United States Patent [19]

Bemis

[11] **3,848,850**

[45] **Nov. 19, 1974**

[54] **VEHICLE MOUNTED HYDRAULIC POWERED POST PULLER**

[75] Inventor: **John H. Bemis,** Kalamazoo, Mich.

[73] Assignee: **Bemis & Sons, Inc.,** Kalamazoo, Mich.

[22] Filed: **Mar. 1, 1974**

[21] Appl. No.: **447,143**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 320,163, Feb. 2, 1973, abandoned.

[52] **U.S. Cl.**..... **254/30,** 214/3, 254/132, 254/124

[51] **Int. Cl.**..... **E21b 19/00,** B66f 3/00

[58] **Field of Search**..... 214/86 A, 3, 74 H; 254/29–31, 132, 124

[56] **References Cited**

UNITED STATES PATENTS

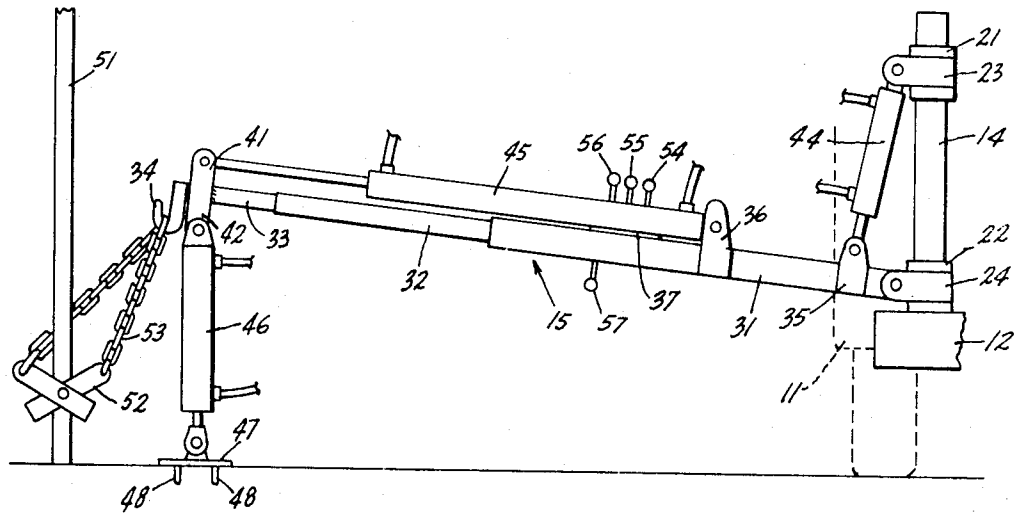
2,244,899	6/1941	Smith	254/29 R
2,645,453	7/1953	Nelson	254/29 R
2,983,482	5/1961	Cary	254/132
3,019,918	2/1962	Keener	214/75 H

Primary Examiner—Othell M. Simpson
Attorney, Agent, or Firm—Gordon W. Hueschen

[57] **ABSTRACT**

A hydraulically operated post-pulling apparatus adapted to be mounted on a motor vehicle, comprising a support adapted to be mounted on a vehicle, a telescoping boom pivotally mounted at one end on the support and having hydraulic cylinder means provided for extending and retracting the boom and for raising and lowering the boom, hydraulic cylinder means carried at the remote end of the boom for pulling out posts comprising a platform adapted to be positioned on the ground, hydraulic cylinder means mounted thereon, the other end of the hydraulic means being pivotally mounted to the end of the boom, hand actuated valves for operating the hydraulic cylinder means, and means carried at the end of the boom adapted to engage and grip a pole or post to be extracted.

17 Claims, 10 Drawing Figures



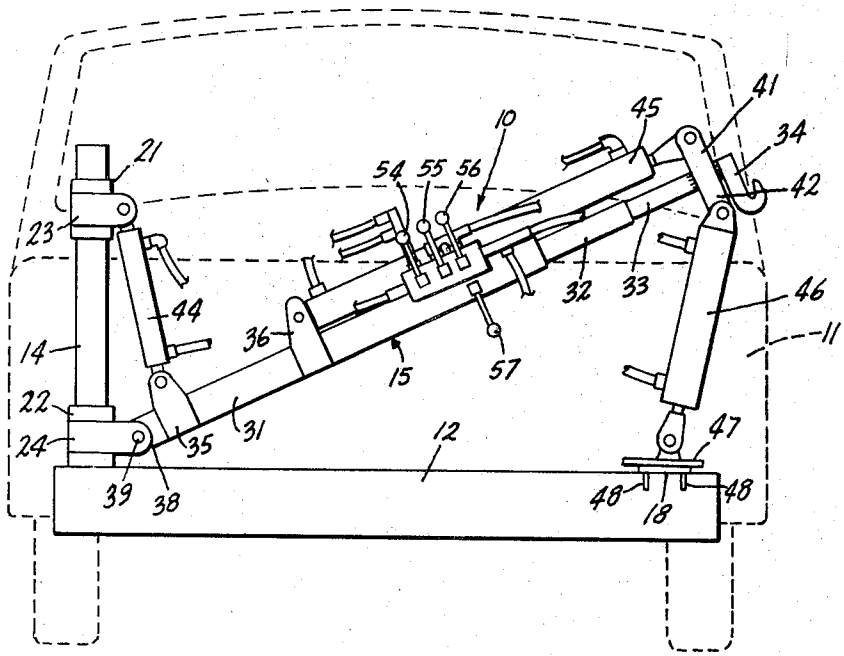

10
11
12
14
15
18
21
22
23
24
31
32
33
34
35
36
38
39
41
42
44
45
46
47
48
54
55
56
57

FIG. 1

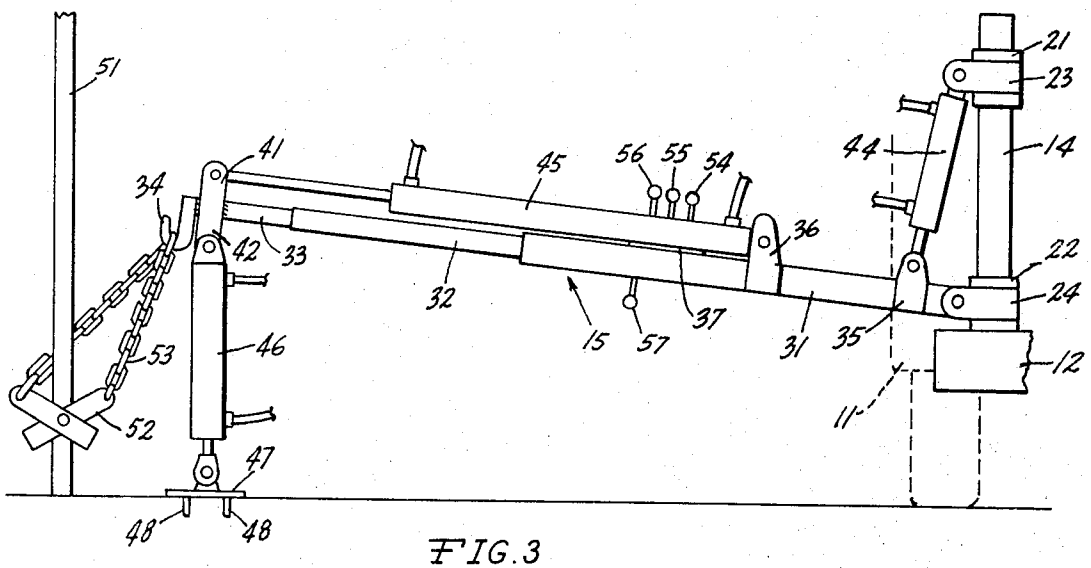

11
12
14
15
21
22
23
24
31
32
33
34
35
36
37
41
42
44
45
46
47
48
51
52
53
54
55
56
57

FIG. 3

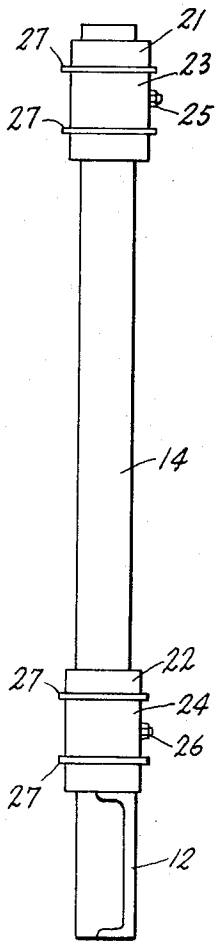


FIG. 2

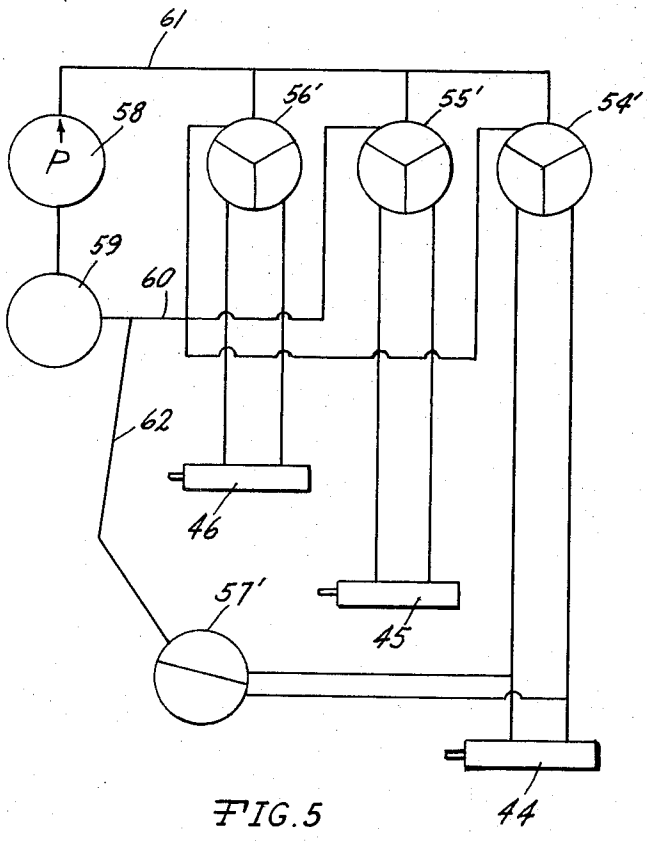


FIG. 5

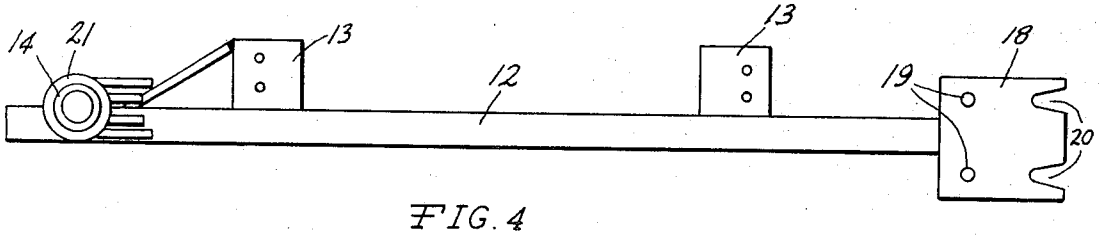


FIG. 4

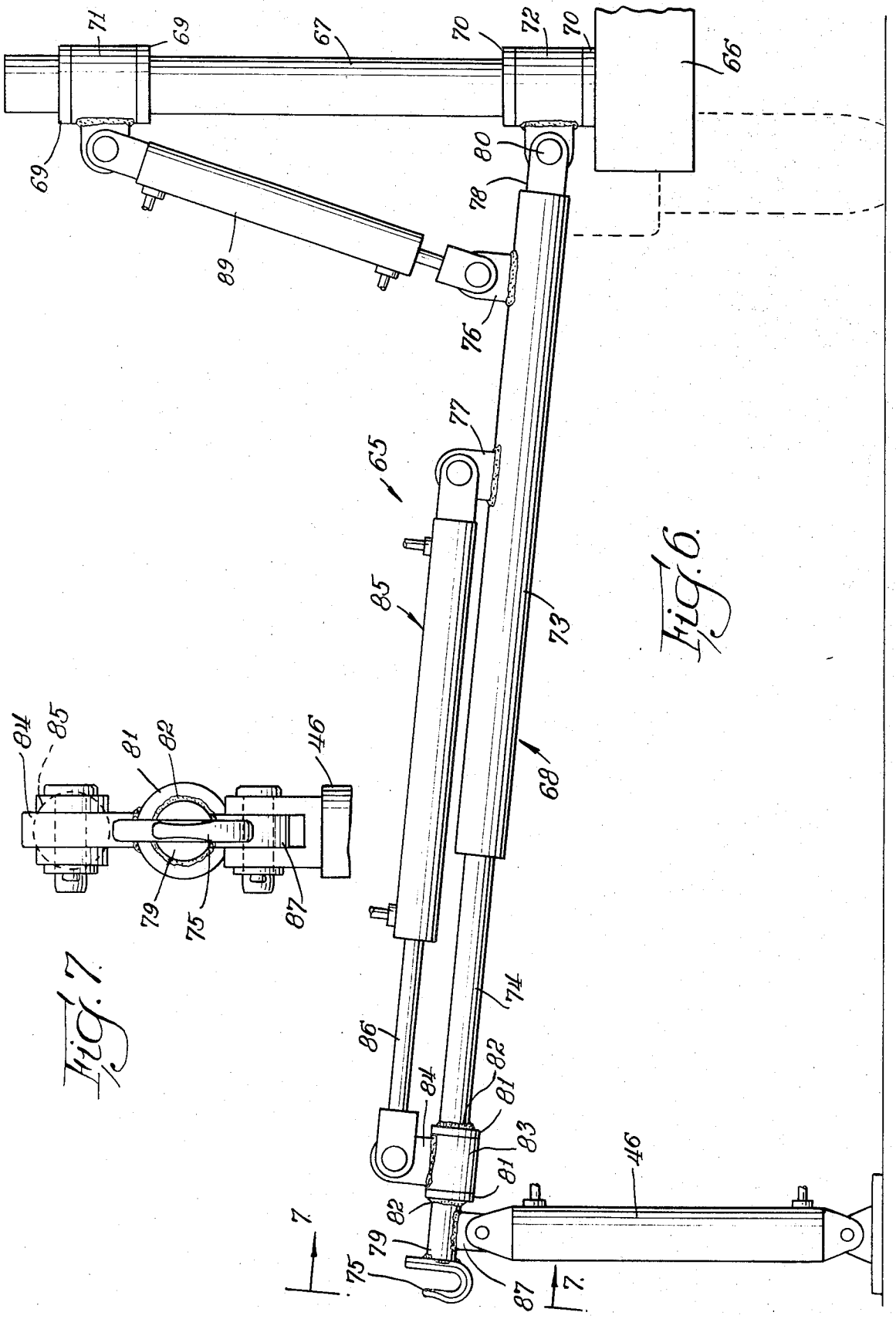

71
69
67
70
72
70
66
69
80
78
89
76
77
65
85
73
68
74
86
84
82
81
83
81
82
79
75
87
46
7
7

Fig. 6.

84
85
81
82
46
79
75
87

Fig. 7.

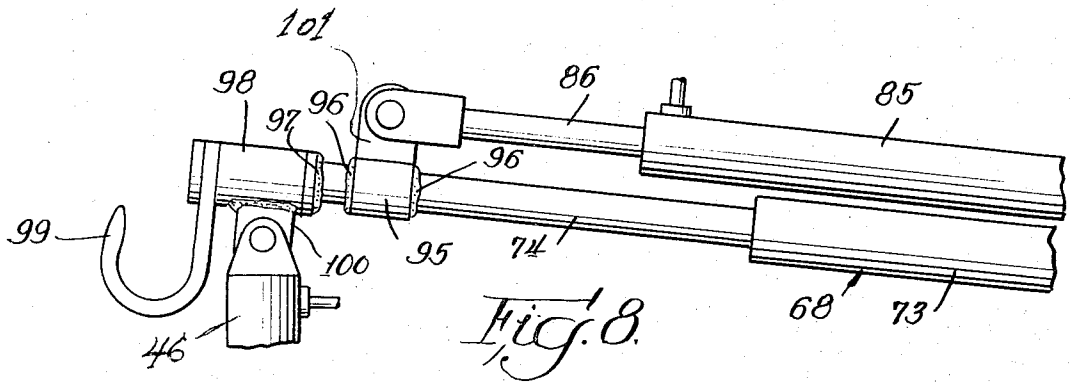


Fig. 8.

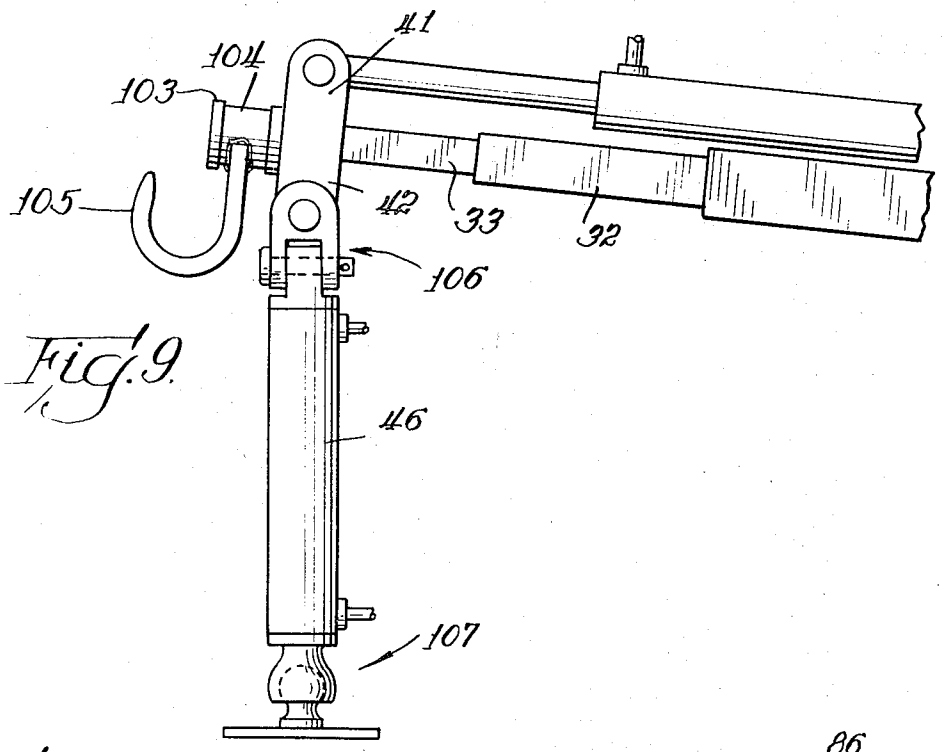
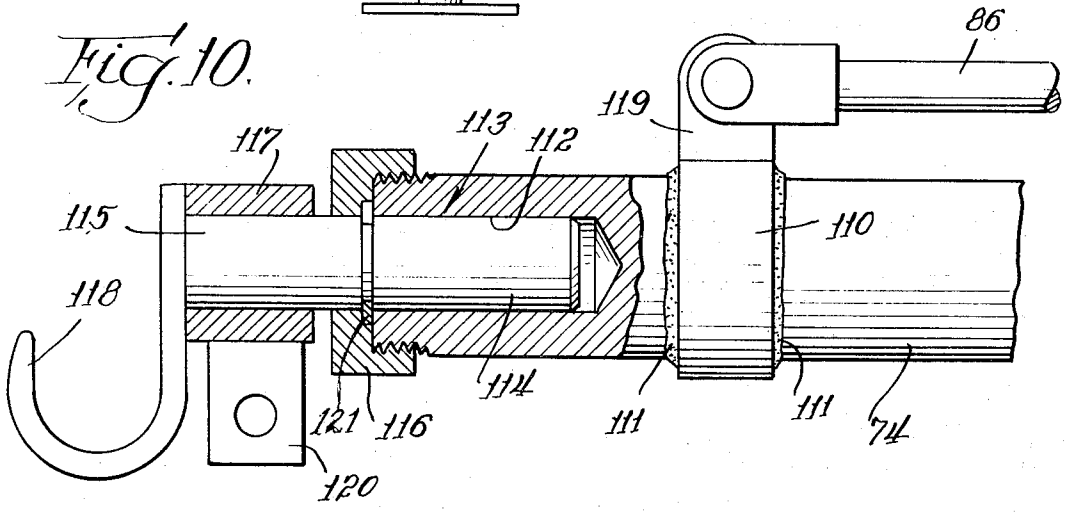


Fig. 9.

Fig. 10.



VEHICLE MOUNTED HYDRAULIC POWERED POST PULLER

BACKGROUND OF THE INVENTION

This is a continuation-in-part of application Ser. No. 320,163, filed Jan. 2, 1973, now abandoned.

The present invention relates to apparatus for pulling embedded articles such as posts or poles (these terms are used interchangeably hereinafter) out of the ground, and more specifically refers to such apparatus designed to be mounted on a motor vehicle and which may be utilized to pull posts from the ground, such as those supporting road signs adjacent to roads.

Apparatus for pulling posts out of the ground are known in the art. Some such apparatus are so designed that they must be handcarried to the site where they are to be used. Other apparatus, although designed to be vehicle mounted, are not provided with sufficient positive extracting force to be used for large or deep posts. Still others which are motor vehicle-mounted have no radius of operation or, at best, are confined to operation within an extremely limited radius from the vehicle.

OBJECTS OF THE INVENTION

It is an object of the present invention to provide an apparatus for pulling posts or poles out of the ground which is adapted to be mounted on a motor vehicle. A further object is to provide such an apparatus adapted to exert a strong pulling force without requiring mounting on a heavy vehicle. Another object is to provide such an apparatus which, although mounted on a vehicle, can be operated so as to apply little or no force against the vehicle itself. An additional object is to provide an apparatus which is hydraulic cylinder-operated and powered by an engine on the vehicle, and having hand-operated controls convenient to the operating site. Yet another object is to provide an apparatus which may be utilized to extract poles located a substantial distance from the supporting vehicle. Still another object is to provide an apparatus which may be readily constructed of standard readily-available components and materials. Yet another object of the present invention is to provide an apparatus which may be relatively simply and rapidly operated even by unskilled workmen.

According to the invention, a pole-pulling apparatus is provided comprising a base which may be readily mounted to the frame of a vehicle by means of brackets. A telescoping boom is pivotally mounted to the support in such manner that it may swing angularly about a vertical axis. Additionally, hydraulic means is provided for extending and retracting the telescoping boom members and for raising and lowering the boom angularly. A post-pulling hydraulic cylinder is mounted at one end to the remote end of the boom and is provided with a ground-engaging platform at the other end. A hook is affixed to the end of the boom and adapted to engage a conventional chain and pulling jaw assembly. Manually operated control valves are mounted on the boom for controlling the operation of the various hydraulic cylinders. Operating hydraulic fluid under pressure is provided by a hydraulic pump which may be operated by the vehicle engine.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings,

FIG. **1** is a side elevational view of the post-pulling apparatus of the invention shown mounted in storage position on a motor vehicle.

FIG. **2** is a partial rear end elevational view of the apparatus.

FIG. **3** is a side elevational view of the apparatus in operating position.

FIG. **4** is a top view of the tower support, and

FIG. **5** is a schematic view of the hydraulic system.

FIG. **6** is a side elevational view of another embodiment of the invention.

FIG. **7** is an end view of the apparatus taken at the line **7 — 7** of FIG **6.**

FIG. **8** is a fragmentary elevational view of the end of the apparatus showing another embodiment.

FIG. **9** is a fragmentary elevational view of still another embodiment of the invention, and

FIG. **10** is a fragmentary elevational view of the end of the apparatus of a further embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. **1,** the post-pulling apparatus **10** of the invention is shown mounted on a motor vehicle **11.** The apparatus comprises a tower support **12** mounted on the vehicle frame. Mounted on the support **12** by suitable means such as welding is a vertical tower or post **14.** A telescoping boom **15** is pivotally connected to the base of the tower **14.**

Referring more specifically to FIGS. **2–4,** the tower support **12** (FIG. **2**) is in the form of a steel channel having mounting brackets **13** (FIG. **4**) of suitable size and position affixed thereto at one end and mounted to the vehicle **11** at the other. At the remote end of the support **12** a base plate rest **18** is affixed by such means as welding having apertures **19** and recesses **20** (FIG. **4**) to permit the anchor pins **48** of the base plate **47** to extend therethrough in the rest or storage position. A pair of clevis rings **21** and **22** are mounted on the tower **14** and have clevises **23** and **24** mounted rotatably thereon and lubricated by Alemite or Zurk Lub fittings **25** and **26.** Thrust washers **27** are provided on each side of the clevises.

The telescoping boom **15** comprises a lower boom member **31,** a lower boom extension member **32,** slidably mounted within the lower boom member **31,** and an upper boom extension member **33** welded to the lower boom extension member **32.** In the preferred form the boom members are rectangular in cross-section, although other suitable forms may be utilized if desired. A hook **34** is welded to the end of the upper boom extension member **33.** Affixed to the lower boom member **31** by means such as welding are a lower boom clevis **35,** an upper boom clevis **36,** and a control plate assembly **37.** A boom tang plate **38** is provided at the end of the lower boom member **31** and is engaged by the clevis **24** by means of clevis pin **39** retained by a cotter pin. Additionally welded to the end of the upper boom extension member **33** is a boom extension clevis **41** having a boom extension tang **42.**

Operation of the post-pulling apparatus of the invention is accomplished by means of hydraulic power furnished by the motor vehicle on which the apparatus is

mounted, in combination with a plurality of hydraulically operated cylinders. A hydraulic cylinder assembly **44** is connected between the lower boom clevis **35** and the tower clevis **23,** which causes the boom to be raised and lowered. A second hydraulic cylinder assembly **45** is pivotally affixed at its ends to the upper boom clevis **36** and the boom extension clevis **41.** The operation of this assembly causes the upper boom extension **33** to be extended or retracted. A pulling hydraulic cylinder assembly **46** is connected at one end to the boom extension tang **42** and at the other end has a base plate **47** pivotally mounted thereto. The base plate **47** is provided with four anchor pins **48.**

As shown in FIG. **3,** a post **51** is engaged by means of conventional pulling jaws **52,** such as those disclosed in U.S. Pat. No. 3,048,368, operated by means of a chain **53** engaged by the hook **34.**

Control of the hydraulic cylinders is provided by means of operating levers **54, 55, 56,** and **57.** FIG. **5** is a schematic drawing showing the operation of the various valves and cylinders. Power for the hydraulic cylinders is supplied by a pump **58** driven by the vehicle transmission through a power take-off. The valves **54',** **55',** and **56'** are operated by operating levers **54, 55,** and **56,** respectively. The valves are conventional three-position valves which extend, retract, or place the cylinders in neutral position. Valve **57'** operated by lever **57** is a relief valve. When relief valve **57'** is closed, cylinder **44** operates normally. When relief valve **57'** is open, all pressure on cylinder **44** is relieved, permitting boom **15** to be raised or lowered as it is caused to move by the operation of pulling cylinder assembly **46.** Pump **58** furnishes fluid under pressure to the valves through a common input line **61.** Exhausted fluid from valves **54',** **55',** and **56'** is returned by a common exhaust line **60** to a reservoir **59.** Exhausted fluid from valve **57'** is returned by exhaust line **62** to line **60.** When cylinder assembly **46** is operating for pulling posts, relief valve **57'** must be in the open position to permit cylinder assembly **44** to "float" so that boom **15** can be raised by the action of cylinder assembly **46.**

The apparatus is placed in operation by swinging boom **15** horizontally to the area near where the post is to be pulled out. Boom **15** is then lowered by operating valve **54'** until base plate **47** is slightly above ground level. Valve **55'** is then activated to extend boom **15** in order to position base plate **47** next to the post. Valve **54'** is then activated to lower base plate **47** to the ground. Pulling jaws **52** are then attached to the post and chain **53** placed over hook **34.** Pulling cylinder valve **57'** is then placed in the open position to relieve the pressure on cylinder assembly **44** and allow it to "float." Valve **56'** is then placed in the extend position to cause pulling cylinder assembly **46** to extend to its full limit. Pulling cylinder assembly **46** is then lowered again and pulling jaws **52** reset on the post. These steps are repeated until the post is free of the ground.

Referring to FIGS. **6** and **7** a post-pulling apparatus **65** in a modified embodiment is shown comprising a tower support **66** mounted on a motor vehicle (not shown). A vertical tower **67** is mounted on the tower support **66,** and a telescoping boom **68** is mounted on the tower **67.** Affixed to the tower **67** are a pair of clevis rings **69** and **70** having a pair of clevises **71** and **72** rotatably mounted thereon. The telescoping boom **68** is comprised of a tubular lower boom member **73** and a cylindrical boom extension member **74.** A hook **75** is affixed to one end of the boom extension member **74,** and tabs **76** and **77** are affixed to the lower boom member **73.** A boom tang plate **78** affixed to one end of the lower boom member **73** is pivotally mounted on the clevis **72** by means of a clevis pin **80.** A tab **87** is affixed to the lower portion **79** of the boom extension member **74** below the hook **75.**

A grooved annular collar support **81** is affixed to the boom extension member **74** by means of welds **82.** A collar **83** having a tab **84** is rotatably mounted on the collar support **81.** Since the boom extension member **74** is of round cross section and is rotatably and slidably mounted in the lower boom member **73,** the boom extension member **74** together with the hook **75** and tab **87** are free to rotate with respect to the remainder of the apparatus.

A hydraulic cylinder assembly **85** is pivotally connected at one end to the lower boom member tab **77** and pivotally connected at the end of its extension rod **86** to the tab **84.** Another hydraulic cylinder **89** is pivotally connected at one end to the tab **76** and at the other end to the clevis **71.**

Operation of the apparatus shown in FIGS. **6** and **7** is generally similar to that shown in FIGS. **1–5.** However, the apparatus of FIGS. **6** and **7** has an advantage when the apparatus is utilized on non-level terrain. For example, when the apparatus of FIGS. **1**–vehicle at a pitched angle, the boom which has a rectangular cross section and the hydraulic cylinder utilized to extend the boom twist with respect to each other as a result of the cylinder **46** being extended at an inclined angle and being drawn vertically downward by the force of gravity. However, when the apparatus of FIGS. **6** and **7** is utilized, since the lower boom member **73** and boom extension member **74** are both round, and the boom extension member is free to rotate within the lower boom member, and moreover, since the boom extension member can rotate within the collar **83,** both the hook **75** and the tab **87** are free to rotate with the boom extension member **74** and to permit the hydraulic cylinder **46** supported by the tab **87** to revolve until it hangs vertically downward, regardless of the pitch angle of the vehicle or the terrain.

Referring to FIG. **8,** a portion of a modified form of the apparatus is illustrated, similar structures utilizing the same numbers as in FIGS. **6** and **7.** A collar **95** is affixed to the boom extension member **74** by welds **96** and has a tab **101** pivotally connected to the hydraulic cylinder extension rod **86.** A grooved annular collar support **97** is affixed to the end of the boom extension member **74** by suitable means such as welding and has a collar **98** rotatably mounted thereon, and axially restrained thereby, and a tab **100** affixed to the collar. Affixed to the collar **98** by suitable means such as welding is a hook **99.**

In operation, a cylinder **46** is pivotally mounted to the tab **100,** and chains such as those designated as **53** in FIGS. **1–5** are mounted on the hook **99.** When the vehicle supporting the apparatus is pitched at an angle with respect to horizontal, the assembly including the boom assembly rotates to the same angle as the pitched vehicle. With a cylinder **46** mounted on the tab **100** and a chain **53** mounted on the hook **99,** the hook and tab rotate to permit the cylinder **46** and chain **53** to remain in vertical position, thereby avoiding any tendency to twist the boom and its operating cylinder.

In the embodiment shown in FIG. **9** a grooved annular collar support **103** is affixed to the end of the boom by means such as welding and has a collar **104** rotatably mounted thereon with a hook **105** affixed to the collar. A universal joint **106** connects the lift cylinder **46** to the boom extension tang **42.** A ball and socket joint **107** connects the cylinder **46** to the base plate **47.** If desired, a ball and socket joint may be used in place of the universal joint **106.**

In operation, when the vehicle is pitched at an angle and the boom assembly twists, the hook **105** rotates to the vertical position and the cylinder **46** revolves about the universal joint **106** until it hangs in a vertical position.

FIG. **10** illustrates a further modified embodiment having a collar **110** with a tab **119** affixed to the boom **74** by welds **111.** A cylindrical recess **112** is provided in the end of the boom **74,** and has a grooved shaft **113** whose one end **114** is rotatably mounted in the recess **112** and whose other end **115** extends through an aperture in a cap **116** threadedly mounted over the end of the boom **74.** The cap **116** cooperating with a split washer **121** provides axial restraint for the shaft **113.** Fixedly mounted on the shaft end **115** are a collar **117** having a tab **120** and a hook **118.**

The operation of the embodiment of FIG. **10** is similar to that of FIGS. **8** and **9.** When the boom rotates as a result of the vehicle being positioned at a pitched angle, the shaft **113** rotates, permitting both the chain **53** affixed to the hook **118** and the cylinder **46** affixed to the tab **120** to revolve and to assume a vertical position.

Although it is not intended to so limit the scope of the invention, in a practical working embodiment the arrangement is such that the boom can rotate about a vertical axis through an arc of about 270°. The boom is arranged to have a travel radius of 108 inches and to operate vertically through a 75° arc. Power for the hydraulic cylinders is supplied by a pump driven by the vehicle transmission through a power take-off. Each cylinder is individually activated by a double-acting control valve.

The post-pulling apparatus of the present invention has a number of advantages over prior art devices. First, it may be readily mounted on a vehicle. Second, it utilizes a post-pulling hydraulic cylinder adapted to have one end buttressed against the ground and to provide a strong pulling force independent of the weight or balance of the supporting vehicle. Third, the device has a telescoping boom which can swing horizontally, be extended radially, and raised or lowered, thereby permitting the post-pulling operation to be carried out at a considerable distance from the supporting vehicle. Additionally, the operating controls are conveniently mounted on the boom in a position well-suited to the convenience of the operator. Further, the apparatus is relatively inexpensive to construct from conventional components and materials and is readily operated by even unskilled workmen.

In addition, the apparatus of the present invention has the advantageous and desirable characteristic of providing such an apparatus which, although mounted on a vehicle, can be operated so as to apply little or no force against the vehicle itself.

It is to be understood that the invention is not to be limited to the exact details of operation or exact compounds, compositions, methods, or procedures shown and described, as obvious modifications and equivalents will be apparent to one skilled in the art.

I claim:

1. A hydraulically operated post-pulling apparatus adapted to be mounted on a vehicle comprising

a. a support adapted to be mounted on said vehicle,

b. a boom pivotally mounted at one end with respect to said support and adapted to revolve about a vertical axis and additionally to be raised and lowered, said boom comprising a pair of telescopingly arranged boom members,

c. first hydraulic cylinder means mounted with respect to said support and said boom and adapted for raising and lowering said boom angularly,

d. second hydraulic cylinder means affixed to said boom members and adapted to extend and retract said boom members with respect to each other,

e. third hydraulic cylinder means pivotally connected at one end to the remote end of said boom and having a ground-engaging support means mounted at the other end, and

f. means on the remote end of said boom for engaging means adapted to engage and grip a post to be pulled from the ground.

2. An apparatus according to claim **1,** wherein said means for raising and lowering said boom comprises a tower vertically positioned and affixed at one end to said support, said boom being pivotally connected to the base of said tower and said first hydraulic cylinder means being pivotally connected at one end to an elevated portion of said tower and at the other end to said boom.

3. An apparatus according to claim **2,** wherein valve means is provided for neutralizing said first hydraulic cylinder means when said post lifting hydraulic cylinder means is being operated, thereby permitting said boom to be raised and lowered by said third hydraulic cylinder means.

4. An apparatus according to claim **1,** wherein said ground-engaging support comprises a base plate having ground-penetrating protuberances mounted thereon.

5. An apparatus according to claim **4,** wherein the support mounted on said vehicle is provided with a support plate affixed thereto and provided with apertures to engage the protuberances of said base plate and to support said base plate during storage of said apparatus.

6. An apparatus according to claim **1,** wherein said boom members have a substantially rectangular cross-section.

7. An apparatus according to claim **1,** wherein a hook is provided at the remote end of said boom to engage said means for engaging and gripping a post.

8. An apparatus according to claim **1,** wherein said boom is provided with a control valve support and has a plurality of control valves mounted thereon.

9. An apparatus according to claim **2,** wherein a pair of vertically spaced-apart clevis rings are mounted on said tower each having a clevis rotatably mounted thereon, one end of said boom being pivotally connected to the lower of said clevises and one end of said first hydraulic cylinder means being pivotally connected to the upper of said clevises.

10. An apparatus according to claim **1,** wherein said means for engaging and gripping a post comprises a

chain having its ends connected to a scissors-form clamp adapted to clamp a post.

11. An apparatus according to claim **1,** including (g) means for engaging and gripping a post.

12. An apparatus according to claim **1,** wherein said third hydraulic cylinder means (e) is additionally connected to revolve about the axis of said boom.

13. An apparatus according to claim **1** wherein one of said boom members is rotatably mounted in the other, wherein a support for said third hydraulic cylinder (e) and a hook are affixed to the end of said rotatable boom member, and wherein collar means rotatably mounted and axially restrained on said rotatable boom member is connected to one end of said second hydraulic cylinder means.

14. An apparatus according to claim **1,** wherein a collar is rotatably mounted on said boom having means pivotally connected to said third hydraulic cylinder means (e) at one end thereof, thereby permitting said cylinder to revolve about the axis of said boom.

15. An apparatus according to claim **14,** additionally having a hook affixed to said collar.

16. An apparatus according to claim **1,** having a universal coupling affixed at one end to said boom and having said third hydraulic cylinder means (e) pivotally connected to the other end of said universal coupling.

17. An apparatus according to claim **1,** having a cylindrical recess provided in the end of said boom and a shaft rotatably mounted therein, a hook affixed to the end of said shaft, and means affixed to said shaft pivotally connected to one end of said third hydraulic cylinder means (e) thereby permitting said third hydraulic cylinder means to revolve about the axis of said boom.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,848,850 Dated November 19, 1974

Inventor(s) JOHN H. BEMIS

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Patent Reads:	Assignment Reads:
"Bemis & Sons, Inc.	---Bemis & Son, Inc.

Signed and sealed this 11th day of March 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,848,850 Dated November 19, 1974

Inventor(s) John H. Bemis

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

PATENT READS:	APPLICATION READS:
Related Application data "Feb. 2, 1973"	---Jan. 2, 1973---
Col. 4, line 27: "Figs. 1-vehicle"	Page 6b, line 5: ---Figs. 1-5 is utilized with the vehicle---

Signed and sealed this 21st day of January 1975.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334