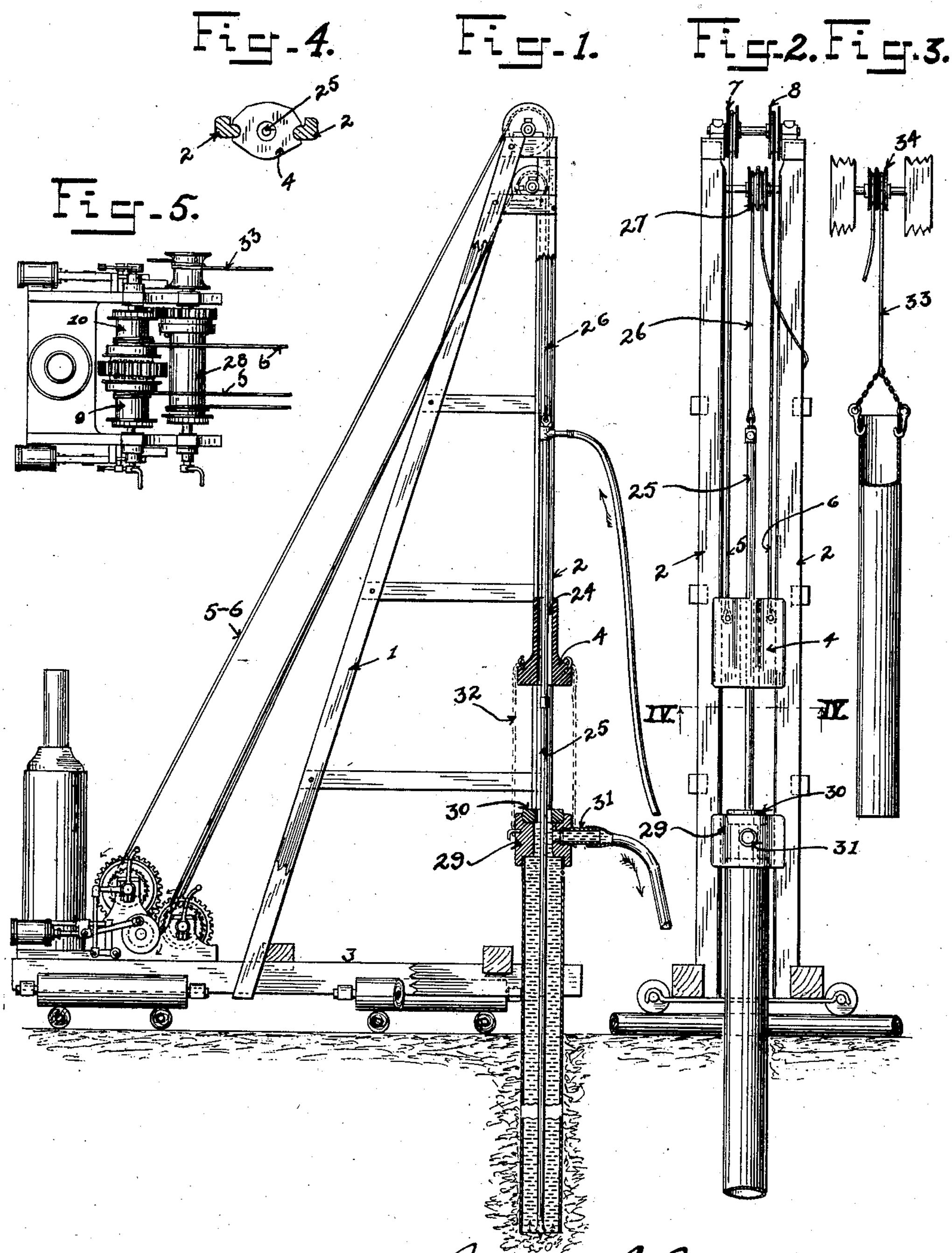
A. B. CLARK.

PILE DRIVER.

APPLICATION FILED MAY 4, 1906. RENEWED NOV. 18, 1909.

1,010,723. Patented Dec. 5, 1911.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 6.

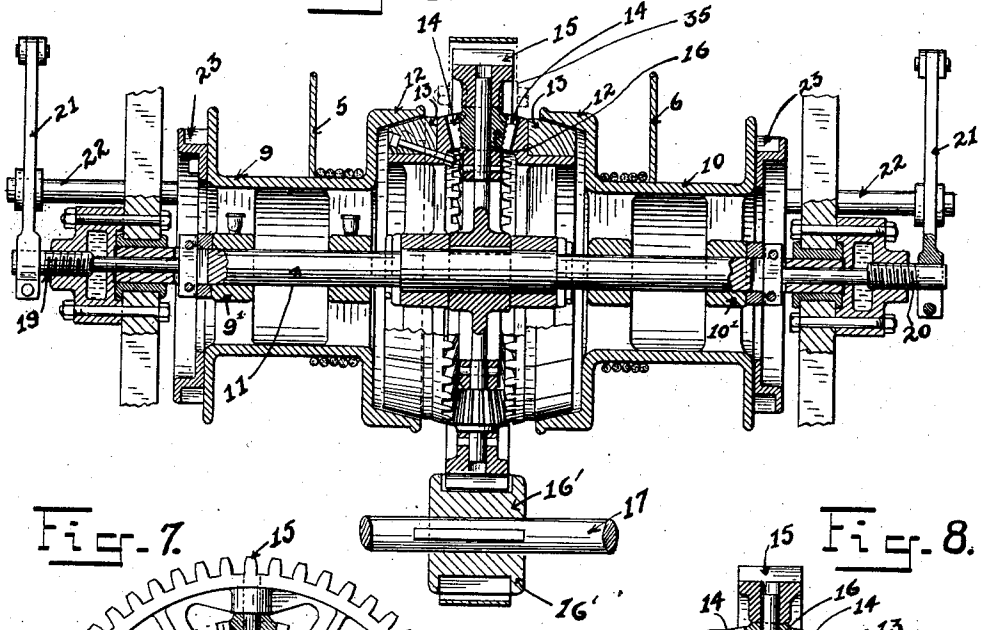


Fig. 7.

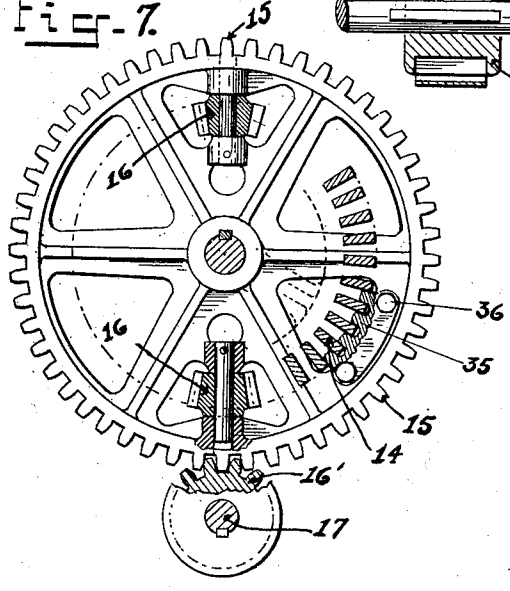


Fig. 8.

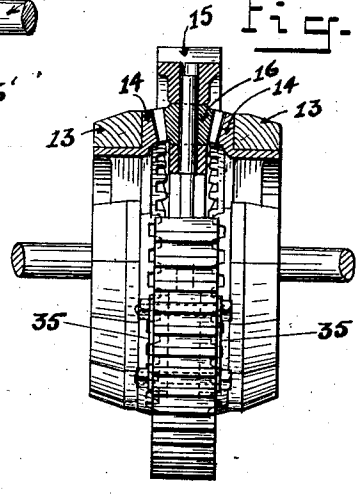
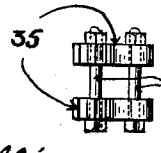


Fig. 9.



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PILE-DRIVER.

1,010,723. Specification of Letters Patent. Patented Dec. 5, 1911.

Application filed May 4, 1906, Serial No. 315,137. Renewed November 18, 1909. Serial No. 528,768.

To all whom it may concern:

Be it known that I, AMASA B. CLARK, a citizen of the United States of America, and resident of the city, county, and State of New York, have invented certain new and useful Improvements in Pile-Drivers, of which the following is a full, clear, and concise specification.

My invention relates to pile-drivers of the class wherein a gravity hammer is hoisted in suitable ways and allowed to drop upon the end of the pile, and has for its object to provide an improved pile-driving apparatus wherein the hammer can be of any desired lateral dimension or provided with an aperature or perforation through it, through which a jet pipe or similar instrument may be manipulated.

The invention comprises various other features of construction and combination of parts as will be hereinbelow fully described and more particularly pointed out in the accompanying claims.

In the two sheets of drawings which form a part of this specification, Figure 1 is a side elevation of a pile-driver constructed according to my invention, with parts of the leader-frame broken away and the hammer and pile in vertical section; Fig. 2 is a front elevation of Fig. 1; Fig. 3 is a detail illustrating a convenient means of bringing the pile into position between the leaders, a tubular pile being shown; Fig. 4 is a section of Fig. 2 on line IV thereof showing the hammer and leaders; Fig. 5 is a plan view of the hoisting mechanism; Fig. 6 is an axial section through the differential winding drums of said mechanism; Fig. 7 is a side elevation with parts in section and broken away, of the driving member of the differential gearing and its pinions; Fig. 8 is a front elevation of the differential gearing with parts broken away; and Fig. 9 is a detail described later.

The frame 1, shown in Figs. 1 and 2, is constructed with the usual vertical leaders 2, 2, and the platform 3 upon which the winding mechanism is located. At the head of the frame are suitably journaled a number of sheaves over which the various lines of hoisting rope are passed. The gravity hammer 4 slides in the guideway formed by the two leaders, and is preferably made with opposite recesses engaging said leaders as indicated by Figs. 2 and 4, but any other suitable form of guideway can be employed with equal effect. The hammer is supplied with a double-line hoist comprising two hoisting lines or stretches of rope connected thereto at separated points thereon about equally distant from the said leaders, and by means of which it may be lifted to the top of the guideway so as to be dropped upon the pile. The two hammer-lifting lines are marked 5 and 6 in the accompanying drawings and are passed over the sheaves 7 and 8, respectively, and from thence led to the winding drums 9 and 10 of the hoisting mechanism. According to the form of my invention illustrated in the present drawings, these winding drums are interrelated with each other, so that they balance or equalize the tension upon the lines 5 and 6, when said drums are connected with the driving mechanism. The means whereby such balance is obtained involves a well known principle of differential gearing, and is constructed as follows: The drums 9 and 10 (Fig. 6) are idly mounted on the shaft 11 and their proximate ends are provided with clutch-members 12 adapted to engage with complementary clutch-members 13, 13 respectively, each of which is carried by, or forms a part of, one of the bevel gears 14. The differential drive-gear 15 is keyed to the shaft 11 and carries the differential pinions 16 in mesh with said bevel gears 14, and is driven by the pinion 16′ on the drive-shaft 17, which latter is operated by the engine or other motor in any suitable manner. The two winding drums 9 and 10 may be moved axially upon the shaft 11 by means of the right and left hand screws 19 and 20 which, as shown in Fig. 6, are threaded into extensions of the bearing of the shaft 11 and act through the ends of said shaft against the hubs 9′ and 10′, respectively, of the winding drums, to force them into clutching engagement with their complementary clutch members 13, 13. A set of levers and links 21 is supplied for operating each of the screws and the two sets are interconnected by the horizontal shaft 22 so that both drums are constrained to be forced equally against their respective clutch members and may be so moved by the operator from either side.

While the utility of the foregoing ar-

rangement will be apparent to those versed in this art, it will be understood that other forms of clutch operating means may be substituted for the one herein described with equal effect.

The outer ends of the winding drums are shown provided with ratchet gears 23.

In operation, the power exerted through the pinion 16 upon the differential drive-gear 15 is transmitted to the gears 14 in the inverse ratio of the load upon the latter, and when these gears are clutched to the winding drums, by the action of the screws, the hoisting lines 5 and 6 are wound upon them with tensions in each which are equalized or balanced, with the result that the hammer is lifted evenly and freely without tendency to bind or cramp in the leaders. Release of the clutching pressure allows the hammer to fall by gravity in the usual manner.

Between the points of attachment of the lines 5 and 6 with the hammer, a vertical recess 24 is provided, for the purpose of receiving a jet-pipe, such as 25, which is provided more especially for use in sinking tubular piles of the kind shown in the drawings. The jet-pipe is suspended by a line 26 passing over the sheave 27 and connected with the winding drum 28, of ordinary construction, whereby it may be raised and lowered in the usual manner.

In order to avoid the upsetting effect of the direct impacts of the hammer upon the end of the pile, I provide the latter with a follower block 29 which is also vertically recessed to receive the jet pipe and fits over the end of the pile, as shown. Its upper end is supplied with an anvil-block 30, which is removable, and a lateral vent opening 31 is also provided in the block, by means of which the waste from the interior of the hollow pile may be conveniently conducted away. The follower block is retained between the leaders by means of opposite recesses engaging the same, similar to those on the hammer, as shown in Fig. 2. As a matter of convenience the hammer and follower block are provided with hooks for a rope connection 32 between them (dotted lines, Fig. 1) whereby the block may be hoisted with the hammer when the driving of a pile has been completed. When the frame has been adjusted for the next operation, a new pile may be lowered in place by means of the hoisting-chain 33 passing over the sheave 34 on the same shaft as the sheave 27, as indicated in Fig. 3.

The apparatus as above described may be further employed for operating ordinary single line hammers by utilizing either one of the lines 5 or 6 and drums 9 or 10, but the differential gears 14 must first be locked together or to the drive-gear 15. For this purpose I show in Fig. 9 two gear engaging dogs 35 adapted to be clamped one on either side of the web of the drive-gear 15 and in respective engagement with a few of the teeth of the bevel gears 14, by means of the bolts 36 which pierce the said drive-gear 15 as indicated in Figs. 7 and 8. With the gears 14 thus locked either of the winding drums 9 or 10 may be employed with the single hoisting line.

It will be understood from the foregoing description and the following claims that this invention is not limited to the specific means shown for equalizing or balancing the tension on the two lines which raise the gravity hammer, but that it includes other and differently constructed means for producing a like effect

Having described my invention, what I claim and desire to secure by Letters Patent are:

1. In a pile-driver, a gravity hammer adapted to slide in a suitable guideway and two lines or stretches of hoisting rope connected to exert lifting force on said hammer at separated points thereon, in combination with a winding mechanism connected with said lines for hoisting the hammer, and means for balancing the tension on said lines, whereby the hammer is lifted evenly in said guideway.

2. In a pile-driver, a gravity hammer adapted to slide upon a suitable guideway and provided with a longitudinal aperture or recess, and two separated lines or stretches of hoisting rope connected to lift said hammer, in combination with hoisting mechanism and means for balancing the tension exerted thereby upon said lines.

3. In a pile-driver, a gravity hammer adapted to slide between vertical leaders and provided with a longitudinal aperture, and two hoisting lines connected with said hammer at separated points thereon, in combination with a hoisting mechanism and means for equalizing the lifting effect exerted thereby through each hoisting line, upon said hammer.

4. In a pile-driver, a gravity hammer adapted to slide upon a suitable guideway and separated hoisting lines attached to said hammer, in combination with a hoisting mechanism for raising said hammer and means associated with said hoisting mechanism for balancing the tension on said hoisting lines.

5. In a pile-driver, a gravity hammer adapted to drop between suitable leaders, and two hoisting lines attached to said hammer at separated points thereon, in combination with a winding drum for each of said lines and a differential gearing interconnecting said drums.

6. In a pile-driver, a gravity hammer adapted to slide in the vertical leaders of a pile-driver frame and provided with a

vertical recess or aperture, in combination with a jet-pipe adapted to be received by said aperture and projected into the pile.

7. In a pile-driver, a gravity hammer adapted to slide in a suitable guideway and provided with a vertical aperture, and a follower block retained in said guideway and also provided with a vertical aperture, in combination with a jet-pipe adapted to be passed through said apertures into the pile.

8. In a pile-driver, a gravity hammer provided with a vertical aperture and hoisting lines attached to said hammer around said aperture, in combination with a jet-pipe adapted to be inserted in said aperture, and a line for lifting said jet-pipe, located between said hoisting lines.

9. In a pile driver, the combination of a gravity hammer, means for guiding the same, a double line hoist for said hammer, said hoist being connected to said hammer at separate points and means for balancing the tension on each line.

10. In a pile driver the combination of a gravity hammer having a double-line hoist and means for balancing the tension on each line comprising a form of differential connection between the same.

In testimony whereof, I have signed my name to the specification in the presence of two subscribing witnesses.

AMASA B. CLARK.

Witnesses:
A. A. LORZER,
H. G. KIMBALL.