United States Patent

Aquila

[15] **3,700,125**

[45] **Oct. 24, 1972**

[54] TOWING APPARATUS

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[52] **U.S. Cl.** .....**214/86 A,** 280/402
[51] **Int. Cl.** **B60p 3/12**
[58] **Field of Search** .214/86 A; 280/402, 425 R, 483, 280/486; 212/58

[56] **References Cited**

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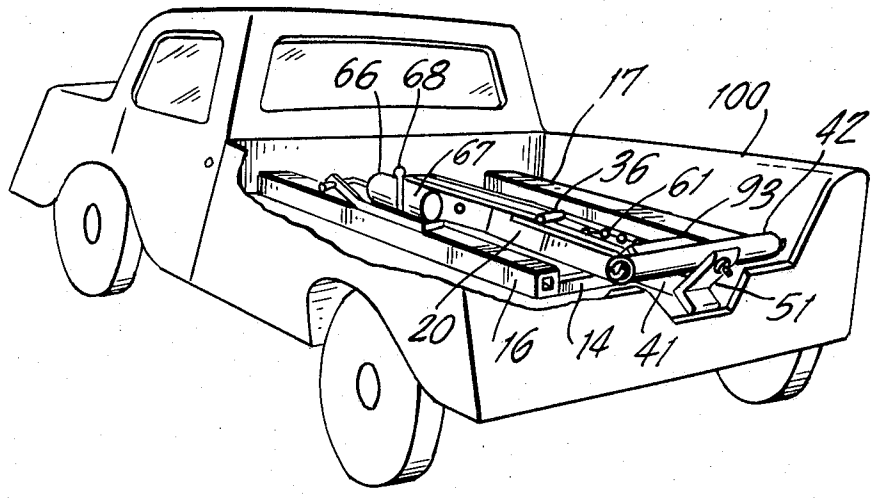
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Primary Examiner—Albert J. Makay
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[57] **ABSTRACT**

A truck mounted crane for pulling automobiles is constructed with a tubular boom pivoted at its front end to a base, with a fluid operated power cylinder being used to raise the rear end of the boom. A tow bar assembly mounted to the boom includes a boom extension that is mounted in telescoping relationship with the boom and a cross-bar supported from below at its center by a universal joint connected to the boom extension at the free end thereof. The tow bar assembly is movable between an extended or operating position and a retracted or storage position. In the operating or extended position, the boom extension projects downwardly and to the rear of the boom, and in the retracted position the boom extension is nested within the boom.

14 Claims, 11 Drawing Figures



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SHEET 1 OF 2

FIG. 1.

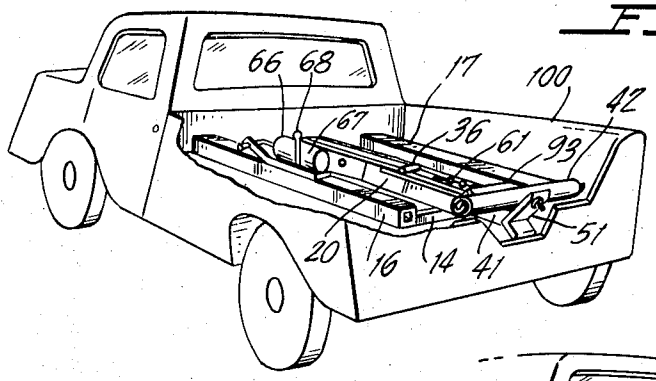


FIG. 2.

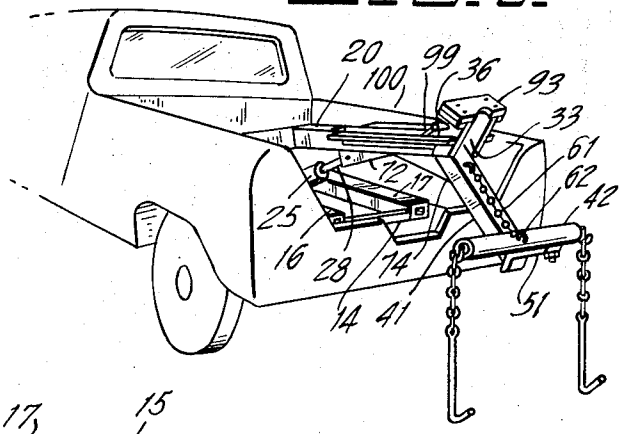
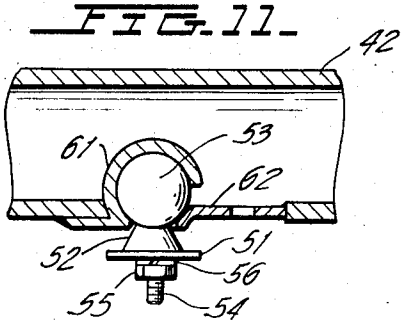


FIG. 11.



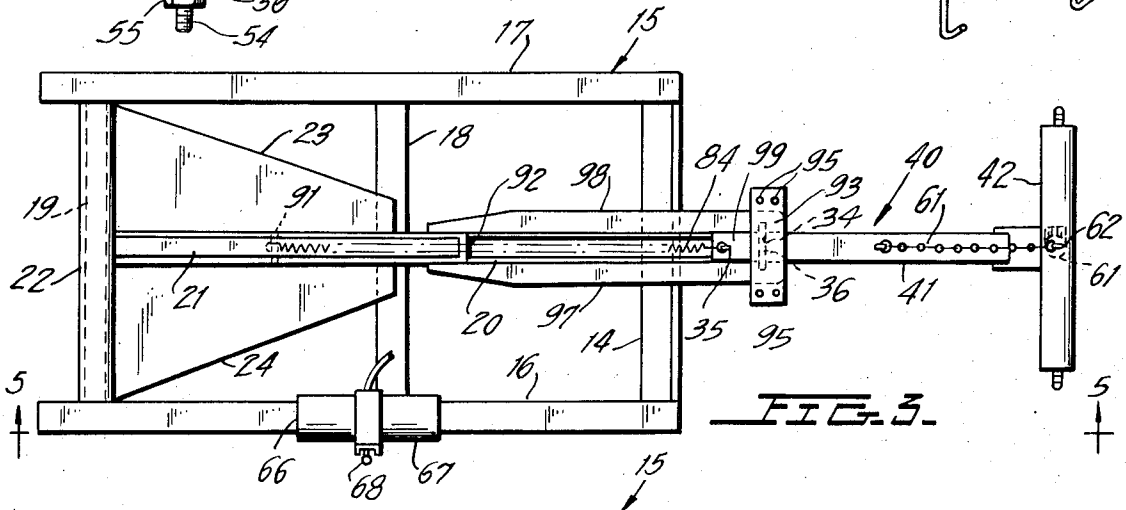


FIG. 3.

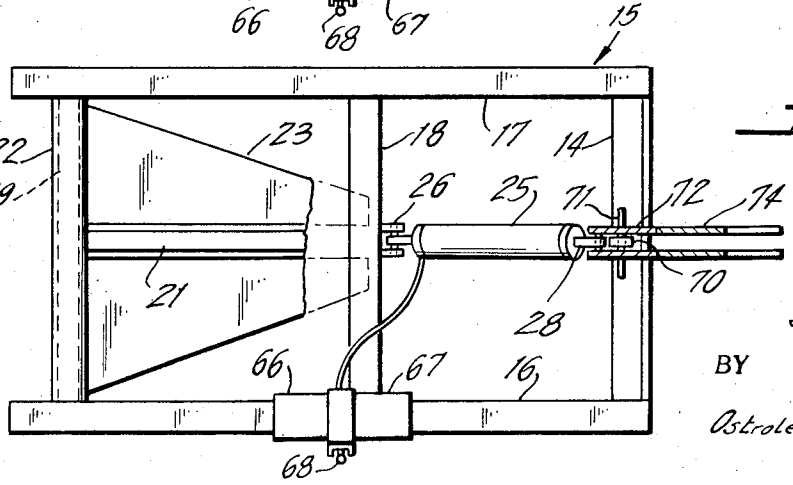


FIG. 4.

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FIG. 5

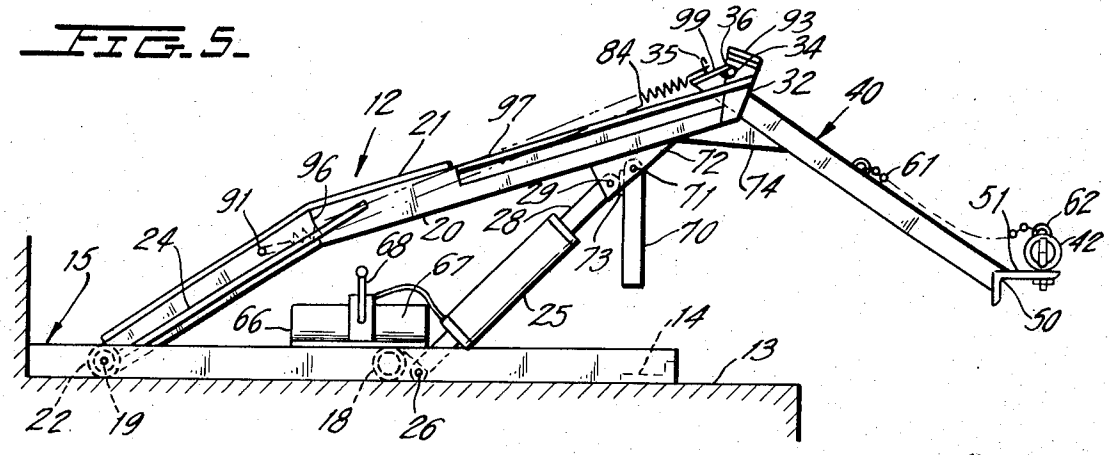


FIG. 6

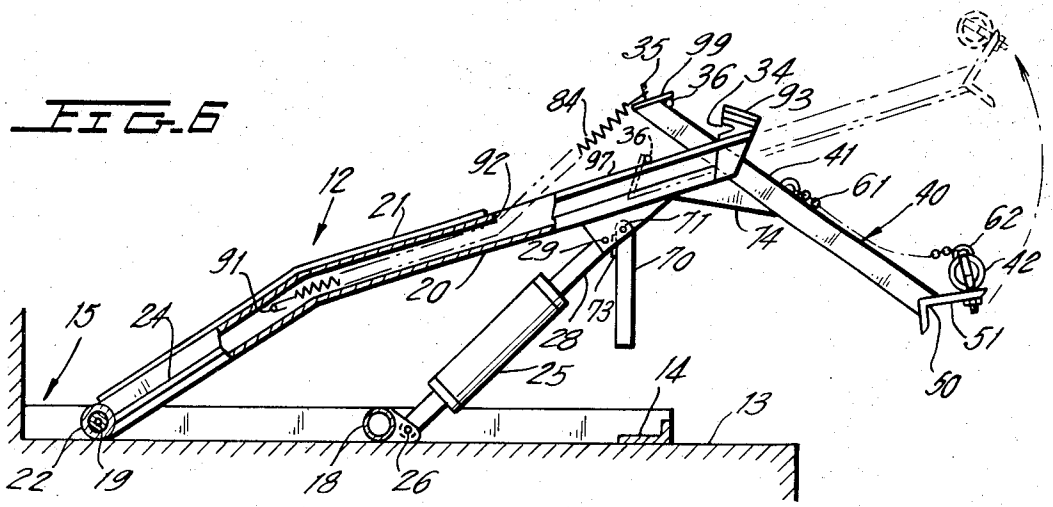


FIG. 7

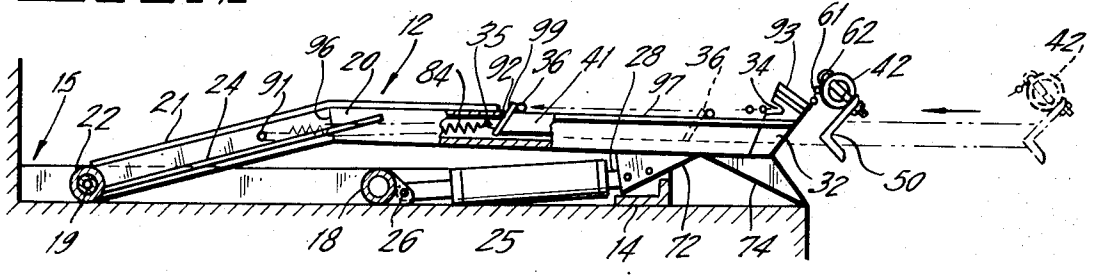


FIG. 10

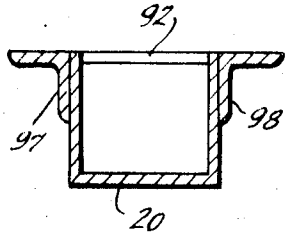


FIG. 8

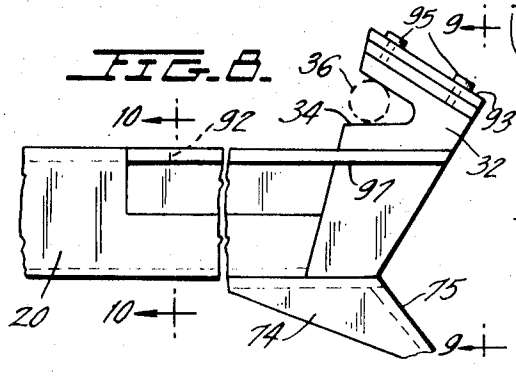
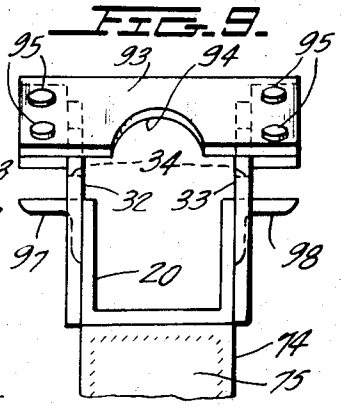


FIG. 9



TOWING APPARATUS

This invention relates to cranes in general, and more particularly relates to a truck-mounted crane for towing disabled automobiles.

For the most part, prior art truck-mounted cranes for the towing of automobiles included a boom that is raised and lowered by cables extending over a tall gantry. Driving power for the cables was usually supplied by a mechanical connection to the automobile engine and the horizontal tow bar was usually suspended from the free end of the boom by chains or cables.

Prior art cranes of this type have proven to be ineffective when mounted on relatively light duty, so-called pickup trucks and called upon to tow relatively heavy automobiles, such as Cadillacs and Lincolns. For the most part, difficulties arise because of weight distribution, which on one hand impedes lifting of the automobile, and on the other hand makes the towing vehicle top-heavy, so that there is a great danger of turnover.

These prior art constructions are also disadvantageous in that once the crane structure is mounted on the truck the bulkiness of the crane structure essentially precludes the truck from being used for any purpose but towing.

In order to overcome the foregoing objectionable features of prior art constructions, the instant invention provides a relatively compact crane structure, which when not being used for towing may be readily collapsed to permit the tow truck to be used for other purposes. In particular, the device of the instant invention comprises a relatively small horizontal base adapted to seat on the floor of a pickup truck body and be bolted otherwise secured directly to the truck frame.

A tubular boom is pivoted at one end thereof to the base, with the other end of the boom being raised and lowered by a fluid operated power cylinder. A tow bar assembly is mounted to the boom so as to be movable between a retractive storage position and an extended or operating position. In its operating position, the tow bar assembly is pivoted to the boom at the end thereof remote from the pivot connecting the boom to the base. In the retracted position of the tow bar assembly, the boom extension is telescoped within the boom. A retracting spring acts to counteract the weight of the tow bar assembly so that handling of the latter requires relatively little physical effort on the part of the operator.

Accordingly, a primary object of the instant invention is to provide a novel construction for an automobile towing crane in which the parts are readily positionable to form an extremely compact unit.

Another object of the instant invention is to provide a boom extension that telescopes within the main boom and when extended is movable to a position inclined downward and to the rear of the boom.

A further object is to provide a tension spring which aids in moving the tow bar assembly to its retracted position.

These objects as well as other objects of this invention will become readily apparent after reading the following description of the accompanying drawings in which:

FIGS. 1 and 2 are perspectives of a pickup truck having the crane device of the instant invention mounted thereon. In FIG. 1 the tow bar assembly is in its retracted position, and in FIG. 2 the tow bar assembly is in its extended position.

FIG. 3 is a plan view of the crane of FIG. 1.

FIG. 4 is a view similar to FIG. 3, with the rear portion of the boom removed to reveal the fluid operated power means for raising the rear end of the boom.

FIGS. 5, 6 and 7 are side elevations of the crane, looking in the direction of arrows 5—5 of FIG. 3. In FIG. 5 the boom is raised and the tow bar assembly is fully extended to its operating position. In FIG. 6 the boom is raised and the boom extension of the tow bar assembly is still angularly inclined with respect to the boom, with the front end of the boom extension moved to a position considerably above and forward of the rear end of the boom. In FIG. 7 the boom is lowered and the tow bar assembly is retracted to its storage position.

FIG. 8 is an enlarged fragmentary side elevation of the rear end of the boom.

FIG. 9 is an end view of the boom, looking in the direction of arrows 9—9 of FIG. 8.

FIG. 10 is a cross-section taken through line 10—10 of FIG. 8.

FIG. 11 is a cross-section of the cross-bar showing its swivel connection to the boom extension.

Now referring to the figures. Crane 12, constructed in accordance with the teachings of the instant invention, is intended to rest upon bed 13 of a relatively light duty vehicle or so-called pickup 100 and be secured to the frame thereof by bolts or other suitable means (not shown). Crane 12 includes horizontal base 15, constructed of spaced side members 16, 17 connected by transverse members 14, 18, 19. Members 16, 17 are tubular and of square cross-section, cross members 18, 19 are also tubular but of circular cross-section, and cross member 14 is an angle iron. Boom 20 is a unitary tubular member of square cross-section having a hump therein at bend line 96. Reinforcing strip 21 is welded to the upper surface of boom 20, extending from the front thereof to point 92. From point 92 rearward the top surface of boom 20 is cut away to form a channel with an open top, for a reason which will become apparent.

The front end of boom 20 is secured to circular tube 22 at the center thereof, and extends at right angles thereto. Transverse frame member 19 is substantially equal in length to tube 22, being disposed therein and cooperating therewith to form the main pivot for boom 20. Triangular stabilizing plates 23, 24 extend from opposite sides of boom 20, being secured to tube 22 and acting to stabilize boom 20 against movement transverse to a plane perpendicular to base 15.

Hydraulically operated power cylinder 25 is pivotally connected at 26 to a radical extension of transverse frame member 18. Piston rod 28, extending from the other end of cylinder 25, is pivoted at its free end to pin 29 extending between the spaced arms in the front portion of U-bracket 74, with pin 29 being to the rear of transverse frame member 18. U-bracket 74 is secured in inverted position to the bottom of boom 20 at the rear thereof, with a wide inverted V-shaped notch being cut in the bottom of bracket 74. When boom 20 is in its lowermost position, power cylinder 25 extends substantially parallel to base 15 with boom 20 being positioned only slightly thereabove, as in FIGS. 1 and 7.

The rear of boom 20 is provided with spaced upwardly extending trunnion forming elements 32, 33, having seat forming notches 34 to receive the ends of

pin 36 extending beyond opposite sides of boom extension 41 at the front end thereof, to establish the operating position for tow bar assembly 40. Boom extension 41 is of square cross-section and is part of tow bar assembly 40 which also includes cross-bar 42, of circular cross-section, secured at its center to the rear of extension 41, in a manner to be hereinafter explained.

One end of coiled tension spring 84 is secured to hook 35 extending from front cover piece 99 of boom extension 41. The other end of spring 84 is secured to pin 91 extending transversely through boom 20. Spring 84 biases tow bar assembly 40 toward the retracted position of FIG. 7, or to the left with respect to FIGS. 5 and 6. However, when tow bar assembly 40 is in the position of FIG. 5, the line of action of spring 34 and the weight of tow bar assembly 40 combine so that the force of spring 34 is ineffective to retract tow bar assembly 40. However, even under these circumstances, spring 84 assists the operator in moving the tow bar from its operating position of FIG. 5 toward its storage position of FIG. 7. That is, when the operator slides the tow bar upward and forward from its operating position of FIG. 5 to the intermediate position of FIG. 6, tow bar assembly 40 assumes a position wherein spring 84 is effective to pivot tow bar assembly 40 counterclockwise about the lower rear edge of boom 20, with the top cutout at the rear portion of boom 20 providing clearance for pivoting movement of boom extension 41. When the latter is generally axially aligned with the rear end of boom 20, spring 84 is effective to move tow bar assembly 40 to its fully retracted position of FIG. 7. Angle irons 97, 98 are secured to the sides of boom 20 at the upper edges thereof, and extend from the rear end of boom 20 for the length of the top surface cutout.

Angle iron 50, welded to the rear of boom extension 41, includes generally horizontal leg 51 forming a support for seat 52 on which swivel joint ball 53 is mounted (FIG. 11). Stud 54, extending downward from ball 53 through seat member 52 and bracket arm 51, is engaged by nut 55 to secure ball 53 to bracket 50. Lock washer 56 is interposed between nut 55 and bracket leg 51. Socket forming elements 61, 62, secured to cross-bar 42 at the center thereof, cooperate to form a spherical socket, wherein ball 53 is disposed, and constitute a swivel joint which, under most conditions, supports cross-bar 42 from below.

Each of the hooks 57 welded at the ends of cross-bar 42 supports an individual chain 58 having an individual automobile engaging hook 59 secured to the lower end thereof. Safety chain 61 extends between horseshoes 62, 63, secured to cross-bar 42 and boom extension 41 respectively. Chain 61 is long enough to permit cross-bar 42 to swivel as required. However, should swivel joint 53, 61, 62 break, cross-bar 42 will remain mechanically connected to boom extension 41 to prevent separation of the towed vehicle (not shown) from the towing vehicle 100. In the storage or fully retracted position for tow bar assembly 40 (FIG. 7), chain 61 extends through clearance notch 94 in a retainer plate 93. The latter is removably secured by bolts 95 to the out-turned legs at the top edges of trunnion forming elements 32, 33.

Retainer 93 prevents boom extension 41 from being separated accidentally from boom 20. However, if it is desired to use boom 20 and its operating cylinder 25 for a purpose not connected with the towing of automobiles, tow bar assembly 41 may be detached from boom 20 by removing pin 91 and removing retainer 93. Then an extension much longer than boom extension 41 may be inserted into boom 20 up to bend line 96.

Rod 28 of power cylinder 25 is extended to raise the rear end of boom 20 by means of fluid pumped into power cylinder by fluid pump 66, operated by battery powered motor 67. Manually operated control 68 is biased to a neutral position, and is selectively operable to two other positions. In one of these positions, motor 67 is energized so that pressure is built up within power cylinder 25 by fluid pump 66 to extend rod 28 and raise the rear end of boom 20. In the other position of control 68, fluid is permitted to escape from power cylinder 25 back to the reservoir portion of pump 66, with this escape of fluid being at a controlled rate to permit the rear end of boom 20 to lower gradually.

Safety bar 70 permits boom 20 to be raised freely, but when bar 70 is in a vertical position it limits the downward movement of boom 20. That is, safety bar 70 is pivotally mounted at pin 71, extending between the arms of U-shaped member 72. Stop formation 73, extending inwardly from the arms of bracket 72, limits clockwise pivoting of safety bar 70. Under normal operating conditions, before boom 20 is lowered, safety bar 70 is manually rotated counterclockwise to a position wherein the lower end thereof is to the right of transverse frame member 14, thereby permitting the lower end of bar 70 to move into the recess formed between the spaced arms of U-shaped bracket 74 behind rear cover plate 75. In the event there is a sudden loss of pressure in power cylinder 25, as boom 20 falls the lower end of safety bar 70 engages the horizontal leg of transverse frame member 14, and further downward movement of boom 20 is arrested. At this time the vertical leg of transverse frame member 14 prevents counterclockwise movement of safety bar 70.

Operation of the apparatus hereinbefore described proceeds as follows. Crane 12 is usually transported in its storage or collapsed position shown in FIG. 1, wherein boom extension 41 is telescoped within boom 20 and cross-bar 42 is adjacent to the rear end of boom 20. Piston rod 28 is retracted, and the rear end of boom 20 is in its lowest position adjacent to pickup bed 13. When pickup 100 is positioned adjacent the vehicle to be towed, the operator pulls tow bar assembly 40 rearward and pivots the latter downward. Thereafter, the operator slides boom extension 41 downward along cover piece 75 as a support until pin 36 engages seat 34. Hooks 59 are brought into engagement with the vehicle to be towed, and chains 58 are slipped into hooks 57.

Control 68 is operated to energize motor 67, thereby driving fluid pump 66 and extending cylinder rod 28 to lift the rear end of boom 20 and tow bar assembly 40 attached thereto, thereby raising the vehicle to be towed. As boom 20 is being raised, gravity pivots safety bar 70 in a clockwise direction into engagement with stop means 73. Motor 67 is deenergized when boom 20 is generally at the desired towing height. Thereafter, control 68 is operated to exhaust fluid from power cylinder 25 back to the reservoir section of pump 66, with the downward movement of boom 20 being arrested when the lower end of safety bar 70 engages the

horizontal leg of transverse base member **14**. When the towed vehicle arrives at its destination, boom **70** is raised slightly, so that safety bar **70**, in being pivoted counterclockwise, will clear the vertical leg of space member **14**, and thereafter fluid is exhausted from cylinder **25** to lower boom **20**.

Although not illustrated in detail in the Figures or hereinbefore described, it is noted that for the most part the connections between elements subject to major mechanical stresses are made by welding. As examples, socket forming elements **61**, **62** are welded to cross-bar **42**; hook **35** is welded to plate **99**; plate **99** and pin **36** are welded to boom extension **41**; plates **23**, **24** are welded to boom **20** and pivot tube **22**; transverse frame members **14**, **18**, **19** are welded to longitudinal frame members **16**, **17**; there are welds at bend line **96**; and strip **21**, angle irons **97**, **98**, V-shaped bracket **74**, and trunnion forming elements **32**, **33** are welded to boom **20**.

Although in the foregoing there have been described preferred embodiments of this novel invention, many variations and modifications will not become apparent to those skilled in the art, and it is preferred therefore that the instant invention be limited not by the disclosure contained herein but only by the appending claims.

The embodiments of the invention in which an exclusive privilege or property is claimed are defined as follows:

1. A crane including an elongated boom; a main pivot at the front end of said boom; power operated means connected to said boom for raising the rear end thereof about said main pivot as a center; a tow bar assembly including an elongated boom extension, an elongated cross-bar, and swivel means connecting said cross-bar at its mid-region to one end of said boom extension and generally at right angles with respect thereto; said tow bar assembly being movable to an operating position wherein the other end of said boom extension is at the rear end of said boom and said done end of said boom extension is positioned below and to the rear of said other end; with said tow bar assembly in said operating position the longitudinal axis of said boom extension being transverse to the longitudinal axis of said boom; said tow bar assembly being movable from said operating position to a retracted position wherein said longitudinal axes are generally parallel and said other end is a substantial distance forward of the rear end of said boom.

2. A crane as set forth in claim **1**, in which said boom and said boom extension are in telescoping relationship when said tow bar assembly is in said retracted position.

3. A crane as set forth in claim **2**, also including a spring connected to said boom extension and urging said tow bar assembly toward said retracted position.

4. A crane as set forth in claim **3**, in which the strength and line of action of said spring are such that said spring is ineffective to move said tow bar assembly from said operating position.

5. A crane as set forth in claim **4**, in which the strength and line of action of said spring are such that said spring is effective to move said tow bar assembly to said retracted position when said boom extension is moved to a position generally in axial alignment with the rear end portion of said boom.

6. A crane as set forth in claim **5**, in which the spring is also effective to move said tow bar assembly to said retracted position when the other end of said boom extension is moved to a predetermined position above and in front of said rear end.

7. A crane as set forth in claim **1**, in which there is a first element at the other end of the boom extension and a second element at the rear end of the boom; with said tow bar assembly in said operating position said first element operatively engaging said second element to cooperate therewith in constituting a horizontal pivot means about which said tow bar assembly is movable relative to said boom.

8. A crane as set forth in claim **1**, in which said boom extension is telescoped within said boom when said tow bar assembly is in said retracted position; said boom being a tubular member having a rear cutaway portion providing a narrow channel having an open top; said open top permitting said other end of said boom extension to be moved to a position above said boom to facilitate movement of said tow bar assembly between said operating and retracted positions.

9. A crane including an elongated boom; a main pivot at the front end of said boom; power operated means connected to said boom for raising the rear end thereof about said main pivot as a center; a tow bar assembly including an elongated boom extension, an elongated cross-bar, and swivel means connecting said cross-bar at its mid-region to one end of said boom extension and generally at right angles with respect thereto; said tow bar assembly being movable to an operating position wherein the other end of said boom extension is at the rear end of said boom and said one end of said boom extension is positioned below and to the rear of said other end; said tow bar assembly being movable from said operating position to a retracted position wherein said other end is a substantial distance forward of the rear end of said boom; said boom and said boom extension being in telescoping relationship when said tow bar assembly is in said retracted position; a spring connected to said boom extension and urging said tow bar assembly toward said retracted position; said spring being of such strength and having its line of action so positioned that said spring is ineffective to move said tow bar assembly from said operating position.

10. A crane as set forth in claim **9**, in which the strength and line of action of said spring are such that said spring is effective to move said tow bar assembly to said retracted position when said boom extension is moved to a position generally in axial alignment with the rear end portion of said boom.

11. A crane as set forth in claim **10**, in which the spring is also effective to move said tow bar assembly to said retracted position when the other end of said boom extension is moved to a predetermined position above and in front of said rear end.

12. A crane including an elongated boom; a main pivot at the front end of said boom; power operated means connected to said boom for raising the rear end thereof about said main pivot as a center; a tow bar assembly including an elongated boom extension, an elongated cross-bar, and swivel means connecting said cross-bar at its mid-region to one end of said boom extension and generally at right angles with respect thereto; said tow bar assembly being movable to an

operating position wherein the other end of said boom extension is at the rear end of said boom and said one end of said boom extension is positioned below and to the rear of said other end; said tow bar assembly being movable from said operating position to a retracted position wherein said other end is a substantial distance forward of the rear end of said boom; said boom extension being telescoped within said boom when said tow bar assembly is in said retracted position; said boom being a tubular member having a rear cutaway portion providing a narrow channel having an open top; said open top permitting said other end of said boom extension to be moved to a position above said boom to facilitate movement of said tow bar assembly between said operating and retracted positions.

13. A crane as set forth in claim 1 also including a generally horizontal base including spaced elongated side members extending generally parallel to the plane of movement for said boom; said main pivot being positioned at the front of said base; said base also including a transverse member positioned rearward of said main pivot; said power operated means connected between said transverse member and a point on said boom positioned to the rear of said transverse member; said cross-bar being positionable below said base by lowering the rear end of said boom.

14. A crane as set forth in claim 13 in which there are stabilizing members extending from opposite sides of said boom and connected to said base at the front thereof.

* * * * *