No. 796,703. PATENTED AUG. 8, 1905.

A. B. CLARK.

SHEET PILE DRIVER.

APPLICATION FILED JUNE 10, 1902.

Fig. 1.

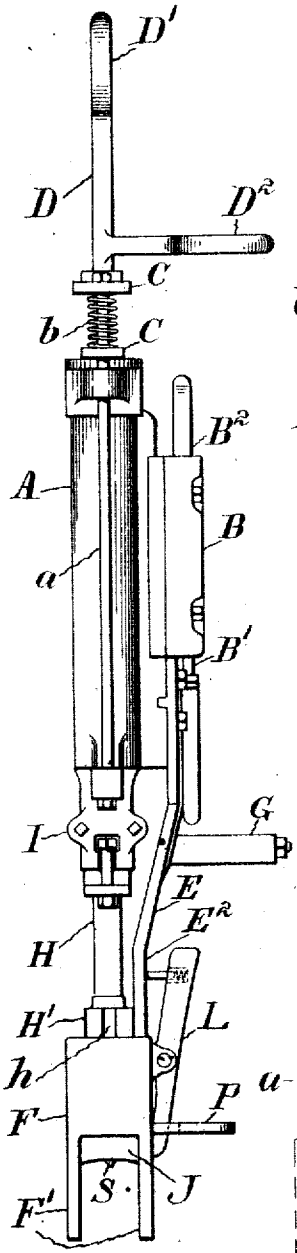


Fig. 2.

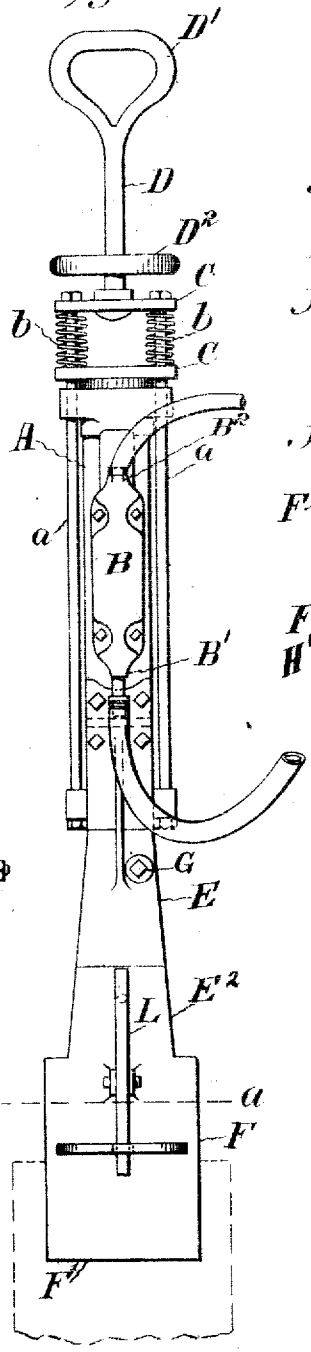


Fig. 7.

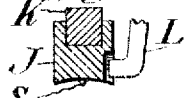


Fig. 6.

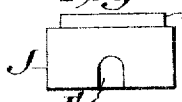


Fig. 4.

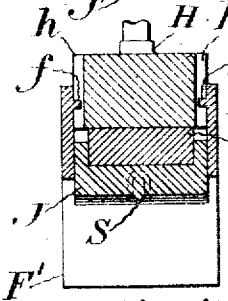


Fig. 5.

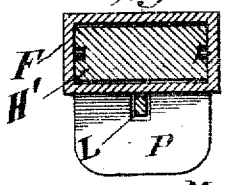
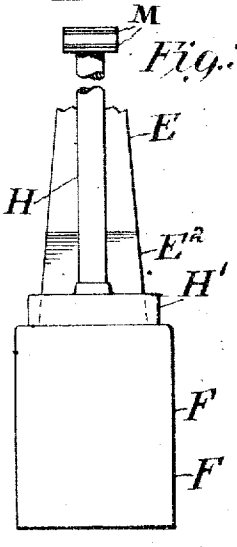


Fig. 3.



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UNITED STATES PATENT OFFICE.

AMASA B. CLARK, OF NEW YORK, N. Y.

SHEET-PILE DRIVER.

No. 796,703. Specification of Letters Patent. Patented Aug. 8, 1905.

Application filed June 10, 1902. Serial No. 110,988.

To all whom it may concern:

Be it know that I, AMASA B. CLARK, a citizen of the United States, residing in the borough of Manhattan, in the city, county, and State of New York, have invented a new and Improved Sheet-Pile Driver, of which the following is a specification.

My invention concerns apparatus for driving piles, and relates more particularly to portable apparatus of few parts and simple construction for quickly and effectively sinking sheet-piling with the minimum amount of skill and attention on the part of the operator.

To this end the invention involves the arrangement and disposition of the several parts whereby the machine may be made of comparatively light construction without sacrifice to the efficiency of its action or its durability, and whereby also certain other advantages hereinbelow referred to are secured.

The invention also involves various details of construction whereby the machine is free from lateral projections on three of its sides, and whereby "brooming" of the pile and other objections are obviated.

Reference is made to the accompanying sheet of drawings, in which—

Figures 1 and 2 are side and front elevations, respectively, of so much of a complete machine as embraces my invention. Fig. 3 is a partial back view of the same including the piston. Fig. 4 is a sectional view through the longitudinal axis of the guideway, showing the relative positions of the parts; Fig. 5, a cross-section on line *a a* of Fig. 2; Fig. 6, an elevation, and Fig. 7 a detail, respectively, of the follower-block.

Similar reference-letters refer throughout to identical parts in the several figures.

Reference A designates the cylinder, and B the valve-box, of a reciprocating direct-acting engine, which is adapted when fluid-pressure is applied thereto to cause a rapid reciprocation of the piston-rod H in the usual manner. The construction of the engine is substantially the same as that of the ordinary rock-drill engine, and as my invention is not involved therein a detailed description of the same is not here necessary. It is necessary, however, to state that in the furtherance of my design to remove all objectionable projections which might interfere with the use of the apparatus in corners and narrow spaces I prefer to use a style of valve-box in which the intake-port opens downwardly from the lower end of the valve-box at B', and the exhaust-passage is led in a similar manner to open upwardly from the upper end of the valve-box at B². This construction of valve-box with the intake and exhaust passages extending in the direction of the axis of the cylinder is not new in the art, and for this reason will not require further explanation or illustration. For the sake of simplicity in the drawings I have purposely omitted therefrom the obviously necessary adjuncts to an engine of this type, though it is of course to be understood that the engine is supplied with suitable stop-cocks, oil-cups, &c.

The flexible piping or hose supplying the fluid-pressure to the engine is attached to the intake-port at the bottom of the valve-box in any approved manner, the advantage of this arrangement being that while the coupling of the hose to the valve-box is conveniently out of the way there is also a certain amount of slack hose hanging below the valve-box which permits an unhindered movement of the machine from pile to pile without relaying or straining the hose for each movement. A short length of flexible piping is usually connected to the exhaust-passage.

The engine-cylinder is embraced by side rods *a a* and top head-plates C C, having top head-springs *b b* between them for the purpose of absorbing vibration and cushioning the jar of the cylinder upon the upward movement of the piston. In order to provide convenient holding and transporting means for the apparatus, a shank D of a double-grip handle is rigidly secured to the upper top head-plate. On the end of the shank D and preferably integral therewith is a hand-grip D', and near the foot of the shank at right angles thereto is a second hand-grip D², which may also be in one piece with the shank.

Secured to the cylinder of the engine by means of a lug and socket and bolts, as indicated in the drawings, and at a point preferably below the valve-box B is a rigid member or shank E, which is preferably of one piece, but may be made of several pieces rigidly joined together and extends in a general downward direction and terminates in a tubular compartment F, affording a guideway for the hammer H' on the end of piston-rod H, as well as a holder for the follower-block J, presently to be described. Opposite sides of the compartment or guideway F are cut away, so as to form a fork or saddle with members F' F', adapted to fit over and embrace the end of a plank or sheet pile. In dotted lines in Fig. 2 is shown the outline of a sheet-pile in-

dicating the position of the fork thereon and also clearly illustrating that the width of the pile which may be driven by my machine is not limited in any way by this construction.

The shape of the guideway F is preferably rectangular in cross-section, as shown in Fig. 5, and the distance between the fork members F' F' is sufficient to allow it to straddle piles of ordinary thickness.

It is a common source of annoyance when driving sheet-piling that the end of the pile has a tendency to splinter off under the impact of the hammer, thereby hindering the operation of driving and ultimately ruining the pile. To prevent this brooming of the pile, I interpose between its end and the hammer a follower-block J of comparatively light weight, which is contained within the guideway F and is capable of limited vertical movement therein. One or more inwardly-projecting lugs *f f* are formed in the inside of the guideway near its top, and these may be of the nature of ears cast integral with the guideway or studs screwed into tapped holes therein to furnish stops to limit the upward movement of the block when the hammer-head H' is not engaging it. A spring-latch L, pivoted between lugs in the front outside face of the guideway F, extends through the said face and normally engages a notch J' in the block J to hold the same within the tubular guideway. By withdrawing the latch L it is obvious that the block may be removed. The distance between the lugs *f f* and the engaging end of the latch is sufficient to give considerable vertical play to the block and at the same time to prevent it from rising to a point within the guideway where it would be struck by the hammer before the latter had acquired the momentum necessary for an effective blow. The bottom face of the follower-block J, which is in contact with the end of the pile, is curved and provided with a spur S, as shown in Figs. 1 and 4, and its upper face is provided with an inlaid block of hardwood K or other suitable material, adapted to protect both follower and hammer and also to deaden the noise.

In addition to handle D' D² an auxiliary handle G is rigidly secured to the shank E, preferably as indicated in the drawings, and a foot-step P is also provided, which may be cast integral with or bolted to the fork F, and has a central perforation to give clearance to the latch L, as indicated in Fig. 5. The fork F and shank E are cast in one piece, and the latter is curved or staggered, so that a part of it (indicated by E²) will be adjacent to and form a way for the hammer H'. The piston of the engine is indicated by M in Fig. 3, and is made in one piece with piston-rod H and hammer-head H'. The latter conforms to the rectangular shape of the guideway F and has sliding engagement on one side with the vertical shank-section E², as well as with the wall of the guideway F. It is also provided with vertical channels *h h* to give clearance to the lugs *f f*. The piston-rod H passes through the split stuffing-box I. The integral construction of hammer-head, piston-rod, and piston involves especial advantage in that the use of chucks likely to shake loose is entirely obviated.

From the above description of the construction the operation of the apparatus will be obvious to those skilled in the art. When the pile has been placed in position and the apparatus brought to play against its end, an attendant may stand on the foot-step P and so add his weight to that of the machine, which is desirable though not necessary. A rapid succesSeon of blows of comparatively short stroke is delivered to the follower-block, which, it will be remembered, rests upon the end of the pile, and the fork which holds the block and straddles the pile aided by the spur S preserves this relation, so that the sinking of the pile is constant and uninterrupted. The curved bottom face of the follower serves to compress the fibers of the pile if it is of wood, rendering the end denser and less liable to broom. Furthermore, I have found that the rapid reciprocation of the hammer upon the pile end sets up a series of composite vibrations throughout the length of the pile, which results in a constant repulsion of the particles of soil immediately surrounding the pile and keeps them out of intimate frictional contact therewith. The particles of the soil are kept loose and in constant motion and they are in actual contact with the surface of the pile during a part only of the time of its descent. The resistance encountered and the time for descent are correspondingly less for the pile so vibrated than if the soil particles are allowed to come to a state of rest, pressing against the pile between each stroke of the hammer, as occurs in the case of gravity-driven piles, in which the time of falling as well as of lifting of the hammer intervenes between the strokes.

It will be noticed that the apparatus above described is specially intended to utilize the reduction of resistance just explained, and that at the same time it is portable, of few parts, and easily manipulated. In all prior devices of this kind of which I am aware the hammers or follower-blocks, or both, have been made heavy in comparison with the engine and pile, and have not been capable of working at speeds high enough to secure the constant vibration of the soil surrounding it.

What I claim is—

1. A portable pile-driver comprising a direct-acting reciprocating engine, a rigid supporting-shank secured thereto and means rigidly connected to the free end of said rigid shank for receiving the end of a pile.

2. A portable pile-driver comprising a reciprocating engine, a rigid supporting-shank

secured at one end thereto, and fork members rigid with the free ends of said rigid shank adapted to straddle the end of a pile and support the engine thereon.

3. A portable pile-driver comprising an engine and a hammer reciprocated thereby, a rigid supporting-shank for said engine secured at one end thereto and formed at its free end with pile-engaging means rigid with said engine, in combination with a follower-block mounted on said shank in the path of the hammer and having direct contact with the end of the pile.

4. In a sheet-pile driver, an engine and a hammer reciprocated thereby, a shank secured to the engine, forming a guide for said hammer and supporting the weight of the engine, said shank being constructed to engage with the end of a pile, and a follower-block resting on the end of the pile in the path of said hammer, and cushioning material between said block and the hammer, substantially as described.

5. A portable sheet-pile driver comprising a direct-acting engine adapted to be run at high speed and a hammer reciprocated thereby, a shank secured to said engine for supporting the same and resting directly upon the end of a pile, and a follower-block of comparatively light weight in the path of said hammer adapted also to rest on the end of the pile, substantially as described.

6. In a sheet-pile driver, a reciprocating hammer and a shank comprising a guideway for said hammer, a follower-block having a curved under face mounted for limited vertical movement within the guideway, and means for operating said hammer at high speed, substantially as described.

7. In a pile-driver, a high-speed direct-acting engine and piston therefor, a rigid shank secured to the engine for supporting the same and provided with pile-engaging means rigid with said engine, and a hammer reciprocated at high speed by said piston to set up continual vibrations in the pile during its descent.

8. The combination with a reciprocating engine having a cylinder and piston, of a staggered shank secured to the side of the cylinder and extended from said cylinder to a position to form a guideway, fork members on said guideway, and a hammer connected with said piston to reciprocate along the guideway, substantially as described.

9. The combination of a high-speed reciprocating engine having a cylinder and piston, of a shank secured to and extending longitudinally from said cylinder, a guideway rigid with the end of the shank and fork members extended from the guideway, a hammer connected with said piston and a follower-block within the guideway and in the path of the hammer adapted to transmit the energy of the hammer to a pile, substantially as described.

10. The combination in a sheet-pile driver of a reciprocating hammer and means to actuate the same, of a guideway for the hammer, a removable follower-block within the guideway and in the path of the hammer, confining means for the block so arranged as to permit of a limited vertical movement of said block, and fork members on said guideway, adapted to hold a pile in engagement with the follower-block, substantially as described.

11. The combination in a sheet-pile driver of a reciprocating hammer and means to actuate the same, of a guideway for the hammer, and a removable follower-block within the guideway and in the path of the hammer, said follower-block having a notch in one of its lower edges, confining means for said follower-block comprising lugs on the guideway above the block and a spring-actuated latch pivoted on the outside of the guideway and extending through the same into engagement with the notch in follower-block, substantially as described.

12. The combination in a sheet-pile driver of a reciprocating hammer, a guideway for the same and means to actuate the hammer, of a removable follower-block within the guideway, having an inlaid block of wood on its upper surface, and a curved under surface, provided with a spur, means on the guideway to limit the vertical movement of the follower-block and suitable means to hold the pile-driver in engagement with a pile, substantially as described.

13. In a sheet-pile driver, a reciprocating hammer, a guideway for the same and an engine to actuate the hammer, in combination with a removable follower-block within the guideway, means on the guideway for limiting the movement of the follower-block, fork members on the guideway adapted to straddle a pile, and a double-grip handle on the engine, substantially as described.

14. In a sheet-pile driver a reciprocating hammer, a guideway therefor and an engine to actuate the hammer, side rods and a top head-plate for the engine, a double-grip handle secured to the top head-plate, in combination with a removable follower-block confined within the guideway, means on the guideway for limiting the movement of the follower-block therein, fork members on the guideway adapted to straddle a pile, substantially as described.

15. In a sheet-pile driver a reciprocating hammer, an engine to actuate the same provided with a longitudinally-extending handle, and having its intake and exhaust passages extending in the direction of the reciprocation of the hammer, in combination with a shank secured to and extended from the cylinder to form a guideway for the hammer, fork members thereon, an auxiliary handle secured to the front of said shank and a foot-step also on the front face of the shank, substantially as described.

16. In a sheet-pile driver, a reciprocating hammer, an engine to actuate the same, having its intake and exhaust passages extending in the direction of the reciprocation of the hammer, a double-grip handle secured to the engine, comprising a shank with a hand-grip at its end and a hand-grip secured at right angles to said shank; in combination with a shank secured to and extended longitudinally from the engine, a guideway on said shank to inclose and guide the hammer, a follower-block confined within the guideway, fork members on the guideway, and an auxiliary hand-grip and foot-rest on the said shank, substantially as described.

17. In a portable pile-driver, a fluid-pressure engine and a hammer reciprocated thereby, in combination with a flexible piping for supplying motive fluid to said engine and a connection between said engine and piping opening into the latter in the direction of the reciprocation of said hammer.

18. A pile-driver comprising a reciprocating fluid-pressure engine, a valve-box mounted on the side of the cylinder thereof and a hammer reciprocated by the engine, a longitudinally-extending shank secured to the engine on the same side as the valve-box and holding means projecting laterally from the pile-driver likewise on the same side as the valve-box.

In testimony whereof I have hereunto signed my name, in the presence of two subscribing witnesses, this 4th day of June, 1902.

AMASA B. CLARK.

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