2 Sheets--Sheet 1.

T. T. LOOMIS.

Steam Pile-Driver.

No. 165,170. Patented July 6, 1875.

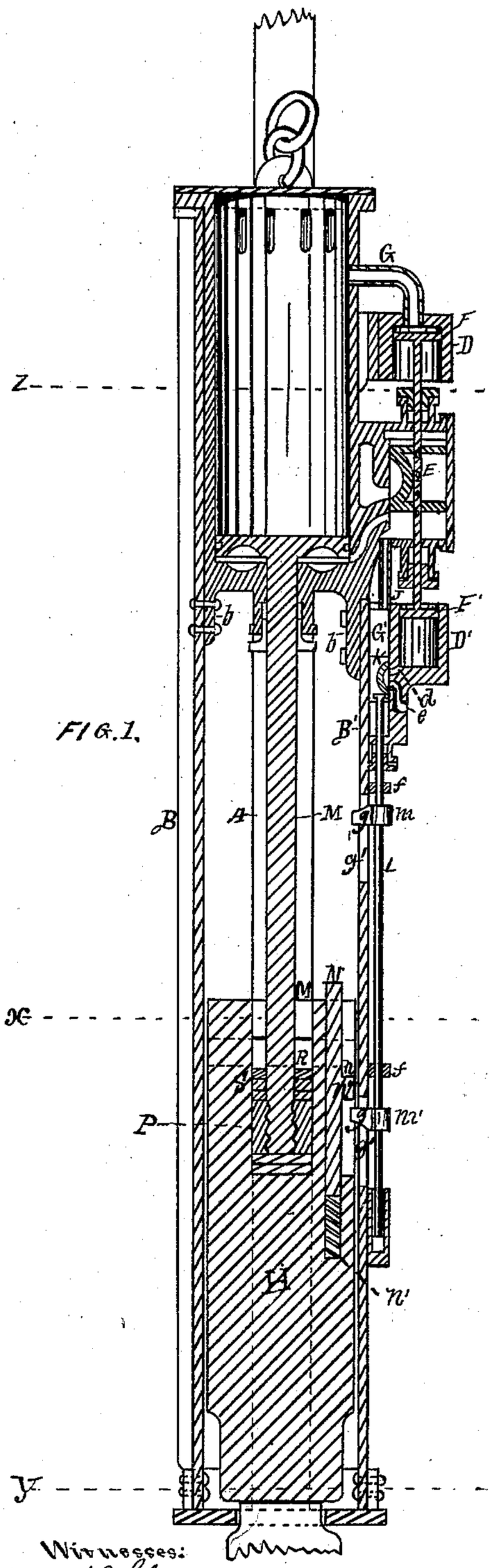

FIG. 1.

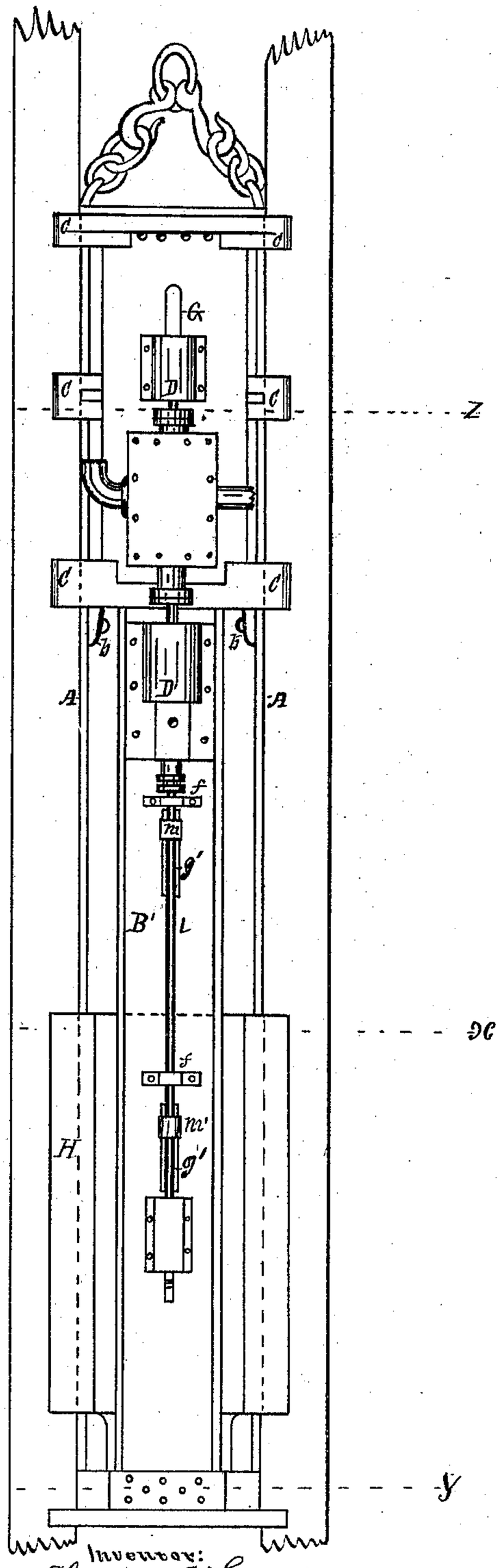

FIG. 2.

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2 Sheets--Sheet 2.

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FIG. 3.

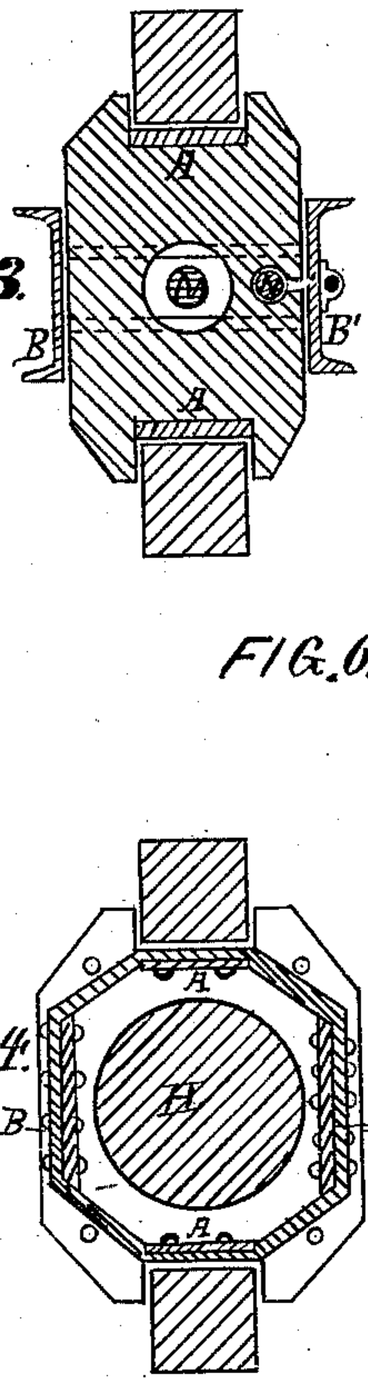


FIG. 6.

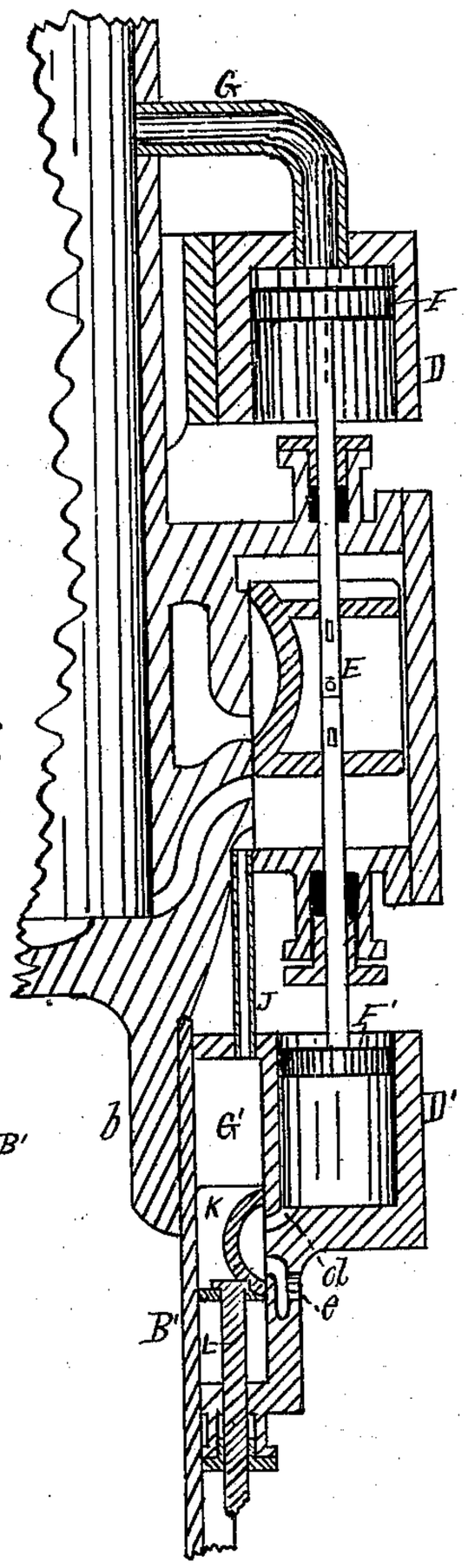


FIG. 7.

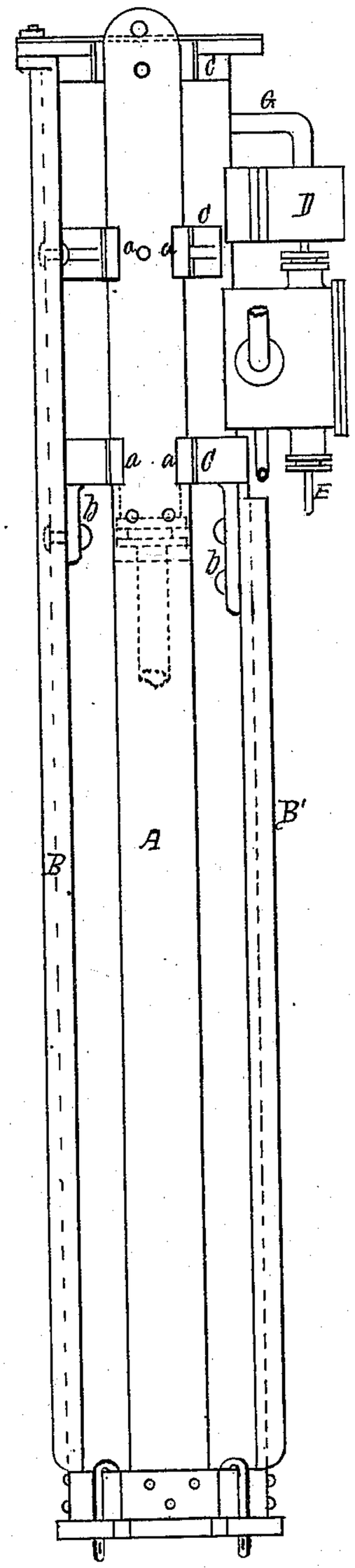


FIG. 4.

FIG. 5.

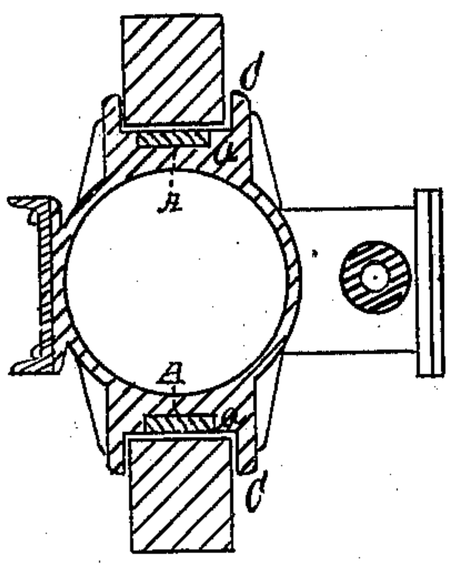
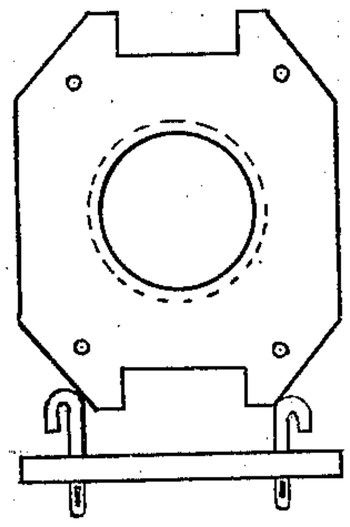


FIG. 8.



Witnesses:
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UNITED STATES PATENT OFFICE.

THOMAS T. LOOMIS, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN STEAM PILE-DRIVERS.

Specification forming part of Letters Patent No. **165,170**, dated July 6, 1875; application filed March 15, 1875.

To all whom it may concern:

Be it known that I, THOMAS T. LOOMIS, of Chicago, in the county of Cook and State of Illinois, have invented certain Improvements in Steam Pile-Drivers; and I do hereby declare the following to be a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings forming part of this specification, in which—

Figure 1, Sheet 1, is a vertical central section of a steam pile-driver embodying my said invention. Fig. 2, Sheet 1, is a front elevation of the same. Figs. 3, 4, and 5, Sheet 2, are sectional plans—Fig. 3 taken on the line *x x*, Fig. 4 on the line *y y*, and Fig. 5 on the line *z z*, drawn across Figs. 1 and 2. Fig. 6, Sheet 2, is an enlarged vertical central section of the steam-chest and parts employed in guiding the upper end of the pile; and Fig. 8, Sheet 2, is an elevation of the hammer-frame with cylinder attached, showing the manner of securing the same thereto.

Similar letters of reference indicate like parts in the several figures of the drawings.

My invention relates to that class of steam pile-drivers in which the hammer is lifted by the direct action of the steam; and its object is to improve the invention in pile-drivers for which Letters Patent were granted to me March 16, 1875, No. 160,781. To that end it consists in the mechanism employed in operating the cut-off valve, whereby the latter is opened and closed by the direct action of the steam; also, in the employment of a primary valve for opening and closing the steam admission port of the primary cylinder for operating the cut-off valve, and in the mechanism employed for operating the primary valve, whereby the latter is alternately opened and closed by the movement of the hammer. It further consists in the means employed in securing the lower end of the piston to the hammer, and in the manner of attaching the hammer-frame to the cylinder, all of which will be more fully understood by the following description and claims.

In my former invention, the upper ends of the bars constituting the hammer-frame were bent at a right angle to their vertical plane, and secured to the lower end of the cylinder only. With such it was found that the jar of the machine would cause the bolts connecting the cylinder to the frame to work loose, in which case the cylinder would work out of line with the frame, causing the piston to bind. To obviate this difficulty, I extend the bars A A and B of the hammer-frame upward to the upper end of the cylinder, and provide each of the edges of the bars A A with notches *a*, as shown in Fig. 5. The bars A A are passed through the groove in the lugs C of the cylinder, and the notches *a* are adapted to closely fit the walls of the grooves. I provide the lower end of the cylinder with depending lugs *b*, to which the bars A A B, and the upper end of bar B′, are firmly bolted. The bars A A and B are also bolted to the sides of the cylinder at the center and upper end of the same, as shown in Fig. 8.

By this connection the frame and cylinder are made as one and the same piece, which entirely overcomes the difficulty previously mentioned.

With this exception, the cylinder, hammer-frame, and its connection to the pile-plate, the steam-chest, cut-off valve, and its ports, are substantially the same as in my former invention. I will therefore omit a description of them in detail.

D and D′ are primary steam-cylinders, which are permanently secured to the side of the main cylinder, immediately above and below the steam-chest. E is the valve-stem, for operating the cut-off valve. This valve-stem passes through suitable stuffing-boxes located in the ends of the steam-chest, and extends into the primary cylinders D and D′. Mounted on the ends of this valve-stem are piston-heads F and F′, which are so arranged as to freely move within their respective cylinders. G is the induction-pipe, through which the steam is admitted from the main cylinder into cylinder D above the piston-head, when the main piston-head has reached the limit of its upward movement. G′ is the primary steam-chest, which communicates with the chamber of cylinder D′ through port *d* below piston-head F′. J is the steam-admission pipe,

through which the steam passes from the main steam-chest into the primary chest G′. K is the primary cut-off valve, which is located in chest G′, and so arranged as to admit of a free and easy ascending or descending movement. *e* is the exhaust-port, through which the steam escapes from cylinder D′ when the primary valve K has reached the limit of its upward movement. L is the primary valve-stem, which is permanently attached to valve K, and extends downward through suitable stuffing-boxes in the lower end of chest G′. This valve-stem extends through guide-boxes *f f*, attached to bar B, downward to a point near the lower end of the hammer-frame, and is so adjusted as to admit of a free and easy longitudinal movement. Mounted on this valve-stem are collars *m m′*, each provided with an arm, *g*, adapted to pass loosely through an elongated mortise, *g′*, in bar B′, as shown in Figs. 1 and 2. N is a concussion-block, which is fitted into a vertical mortise in the upper end of the hammer, and so adjusted as to admit of a free and easy ascending and descending movement. Permanently attached to this block is a lug, *n*, passing through an an elongated slot in the hammer, and in the same vertical plane with arm *g* of the collars.

Loosely secured within the mortise in the hammer, under the concussion-block, is a spring, *n′*, which is so adjusted as to yield and allow the block to be moved downward by the concussion of the hammer.

The arrangement of this block and spring is such that when the hammer has nearly reached the limit of its upward movement lug *n* impinges arm *g* of collar *m*, imparting an upward movement to valve K, opening an exhaust-port of cylinder D′, and when the valve has reached the limit of its upward movement the spring yields, thus preventing injury to the valve should the hammer ascend above the limit allowed. When the hammer has reached the limit of its descending movement the momentum of the block overbalances the elasticity of the spring and the latter yields, allowing the block to descend, causing the lug to impinge arm *g* of collar *m*, imparting a downward movement to the valve, again closing the exhaust and opening the admission port *d* of cylinder D′.

H is the hammer, which is grooved on opposite sides to receive the bars A A of the frame and the leaders of the derrick, and its lower end or face is made rounded, as shown in Fig. 1. The upper end of the hammer is provided at its center with a quadrangular-shaped mortise, M, into which the lower end of piston M′ loosely passes. P is a clamp-block adapted to fit loosely into mortise M of the hammer. This block is made in two parts, and is provided at its center with a vertical aperture, the walls of which are grooved, forming a series of curvilineal ribs, adapted to fit into corresponding grooves formed around the lower end of the piston, as shown in Fig. 1. R is a metal plate, which is loosely fitted into mortise M above the clamp-block. S is a wood packing, which is also fitted into the mortise between the plate and upper end of the block. The upper end of the hammer is provided with two horizontal mortises, formed transversely through the same immediately over the plate. These mortises are adapted to receive suitable keys, shown by dotted lines in Figs. 1 and 3, the object of which is to secure the clamp-block in the mortise; consequently the piston to the hammer. The arrangement of these parts is such that, when necessary to remove the piston-head from the cylinder, the keys are removed and the piston drawn upward so as to withdraw the clamp-block from the mortise, when the block relieves itself from the piston, and the piston is drawn upward through the lower cylinder-head.

The operation is as follows: The hammer, hammer-frame, and consequently the cylinder and pile-plate, are adjusted between the leaders and secured at the proper height to admit the pile under them. The pile, being shouldered at its upper end to allow it to pass slightly through the pile-plate, is then adjusted between the leaders in the usual manner, and the frame allowed to descend, so that the upper end of the pile enters the aperture in the plate, allowing the latter to rest on the shoulder of the pile. Steam is then admitted into the steam-chest. The cut-off valve being at the limit of its upward movement the steam flows through the admission-port into the cylinder under the main piston-head, causing the latter to ascend, (consequently, the hammer,) and when the latter has nearly reached the limit of its upward movement lug *n* of block N is caused to impinge arm *g* of collar *m*, imparting an upward movement to the valve-stem L, (consequently to the primary valve K,) opening exhaust-port *e* of cylinder D′, and the steam in said cylinder exhausts therefrom through ports *d e*, relieving the pressure of steam from the primary piston-head F′, and by the further ascent of the main piston-head it is carried above the opening of pipe G, when the steam instantly flows through said pipe into primary cylinder D, impinging cylinder-head F, causing it to descend, imparting a downward movement to valve-stem E, (consequently to the cut-off valve,) opening the exhaust-port of the main cylinder, and the steam exhausts from the latter, relieving the impact of steam under the main piston-head, when the gravity of the hammer causes it to descend. When the hammer has reached the limit of its descent its concussion causes a further descent of block N, bringing lug *n* of the latter in contact with arm *g* of collar *m*, imparting a downward movement to valve-stem L, (consequently to the primary valve K,) closing exhaust-port *e*, and opening admission-port *d*, and the steam flows through pipe J into cylinder D, imparting an upward movement to piston-head F′, (consequently to the main cut-off valve,) closing the main ex-

haust and opening the admission, and the steam flows into the main cylinder, again imparting an upward movement to the hammer.

Having thus described my invention, I claim—

1. In a steam pile-driver, the combination of the cut-off valve and stem E with the primary cylinders D D and piston-head F F′, arranged to open and close the cut-off valve by the impact of steam, as specified.

2. In a steam pile-driver, the primary valve K, arranged to alternately open and close the ports *d e* of the primary cylinder D′ by the ascending or descending movement of the hammer.

3. The spring concussion-block M, having the lug *n*, in combination with valve-stem L, having the arms *g* for operating the primary cut-off valve, as specified.

4. The hammer-frame, consisting of the bars A A and B B′, the bars A A and B extending to the upper end of the cylinder and bolted to the sides of the same, as specified.

The above specification of my invention, signed by me this 9th day of March, 1875.

THOMAS T. LOOMIS.

Witnesses:

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JULIUS WELCKE.