May 22, 1951 J. G. JOHNS 2,554,146

PILE HAMMER

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Fig. 1.

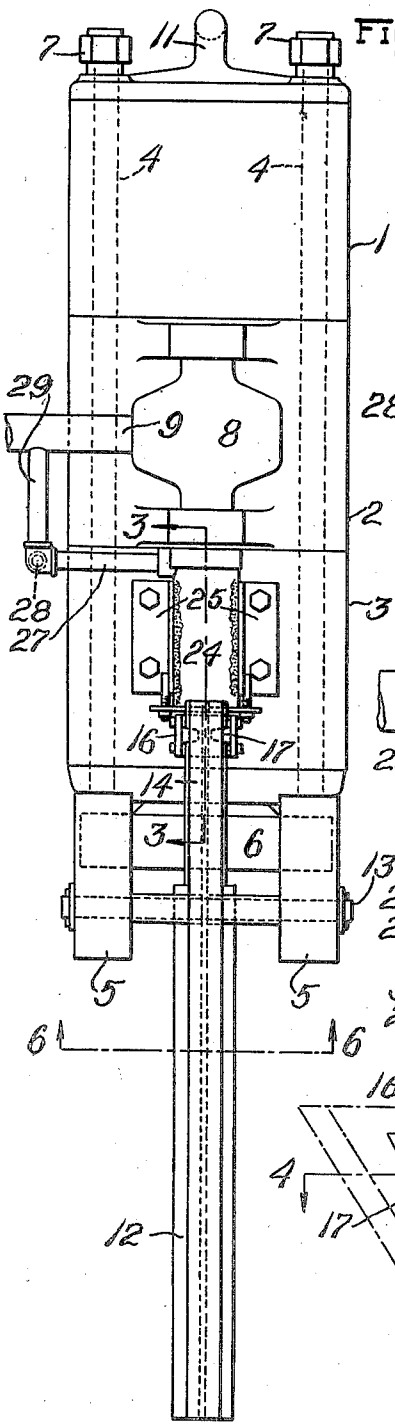
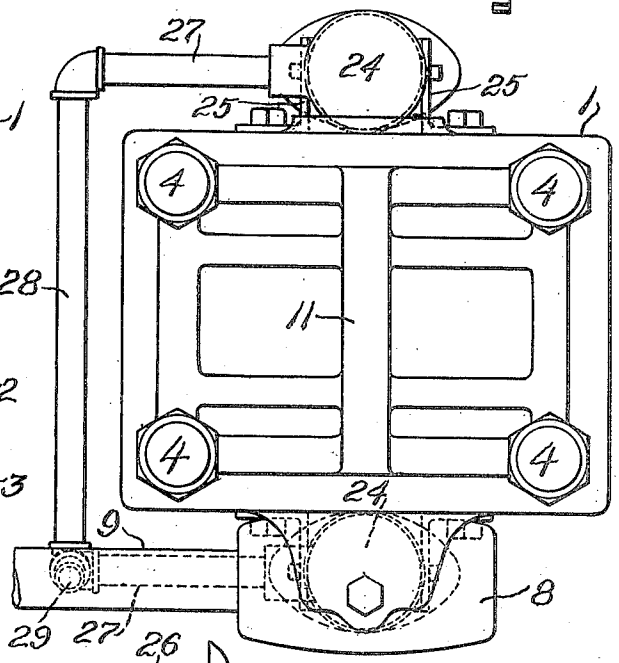


Fig. 2.



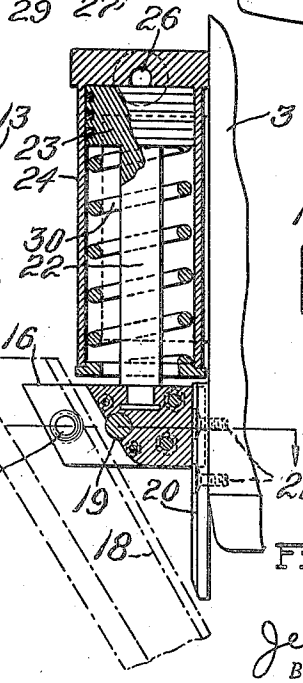
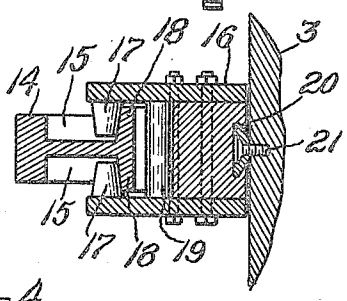


Fig. 3.

Fig. 4.



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Fig. 5.

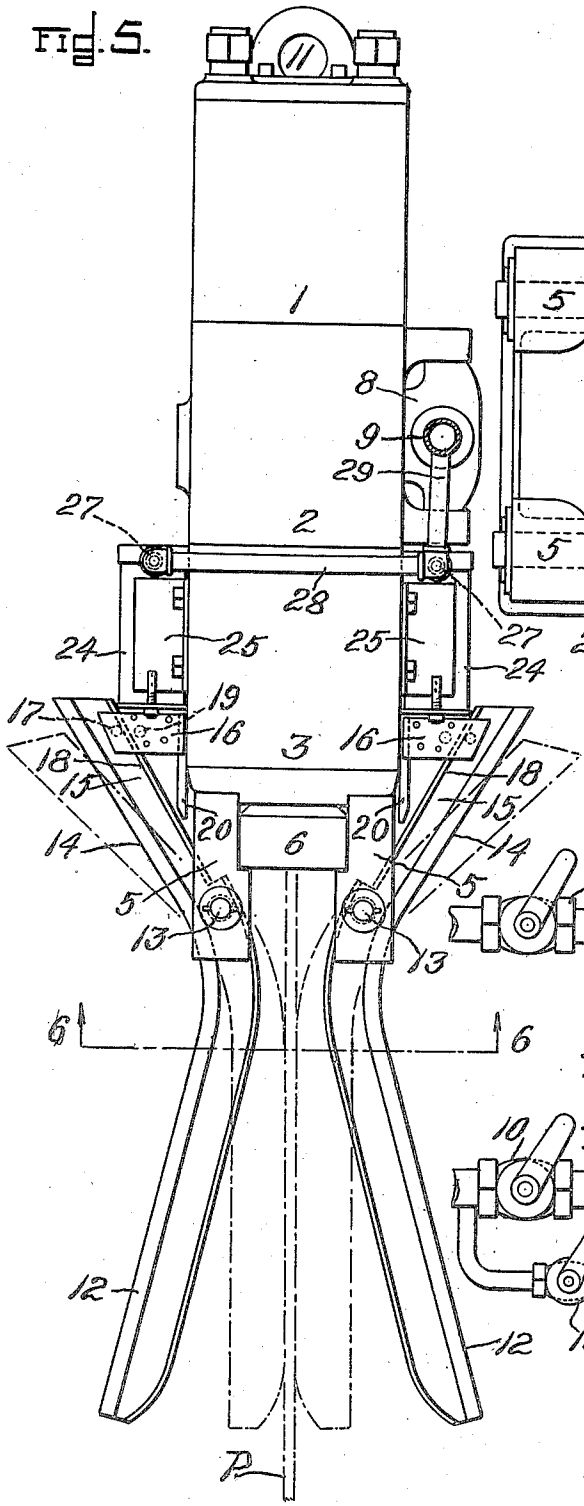


Fig. 6.

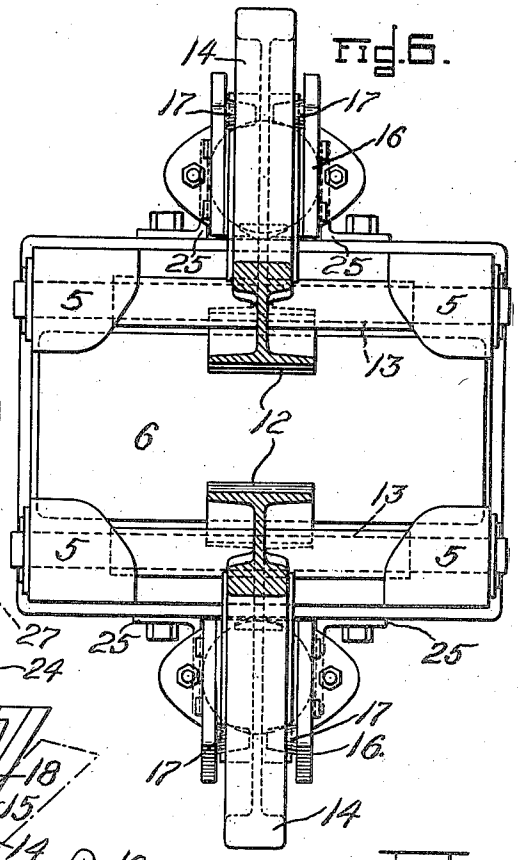


Fig. 7.

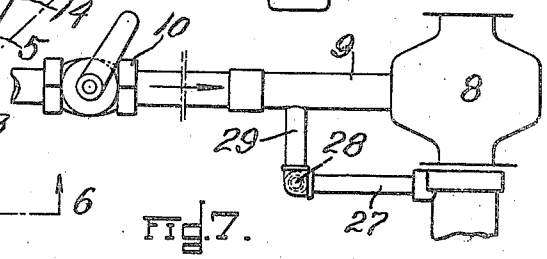
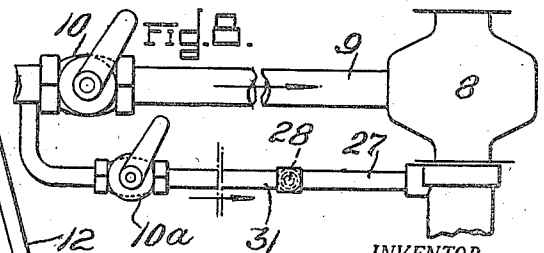


Fig. 8.



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PILE HAMMER

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4 Claims. (Cl. 61—76)

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This invention relates to fluid-operated pile-driving hammers, and it has for its object to improve the construction and operation of hammers of this class.

It is also an object of the invention to expedite the sinking of a pile and to prevent injury to the latter while it is being driven.

To these ends I have provided an improved fluid-operated pile-driving hammer which, in its preferred embodiment, may be constructed and operated as set forth in the following description, it being understood, however, that modifications not herein shown are intended to be included within the scope of the appended claims by which the several features of the invention are separately pointed out.

In the accompanying drawings:

Figure 1 is a side elevation of a fluid-operated pile-driving hammer constructed in accordance with this invention.

Figure 2 is a top plan view of the hammer shown in Fig. 1.

Figure 3 is a section on line 3—3 of Fig. 1.

Figure 4 is a section on line 4—4 of Fig. 3.

Figure 5 is a side elevation of the hammer shown in Fig. 1 as viewed from the left in the latter figure.

Figure 6 is a section on lines 6—6 of Figs. 1 and 5.

Figure 7 illustrates one means for supplying fluid under pressure to the hammer.

Figure 8 illustrates an alternative means for supplying fluid under pressure to the hammer.

Herein I have embodied my improvements in a steam-operated pile hammer comprising a body consisting of three cylinder sections 1, 2 and 3 (Figs. 1 and 5) disposed end to end and rigidly held in their assembled relationship as usual by four tie rods 4 occupying registering apertures formed through the cylinder sections. Each tie rod 4 is provided at its lower end with an elongate head 5 and these four heads provide a cage for the usual anvil block 6. The upper ends of the tie rods 4 are threaded to receive nuts 7 by which the cylinder sections are clamped together.

Fixed to one side of the intermediate cylinder section 2 is the usual valve 8 whose inlet is connected as usual by a conduit 9 including a flexible hose (not shown) with a source of steam under pressure. In this conduit 9 is provided a throttle valve 10 (Fig. 7) that is manually operated to control the supply of steam to valve 8 thereby to start, stop and regulate the action of the ram (not shown), of the hammer, said ram being mounted within the main cylinder sections 1, 2 and 3 and cooperating as usual, with the anvil block 6 through which the force of its blows is transmitted to the pile that is indicated by broken lines at P in Fig. 5.

An eye 11 provided upon the top cylinder section 1 serves as an anchorage for one end of the cable of a crane by which the hammer is raised, lowered and moved about.

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The above described construction is old and well known. Pile-driving hammers of that type which is devoid of means for axially alining the ram with the vertical medial plane of the pile while the ram is operating are characterized by the objection that the blows of the hammer would often be delivered obliquely against the top of the pile, with the result that the full force of the hammer was not utilized and the glancing blows imposed upon the pile not only resulted in serious damage and disfiguration to the top of the pile but would also be accompanied by dislocation and injury to certain woodwork that is commonly erected alongside of the position occupied by the pile.

My invention obviates these objectionable features and it contemplates the provision of a pair of opposed pile-gripping and hammer-alining members 12, 12 (Figs. 1, 5 and 6) each of which is pivotally supported between the heads 5 of a pair of tie rods 4 by means of a pintle 13 whose axis is disposed at right angles to the axis of the hammer so that said members are adjustable toward and from the pile that is indicated by broken lines at P in Fig. 5.

The inner pile-engaging faces of the pile-gripping members 12 are made straight and disposed so that when said two members are forcibly adjusted into positions against the opposite faces of pile P, as indicated by broken lines in Fig. 5, the hammer is forced into a position where the axis of the ram is in alinement and parallel with the pile.

Each pile-gripping member 12 is an angular lever that is pivotally supported intermediate its ends by its pintle 13 thereby providing the same with an upwardly extending outwardly inclined arm 14 formed upon its opposite sides with longitudinal grooves 15 (Figs. 4 and 5).

Each arm 14 is embraced by a yoke member 16 that is provided interiorly with a pair of studs 17 which project into the grooves 15 of the arm to cooperate with the inner sides of the flanges 18 thereof which border the grooves 15, the opposite sides of said flanges being straight and relatively parallel as shown in Fig. 5. Each yoke member 16 is also provided interiorly with an anti-friction roller 19 to cooperate with the proximate side of its arm 14 as shown in Figs. 3, 4 and 5.

Each yoke member 16 is slidably associated with a vertical guidebar 20 fastened by screws 21 (Fig. 3) to the lower cylinder section 3 so that it is a fixed part thereof.

Also, each yoke member 16 is coupled to the lower end of a piston rod 22 whose upper end carries a piston head 23 mounted within a supplemental cylinder 24 that is rigidly fixed to the

proximate side of cylinder section 3, said cylinder 24 being brazed or welded to a pair of angles 25 which in turn are secured by screws to the cylinder section 3.

Communicating with the upper end of the interior of each cylinder 24 is a port 26 (Fig. 3) and these ports of the two cylinders are connected by pipe sections 27 and 28 and two elbows, one of the latter being a three-way elbow that is also connected by a pipe section 29 with conduit 9.

While throttle valve 10 (Fig. 7) is closed each piston head 23 is held at the limit of its upward movement by a coiled spring 30 (Fig. 3) disposed within the cylinder of said piston, the lower end of said spring being seated upon a shoulder provided at the lower end of the cylinder. When the throttle valve 10 is opened to start the operation of the ram some of the steam under pressure moving through conduit 9 toward valve 8 is diverted through pipe sections 29, 28 and 27 to the upper ends of cylinders 24 whose pistons and yokes 16 are immediately thrust downwardly thereby causing said yokes to swing arms 14 (Fig. 5) apart on pintles 13 and forcing the two pile-gripping members into positions against the opposite faces of the pile P thus bringing the axis of the ram of the hammer into edgewise alinement with the pile P where it is rigidly held during the operation of the ram. When the throttle 10 (Fig. 7) is closed to stop the operation of the hammer the springs 30 within cylinders 24 return their pistons and yokes to their uppermost positions again thereby shifting the arms 14 (Fig. 5) toward each other and swinging gripping members 12 apart to free the hammer from the pile P. During the upstrokes of the pistons 23 the upper ends of their cylinders are vented through a constricted port of valve 8 which latter is constructed as usual.

In Fig. 8 of the drawings the pipe sections 27 and 28 are connected by a conduit 31 directly with the source of steam under pressure and in this conduit is arranged a supplemental throttle valve 10*a* for controlling the pistons 23 and this throttle 10*a* can be opened before the main throttle 10 is opened thereby to close members 12 (Fig. 5) against the pile before the ram is started.

The construction illustrated in Fig. 7 is also operable to close the gripping members 12 against the pile P before the ram is started which fact is probably due to the great weight and inertia of the latter, while the construction illustrated in Fig. 8 provides for independent control of the ram and pistons.

While I have herein shown the gripping members 12 as particularly constructed for application to sheet steel piles, it will be understood that the said members may be formed to handle wooden and other types of piles.

What I claim is:

1. In a pile driving hammer of the character described, the combination with the cylinder and anvil thereof, of a pair of pile-gripping and hammer-aligning members supported by said cylinder adjacent to said anvil for pivotal movement on axes that are perpendicular to the axis of said cylinder and disposed at opposite sides of said cylinder axis; fluid-operated mechanism on said cylinder for swinging said members on said axes into and out of clutching engagement with the opposite sides of the pile that is to be driven; a conduit connecting said fluid-operated mechanism with a source of fluid under pressure, and a manually controlled throttle valve in said conduit, said members serving while held in engagement with the pile by said mechanism to hold said anvil in position upon the top of the same with the axis of the cylinder parallel and in alignment with the pile.

2. In a pile driving hammer, the combination of claim 1 wherein said fluid-operated mechanism comprises a pair of supplemental cylinders disposed at opposite sides of said main cylinder and each provided with an inlet port at one end thereof that is connected with the delivery end of said conduit; two pistons each one of which is within one of said supplemental cylinders; means connecting each piston with one of said pile-gripping members through which movement of said piston acts to swing its member on its pivotal support into and out of engagement with the pile, and spring means yieldingly maintaining each piston normally at the limit of its movement toward said inlet port with its pile-gripping member occupying a position at the limit of its movement away from the other gripping member.

3. In a pile driving hammer, the combination of claim 1 wherein said fluid-operated mechanism comprises a pair of supplemental cylinders disposed one at each side of said main cylinder and each provided with an inlet port at one end thereof that is connected with said conduit; two pistons each one of which is mounted within one of said cylinders; two yokes slidably mounted upon said main cylinder at opposite sides thereof each one of which is connected with one of said members and also rigidly connected with one of said pistons so that it moves with the latter thereby to swing its member into and out of engagement with the pile, and spring means yieldingly maintaining each yoke and its piston normally at the limit of their movement in one direction where they hold their gripping member at the limit of its movement away from the other gripping member.

4. In a pile driving hammer of the character described, the combination with the main cylinder, its anvil, and its valve for controlling the admission of fluid under pressure to said main cylinder, of a pair of pile-gripping and hammer-aligning members supported by said main cylinder adjacent to said anvil for pivotal movement on axes that are perpendicular to the axis of said cylinder and disposed at opposite sides of said axis; fluid-operated mechanism on said cylinder for swinging said gripping members on said axes into and out of clutching engagement with the opposite sides of the pile that is to be driven; a source of fluid under pressure; a conduit connecting said valve with said source; a throttle valve in said conduit; a conduit connecting said fluid-operated mechanism with said source independently of said first-mentioned conduit, and a throttle valve in said last-mentioned conduit, said gripping members serving while in engagement with the pile to hold said anvil in position upon the top of said pile with the axis of said main cylinder parallel and in alignment with the pile.

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