Aug. 1, 1961 S. A. MICHALAK 2,994,510

STAKE PULLING DEVICE

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Fig. 1

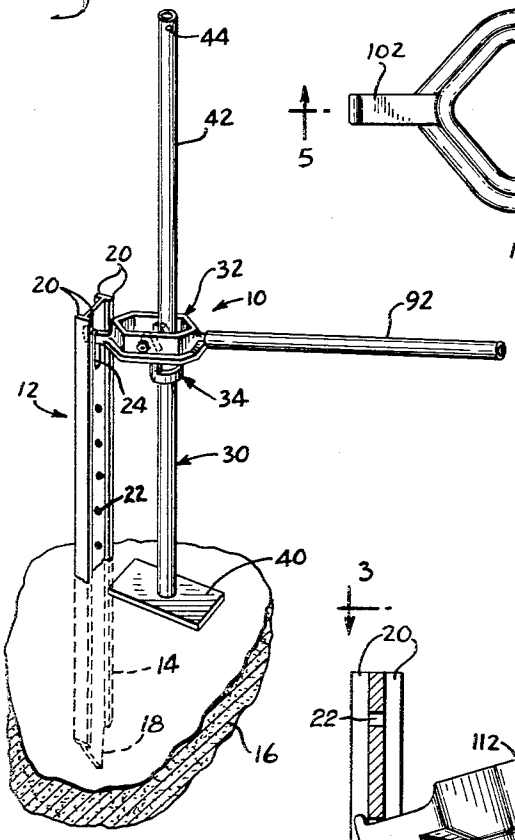


Fig. 3

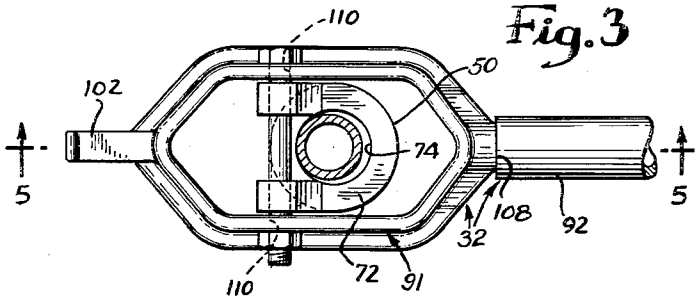


Fig. 2

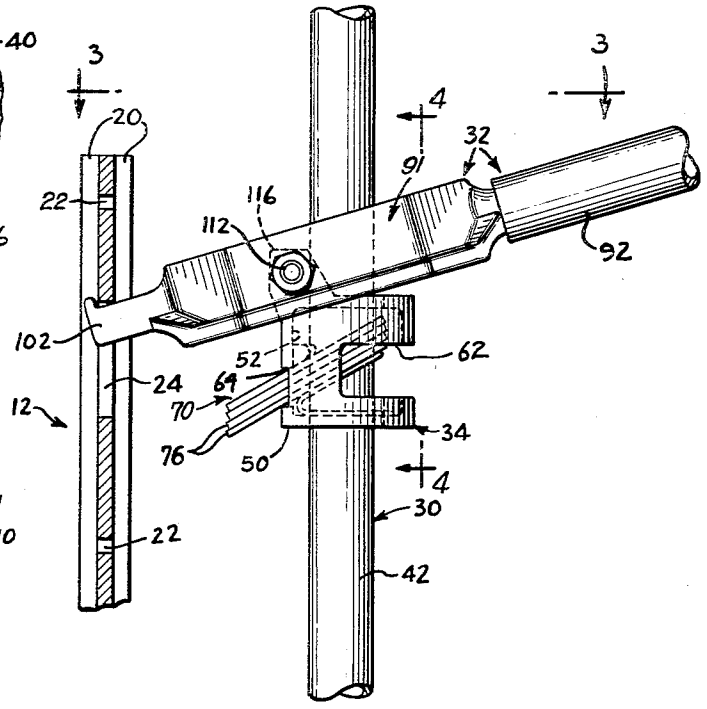
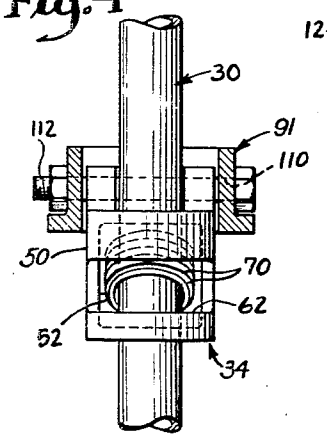


Fig. 4



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STAKE PULLING DEVICE

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Fig. 5

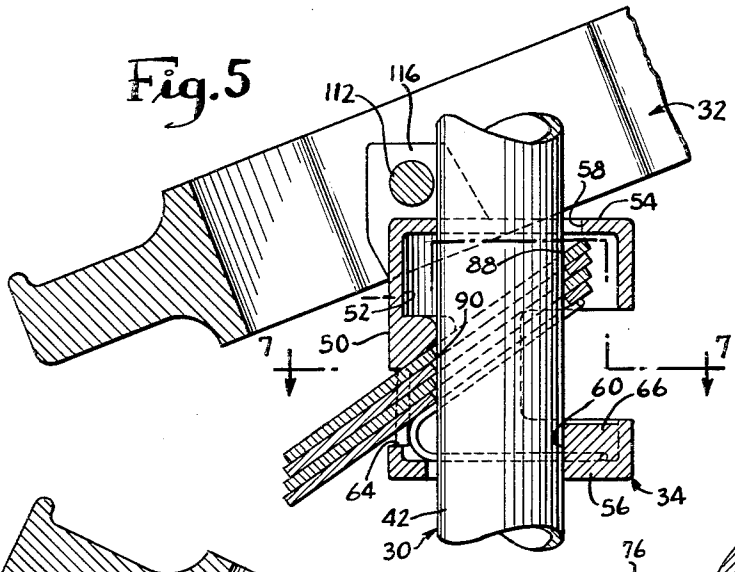


Fig. 7

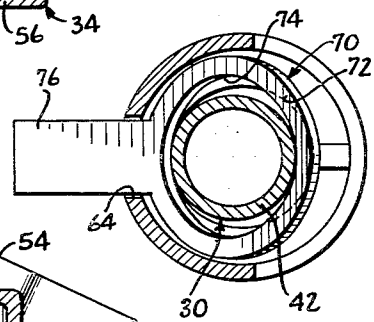
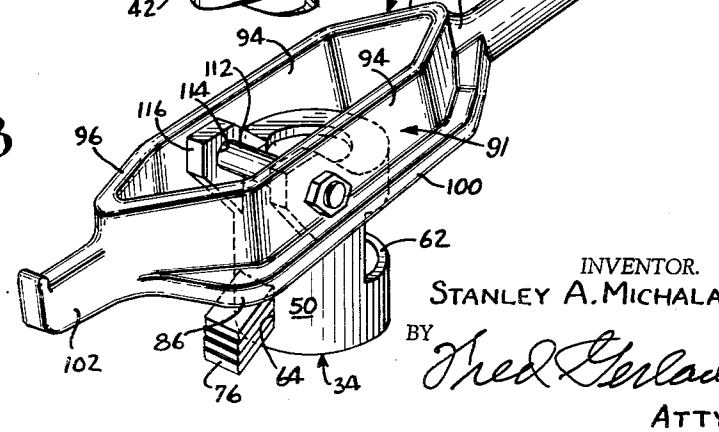


Fig. 6

Fig. 8



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STAKE PULLING DEVICE

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1 Claim. (Cl. 254—30)

The improved stake pulling device comprising the present invention has been designed for use primarily in the pulling of steel construction stakes from their positions of partial embedment in the ground, such stakes having a wide variety of uses in the construction field, as, for example, as anchoring devices for holding concrete wall and other forms in place, as reinforcing members in planking installations and as reaction members for various installations too numerous to mention. The invention is, however, capable of other uses and the improved stake pulling device of the present invention may, if desired, with suitable modification if required, be employed for the successive application of thrust to a wide variety of objects for the purpose of imparting progressive increments of motion to the same.

Heretofore, various devices capable of pulling stakes or performing other useful functions in the construction field and operating upon the principle of a lever of one class or another to obtain a mechanical advantage when moving the load, have been employed for staking pulling purposes. These devices operate with the actual load moving lever arm swinging about a fixed fulcrum so that it is necessary, after each increment of movement has been applied to the load, to adjust the device or to otherwise obtain a fresh purchase on the load before the next increment of motion can be applied to the same. Such devices require the use of two workmen, one to manipulate the device, and the other to make the necessary adjustments on the load. Where the load is of irregular shape, it frequently is difficult for the adjustments to be made, and particularly, where increments of vertical motions are to be applied to a given load, the use of a leverage device of this character having a fixed fulcrum will materially limit the height to which the load may be raised.

The present invention is designed to overcome the above noted limitations that are attendant upon the use of present day conventional stake pulling and similar devices and, toward this end, it contemplates the provision of a mechanism utilizing a lever arm having a shiftable fulcrum axis, the position of which will automatically shift with little or no effort, thought, or attention on the part of the operator, merely by the act of manually oscillating the lever arm between its advanced and its retracted positions.

The provision of a stake pulling device of the character briefly outlined above being among the principal objects of the invention, it is a further object to provide such a stake pulling device which cooperates with the stake or other load undergoing pulling or other movement in such a manner that the lever arm proper will remain in operative engagement with the stake or other load throughout the entire pulling procedure.

A similar and related object of the invention, in a stake pulling device of this character, is to provide a mechanism including a lever arm designed for imparting successive increments of vertical motion to a stake undergoing pulling and which does not require the use of special attachment means such as a chain or the like which must be repeatedly applied to and removed from the stake before and after the actual power stroke of the lever arm associated with the device.

The provision of a stake pulling device which is extremely simple in its construction; one which is comprised

of a minimum number of moving parts and which is, therefore, unlikely to get out of order; one which is rugged and durable and which, therefore, will withstand rough usage; one which is capable of ease of assembly and disassembly for purposes of inspection, replacement of parts, or repair; one which may be manufactured at a relatively low cost; one which will accommodate stakes of varying length and which, therefore, may project from the ground at widely varying distances; one which is capable of extreme ease of manipulation, and one which otherwise is well adapted to perform the services required of it are further desirable features which have been borne in mind in the production and development of the present invention.

Numerous other objects and advantages of the invention, not at this time enumerated, will become more readily apparent as the nature of the invention is better understood.

In the accompanying two sheets of drawings forming a part of this specification, a preferred embodiment of the invention has been shown.

In these drawings:

FIG. 1 is a perspective view of a stake pulling device constructed in accordance with the principles of the present invention, showing the same operatively applied to a construction stake for pulling purposes;

FIG. 2 is a fragmentary enlarged side elevational view of the device showing the same operatively applied to a construction stake with the parts being shown in the position which they assume at the commencement of the power stroke;

FIG. 3 is a sectional view taken substantially along the line 3—3 of FIG. 2;

FIG. 4 is a sectional view taken substantially along the line 4—4 of FIG. 2;

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

FIG. 6 is a sectional view similar to FIG. 5 showing the parts in the position which they assume at the commencement of the return stroke;

FIG. 7 is a sectional view taken substantially along the line 7—7 of FIG. 5: and

FIG. 8 is an enlarged perspective view of an assembled post gripping unit and lever unit employed in connection with the present invention.

Referring now to the drawings in detail and in particular to FIG. 1, a stake pulling device designated in its entirety at **10** is shown as being operatively applied to a construction stake **12** which has been partially embedded as at **14** in the ground **16** in the vicinity of a concrete installation, and which stake it is desired shall be pulled from its partially embedded position and thus freed for subsequent use. The stake **12** is of more or less conventional design and is in the form of an elongated steel member having a lower pointed end **18** to facilitate driving of the same into the ground at a desired location. The bar which constitutes the stake **12** may assume various cross sectional forms as, for example, flats, channels, T-bars, I-bars and the like. For purposes of illustration herein the stake **12** is illustrated as being in the form of an I-bar having marginal flanges **20** and the cross sectional shape of which is best seen in FIGS. 1 and 2. The stake **12** may be provided with the usual row of spaced holes **22** therein and, adjacent the upper end of the stake, there is provided a longitudinally extended elongated slot **24**, this slot constituting the only departure in the stake structure from conventional construction stakes and the nature and function of which slot will be set forth presently.

As best seen in FIGS. 1, 2 and 8, the stake pulling device **10** is comprised of three principal parts or assemblies including a post assembly **30**, a lever assembly **32**

and a post gripping assembly 34. Briefly, the grip assembly 34, in the operation of the device, is unidirectionally slidable upwardly and vertically on the post assembly 30 and provides a vertically shiftable fulcrum for the lever assembly 32 which is engageable with the stake 12 in such a manner that during the power stroke of the lever assembly 32 the stake will be pried, so to speak, upwardly and withdrawn from its partially embedded position in the ground and so that during the return stroke of the lever assembly 32 the grip assembly 34 will slide upwardly on the post assembly 30 and assume a new elevated position thereon preparatory to the next succeeding power stroke, all in a manner that will be made clear presently.

The post assembly 30 is comprised of a flat base plate 40 which is preferably of rectangular configuration and from the medial regions of which there extends upwardly a cylindrical post 42 which may be in the form either of a solid block or of a tube, the latter form being selected for illustration herein. The upper end of the post 42 is adapted to receive therein a stop screw 44 the head portion of which serves as a limit stop to prevent removal of the grip assembly 34 from the post.

The grip assembly 34 is telescopically received over the post 30 and is slidable vertically therealong. The assembly 34 is in the form of a friction clamp, the casting of which has been especially designed in accordance with the principles of the present invention to afford a convenient fulcrum axis for the lever assembly 32. The assembly 34 involves in its general organization a tubular casting 50 preferably formed of malleable iron and provided with a central vertical bore 52 therein of appreciably greater diameter than the diameter of the tubular post 42. The upper and lower open ends of the bore 52 are provided with internal flanges 54 and 56 presenting central openings 58 and 60, respectively, therethrough. The diameter of each opening being slightly larger than the diameter of the cylindrical post 42. The tubular casting 50 is provided with a horizontally extending arcuate slot 62 of approximately 180° extent and with a similar arcuate slot 64 of lesser circumferential extent and which is diametrically opposed to the slot 62. A radially extending rib 66 projects upwardly from the flange 56 and is adapted to bear against the side of the post 42. The rib 66 functions both as a wear and a reinforcing member for the casting 50.

The opening 62 constitutes an installation opening by means of which a series of stacked gripping plates 70 (see also FIG. 7) may be inserted into the interior of the casting 50 and caused to assume an operative gripping relationship with respect to the post 42. In the present instance, four such gripping plates 70 have been illustrated for exemplary purposes, but it will be understood that a greater or lesser number of such plates may be employed if desired. Each gripping plate is in the form of a flat washer-like ring 72 having a central opening 74 therethrough somewhat larger than the external diameter of the post 42 and from which there extends radially outwardly a generally rectangular tab or release finger 76. The various gripping plates 70 are disposed within the bore 52 of the casting 50 in superimposed face-to-face contact, thus providing a laminated effect, with the various release fingers 76 projecting rearwardly through the slot 64, as shown in FIGS. 5 and 6. A spring 78, which may be in the form of a spring wire stock bent into figure-eight form and reversed upon itself where the wire strands cross each other as at 80, has one leg 82 thereof surrounding the post 42 and resting on the flange 56 while the other leg 84 thereof surrounds the post and bears against the underneath side of the lowermost gripping plate 70 in the series, thus urging the entire stack of gripping plates upwardly within the bore 52 so that the upper surface of the release finger 76 of the uppermost plate in the series normally bears as at 86 (FIG. 8) against the upper edge of the slot 64 in the free state of the various parts before the gripping assembly 34 is installed on the post 42, while the extreme upper edge of the uppermost gripping plate 70 bears against the underneath side of the flange 54. When the assembly 34 is telescopically received over the post 42 with the latter extending through the openings 74 in the plates, the various plates will assume a lesser inclination within the bore 52, and, under the influence of the spring 78, the contact between the finger 76 of the uppermost plate 70 with the upper wall of the slot 64 will remain effective while the edge of the slot 74 in the uppermost plate remote from the finger 76 will frictionally engage the side of the post 42 indicated at 88 in FIG. 5 while the edge of the slot 74 at a point 90 diametrically opposed to the point 88 will be forced into frictional engagement with the post 42 under the influence of gravitational forces acting on the casting 50 and which are applied downwardly against the finger 76. The gripping effect set forth above in connection with the uppermost plate 70 in the series of four plates holds true for the three other plates 70 since each of the plates bears the same angular relationship with respect to the post 42 at all times, all under the influence of the spring 78 as well as under the influence of any gravitational force which may be applied from the casting 50 at the corresponding points associated with each plate. The number of gripping plates 70 employed merely determines the weight-supporting capacity of the device as a whole in terms of units of downwardly thrust on the casting 50, the greater the number of plates employed, the greater being the frictional forces developed between the plates and post 42 for gripping purposes.

From the above description, it will be seen that the entire gripping or clamp assembly 34 is normally prevented from downwardly sliding movement on the post 42 by virtue of the gripping characteristics set forth above. Substantially free upward sliding movement of the assembly 34 on the post 42 is at all times made possible by virtue of the fact that any upward thrust which may be applied to the casting 50 will be imparted to the stacked series of gripping plates 70 by the spring 84 acting more or less evenly on the underneath surface of the lowermost gripping plate 70 so that no binding action on the post 42 will be obtained. The lower edge of the slot 64 is at all times out of contact with the underneath face of the lowermost plate 70 and the spring 82 constitutes the sole thrust-applying medium acting on the group of plates as the casting 50 is moved upwardly. Unidirectional friction clamp devices such as have been described above are known and no claim is made herein to any novelty associated with the various gripping plate 70 and the relationship which they bear to the vertically disposed post 42 except insofar as the casing or housing 50 has been modified for cooperation with the lever assembly 32 which will now be more fully described.

The lever assembly 32 is comprised of two main parts, namely, a hub casting 91, best seen in FIG. 2, and a lever handle 92. The hub casting is in the form of an open frame or cage-like structure having elongated parallel side members 94 which merge adjacent their ends with V-shaped end portions 96 and 98, respectively. Lateral reinforcing flanges 100 are formed on the casting adjacent the bottom thereof. The end portion 96 is formed with a forwardly extending shallow hook portion 102 while the end portion 98 is formed with a rearwardly extending cylindrical shank 104, the extreme outer end of which may be squared as at 106. The squared portion 106 is adapted to removably receive thereover a suitable operating tool or handle (not shown) having a square socket formed therein so that the lever assembly may, if desired, be disassembled for convenience in transportation or storage. In the illustrated form of the lever assembly, the handle 92 is designed for permanent installation over the shank portion 104 of the casting, and toward this end, this handle may be in the form of a tubular member, which, when inserted over the shank 104, is

adapted to have its extreme forward end or rim permanently welded to a shoulder **108** formed at the juncture between the shank **104** and the end portion **98** of the casting **91**.

The side members **94** of the casting **90** are provided with a pair of aligned openings **110** therein (FIGS. 3 and 4) through which openings there extends a hinge pin **112** in the form of a nut and bolt assembly. The hinge pin **112** also extends through a pair of aligned openings **114** provided in a pair of ears **116** formed on the upper rim of the casting **50**, thus, in effect, providing a trunnion support for the casting **91**. With the hinge pin **112** in position in the assembled pulling device **10**, a lever assembly **32** is thus capable of limited swinging movement about the axis of the hinge pin **112** between the approximate useful exemplary positions shown in FIGS. 5 and 6, respectively, for stake pulling purposes.

In the operation of the stake pulling device **10**, the base portion **40** of the post assembly **30** is positioned on the ground as shown in FIG. 1 in fairly close proximity to a stake such as the stake **12** which is to be pulled from its position of partial embedment in the ground, with the post **42** extending vertically upwardly alongside the exposed portion of the stake **12**. The interconnected gripping and lever assemblies **34** and **32**, respectively, are lowered or raised, as the case may be, to the approximate elevation of the slot **24** provided in the stake **12** and are preferably positioned so that the axis of the hinge pin **112** lies in a plane somewhat above the plane of the uppermost edge of the slot. If it is necessary to raise the gripping assembly **34** from a previous low position, the application of manual upward thrust to this assembly will permit the casting **50** and the associated elements to slide freely upwardly along the post **40** to the desired elevation. If it is necessary to lower the casting **50** from a previously elevated position, it is merely necessary to apply upward force to the underneath side of the radially extending release finger **76** of the lowermost gripping plate **70** to release the binding action of the various gripping plates, whereupon the casting may be slid downwardly along the post to the desired elevation. With the assemblies **32** and **34** assuming the approximate elevation illustrated in FIGS. 1 and 2 relative to the slot **24**, the hook portion **102** is projected through the slot **24** and downward pressure is applied to the handle **92** to swing the same about the axis of the hinge pin **112**. Downward thrust will thus be applied to the hinge pin **112**, and consequently, to the casting **50** so that the various gripping plates **70** will bind on the post **42**, as previously described, and the post will thus constitute a reaction member for receiving this thrust, whereupon the entire lever assembly **32** will operate in the manner of a lever of the first class so that the hook portion **102** will engage the upper edge of the slot **24** and cause the stake **12** to be elevated during downwardly swinging movement of the handle **92**. The extent of lifting movement of the stake throughout any given angle of swinging movement of the lever assembly **32** during its power stroke will be a function of the sine of the angle involved. During such upward movement of the stake **12**, the upward edge of the slot **24** will move to a position wherein it is disposed in a plane above the level of the hinge pin **22**. Thereafter, during the return stroke of the handle **92**, the hook portion **102** will move downwardly in the slot **24** and engage the lower edge of the slot, whereupon this lower edge will serve as a reaction point to receive the downward thrust of the hook portion **102** and the lever assembly **32**, then operating in the manner of a lever of the second class, will cause the casting **50** to be lifted upwardly and thus slide vertically upwardly along the post **42** until the handle **92** is restored to its initial elevated position preparatory to the commencement of a subsequent downward power stroke.

The operation described above is repetitious with the stake **12** moving upwardly during each power stroke of the lever assembly **32** and with the casting **50** moving upwardly during each return stroke of the lever assembly. These two members, namely, the post **12** and casting **50**, will, during normal operation of the pulling device **10** effect alternate increments of upward motion until such time as the stake **12** has been withdrawn from the ground.

A preferred form of the invention has been shown in the drawings and described herein, but it should be understood that the invention is not limited to the specific disclosure made, and that the appended claim should be construed as broadly as the prior art will permit.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

In a stake pulling device of the character described for exerting successive increments of upward thrust to a driven construction stake having a vertically extending slot formed therein adjacent the upward end thereof, in combination, a cylindrical reaction post adapted to have its lower end effectively supported on the ground in the vicinity of said stake with the post extending vertically, a unidirectional friction clamp slidably supported on said post, said friction clamp including a tubular casing loosely surrounding the post and unidirectional post-binding means disposed within said casing and positively yieldingly and frictionally engaging the post for preventing downward movement of the casing relative to the post while permitting free upward sliding movement of the casing along the post, said casing having an upper rim portion provided with a pair of spaced upwardly extending lugs thereon on the rear side of the post, a pair of aligned holes formed in said lugs respectively, a lever having a bifurcated medial region provided with spaced apart parallel sides, there being a pair of aligned holes formed in said sides in the medial regions thereof, said sides straddling said pair of ears with the holes in said sides extending in alignment with the holes in said ears, a hinge pin projecting through all of said holes whereby said lever is pivotally mounted medially of its end on said casing for swinging movement in a vertical plane, a relatively short lever arm projecting forwardly from said bifurcated portion of the lever and having a hook portion formed on its distal end and adapted to be projected through said slot during stake pulling operations, and a relatively long lever arm projecting rearwardly from said bifurcated portion of the lever and constituting an operating handle for the lever whereby, upon downward movement of said operating handle, the lever will function as a lever of the first class and perform an operating stroke to pry said stake upwardly with the distal end of the relatively short lever arm engaging the upper edge of the slot in said stake and with said post and casing assimilating the consequent downward reaction thrust on the hinge pin and whereby, upon subsequent upward return movement of the operating handle, the lever will function as a lever of the second class to lift said casing upwardly and cause the same to slide vertically on said post with said distal end of the relatively short lever arm engaging the lower edge of the slot in said stake and with said stake assimilating the consequent downward reaction thrust applied thereto by said distal end of the short lever arm.

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