May 6, 1941. R. C. TAYLOR 2,240,814

TIE PULLER

Filed Nov. 24, 1939 2 Sheets-Sheet 1

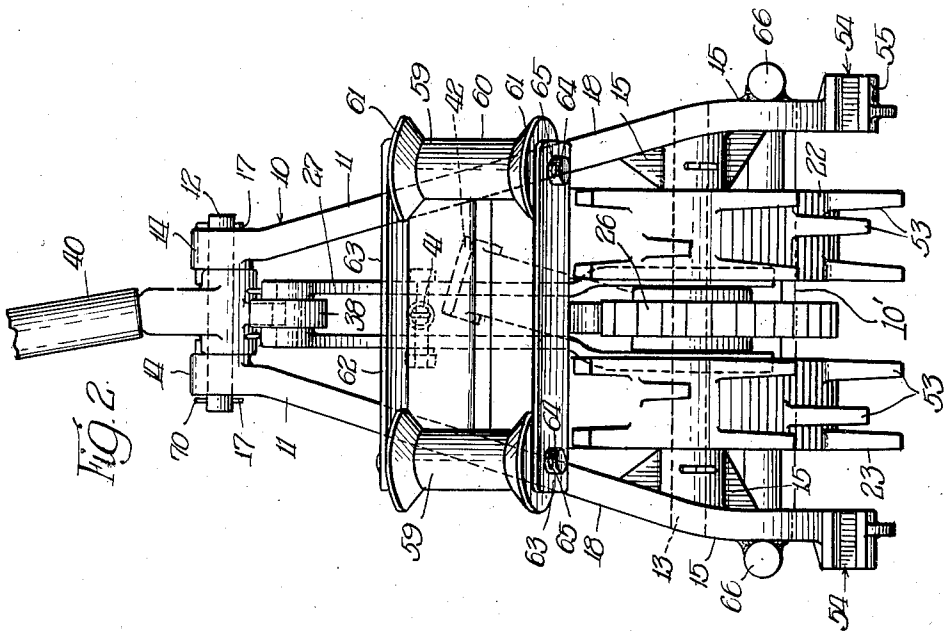


Fig. 2.

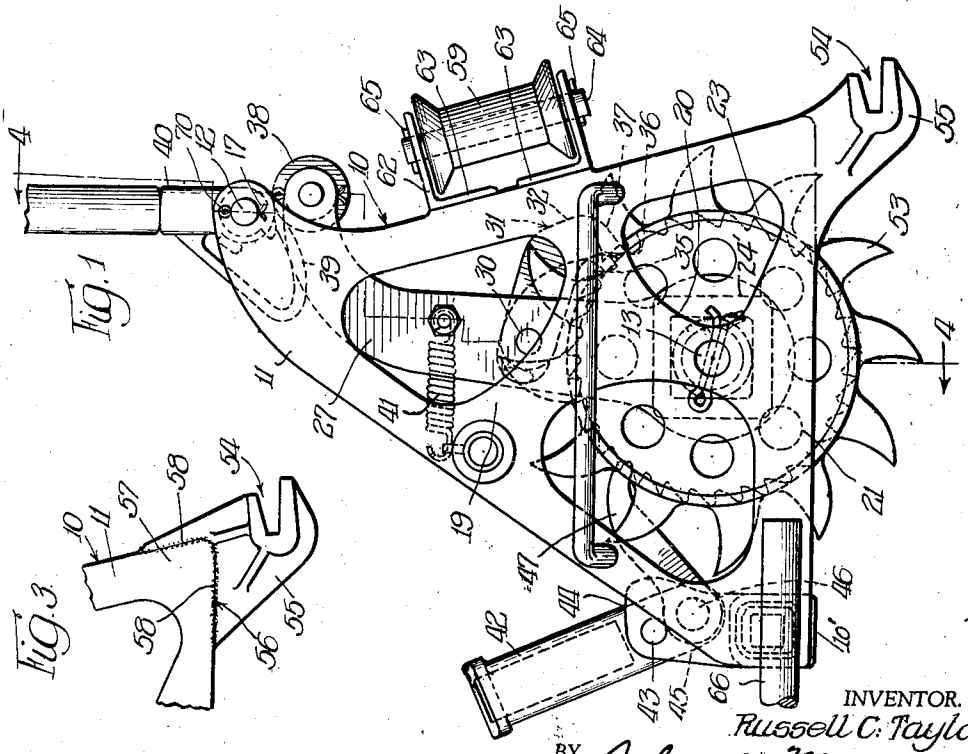


Fig. 1.

Fig. 3.

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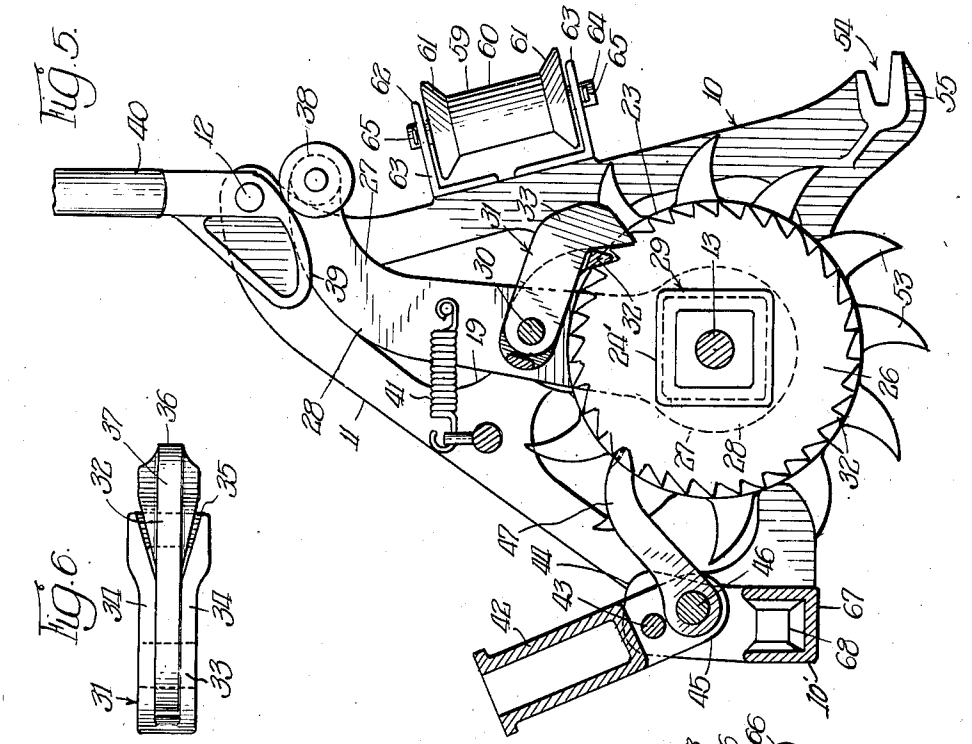


Fig. 5.

Fig. 6.

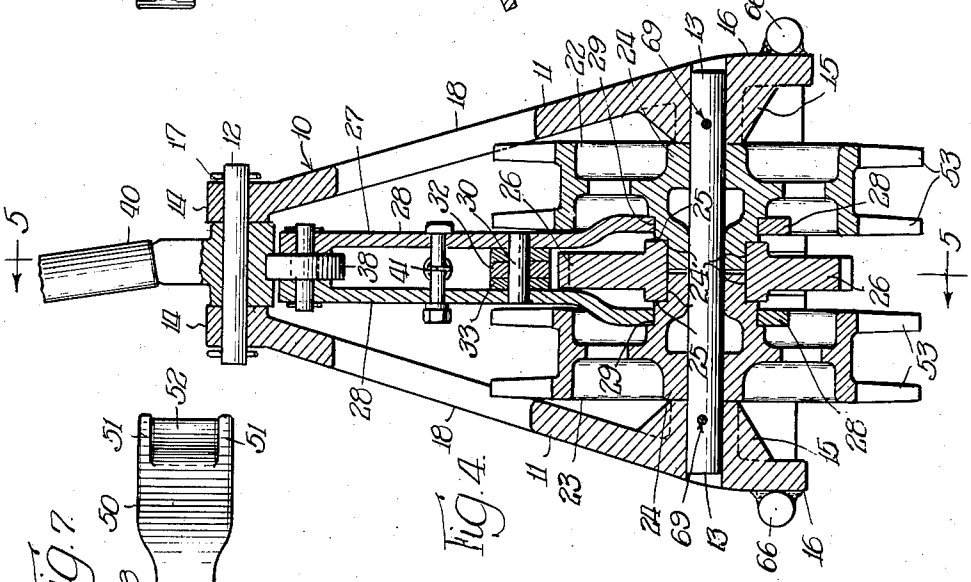


Fig. 4.

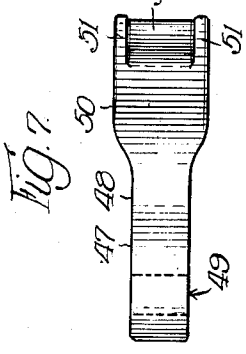


Fig. 7.

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UNITED STATES PATENT OFFICE

2,240,814

TIE PULLER

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Application November 24, 1939, Serial No. 305,830

20 Claims. (Cl. 254—43)

This invention relates to tie pullers and particularly to the type shown in application Serial No. 281,514, filed June 28, 1939, this application being an improvement over the aforesaid pending application.

An important object of the present invention is the provision of a tie puller having improved means for effecting operation of the toothed tie engaging wheels, there also being new and novel tie engaging means or wheels cooperating with a pawl operated ratchet wheel.

Another important object of the invention is the provision of a tie puller which is provided with a frame constructed and arranged to absorb and take up strains and stresses which may occur during the operating of the device in the field; which is provided with a new replaceable flange engaging a structure to lock and brace the device during operation; which is provided with new and improved means for the operation of the individual operating members; which is provided with a strong and durable ratchet pawl of a particular type; which is rigidly constructed and not likely to get out of order; and which has its parts constructed and assembled in a particular manner or way, so as to permit free and easy assembly of the parts and to permit quick and easy repair or replacement of the parts.

Numerous other objects and advantages will be apparent throughout the progress of the following specification.

The accompanying drawings illustrate certain selected embodiments of the invention, and the views therein are as follows:

Fig. 1 is a detail elevational view of the improved tie puller.

Fig. 2 is a front elevational view thereof.

Fig. 3 is a detail view of the replaceable rail-flange engaging jaw.

Fig. 4 is a detail sectional view on the line 4—4 of Fig. 1.

Fig. 5 is a detail sectional view on the line 5—5 of Fig. 4.

Fig. 6 is a detail view of the double low speed ratchet pawl.

Fig. 7 is a detail view of the high speed ratchet pawl.

The particular tie puller herein shown for the purpose of illustrating the invention comprises a frame 10 having rigid oppositely disposed side members 11 rigidly but detachably connected together by an upper shaft or axle 12, a lower shaft or axle 13, and the main tie bar 10' arranged at the lower left hand part of the machine, Fig. 5. The upper ends of the frame members 11 are provided with extensions or bosses 14 in which the shaft or axle 12 is journaled. The lower ends of the side members 11 are provided with inwardly extending hollow bosses 15 in which the shaft or axle 13 is journaled. The side members 11 are relatively straight at their bottom and upper ends as indicated at 16 and 17, respectively, and are connected by straight, inclined, integral connection portions 18, Figs. 2 and 4, whereby the puller is considerably wider at the bottom than at the top. These side members 11 are relatively A-shaped in elevation as clearly shown in Fig. 1 and each are provided with a horizontally, inclined rib 19 merging with a vertically, inclined rib 20 so as to materially strengthen these side frame members, whereby they will be of sufficient strength to prevent damage or breaking during use, but at the same time will be relatively light in weight. The provision of the inclined strengthening webs or ribs 19 and 20 are so constructed and arranged that the stress and strains will be absorbed and the device will stand up under severe working conditions to which the device is subjected in actual use. The frames 11 also include a bottom cross member 21 which connect the opposite sides of each frame member 11, and each bottom member 21 merges with the vertically inclined web or rib 20. The bosses 15 are formed integral with the bottom bars or members 21 and with each vertically inclined member or rib 20, so as to further strengthen the structure but at the same time reduce the weight thereof to a minimum.

A pair of toothed wheels 22 and 23 are revolubly mounted on the shaft or axle 13, being arranged between the inside faces of the bosses 15. These wheels 22 and 23, commonly termed "bull wheels," are each provided with a hub 24, including a rectangular or multi-side part 24'. The outer face of each hub is straight and smooth, being adapted to engage an inner face of its cooperating boss 15. The inner surfaces of the hubs 24 are also straight and smooth as they are adapted for engagement with the faces of the bosses during operation of the device.

The inner portions of each hub 24 are provided with enlarged, stepped parts to provide a shoulder 25 on each hub. A ratchet wheel 26 is provided with a square opening to receive the inner squared portions of the hubs 24, and this wheel is prevented from lateral movement by being arranged or nested between the shoulders 25 on the hubs 24. The toothed bull wheels 22 and 23 are provided further with internal round

openings suitably bushed to receive the shaft 13 upon which they are mounted, and inasmuch as the ratchet wheel 26 receives the square ends of the hubs 24 the bull wheels 22 and 23 will be rotated during rotation of the ratchet 26.

A low speed pawl lever arm 27 comprising spaced plates or members 28 is provided with a round central opening to receive the rounded parts 29 of the hubs 24, Figs. 4 and 5. The side members 28 of the operating low speed pawl lever arm 27 are rigidly secured together and carry a transverse pin 30 upon which there is loosely mounted an operating ratchet pawl 31. The ratchet pawl 31 is a double pawl and comprises a male member 32 and a female member 33, each mounted on the ratchet pin 30 which extends through both plates 28 of the low speed pawl lever arm 27. The female member or pawl 33 has spaced side legs or ribs 34 and a hardened engaging-nose or point 35. The male member or pawl 32 is positioned between the legs 34 of the female member and has a hardened nose or point 36, which engages the teeth of the ratchet wheel 26. The forward end 37 of the male member 32 extends a predetermined distance forwardly to the forward end of the female ratchet pawl 33. In practice it has been found desirable to space the driving end of the male pawl a distance equal to a tooth and a half from the driving end of the female pawl, so that there will be no lost motion in the driving action of the cam lever arm 40. Should the lever arm 40 be moved to the full extent of its movement and then returned to take a bite on the ratchet wheel 26, the driving end of the male pawl may rest on top of a tooth on the ratchet wheel 26, and therefore there would be lost motion, or at least there would be a non-driving action until the pawl had reached the end of the tooth. By providing the double pawl, that is the male and female members thereof, the female pawl is in position to engage a tooth should the male pawl rest on top of a tooth of the ratchet wheel and not be in driving position, therefore the driving of the ratchet wheel will be assured. The double pawl arrangement tends to prevent any lost motion, because either one or the other of the pawl members 32 or 33 will be in driving engagement with respect to a tooth on the ratchet wheel 26.

The low speed pawl lever arm 27 is curved at its upper end as clearly shown in Fig. 5 and carries a roller 38 which is adapted to engage the periphery of a cam 39 on the low speed cam lever arm 40. The cam lever arm 40 is mounted between the bosses 14 on the side members 11 and is revolubly supported on the upper shaft or axle 12. A spring 41 attached to the pawl lever arm 27 and to a part of the frame, Fig. 5, pulls the pawl lever arm 27 in a predetermined direction so that the roller 38 will be kept in operating contact with the cam 39 on the cam lever arm 40. Operation of the cam lever arm 40 therefore, causes reciprocal movement of the pawl lever arm 27, which moves the ratchet pawl 31 into driving engagement with the ratchet wheel 26 when force is applied to the cam lever arm 40. Upon the return stroke of the cam lever arm 40, the pawl 31 including the members 32 and 33 rides over the teeth of the ratchet wheel 26.

The structure so far described is what may be termed "low speed" operation of the tie puller for the purpose of first breaking loose a tie. After a tie is once loosened, it is desirable to move it out of position more rapidly and therefore "high speed" means are provided to pull the tie from place. This "high speed" operating means comprises a high speed operating lever 42, which is pivoted at 43, Figs. 1 and 5, to upstanding ears 44 rigidly attached to the main tie bar 10'. The high speed operating lever 42 is provided with a tail piece 45 to which there is pivoted at 46 a high speed driving pawl 47. This high speed driving pawl 47 engages the teeth on the ratchet wheel 26 so that during operation of the high speed lever 42, the ratchet wheel 26 will be rotated according to the amount of movement given by the pawl 47. The leverage obtained by the high speed combination of the ratchet 47 and the high speed lever arm 42 is not as great as the combined leverage created by the ratchet 31, the pawl lever arm 37, the cam 39 and the cam 40. However, it has the advantage of greater rotational travel of the ratchet wheel and accordingly speeds up the removal of the tie when broken loose.

This ratchet pawl 47 is substantially as wide as the width of the ratchet wheel 26 and is adapted for engagement with the teeth on the ratchet wheel 26 to cause step by step rotative movement of the ratchet wheel 26. The pawl 47 comprises a straight portion 48 and is provided with an opening 49 therein to receive the pin 46. The pawl 47 has an outer or operating end of which flares outwardly, as indicated at 50, Fig. 7, and carries side ribs 51 to strengthen materially the operating end or nose 52. The body portion of the pawl is relatively thick and heavy, and by providing the side strengthening ribs 51, the operating life of the pawl is greatly increased.

The bull wheels 22 and 23 are provided with tie engaging teeth 53 which are adapted to dig into the tie. These teeth 53 are curved so that their sharp points will dig into a tie when the wheels are rotated during operation of either of the lever arms 40 or 42. While the teeth 53 lead slightly toward the direction of the rotation, the leading edges are constructed to permit the teeth to become released from the tie at the end of the pulling operation. The teeth 53 are staggered about the periphery of the wheels, so that they engage consecutively the tie during rotation of the bull wheels.

In operation, the tie puller is arranged outside of a rail, so that the flange of the rail will be received in the mouth or jaw 54 of each frame extension 55, Figs. 1–3 and 5. This frame extension 55 has an angular opening 56, Fig. 3, to receive the corner 57 of the tie puller frame. The extension 55 is fixed to the frame in any suitable manner, such as by welding, as indicated at 58, Fig. 3. Should, however, the extensions 55 become damaged through use or unloading, or rough handling it is a simple matter to substitute new extensions 55. After the tie puller has been positioned with the rail flange in the jaws 54, the tie puller is braced or supported against the rail. When the operating cam lever 40 is reciprocated back and forth, causing reciprocal movement of the pawl lever 27, the male and female parts 32 and 33 of the pawl 31 will cause the ratchet wheel 26 to be rotated. The ratchet wheel 26 is removably but rigidly connected to the bull wheels 22 and 23, and therefore this rotative movement of the ratchet wheel 26 will be transmitted to the bull wheels 22 and 23.

After the tie to be removed has become sufficiently loosened the handle of the cam operating lever 40 may be inserted in the high speed

operating lever 42; and when this latter lever is operated, a faster movement is given to the ratchet wheel 26, therefore giving faster rotary movement to the bull wheels 22 and 23.

The cam lever arm 40 is bent or offset to the left, Figs. 2 and 4, while the operating lever 42 is offset to the right, Fig. 2. Offsetting these two levers prevents interference with each other should the operating handles be inserted and both members 40 and 42 be operated at the same time.

After a tie has been removed by the operation just described, the tie puller is moved to a new location by sliding the puller along the ball of the rail on spaced rollers 59. These rollers 59 are provided with cylindrical portions 60 which engage the ball of a rail, and end flanges 61 are provided to guide the tie puller and prevent it from leaving the rail as it is being moved along the rail from one location to another. The rollers 59 are mounted on a roller support frame 62 which is rigidly secured to the frame and acts as a frame tie. The roller support 62 may comprise opposite angle bars 63, which carry the pins or shafts 64 upon which the rollers 59 are revolubly mounted. These pins or axles 64 are maintained in position by means of cotter pins 65 passing through holes therein provided.

A rolling handle 66 which is preferably made V-shaped or U-shaped is connected to the outer surfaces of each of the frame members 11, to permit the tie puller to be swung about so as to position the rollers 55 on the ball of the rail when the puller is to be moved from one site to another.

In cases where the tie being pulled is of exceedingly hard wood, and after the tie has been practically removed, there may be a tendency of the teeth 53 sticking into the tie. In other words after the tie has been pulled as far as it is practical to do so with the tie puller, there may be a reluctancy on the part of the teeth from disengaging the tie. To assist in releasing the teeth from the tie there is provided a socket member 67 having a hole 68 into which hole there may be inserted a bar to lift the tie puller and release the teeth 53 from the tie. Likewise, the bar may be used for pressing the teeth 53 into the top surface of the tie if necessary, but it has been found from actual practice in over several thousand tests that this latter operation is unnecessary because the weight of the structure is sufficient to cause the teeth 53 to penetrate sufficiently into the tie.

Spacer bars may be provided at suitable positions between side members 11 to space the members and hold them rigidly in position.

The entire tie puller is so constructed and arranged that it may be dismantled very readily whereby repairs and replacements may be made instantly. The lower shaft or axle 13 is loosely supported in the bushings 15 and held in position by means of cotter pins passing through alined openings 69 formed in the bosses 15 and the shaft 13, respectively. Therefore, when it is desired to dismantle the device, the cotter pins in the holes 69 are removed and the shaft or axle 13 withdrawn, and inasmuch as the bull wheels 22 and 23 are revolubly supported on the axle 13, they immediately become freed. Moreover, by spreading the bull wheels apart they become loosened from the ratchet wheel 26 and the pawl operating lever 27. Also the low speed operating lever 40 can be immediately removed by merely removing a cotter pin 70 from the top axle or shaft 12. After a cotter pin has been removed, the entire axle or shaft 12 can be withdrawn from position. The pawl pin 46 which pivotally supports the pawl 47 is loosely mounted in the extensions 45, and the pawl 47 is prevented from moving axially as it is confined between the ears 44. The high speed lever 42 is pivotally mounted on the ears 44 by the pivot pin 43, which passes through the ears 44, the pin 43 being maintained in place by cotter pins passing through openings in the pivot pin 43 exteriorly of the ears 44. The roller 38 also can be easily removed from the pawl operating lever 27 by removing a cotter pin which passes through holes on opposite sides of its pivot pin. The pin 30 which supports the male and female parts 32 and 33, respectively of the pawl 31, likewise is adapted to be instantly removable.

The invention provides a tie puller which is exceedingly durable and rigid in construction and which operates efficiently. The tie puller may be easily and readily removed from one position to another, and for the purpose of making repairs or replacements the entire structure may be quickly and easily dismantled and reassembled. The parts are so constructed and arranged so as to be capable of immediate disassociation. The toothed bull wheels are constructed to support the ratchet wheels 26 on their hubs, as well as providing a pivotal connection for the pawl lever 27. The bull wheels are adequately and rigidly supported on the shaft 13, which can be instantly removed by removing a pair of cotter pins. Also, several of the other parts are capable of instant removal by the removal of cotter pins. All the parts of the tie puller are so constructed and correlated to provide for the greatest amount of efficiency, as well as to permit repairs or replacements to be instantly made. Moreover, the parts are constructed so as to overcome the necessity of expensive machining, whereby the cost of manufacturing is reduced to a minimum.

Changes may be made in the form, construction and arrangement of parts without departing from the spirit of the invention or sacrificing any of its advantages and the right is hereby reserved to make all such changes as fairly fall within the scope of the following claims.

The invention is hereby claimed as follows:

1. A tie puller comprising a frame, a shaft mounted in the frame, toothed wheels having hubs and removably mounted on said shaft, a ratchet wheel removably mounted on the hubs of said wheels and in driving engagement therewith, and means for rotating said ratchet wheel.

2. A tie puller comprising a frame, a shaft mounted in the frame, toothed wheels having hubs and removably mounted on said shaft, a ratchet wheel removably mounted on the hubs of said wheels and in driving engagement therewith, a pawl lever, a pawl engaging the ratchet, and a connection between the pawl and lever to drive the ratchet during operation of the pawl lever.

3. A tie puller comprising spaced side frames having inwardly extending bosses thereon, there being alined openings in the bosses, a shaft in said alined openings, said bosses and said shaft having alined transverse openings thereon, removable means passing through said last named alined openings for fastening the shaft in position to the frames, toothed wheels revolubly mounted on said shaft, and means for rotating said wheels.

4. A tie puller comprising spaced side frames having inwardly extending bosses thereon, there being alined openings in the bosses, a shaft in said alined openings, said bosses and said shaft having alined transverse openings thereon, removable means passing through said last named alined openings for fastening the shaft in position to the frames, toothed wheels loosely mounted on the shaft, a ratchet wheel mounted on parts of said wheels, and a low speed pawl-carrying-lever for operating said toothed wheels through the ratchet wheel.

5. A tie puller comprising spaced side frames having inwardly extending bosses thereon, there being alined openings in the bosses, a shaft in said alined openings, said bosses and said shaft having alined transverse openings thereon, removable means passing through said last named alined openings for fastening the shaft in position to the frames, toothed wheels on said shaft, hubs on said wheels, a pawl lever mounted on said hubs, a ratchet wheel on said hubs for driving the wheels, a pair of pawls on said lever and driving said ratchet wheel, said pawls comprising male and female members arranged in nested relationship and having their driving ends spaced apart and engaging the ratchet wheel.

6. A tie puller comprising spaced frame members each having a peripheral rib, a strengthening web integral with the sides of a peripheral rib, a second strengthening web integral with the bottom of the peripheral rib and merging with the first strengthening web and integral therewith, a shaft passing through one of said webs near the point where the second web connects with the bottom of the rib, toothed wheels mounted on said shaft, and means for operating said wheels.

7. A tie puller comprising spaced A-shaped frame members each provided with continuous side and bottom ribs integrally connected together, the side ribs of each frame being connected by an inclined transverse strengthening rib, a second strengthening rib extending from the bottom rib at an angle thereto and integrally connecting the bottom rib to the transverse rib, a shaft journaled in one of said inclined ribs near its point of juncture, tie engaging wheels on said shaft, and means for rotating said wheels.

8. A tie puller comprising a frame, a shaft mounted in the frame, toothed wheels removably mounted on said shaft, said wheels having hubs with multi-sided portions thereon, a ratchet wheel having a multi-sided opening removably mounted on the multi-sided portions of the hubs to drive the wheels, a pawl lever arm pivotally mounted on a part of said hubs, means for operating said lever arm, and driving means carried by said lever arm and in driving relationship with said ratchet wheel.

9. A tie puller comprising a frame, a shaft mounted in the frame, toothed wheels removably mounted on said shaft, said wheels having hubs with multi-sided portions thereon, a ratchet wheel having a multi-sided opening removably mounted on the multi-sided portions of the hubs to drive the wheels, a pawl lever arm pivotally mounted on a part of said hubs, a driving pawl pivotally carried by the pawl lever arm and engaging the ratchet wheel, a second pawl carried by the said lever and engaging said ratchet wheel at a point remote from said first pawl, and a low-speed lever arm for operating the pawl lever arm.

10. A tie puller comprising a frame, a shaft mounted in the frame, toothed wheels removably mounted on said shaft, said wheels having hubs with multi-sided portions thereon, a ratchet wheel having a multi-sided opening removably mounted on the multi-sided portions of the hubs to drive the wheels, a pawl lever arm pivotally mounted on a part of said hubs, a driving pawl pivotally carried by the pawl lever arm and engaging the ratchet wheel, a second pawl carried by the said lever and engaging said ratchet wheel at a point remote from said first pawl, a cam roller on the pawl lever arm, a cam engageable with the roller and a low speed lever arm for operating said cam.

11. A tie puller comprising a frame, spaced ears on the frame and integral therewith, an operating lever mounted between said ears and pivotally connected thereto, a pivot pin supported by the lever arm and loosely positioned between the spaced ears, whereby axial movement of the pin is prevented by said ears, a driving pawl between said ears and pivotally mounted on said pivot pin, a ratchet driven by said pawl, and tooth wheels driven by said ratchet wheel.

12. A tie puller comprising a frame, spaced ears on the frame and integral therewith, an operating lever mounted between said ears and integral therewith, a pivot pin passing through the lever arm and having its ends arranged between said ears to prevent lateral displacement, a pawl mounted on the pin between the outer sides of the lever and between the ears, means driven by said pawl, and tie engaging means driven by the last named means.

13. A tie puller comprising a frame having side members, means for spacing said side members, an upper shaft passing through said side members and extending a predetermined distance beyond each side thereof, cotter pins extending through said shafts on the outer sides of the side members, a bottom shaft slidably mounted in said frame, cotter pins passing through a part of the frame and the shaft to hold the shaft in position, toothed wheels mounted on the lower shaft, a lever for operating the toothed wheels, and an operating lever on the upper shaft between the frame sides for operating said lever.

14. A tie puller comprising a frame having side members, means for spacing said side members, an upper shaft passing through said side members and extending a predetermined distance beyond each side thereof, cotter pins extending through said shafts on the outer sides of the side members, a bottom shaft slidably mounted in said frame, cotter pins passing through a part of the frame and the shaft to hold the shaft in position, toothed wheels mounted on the lower shaft, a lever for operating the toothed wheels, a cam roller on the lever, a cam engageable with the cam roller for operating the lever, and a manually operated lever on the upper shaft between the frame sides for operating the cam.

15. A tie puller comprising a frame including side members, spaced angles fixed to said side members, rollers between said angles, shafts passing through said rollers and said angles, and means for locking the shafts in position to prevent accidental removal of the shafts.

16. A tie puller comprising a frame, toothed wheels mounted in the frame and adapted for engagement with a tie, means for operating said toothed wheels, and a socket member carried by the frame and adapted to removably receive

a handle for releasing the teeth on the wheels from the tie.

17. A tie puller comprising a frame having spaced side members, an extension for each of said side members and adapted to be rigidly fastened thereto, said extensions projecting forwardly and outwardly from a lowermost corner of the frame and having jaws to receive the flange of a rail, a strengthening rib about each jaw, and a plurality of strengthening ribs on each extension merging with the last named rib.

18. A tie puller comprising a frame, toothed wheels mounted in the frame, means including a ratchet wheel for driving said wheels, and pawl means for operating the ratchet wheel, said pawl means comprising a pair of interengaging means mounted on a single pivot.

19. A tie puller comprising a frame including spaced side members, bosses on said side members, said bosses having alined openings thereon, a shaft in said alined openings, toothed wheels on said shaft, a ratchet wheel supported by said toothed wheels, means to operate said ratchet selectively at different speeds and comprising a pawl lever arm carried by said toothed wheels, a ratchet pawl including interengaging male and female pawls carried by said pawl lever arm, to operate the ratchet wheel, a roller carried by said pawl lever arm, a lever arm revolubly mounted between the frame members, a cam on said last named lever arm and having engagement with said roller to operate the pawl lever arm during operation of the last named lever arm, a second lever arm pivotally mounted to the frame, and means operatively connecting the second lever to the ratchet wheel to cause rotation thereof.

20. A tie puller comprising a frame including spaced side members, bosses on said side members, said bosses having alined openings thereon, a shaft in said alined openings, toothed wheels on said shaft, a ratchet wheel supported by said toothed wheels, a pawl lever carried by said toothed wheels, a ratchet pawl including interengaging male and female pawls carried by said pawl lever arm to operate the ratchet wheel, a roller carried by said pawl lever arm, a low speed lever arm revolubly mounted between the frame members, a cam on said last named lever arm and having engagement with said roller to operate the pawl lever during operation of the low speed lever arm, said low speed lever arm being offset vertically, rail engaging rollers on said frame, and handle means fixed to said frame.

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