

**June 2, 1964**

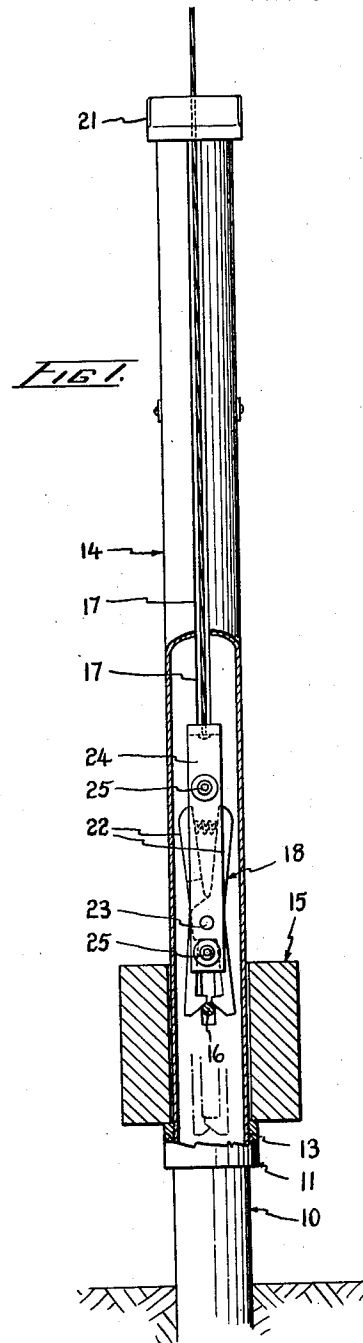
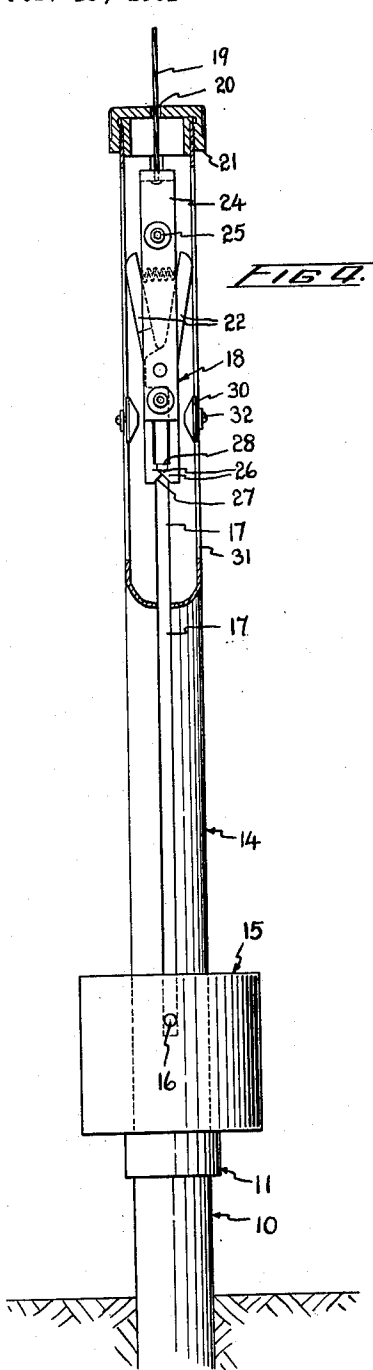
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**3,135,340**

DRIVING TOOL

Filed Feb. 13, 1961

3 Sheets-Sheet 1



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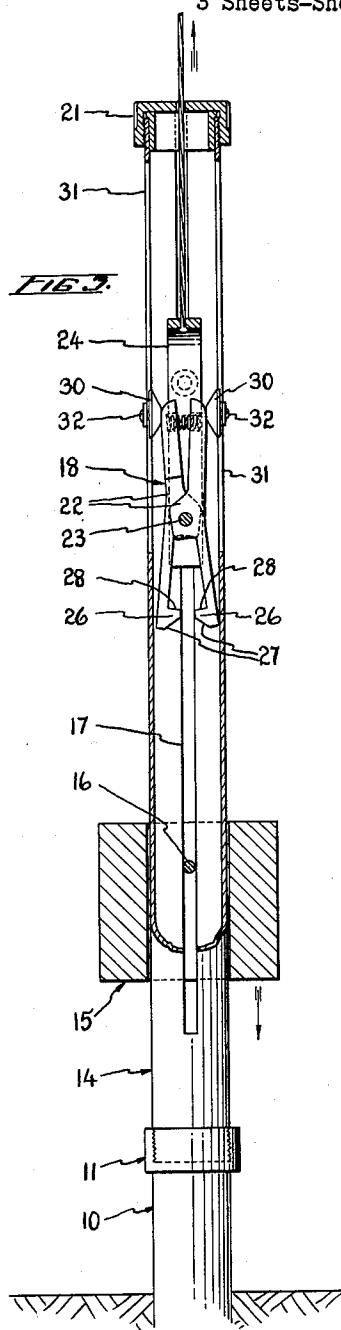
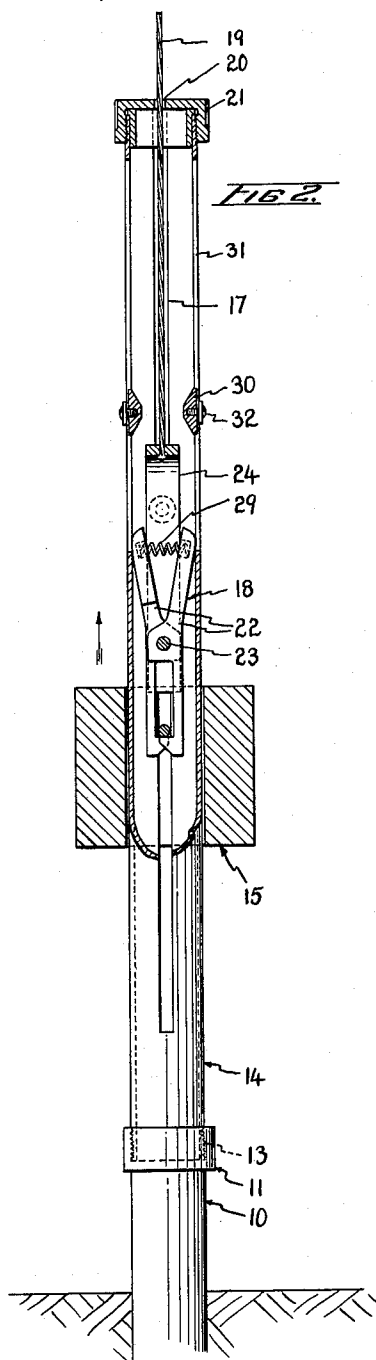
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3 Sheets-Sheet 2



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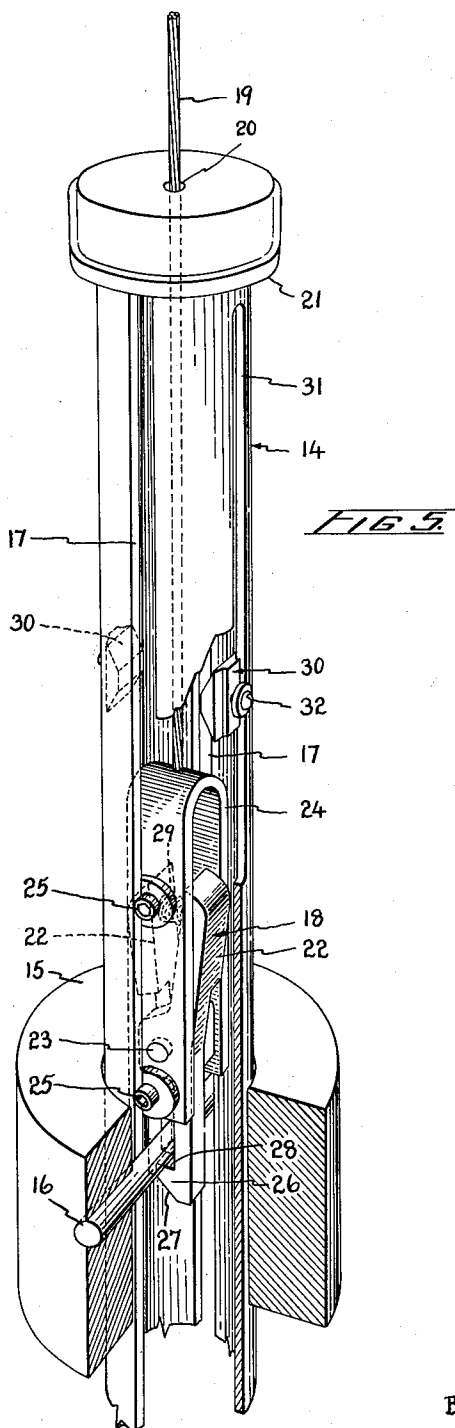
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3 Sheets-Sheet 3



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3,135,340

DRIVING TOOL

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9 Claims. (Cl. 173-115)

This invention relates to a device having a novel construction for driving objects to the desired depth in soil and more particularly to a device provided with an automatically-actuated free-falling drive weight which may be operated to drive tools, such as soil samplers and soil testing equipment, a given distance into soil.

An object of this invention is to provide a device which may be easily and readily mounted on an object and simply and controllably operated to drive the object in soil.

A further object of the present invention is to provide a driving device equipped with a free-falling drive weight which is automatically-actuated to deliver any number of successive blows to an object mounted below the device whereby the object is driven a given distance in soil.

A still further object of the present invention is to provide a device having a free-falling drive weight which is automatically actuated by self-operable lifting means in cooperation with adjustable release means thereby permitting the fall of the weight to be selectively varied so that the driving of an object in soil may be carried out with only the free-fall distance of the weight being a variable.

Heretofore, drive weights were not free-falling as they were dropped while still attached to the lift-rope or cable and consequently variables, other than the drop distance of the weight, such as the possible retardation of the drive weight due to the lift rope, the weight of the lift rope, the technique employed to run the drive means to lift the weight, etc., which would effect the blow delivered to an object had to be taken into account in cases where the number and driving force of the blows had to be accurately controlled. The present invention eliminates these other variables and in effect can be used as a standard for driving so that comparable results could be measured from job to job. This feature of the device is important when used with soil testing equipment for accurately determining the conditions of soil, such as hardness, penetration, etc., in exploration work.

The above objects and other objects which will become evident from a reading of this specification are attained by using this invention which essentially comprises a device for driving a drive member in soil by means of a free-falling drive weight slidably mounted on a hollow elongated casing and automatically actuated to be raised by releasably engaging lifting means from the top of the drive member to a selected point thereabove where the drive weight is released by release means for free-falling a predetermined distance to strike the drive member and drive it in the soil.

The following is a detailed description of the construction and operation of my invention with reference to the accompanying drawings in which:

FIGURES 1 to 4 are elevation views of the device, each being cut away to show:

(a) the drive weight at rest against the drive member and about to be engaged by the lifting means (FIGURE 1),

(b) the drive weight, engaged by the lifting means, travelling upwardly on the casing (FIGURE 2),

(c) the drive weight travelling downwardly on the casing after the lifting means has been disengaged by the release means (FIGURE 3),

(d) and the drive weight again at rest against the

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drive member while the lifting means approach a top position within the casing (FIGURE 4); and

FIGURE 5 is an enlarged perspective view of the upper portion of the device, cut away to show the drive weight being lifted by the lifting means.

In FIGURES 1 to 4 the device is illustrated mounted on top of a drive member 10 having an anvil 11. The anvil has threads 13 on its inside wall for the purpose hereafter described.

The drive member 10 has not been shown in detail as it represents tools, such as drive sampling equipment, which are well known in the art and which form no part of this invention. For example, it is known that to obtain samples of soil and to determine soil conditions in exploration work, a sampling method, commonly called "drive sampling" is usually employed.

Generally this method comprises driving a sampler or "sample spoon" (not shown) located at the lower end of the drive member 10, in soil by delivering a succession of blows to the anvil. Information of the soil conditions may be obtained by recording the number of blows of the drive weight falling freely for a known distance required to drive a sampler a given distance. The device of this invention is an improvement on testing equipment used heretofore for this purpose in that it may be simply and controllably operated to obtain more accurate information of soil conditions.

With reference to FIGURES 1 to 4, the device for driving the drive member into the soil comprises a hollow elongated casing 14 which has its lower end formed with screw threads which fit into the threads 13 of the anvil 11. In all the figures the casing 14 is tubular but it could be formed to have other geometrical cross-sections suitably equipped for attachment to a drive member 10 depending on the use of the device.

A drive weight 15 is slidably mounted on casing 14 for upward and downward travel thereon. A lifting bar 16 is attached diametrically across the hammer and rides in a pair of longitudinal oppositely disposed guide slots 17 in the wall of the casing 14.

The drive weight 15 is raised by lifting means 18 which releasably engage lifting bar 16. Referring to FIGURE 5 the lifting means 18 is connected to cable 19 which passes through a central bore 20 in cap 21 covering the top of casing 14. The lifting means 18 comprises a pair of rocker arms 22, pivotally joined at the middle portions thereof by pin 23 which has its ends supported by bracket 24. The bracket 24 carries 4 guide rivets or screws 25, two on each side riding in guide slots 17, the top of the bracket being connected to the end of the cable 19 which is inserted through the bore 20.

The rocker arms 22 each have an inwardly projecting jaw 26 at the bottom thereof, the jaw having an upwardly bevelled underface 27. Referring to FIGURE 4, when the lifting means is dropped from the top of the casing, to the position shown in FIGURE 1, its momentum carries the jaws 26 below the lifting bar 16 so that the lifting bar is positioned above the upper faces 28 of the jaws which are forced together by compression spring 29 joining the upper portions of the rocker arms. This would be considered the beginning of a cycle as the lifting means 18 releasably engage the drive weight 15 which is at rest against anvil 11 in FIGURE 1.

By pulling on the cable 19 the lifting means 18 raises the drive weight 15 as shown by the arrow in FIGURE 2 to a point substantially above the drive member 10 but below a pair of spaced apart, oppositely disposed releasing crown cams 30 adjustably mounted in a second pair of longitudinal slots 31 by set screws 32. The point, below cams 27, indicating the height arrived at by the drive weight 15 may be defined as the approximate dis-

tance between the top of the drive weight 15 and the upper portions of the rocker arms 22 when said upper portions are registering with cams 30. When the drive weight 15 reaches this point the cams 30 compress the spring 29 and force the rocker arms 22 apart so that the jaws 26 automatically release the drive weight 15, which being released from the cable 19, falls freely as shown by the arrow in FIGURE 3 and strikes the anvil 11 thereby driving the drive member 10 in the soil.

In FIGURE 4, the lifting means 18 is shown above cams 30 while the drive weight 15 has returned to its rest position against the anvil 11 to complete the cycle.

The power means (not shown) used to raise or lower the lifting means 18 may be any suitable equipment known in the art, such as the means employed in a well drilling rig of the type described and illustrated in U.S. Patent 2,342,253 dated February 22, 1944. The power means is operatively connected to the other end of the cable 19 having a length sufficient to permit the travel of the lifting means 18 within the casing 14 and the increase of the distance between the driving device and the power means as the drive member is driven in the soil, without affecting the operation of the drive weight 15.

Although the foregoing description of my device is directed for use with sampling equipment, it should be obvious that this invention would have many diversified uses. By simply modifying the construction of the lower end of the casing 14, the device of my invention may be mounted on objects such as piles or poles, for driving same in the ground.

It is to be understood that variations and modifications could be made to the invention without departing from the scope thereof, but it is intended to include all such variations and modifications in the appended claims.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. In a device for driving a drive member a given distance in soil for the determination of soil conditions, a hollow elongated casing mountable on top of the drive member, the casing having longitudinal oppositely disposed guiding slots, a drive weight slidably mounted on said casing and provided with a lift member slidable in said slots for travel between the top of the drive member and a selected point thereabove, drive weight lifting means slidably mounted within said casing for releasably engaging said lift member of the drive weight when it is at rest against the drive member, release means adjustably mounted within said casing to permit the upward travel of the lifting means above the release means a distance at least equal to the given distance the drive member is to be driven in the ground, said release means being engageable with the lifting means to disengage it from said drive weight when the drive weight is raised on the casing to said point thereby releasing said weight for free falling to strike the drive member and drive it in the soil, and power means operatively connected to said lifting means.

2. A device as defined in claim 1, in which the lift member is a bar mounted diametrically across the drive weight and having its intermediate portion riding in said guiding slots.

3. A device as defined in claim 1, in which said lifting means comprises a pair of spring actuated latch-like members each having a jaw at the lower end thereof, the jaws engaging said lift member.

4. A device as defined in claim 1, in which said lifting means comprises a pair of arms pivotally joined at the middle portions thereof each having a jaw at the lower end thereof, a spring joining the upper ends of said arms, the spring normally holding said jaws in closed position to engage said lift member.

5. A device as defined in claim 4, the additional feature of a support member connected to the middle portions of said arms, the support member being slidably mounted in said slots and having a top section connected to one end of a cable which is operatively connected to said power means.

6. A driving device as defined in claim 1, in which said release means comprises inwardly projecting, spaced apart, crown cams adjustably mounted on a second set of longitudinal, oppositely disposed guiding slots, to disengage said lifting means whereby the free fall of the drive weight may be selectively varied.

7. A driving device as defined in claim 3, in which said release means comprises inwardly projecting, spaced apart, crown cams adjustably mounted on a second set of longitudinal, oppositely disposed guiding slots to engage the latch-like members when the drive weight is raised on the casing to said point whereby the jaws open to release the drive weight.

8. A driving device as defined in claim 4 in which said release means comprises inwardly projecting, spaced apart, crown cams adjustably mounted on a second set of longitudinal, oppositely disposed guiding slots to engage the pair of arms, said cams compressing said spring whereby the jaws open to release the drive weight when the drive weight is raised on the casing to said point.

9. A device as defined in claim 1, in which said lifting means comprises a pair of arms pivotally connected at the middle portions thereof and each arm having a jaw at the lower end thereof, a spring joining the upper sections of said arms, the spring normally holding said jaws in closed position to engage said weight and a support member slidable in said slots and supportably connected to the middle portions of said arm, said support member being operatively connected to said power means, and said release means comprises a pair of inwardly-projecting, spaced apart, crown cams adjustably mounted on a second pair of longitudinal oppositely-disposed guiding slots, said cams compressing said spring whereby the jaws open to release the drive weight when the hammer is raised on the casing to said point.

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