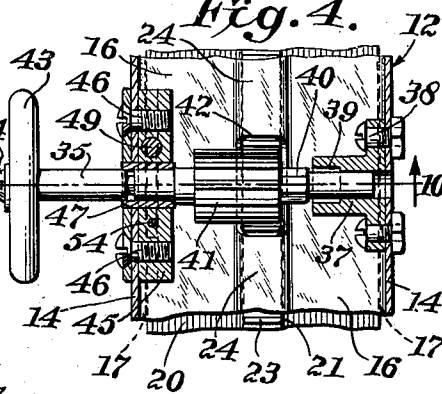


Fig. 4.



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LADDER EXTENSION

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7 Claims. (Cl. 228—63)

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The present invention relates to ladders and more particularly, to improved means for adjustably connecting ground engaging legs to the stiles of the ladder.

An important object of the invention consists in associating with a stile of a ladder, an attachment including a fixed member preferably in the form of a channel-shaped plate, and a slidable leg member having a ground engaging shoe. Manually operating means extends transversely through the channel member and is operatively connected to the slidable leg to move the same longitudinally in order that the ladder may be easily set up and the stile locked at the proper level, irrespective of the unevenness of the ground on which it is supported.

A further object is to provide the slidable leg member of the attachment, with a rack bar that extends lengthwise of the leg member. An operating shaft extends transversely through the attachment and is operatively connected to the rack bar. Locking means in the form of a clutch mechanism is associated with the operating shaft so as to lock the same and the rack bar in a fixed position.

Another object consists in associating with the attachment a foot or ground engaging member comprising revoluble discs having pointed teeth extending radially therefrom and arranged selectively to be locked in a fixed or non-rotatable position by means connected to the slidable members.

Other objects and advantages of the invention will become apparent from the following description when taken in conjunction with the accompanying claims and drawings.

Referring to the drawings in which are shown several preferred embodiments the invention may assume:

Figure 1 is a front view of a ladder constructed in accordance with the present invention.

Figure 2 is a detail side view of Figure 1.

Figure 3 is a sectional view taken substantially along the line 3—3 of Figure 1 with the operating parts in their locked position.

Figure 4 is a detail view similar to Figure 3 with the operating parts moved to their unlocked position.

Figure 5 is a sectional view taken substantially along the line 5—5 of Figure 3.

Figure 5a is a detailed perspective view of the slidable leg member and the rack bar.

Figure 6 is a view similar to Figure 5 but with the adjustable leg attachment removed from the stile.

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Figure 7 is a front view of Figure 6.

Figure 8 is a sectional view taken substantially along the line 8—8 of Figure 3.

Figure 9 is a sectional view taken substantially along the line 9—9 of Figure 3.

Figure 10 is a view similar to Figure 9 with the parts shown in their unlocked position, and

Figure 11 is a detail sectional view of a modified form of the invention.

Referring to the drawings in which like numerals indicate like parts in the several views, 10 designates the stiles or side rails of a ladder and 11 the spaced transverse rungs which are suitably connected to the stiles. The ladder may be made of wood or other suitable light, durable material and of such length and construction as to be used as a fire ladder or the like.

Each stile 10 of the ladder at the lower end thereof is shaped to receive an extensible leg attachment which preferably includes a substantially channel-shaped metal member 12 having an exposed face or base 13 (Fig. 9) of substantially the same width as the stile 10 (Fig. 2) and which is arranged to extend over the outer side of the stile. Extending inwardly from the base 13 are spaced flanges 14 which overlap the front and rear sides of the stile and are secured thereto by the transverse retaining bolts 15. The inner opposed faces or sides of the stiles 10 are free from contact with the channel member 12 and are provided with aligned openings for receiving the rungs 11. Within the channel member 12 and between the flanges 14 is positioned a plate 16 having depending flanges 17 (Fig. 9) which engage the adjacent flanges 14 and may be welded thereto as at 18 so as to provide an elongated passage or chamber 19 between the plate 16 and the base 13 for receiving an elongated flat slidable leg member 20 to which is medially and longitudinally connected a rib 21 by the spaced screws 22. The outer face of the rib has transverse teeth 23 so as to form a rack bar. The plate 16 has a centrally and longitudinally disposed offset portion 24 which constitutes a housing for the rack bar 23 and is substantially co-extensive in length therewith.

The slidable leg member 20 has its lower end projecting outwardly from the compartment or chamber 19 and preferably carries a transverse bolt 25 which extends through an elongated vertical opening 26 in the lower portion of the member 20 so as to constitute a support for a foot or ground engaging member. This foot preferably comprises a pair of disc-shaped members 27 and 28 that are detachably connected through

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the retaining nut 29 to the bolt 25 and the leg 20. Each of the discs 27 and 28 has a V-shaped notch 30 that extends circumferentially around the outer periphery thereof and which forms pairs of transverse aligned outwardly projecting prongs or teeth 31 (Fig. 5) that provide sharp ground engaging means for insuring the ladder being maintained in a fixed immovable position even on hard ground such as cement or the like. The rack bar 23 has a pointed lower end 32 arranged to fit into the groove or notch 30 and between the teeth 31 of the disc 27 so as to prevent rotation of the disc or the foot member. A plate 33 extends between the discs 27 and 28 (Fig. 5) and is secured to the lower end of the rack bar 23 by the bolts 33'. The plate 33 extends parallel with the leg member 20 and has an elongated opening 26' through which extends the bolt 25. The inner surface or side of the plate 33 is formed with a cut-out pointed portion 32' that registers with the pointed end 32 of the rack bar 23 so as to engage in the peripheral teeth 31 of the disc 27, to lock the foot member in position.

The inner surface of the lower end portion of the stile 12 is preferably cut out to form a centrally longitudinally extending groove 34 (Fig. 7) that is arranged to receive and is co-extensive in length with the offset portion 24 of the plate 16 which houses the rack bar 23. Extending transversely of the stile 10 and through the flanges 14 of the channel member 12 is a revoluble operating shaft 35 (Fig. 3) which preferably has its inner end 36 axially slidable in a tubular boss 37 secured by the bolts 38 to a flange 14 of the channel member 12. The tubular boss 37 is counterbored as at 39 (Fig. 4) and is of polygonal shape so as to slidably receive a complementary formed collar or clutch member 40 fixed to the shaft 35. A relatively wide pinion or cog wheel 41 is keyed or otherwise secured to the shaft 35 so as to mesh with the teeth 23 of the rack bar 21, and the offset portion 24 of the plate 16, is cut away as at 42 (Fig. 4) so that the pinion or worm 41 may mesh with the teeth 23. A handle 43 is secured as at 44 to the outer exposed end of the shaft 35 so as to rotate the same and cause longitudinal movement of the leg member 20 and the foot 27 in order to adjust the stile to the desired length for the purpose of insuring the ladder being maintained in a level position irrespective of the unevenness of the ground on which it is supported. It will be seen that upon inward axial movement of the shaft 35 from the position shown in Figure 4 to that disclosed in Figure 3, the polygonal collar 40 will move into locking engagement with the recess 39 so as to prevent rotation of the pinion 41 and the rib or rack bar 21, thus maintaining the leg 20 and the foot 27 in a fixed position relative to the ladder. Conversely, when the shaft 35 is moved axially outward to free the collar 40 from engagement with the recess 39, the width of the pinion is such as to maintain the same in engagement with the teeth 23 of the rack bar 21 so that rotating of the shaft 35 through the handle 43 in one direction will move the leg member 20 and its associated parts downward to lengthen the stile 12. Rotating of the shaft 35 in an opposite direction will shorten the length of the stile 10 in order that the ladder may be maintained level when set up. Inward axial movement of the shaft 35 will cause the collar 40 to engage the recess 39, so as to lock the leg member 20 and its associated parts in any desired adjusted position. In order to releasably retain the shaft 35 and its associ-

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ated parts in their locked position as shown in Figure 3, a bearing block 45 is connected through the bolts 46 to the inner side of one of the flanges 14 of the channel member 12 (Fig. 3). The block 45 has an opening in which is mounted a bushing 47 for receiving the shaft 35. The block 45 also is provided with a transverse opening 48 (Fig. 8) through which extends a plunger 49 having a removable head 50 and is provided at its inner end with a laterally extending portion or arm 51 arranged to fit into a circumferential groove 52 in the shaft 35 (Fig. 9) so as to prevent longitudinal movement of the shaft. The arm 51 is released from the groove 52 by depression of the plunger 49 so that the shaft may be moved outwardly to the position shown in Figure 10, to release the collar or clutch member from the boss 37. A spring 53' is connected as at 53 to the block 43 and engages the arm 51 so as yieldably to maintain the same in contact with the shaft 35. The inner free end of the arm 51 has a stud or pin 54 that slides within a complementary formed recess 55 in the bearing block so as to insure the plunger 49 and its associated parts being maintained in proper position. The inner surface of the stile 12 adjacent the transverse shaft 35 is cut out as at 56 (Fig. 6) so that the leg attachment may be conveniently connected to the stile and firmly secured thereto by the spaced retaining bolts 15.

Preferably each of the lower end portions of the stiles 12 is provided with one of the attaching members. It will be seen that when it is desired to use the ladder on an uneven surface such as when associated with a stair or a sudden drop in the ground, that upon releasing the shaft 35 from its locked engagement with the boss 36 by depressing the plunger 49, the shaft 35 may be moved axially outward from the position shown in Figure 9 to that shown in Figure 10 without disturbing the engagement of the pinion 41 with the teeth 23 of the rib 21. Upon this axial outward movement of the shaft 35, the collar 40 is moved out of engagement with its associated recess 39 to allow free rotatable movement of the shaft 35 in order to move the leg member 20 and the foot 27 either outwardly or inwardly so as to properly adjust the stile 12 in order to maintain the ladder level. When the leg member 20 is moved to the desired adjusted position it is maintained locked in this position by moving the shaft 35 inwardly so as to cause the clutch or collar 40 to again engage the recess 39, to prevent rotation of the shaft 35 and its associated parts.

In the modified form of the invention shown in Figure 11, the operating shaft 35 and its associated parts are substantially similar to the parts previously described, with the exception that instead of forming a locking member on the shaft, the pinion 41 is arranged to co-act with the teeth 57 of a serrated plate 58 that is fastened to the plate 16 adjacent the side of the rib 24. The inner end portion 59 of the shaft 35 is slidable in a boss 60 which may be connected to one of the side flanges 14 by the threaded bolts 61 and their co-acting threaded nuts 62. As shown in full lines in Figure 11 the shaft 35 is moved inwardly so that the pinion 41 meshes with the teeth 57 for locking the leg member 20 in a fixed position. Upon axial movement of the handle 43 to the dotted line position, the pinion 41 is moved laterally out of mesh with the teeth 57 on the plate 58 so that rotation of the shaft 35 moves the leg member 20 and its associated parts

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relative to the stile in order that the ladder will assume a level position irrespective of the unevenness of the ground on which it is supported.

Thus, it will be seen that simple, efficient and positive means are provided in the form of an attachment which may be readily connected to either or both the stiles 10 of a ladder and which when the parts are set up, insures the ladder being firmly maintained in a fixed position. Additionally, the discs 27 and 28 which constitute the foot member may when the teeth become dull or worn be rotated to present new teeth to be engaged with the ground, by the simple expedient of loosening the bolt 25 so as to allow the disc 27 to be moved away from locking engagement with the pointed end 32 of the rack bar 21 so as to rotate the discs and present a new set of teeth to be engaged with the ground. The discs are then moved so that the pointed end 32 of the rack bar 21 again engages the sides of the teeth 31 of the disc 27 so as to prevent rotation thereof. The bolt 25 is then clamped by the nut 29 so as to maintain the discs 27 and 28 in their proper fixed position. While the discs 27 and 28 are shown separate they could be made in one piece. Additionally, the pointed end 32 of the rack bar while shown arranged to engage only the teeth of the disc 27 may be of sufficient width to engage the teeth in the disc 28 so as to prevent rotation of both of these parts when it is desired to lock the discs or wheels.

It will be understood that the forms of the invention shown are merely illustrative of preferred embodiments and that such changes may be made as fall within the purview of one skilled in the art without departing from the spirit of the invention and the scope of the following claims.

I claim:

1. In combination with a ladder stile, an extensible attachment including a channel shape member engaging the outer side of the stile and having spaced arms engaging the front and rear sides thereof, a leg member slidably mounted within the channel member, a rack bar connected to the leg member and extending longitudinally thereof, a rotatable and axially movable operating shaft extending transversely through the channel member, said shaft having a pinion constantly in mesh with said rack bar, a tubular boss connected to one arm of the channel member and arranged to slidably receive the operating shaft, said boss having means co-acting with complementary means on said shaft for locking the shaft and the leg member in a fixed position, and means for moving said shaft into and out of its locked position.

2. In combination with a ladder stile, an extensible attachment including a channel member having a base engaging the outer side of the stile and spaced arms engaging the front and rear sides of the stile, a plate secured within said channel member and spaced from the base to provide a passage, said plate having a longitudinally extending outward offset housing provided with a cut-out portion, a rack bar on said leg member and positioned within said housing, an operating shaft extending transversely of the channel member and having a pinion extending through the cut-out portion of said housing and meshing with said rack bar, said operating shaft being rotatably and slidably mounted on the spaced arms of the channel member, and locking means associated with said pinion for preventing

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rotation of the shaft and movement of the leg member, and means for moving the pinion into and out of engagement with the locking means.

3. In combination with a ladder stile, an extensible attachment including a channel member having a base engaging the outer side of the stile and spaced arms engaging the front and rear sides of the stile, a plate secured within said channel member and spaced from the base to provide a passage, said plate having a longitudinally extending outward offset housing provided with a cut-out portion, a rack bar on said leg member and positioned within said housing, an operating shaft extending transversely of the channel member and having a pinion extending through the cut-out portion of said housing and meshing with said rack bar, a tubular boss connected to an arm of the channel member and arranged to slidably receive said operating shaft, said boss having means co-acting with complementary means on said shaft for locking the shaft and the leg member in a fixed position, and means for moving said shaft into and out of its locked position.

4. In combination with a ladder stile, an extensible attachment including a channel member having a base engaging the outer side of the stile and spaced arms engaging the front and rear sides of the stile, a plate secured within said channel member and spaced from the base to provide a passage, said plate having a longitudinally extending outward offset housing provided with a cut-out portion, a rack bar on said leg member and positioned within said housing, an operating shaft extending transversely of the channel member and having a pinion extending through the cut-out portion of said housing and meshing with said rack bar, a tubular boss connected to an arm of the channel member and arranged to slidably receive said operating shaft, clutch means on said boss co-acting with complementary clutch means on said shaft for preventing rotation of the shaft and the movement of the leg member, and means for moving the clutch means into and out of locking engagement.

5. In combination with a ladder stile, an extensible attachment including a channel member having a base engaging the outer side of the stile and spaced arms engaging the front and rear sides of the stile, a plate secured within said channel member and spaced from the base to provide a passage, said plate having a longitudinally extending outward offset housing provided with a cut-away portion, a rack bar on said leg member and positioned within said housing, an operating shaft extending transversely of the channel member and having a pinion extending through the cut-out portion of said housing and meshing with said rack bar, said operating shaft being rotatably and slidably mounted on the spaced arms of the channel member, and locking means associated with said pinion for preventing rotation of the shaft and movement of the leg member, and means for moving the pinion into and out of engagement with the locking means, and a serrated plate connected to the channel member adjacent the rack bar, said pinion upon axial movement of the operating shaft being moved into and out of locking engagement with said plate to prevent movement of the leg member.

6. In combination with a ladder stile, an extensible attachment including a channel member having a base engaging the outer side of the

stile and spaced arms engaging the front and rear sides of the stile, a plate secured within said channel member and spaced from the base to provide a passage, said plate having a longitudinally extending outward offset housing provided with a cut-out portion, a rack bar on said leg member and positioned within said housing, an operating shaft extending transversely of the channel member and having a pinion extending through the cut-out portion of said housing and meshing with said rack bar, and releasable means engaging said shaft for preventing axial movement thereof.

7. In combination with a ladder stile, an extensible attachment including a channel member having a base engaging the outer side of the stile and spaced arms engaging the front and rear sides of the stile, a plate secured within said channel member and spaced from the base to provide a passage, said plate having a longitudinally extending outward offset housing provided with a cut-out portion, a rack bar on said leg member and positioned within said housing, an operating shaft extending transversely of the channel member and having a pinion extending through the cut-out portion of said hous-

ing and meshing with said rack bar, spaced bearing members connected to the arms of said channel member for slidably receiving said shaft, a movable plunger extending outwardly from one of the bearing members and yieldably connected to said plunger and arranged to engage said shaft for preventing axial movement thereof.

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