This invention relates to a new and improved stake puller machine, and, more particularly, to a stake puller machine especially adapted for removing concrete form stakes.

In the laying of concrete roads, aircraft runways, and like constructions, it is common practice to pour the concrete between steel forms which are spaced parallel to each other and accurately laid on a prepared surface. The steel side forms are usually about ten feet in length and are securely held in place by means of a plurality of one-inch diameter steel stakes which are driven through suitable holes in the forms and into the ground to a depth of from one to three and one-half feet, depending on the length of the stake used. These side forms are used repeatedly for successive pourings on the same or different road constructions and, accordingly, it is necessary to remove the stakes with which they are held in place. After the concrete road has been poured between the forms and the concrete has set, the stakes holding the forms in place must be removed vertically so as not to induce any sideward stresses on the forms which could damage the new concrete. The stakes are removed from the forms either manually or by a power machine. When the stakes are removed manually a two man team is usually required and the stakes are loosened by hitting them on the sides thereof with a sledge hammer so as to loosen them, whereby, they may be manually removed. The manual removal of these stakes is a time consuming and laborious process, especially when the stakes have set for long periods of time in heavy clay or rocky soil. Furthermore, the loosening of the stakes by hitting them on the side with a sledge hammer is injurious to the stakes and to the steel forms. Heretofore, it has been proposed to remove concrete form stakes by means of complicated and expensive hydraulically or pneumatically operated power machines. Machines of the last mentioned type have proved to be expensive, slow and cumbersome in operation, and heavy in weight. Accordingly, it is the primary object of this invention to provide a novel and improved mechanically operated machine for removing concrete form stakes and the like which will be compact and rugged in construction, lightweight, efficient in operation and, which may be operated by one person, whereby, savings in labor may be achieved.

It is another object of this invention to provide an improved stake puller machine which will be physically small in construction, economical of manufacture, and, which may be manually pushed from stake to stake and be reliable and serviceable, and capable of withstanding road construction conditions.

It is a further object of this invention to provide a portable power actuated stake puller machine which is powered by a small gasoline engine which is adapted to drive a novel inertia wheel means for providing a constant and smooth flow of power to a stake grapping means which in turn is adapted to exert a vertically upwardly directed removal force on a stake engaged by the stake grapping means.

A still further object of the invention is to provide a stake or pin puller machine which is completely mechanical in construction and operation and which includes a three wheeled truck upon which all of the operative structure of the machine is mounted, and, which truck is constructed and arranged so as to have two of the wheels ride in contact with the concrete side forms, whereby, the stake removal reactive forces will be transmitted through said two wheels and the concrete side forms to the road bed, whereby, the machine may be used soon after the concrete has set without injury to the curing concrete.

Other objects, features and advantages of this invention will be apparent from the following detailed description and appended claims, reference being had to the accompanying drawings forming a part of the specification wherein like reference numerals designate corresponding parts of the several views.

In the drawings:

Fig. 1 is a perspective view of a stake puller machine made in accordance with the principles of the invention and showing the machine in an operative position at work on a roadway;

Fig. 2 is a rear elevation view, slightly enlarged and partly broken away, of the structure illustrated in Fig. 1, taken in the direction of the arrow marked "2";

Fig. 3 is a partial, enlarged, horizontal sectional view of the structure illustrated in Fig. 2, taken along the line 3-3 thereof, and looking in the direction of the arrows;

Fig. 4 is a partial, enlarged, horizontal sectional view of the structure illustrated in Fig. 2, taken along the line 4-4 thereof, and looking in the direction of the arrows;

Fig. 5 is a partial, enlarged, horizontal sectional view of the structure illustrated in Fig. 2, taken along the line 5-5 thereof, and looking in the direction of the arrows;

Fig. 6 is a top plan view, with parts broken away, of the structure illustrated in Fig. 2, taken in the direction of the arrow marked "6";

Fig. 7 is a fragmentary, enlarged, elevational view, partly in section, of the structure illustrated in Fig. 6, taken along the line 7-7 thereof, and looking in the direction of the arrows;

Fig. 8 is a fragmentary, enlarged, horizontal sectional view of the structure illustrated in Fig. 7, taken along the line 8-8 thereof, and looking in the direction of the arrows;

Fig. 9 is an elevational sectional view of the structure illustrated in Fig. 8, taken along the line 9-9 thereof, and looking in the direction of the arrows;

Fig. 10 is a fragmentary, end elevational view of a modified truck wheel employed in the invention;

Fig. 11 is an enlarged end elevational view of the truck wheel illustrated in Fig. 10 and showing the parts thereof disassembled from each other; and, Fig. 12 is a side elevational view of the truck wheel illustrated in Figs. 10 and 11.

Referring now to the drawings, a stake puller machine made in accordance with the principles of the invention is illustrated in operative position on a roadway 10, as shown in Figs. 1, 2 and 6. The numeral 11 designates, generally, a concrete road side form which is illustrative of one of many types used in laying concrete roads and the like. The forms 11 are normally made from steel plates and, as best seen in Figs. 1 and 2, each includes an inner vertical leg portion 12 which is integral on the upper end thereof with the upper face or top horizontal portion 13. The forms 11 each further include the outer integral leg portion 14 which slopes outwardly and downwardly, and which is integral with its upper edge with the upper face 13 and, at its lower edge, with the base portion 15. Each of the forms 11 is provided with a plurality of stake pockets, generally designated by the numeral...
3. The pockets are fixedly secured to the leg portion 14 and the base portion 15 by any suitable means, as by welding. As best seen in Fig. 1, each of the stake pockets 16 comprises the vertical spaced apart plates 17 and 18, the upper ends of which are connected by an integral horizontal plate 19. A stake hole 20 is formed through the plate 19 and is aligned with a similar stake hole 21 in the base portion 15. The forms 11 are securely retained in place by means of the stakes or pins 22 which are adapted to be disposed in the holes 20 and 21 and driven therethrough and downwardly into the ground.

As shown in Figs. 1, 2 and 6, the wheel assembly 28 comprises the longitudinally disposed wheel 30 which is rotatably mounted on the axle 31 as shown in Fig. 2 and the horizontal plate 33 which is fixedly secured to the plate 34 by means of the bolts 35 and 36. The plate 34 is fixedly secured to the lower side of the forward end of the angle rail 24 by means of the bolts 35 and 36. The wheel assembly 29 is constructed in the same manner as the wheel assembly 28 and the corresponding parts are marked with similar reference numerals, followed by the small letter “a.”

4. The wheel assembly 37 comprises the wheel 38 which is rotatably carried on the shaft 39 which is provided with the head 40 and which is fixedly mounted on the vertical arm 41 by any suitable means, as by the retainer nut 42. A horizontal arm 43 is integrally formed on the upper end of the vertical arm 41 and extends inwardly therefrom and carries a fixedly mounted upwardly extended vertical shaft 44 which is suitably rotatably journaled in the platform 45. The platform 45 is secured to the outer face of the frame 27 by any suitable means, as by welding. The shaft 44 is suitably retained in the sleeve 45, as by means of the nut 46.

5. As shown in Figs. 1, 2 and 6, the truck 23 is provided with a pair of vertically disposed guide members, generally indicated by the numerals 47 and 48, which are adapted to provide tracking of the wheels 30 and 30a on the upper face 13 of the forms 11. The guide members 47 and 48 permit use of wheels without rim flanges which would undesirably cut into the finished surface of the road 10. The guide members 47 and 48 each comprise a vertical guide sleeve 49 which is welded to the outer side of the longitudinal channel rail 24. A guide pin 50 is freely slidable mounted in each of the guide sleeves 49 with the lower end thereof being adapted to slidably engage the outer face of the sloping leg portion 14 of the forms 11, at a point above the stake pockets 16. Each of the guide pin 50 is provided with an annular shoulder or flange as 51 which is adapted to limit the downward movement of the guide pin.

6. As best seen in Figs. 1 and 2, the stake puller machine of the present invention comprises a wheel supported truck, generally indicated by the numeral 23, which includes a substantially quadrangularly shaped frame. The truck frame comprises the horizontal, longitudinally disposed channel rails 25 and 26, respectively, and the vertically disposed vertical plate 27. The various aforementioned frame elements are fixedly secured together by any suitable means, as by welding. As best seen in Figs. 1 and 2, the wheel assembly 29 is supported by a pair of wheel assemblies, generally indicated by the numerals 28 and 29. The wheel assembly 28 comprises the longitudinally disposed wheel 30 which is rotatably mounted on the axle 31 which is carried by the two vertically spaced apart arms 32. The arms 32 are fixedly secured, as by welding, to the horizontal plate 33. The plate 33 is fixedly secured to the plate 34 by means of the bolts 35 and 36. The plate 34 is fixedly secured to the lower side of the forward end of the angle rail 24 by any suitable means, as by welding. The wheel assembly 29 is constructed in the same manner as the wheel assembly 28 and the corresponding parts are marked with similar reference numerals, followed by the small letter “a.”

7. As shown in Figs. 1, 2, 4 and 6, the wheel assembly 29 comprises the wheel 38 which is rotatably carried on the shaft 39 which is provided with the head 40 and which is fixedly mounted on the vertical arm 41 by any suitable means, as by the retainer nut 42. A horizontal arm 43 is integrally formed on the upper end of the vertical arm 41 and extends inwardly therefrom and carries a fixedly mounted upwardly extended vertical shaft 44 which is suitably rotatably journaled in the platform 45. The platform 45 is securely retained in the sleeve 45, as by means of the nut 46.

8. As shown in Figs. 1, 2, 4 and 6, the upper end of the puller side 51 which comprises the vertical plate 53 and the integral downwardly and outwardly sloping plate 54. The sloping plate 54 is provided with a forwardly facing U-shaped slot 55 which extends inwardly from the forward edge thereof. Fixedly mounted on the upper end of the vertical plate 53, as by welding, are the spaced apart horizontally disposed sleeves 56 and 57. A cable connector member as 58 is disposed with the lower end thereof between the horizontal sleeves 56 and 57 and is hingedly connected thereto, as by means of the bolt 59 and nut 60. Fixedly connected by any suitable means to the upper end of the cable connector member 58 is a puller cable 61 which is adapted to be maintained in a vertically disposed position by means of the cable guide means, generally designated by the numeral 62.

As best seen in Figs. 1 and 5, the cable guide means 63 is arranged and constructed so as to provide vertical guidance to the cable 61 and comprises the horizontal plate 63 and the vertically disposed spaced apart plates or arms 64 and 65 which are fixedly connected thereto by any suitable means, as by welding. Fixedly mounted between the arms 64 and 65, as by welding, is the block 66 on the outer face of which is rotatably mounted the two adjacent disposed guide rollers 67 and 68. Each of the guide rollers 67 and 68 is provided with a peripherally disposed cable groove 69. The guide roller arms 64 and 65 are each fixedly mounted to the block 66 by means of a bolt and washer, as 70 and 71, respectively.

As shown in Figs. 1, 2, 4 and 6, the guide cable means 62 is mounted on the outer side of a platform formed on the truck 23 and includes the horizontal angle rails 72 and 73. The outer ends of the horizontal rails 72 and 73 are fixedly supported on the horizontal truck rail 24 by means of the spaced apart vertical angle rails or legs 74 and 75 to which they are fixedly secured, as by welding. The inner ends of the horizontal angle rails 72 and 73 are fixedly supported on the truck rails 25 and 26 by means of the angle rails 76 and 77, respectively, and the aforementioned rails are fixedly connected to the platform 27 by welding. The outer ends of the platform rails 72 and 73 are interconnected by means of the horizontal plate 78 which is fixedly connected thereto, as by welding, and on which the cable guide means 62 is fixedly mounted, as by welding or suitable bolts and nuts.

As shown in Figs. 1, 2, 4 and 6, the upper end of the puller side 51 is connected to a cable connector member 79 which is rotatably journaled on the pin 80 which is threadably mounted on the horizontal outwardly extended arm 81. The cable connector member 79 is rotatably held on the pin 80 by a cotter pin 81 and the washers 82 and 83 and the bolt 84. The arm 81 is fixedly mounted, as by welding, on the lower end of the puller lever 85 and, as best seen in Figs. 1 and 5, the upper end of the lever 85 is fixedly mounted, as by welding, on the horizontal sleeve 86 which is fixedly mounted on the outer end of the shaft 87 by means of the washer 88 and the bolt 89.

As shown in Figs. 1, 2, 6 and 7, the shaft 87 is rotatably journaled in the bearing 90 which is fixedly secured on the inner side of the vertical plate 93 by means of the bolts 91 and the nuts 92. The shaft 87 passes through the plate 93 which is integrally formed and fixedly mounted on the platform on the truck 23. The aforementioned first column comprises the longitudinally spaced vertical angle rails 94 and 95, the upper ends of which slope toward each other. The plate 93 is fixedly secured to the rails 94 and 95 by means of the bolts 96 and the nuts 97. The plate 93 is integrally formed by means of the spaced angle brackets 98 which are disposed on opposite ends of the cable guide means 62 and which are secured to the plate 93 by the bolts 99. The brackets 98 are freely secured to the platform plate 78 by any suitable means, as by welding.

As shown in Figs. 6 and 8, the guide cable means 62 includes a horizontally disposed cable 100 which is rotatably journaled directly through the guide rollers 67 and 68 which are adapted to be disposed in the holes 20 and 21 and driven therethrough and downwardly into the ground.
hereinafter. The inner end of the shaft 87 is rotatably journaled in the bearing 101 which is fixedly mounted on the inner side of the vertical plate 102 by means of the bolts 105 in Figs. 1, 2, 5, 6, and 10. The vertical plate 102 is part of a second column which is spaced inwardly from the first column and comprises the longitudinally disposed horizontal angle rail 105 which is fixedly secured between the platform rails 72 and 73 by any suitable means, as by welding. The second column further includes the longitudinally spaced apart vertical angle rails 106 and 107, the lower ends of which are fixedly secured to the platform rails 72 and 73, respectively, as by welding, and, the upper ends of which slope toward each other. The plate 102 is fixedly secured to the vertical rails 106 and 107 by means of the bolts 108 and nuts 109. The first and second columns are interconnected by means of the horizontal transversely disposed angle rails 110 and 111 which are fixedly secured to the columns as by welding.

As shown in Figs. 2, 6 and 8, and as more fully explained hereinafter, the clutch 142 is driven by the gear 112 which is preferably of a size having 42 teeth thereon. The gear 112 is meshably connected to and driven by the pinion gear 113 which is fixedly mounted on the shaft 114 by means of the usual key 115. The gear 113 is preferably of a size having 12 teeth thereon. The shaft 114 is rotatably journaled at one end thereof in a bearing member (not shown) similar to bearing member 101 on the inner side of the vertical plate 93, and it is secured in place by means of the bolts 116 and nuts 117. As shown in Fig. 1, the other end of the shaft 114 is journaled through the hub 118 of the vertical plate 102 and this end is rotatably journaled in the bearing member 119 which is fixedly secured on the inner side of the vertical plate 120 by means of the bolts 121 and nuts 122.

As shown in Figs. 1, 2, 6, and 10, the plate 120 is part of a third column which is disposed invadesly of the second column or toward the right side of the machine as viewed in Fig. 2. This third column comprises the longitudinally disposed horizontal angle rail 123 which is fixedly secured between the platform rails 72 and 73 by any suitable means, as by welding. This third column further includes the longitudinally spaced apart vertical angle rails 124 and 125, the lower ends of which are fixedly secured to the platform rails 72 and 73, respectively, as by welding, and, the upper ends of which slope toward each other. The plate 120 is fixedly connected to the vertical rails 126 and 127 by means of the bolts 126 and the nuts 127.

As viewed in Fig. 2, a bull gear 128 is fixedly mounted on the shaft 114 by means of the key 129, between the aforementioned second and third columns. The bull gear 128 is driven by a pinion gear 130 which is fixedly mounted on the horizontal shaft 131 by means of the lock key 132. The pinion gear 130 is preferably of a size having 18 teeth thereon. The bull gear 128 is driven by a pinion gear 130 which is fixedly mounted on the horizontal shaft 131 by means of the lock key 132. The pinion gear 130 is preferably of a size having 18 teeth thereon. As viewed in Fig. 2, the left end of the shaft 131 is rotatably journaled in the bearing member 133 which is fixedly mounted on the outer side of the vertical plate 120, and by means of the bolts 134 and nuts 135. The right end of the shaft 131 is rotatably journaled in a bearing member 136 which is fixedly mounted on the inner side of the vertical plate 120, by any suitable means. Fixedly mounted on the shaft 131 is a flywheel or inertia wheel 137, and this wheel is secured on the shaft 131 by means of the lock key 138. As shown in Figs. 2 and 6, the shaft 131 extends through the vertical plate 120 and carries on the right end thereof the sprocket wheel 139. The sprocket wheel 139 is fixedly secured to the shaft 131 by means of the lock key 140. The sprocket wheel 139 is driven by means of the sprocket chain 141 which is in turn driven by a drive member forming a part of the clutch 142 which is manually operable by means of the control lever 143. The clutch 142 is a friction type clutch and is driven by means of the engine 144 to which it is connected by means of the engine output shaft 145. The purpose of the clutch 142 is to engage the operating load when starting the engine 144. The engine 144 is suitably fixedly mounted on the truck 23 by any suitable means and is provided with the usual gas tank 146. The clutch 142 may be supported by any suitable means, as by means of the bracket 147 which is connected to the engine 144 and carries the clutch 142 to the clutch by means of the bolt 149. The engine 144 is preferably a three horsepower, four cycle gasoline engine, and engines of this type are readily available on the market. Any conventional type clutch may be employed to carry out the function of clutch 142, and a suitable clutch for this purpose is one available on the market manufactured by the "Rockford Clutch Division of Borg-Warner Incorporated, Rockford, Illinois, and known as the "Rockford Sprocket Over Center Clutch."

As shown in Figs. 7, 8 and 9, the single action clutch 140 includes a sleeve bearing 150 which is carried integral of the collar 151 of a driving member on which the gear 112 is fixedly mounted, as by means of the lock key 152 and the lock screws 153. The driving member is continued in the form of an enlarged annular casing 154, the inner face of which may be lined with a layer 155 of suitable contact material. The shaft member to be rotatably mounted relative to the driving member, and this shaft extends through the sleeve bearing 150. Secured against movement with respect to the shaft 87 is a sleeve 156 which is fixed to the shaft 87 by means of the lock screw 157 and the lock key 158. Fixedly mounted on the sleeve 156, by means of the lock key 160, is an annular cam 159. The cam 159 is provided with a plurality of cam faces 161 and, upon alternate cam faces 161, are rollers 162 which are retained against undue displacement by means of a collar or conning ring 163 having openings such that the rollers 162 may be projected to extend beyond the same and into engagement with the layer of contact material 155. The collar 163 may be secured in position by means of an annular plate 164 which rotatably encircles the sleeve 156 and which may be attached to the collar 163 in any suitable manner, as, for example, by the bolt 165. The collar 163 has its several sections integral or otherwise fixed with respect to a plate 166 which rotatably encircles the sleeve 156.

It will be seen that if plate 166 be rotated with respect to shaft 87, that it will effect rotation of the cage or collar 163 and cause the rollers 162 to shift along the cam faces 161 with which they contact, so as to be projected outwardly and into a driving engagement with the contact layer material 155. The edge of the casing 154 is preferably grooved to receive a layer of oil retaining material 167, to which oil may be supplied in any desired manner. The outer face of the oil retaining material 167 contacts the inner face of plate 166.

The plate 166 is shifted relative to the shaft 87 by means of the following described structure. As shown in Fig. 8, the outer face of the plate 166 is provided with a radially extending groove or slot 168 within which is disposed a block 169 which is pivotally supported by the pin 170 which is in turn mounted on a cam plate 171. The cam plate 171 encircles the sleeve 156 and is supported by means of the pin 172 which is mounted upon a hub plate 175. The hub plate 173 is fixed with respect to the sleeve 156 in any suitable manner. The end of a spring 174 is secured to the hub plate 173 by being fastened to the pin 175 which extends from the hub plate 173. The other end of the spring 174 is fixed to the pin 176 which is mounted on the cam plate 171. The cam plate 171 is rotatable with an annular cam surface 177 which terminates in a raised portion or shoulder 178 with which a trip bar or rod 179 is adapted to be engaged.
As shown in Fig. 7, a support bracket 180 is fixedly mounted on the angle plate 111, as by welding, and carries on the upper end thereof a fixedly mounted block 181 through which is formed the hole 182. The trip bar 179 is slidable mounted through the hole 182 and is positioned in the inner end thereof with a fixedly mounted annular flange 183. The trip rod 179 is normally biased inwardly to an operative engagement with the shoulder 178 on the cam plate 171, by means of the spring 184. One end of the spring 184 abuts the trip bar flange 183 and the other end of the spring abuts the inner end of the trip bar 181. Operating lever 185 is hinged connected, as at 186, to the outer end of the trip rod 179. The operating lever 185 is also pivotally mounted at a central point, as at 187, on the brackets 188 which are fixedly mounted on the angle rail 111. The operating lever 185 extends downwardly to form an operating handle portion 189. It will be seen that as long as the trip bar 179 is in the position shown in Fig. 7, the cam plate 171 will remain inoperative and the gear 112 may drive the casing 154 but the shaft 87 will not be driven since the cam rollers 162 are not engaged with the contact material 155. When it is desired to rotate the shaft 87, the operator merely moves the operating handle 189, whereby, the trip bar 179 will be moved outwardly and the spring 174 will contract and will rotate the cam plate 171 in a counter clockwise direction, as shown by the arrow in Fig. 7. The aforementioned action will cause the cam 159 to be correspondingly moved so as to move the rollers 162 over the cam surfaces 161 and to firmly bind these rollers against the contact material 155, whereby, the driving member 154 may impart rotation to the shaft 87. The operator releases the operating handle 189 immediately after the aforementioned action takes place and the inner end of the trip bar 179 will ride over the periphery of the cam plate 171. The shaft 87 will make one revolution and will stop because the inner end of the trip bar 179 will eventually follow the cam surface 177 down to the shoulder 178, whereby, the clutch will be disengaged and the shaft 87 will be stopped. A single revolution clutch of the aforementioned type is readily available on the market and the clutch 100 described hereinbefore is a preferable clutch of this kind, and is more fully described in detail in the U.S. patent to Richard G. Dickens, No. 2,140,737.

In the use of a stake puller machine of the present invention, the machine would be positioned on top of the concrete forms 11 which have the upper face 13 of the forms. The concrete road 10 which has set, will support the carot assembly 37. The clutch 142 is first disengaged and the gasoline engine 144 is started after which the clutch 142 may be shifted to the operative position. The drive from the engine 144 is transmitted through the friction clutch 142 and, by means of the chain 141 and sprocket 139, it is transferred to the shaft 131 and the inertia wheel 137. The inertia wheel 137 furnishes a constant potential force capable of supplying sufficient energy to the pin puller system to overcome the load of pulling a stake out of the ground. The driving force is further transferred by means of the pinion 130 to the bull gear 128 and to the intermediate shaft 114 and thence by means of the pinion 113 and gear 112 to the single revolution clutch 100. The aforementioned gear train is adapted to reduce the revolutions per minute put out by the gasoline engine 144. The engine 144 has been started and the clutch 142 has been shifted to the operative position so as to drive the aforementioned gear train, the machine is manually pushed to a position beside a stake as shown in Figs. 1 and 2. The puller lever 85 will be in the solid line position shown in Figs. 1 and 2, and the operator may manually position the puller bracket 52 so as to engage the stake 22 in the slot 53 in the bracket plate 54. The operator then pushes inwardly on the single revolution clutch operating lever handle 189, whereby, the clutch 100 will operate. The operator immediately releases the lever handle 189 and the clutch 100 will rotate the lever 85 through one revolution from the solid line position shown in Fig. 2 up to the dotted line position designated by the numeral 190, and back down to the solid line position. Some pins may pull out of the ground with only one revolution of the puller lever 85, as shown by the dotted line stake designated by the numeral 191 in Fig. 2. If a long stake is being pulled from the ground, a number of revolutions may be required. In the latter case, the stake puller bracket 52 which is carried on the lower end of the cable 61, will slide down the stake after each revolution and will remain engaged thereon as the puller lever 85 makes each down stroke. It will be seen that the sloping bracket plate 54 frictionally engages the stakes 22 between each of the side faces of the U-shaped slot 55 and exerts an upward removal force thereon when cable 61 is moved upwardly. The friction grip of the bracket 52 on the stakes 22 is further effected because of the fact that the bracket 52 is hinged connected to the cable connector 58, whereby, said friction grip is applied on the downward movement of the cable 61. The aforementioned action is repeated at each stake.

Experience has shown that the stake puller machine of the present invention may be easily and quickly operated by only one man and that the number of stakes which can be removed per hour is greatly increased by the use of this machine, compared to the removal rate when the stakes are manually removed. The present stake puller is simple to operate since the operator, in order to remove a stake, has merely to engage the puller bracket 52 therewith, and to operate the single revolution clutch handle 189 either singly or repeatedly, as desired. The operation of the present invention is completely based on mechanical forces transmitted through gears, shafts and clutches.

A modified wheel assembly adapted for use with the pin puller of the present invention is shown in Figs. 10, 11 and 12. In Fig. 10, the numeral 10 indicates a concrete roadway which has been constructed between concrete forms having a cross sectional shape as shown in this figure. The numeral 192 generally designates a concrete form having a vertical outer wall 193 which is integral with an upper horizontal face 194. The numeral 195 designates a horizontal wall similar to the plates 33 illustrated in Fig. 1. Fixedly mounted on the lower side of the plate 195, toward the inner side thereof, is a depending support arm 196. Fixedly mounted on the inner face of the arm 196, by welding, is a journal member 197 which is provided with a vertical reinforcing plate 198. The journal member 197 provides an arm or horizontal aperture 199 which extends therethrough and in which is slidably mounted the inner end of a horizontal shaft 200. The shaft 200 is adapted to be fixed in a selected adjusted position in the journal member 197 by means of the lock bolt 201. The shaft 200 extends through a suitable aperture in the arm 196. A rubber tired wheel 203 is suitably rotatably mounted on the outer end of the shaft 200 and is provided with a removable guide flange 204. The flange 204 is adapted to be mounted on the hub 205 against the outer face of the wheel 205. As best seen in Figs. 11 and 12, the flange 204 is secured to the wheel 203 by means of the bolts 206 and the wing nuts 207. The wheel 203 is fixed on the shaft 200 against endwise movement by any suitable means as by means of the two C-shaped clip rings 208 which are sealed in suitable grooves in the shaft 200 in the usual manner.

The modified wheel assembly of the invention is more preferably adapted for use with a concrete form having a vertical outer leg or wall as 193. As clearly shown in Figs. 10, 11 and 12, the removable flange 204 is...
adapted to extend beyond the periphery of the wheel of 203 and to abut the outer face of the concrete form wall 193, whereby, it serves as a guide means for guiding the pin 96, as it is pushed along the concrete forms. It will be obvious that flanged guide wheels of the type illustrated in Figs. 10, 11 and 12 may be substituted for the wheel assemblies 28 and 29 illustrated in Fig. 1, when desired. When flanged wheel assemblies as shown in Figs. 10, 11 and 12 are used, the guide members 47 and 48, as shown in Fig. 1, are deleted. It will be seen that the flanged wheel 203 may be adjusted relative to the machine frame by sliding the shaft 200 in the journal member 197. The purpose of this adjustment is to permit positioning of the pulley cable for different size road forms.

While it will be apparent that the preferred embodiments of the invention herein disclosed are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What we claim is:

1. A stake puller machine comprising: a wheel supported truck; an engine mounted on said truck; a gear train operatively mounted on said truck; an inertia wheel rotatably mounted on said truck and operatively connected to said gear train; means interconnecting said gear train and inertia wheel; whereby, said engine may drive said inertia wheel and gear train; a single revolution clutch operatively connected to said gear train; and, means interconnecting said grappling means and said engine. For the purpose of this adjustment is to permit positioning of the pulley cable for different size road forms.

2. A stake puller machine comprising: a wheel supported truck; an engine mounted on said truck; a gear train operatively mounted on said truck; an inertia wheel rotatably mounted on said truck and operatively connected to said gear train; means interconnecting said gear train and inertia wheel; and, a stake grappling means operatively connected to said gear train.

3. A stake puller machine comprising: a wheel supported truck; an engine mounted on said truck; a gear train operatively mounted on said truck; an inertia wheel rotatably mounted on said truck and operatively connected to said gear train; means interconnecting said gear train and inertia wheel; whereby, said engine may drive said inertia wheel and gear train; and, a single revolution clutch operatively connected to said gear train; and, a stake grappling means operatively connected to said single revolution clutch.

4. A stake puller machine comprising: a wheel supported truck; an engine mounted on said truck; a gear train operatively mounted on said truck; an inertia wheel rotatably mounted on said truck; a gear train operatively mounted on said truck; a drive means interconnecting said first clutch and said gear train and inertia wheel; whereby, said engine may drive said inertia wheel and gear train; and, a second clutch operatively connected to said gear train; and, a stake grappling means mounted on said truck and connected to and operable by said second clutch.

5. A stake puller machine comprising: a wheel supported truck; an engine mounted on said truck; a first clutch operatively connected to said engine; a second clutch operatively connected to said gear train; a gear train operatively mounted on said truck; a sprocket and chain drive means interconnecting said first clutch and said gear train and inertia wheel; whereby, said engine may drive said inertia wheel and gear train; a single revolution clutch operatively connected to said gear train; and, a stake grappling means mounted on said truck and connected to and operable by said single revolution clutch.

6. A stake puller machine comprising: a wheel supported truck; an engine mounted on said truck; a gear train operatively mounted on said truck; an inertia wheel rotatably mounted on said truck and operatively con-

7. A stake puller machine comprising: a wheel supported truck; an engine mounted on said truck; a gear train operatively mounted on said truck; an inertia wheel rotatably mounted on said truck; a first clutch operatively connected to said gear train; a sprocket and chain drive means interconnecting said first clutch and said gear train and inertia wheel; whereby, said engine may drive said inertia wheel and gear train; a single revolution clutch operatively connected to said gear train; and, means interconnecting said grappling bracket and said member, whereby, when said member is rotated said grappling bracket will be actuated upwardly and downwardly.

8. A stake puller machine comprising: a wheel supported truck; an engine mounted on said truck; a first clutch operatively connected to said engine; a first shaft rotatably mounted on said truck; an inertia wheel fixedly mounted on said first shaft; a drive means interconnecting said first clutch and said first shaft; a first shaft driven gear; a second driven gear operatively connected to said last named clutch; a second clutch clutch operatively connected to said gear train and inertia wheel; whereby, said engine may drive said inertia wheel and gear train; and, a stake grappling means mounted on said truck and operatively connected to said single revolution clutch for selective rotation of said member; a stake grappling bracket; and, means interconnecting said grappling bracket and said member, whereby, when said member is rotated said grappling bracket will be actuated upwardly and downwardly.

9. A stake puller machine comprising: a wheel supported truck; an engine mounted on said truck; a first clutch operatively connected to said engine; a first shaft rotatably mounted on said truck; an inertia wheel fixedly mounted on said first shaft; a drive means interconnecting said first clutch and said first shaft; a first shaft driven gear; a second driven gear operatively connected to said last named clutch; a second clutch clutch operatively connected to said gear train and inertia wheel; whereby, said engine may drive said inertia wheel and gear train; and, a stake grappling means mounted on said truck and operatively connected to and operable by said second clutch.

10. The invention as defined in claim 9, wherein: said means interconnecting said grappling bracket and said rotational member includes a cable guide connected at one end thereof to said rotational member and at the other end thereof to said grappling bracket; and, a guide means mounted on said truck adapted to guide said cable whereby the grappling bracket will be actuated vertically.

11. A stake puller machine comprising: a wheel supported truck; an engine mounted on said truck; a first clutch operatively connected to said engine; a first shaft rotatably mounted on said truck; an inertia wheel fixedly mounted on said first shaft; a drive means interconnecting said first clutch and said first shaft; a second shaft rotatably mounted on said truck; a first driven gear...
on said second shaft; a first drive pinion on said first shaft meshably engaged with said first driven gear; a single revolution clutch operatively mounted on said truck; a second drive gear operatively connected to said last named clutch; a second drive pinion on said second shaft meshably engaged with said second driven gear; a third shaft rotatably mounted on said truck and being operatively connected to said single revolution clutch; a lever flexibly mounted on said third shaft; a cable connected to said lever; a stake grasping bracket connected to said cable; and, a cable guide means mounted on said truck and adapted to guide said cable whereby the grasping bracket will be actuated in the vertical direction when said lever is rotated by said third shaft.

12. The invention as defined in claim 11, wherein: said grasping bracket includes a vertically disposed portion hingedly connected to said cable, and a downwardly and outwardly sloping portion connected to said vertically disposed portion, and, said sloping portion being provided with a stake receiving slot.

13. The invention as defined in claim 12, wherein: the upper end of said cable is pivotally connected to said lever.

14. In a stake puller machine provided with a self-contained power drive means; a single revolution clutch operatively connected to said power drive means; a horizontal shaft rotatably mounted on said machine and being connected to said clutch for selective rotation of said shaft; a laterally extended lever flexibly mounted on said shaft for rotation therewith; a stake grasping bracket; and, means interconnecting said grasping bracket and said lever, whereby, when said lever is rotated said grasping bracket will be actuated upwardly and downwardly.

15. In a stake puller machine provided with a self-contained power drive means; a single revolution clutch operatively connected to said power drive means; a horizontal shaft rotatably mounted on said machine and being connected to said clutch for selective rotation of said shaft; a laterally extended lever flexibly mounted on said shaft for rotation therewith; a cable rotatably mounted on said lever; a cable having one end thereof flexibly connected to said cable connector; a grasping bracket hingedly connected to said cable; and, a guide means for guiding said cable so that the grasping bracket will be moved vertically when said lever is rotated to move the cable.

16. In a stake puller machine provided with a self-contained power drive means; a single revolution clutch operatively connected to said power drive means; a horizontal shaft rotatably mounted on said machine and being connected to said clutch for selective rotation of said shaft; a laterally extended lever flexibly mounted on said shaft for rotation therewith; a cable rotatably mounted on said lever; a cable having one end thereof flexibly connected to said cable connector; a grasping bracket hingedly connected to said cable; and, a guide means for guiding said cable so that the grasping bracket will be moved vertically when said lever is rotated to move the cable.

17. In a stake puller machine provided with a self-contained power drive means; a single revolution clutch operatively connected to said power drive means; a horizontal shaft rotatably mounted on said machine and being connected to said clutch for selective rotation of said shaft; a laterally extended lever flexibly mounted on said shaft for rotation therewith; a cable connector rotatably mounted on said lever; a cable having one end thereof flexibly connected to said cable connector; a grasping bracket hingedly connected to said cable; and, a guide means for guiding said cable so that the grasping bracket will be moved vertically when said lever is rotated to move the cable.

20. The invention as set forth in claim 19, wherein: said machine includes, a guide means mounted on each of said pair of wheels adapted to roll on the road forms.

21. The invention as set forth in claim 19, wherein: said machine includes, a guide means mounted on each of said pair of wheels adapted to roll on the road forms with said guide means being adapted to engage the outer side of the road forms.

References Cited in the file of this patent

UNITED STATES PATENTS

- Buchanan Apr. 1, 1919
- Talboys Jan. 10, 1933
- Winquist May 8, 1934
- O'Quinn Dec. 30, 1947
- Tofy Sept. 27, 1949
- Brouther Jan. 20, 1955
- Janzer Feb. 7, 1956