

(No Model.)

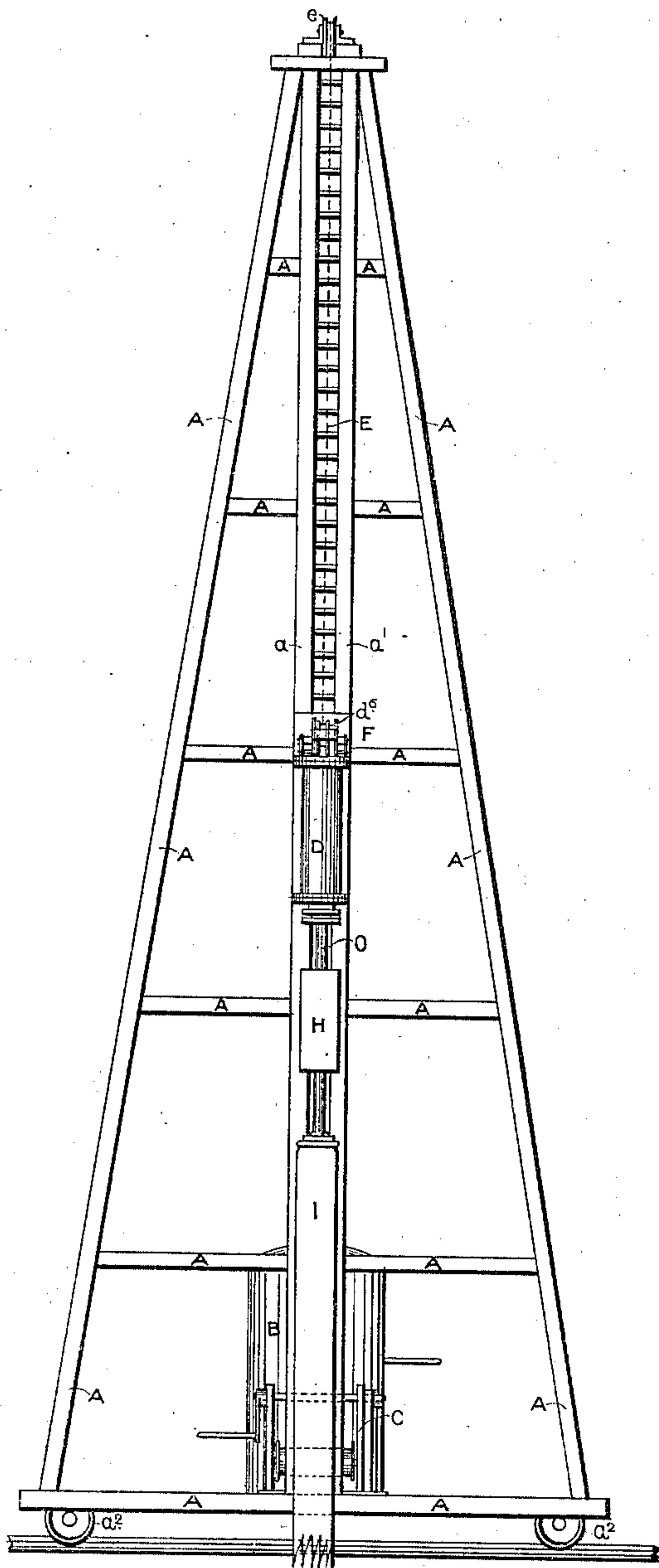
2 Sheets—Sheet 1.

T. WHITAKER.
PILE DRIVING MACHINE.

No. 313,637.

Patented Mar. 10, 1885.

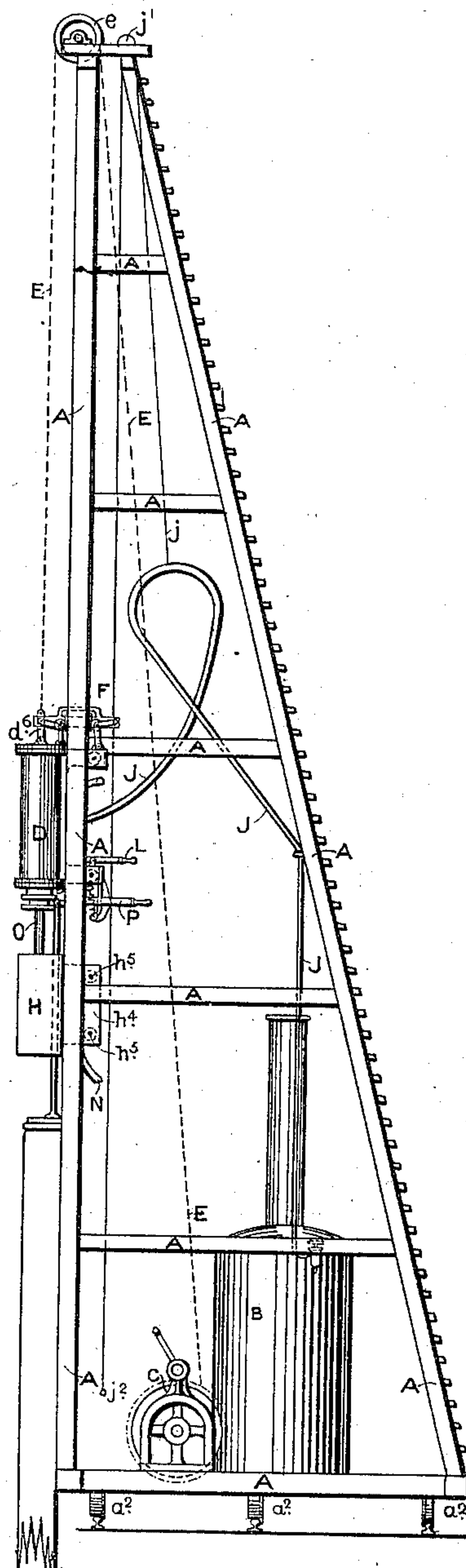
FIG 1



WITNESSES

Jas. F. Duhamel
Walter L. Dodge

FIG 2



INVENTOR

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(No Model.)

2 Sheets—Sheet 2.

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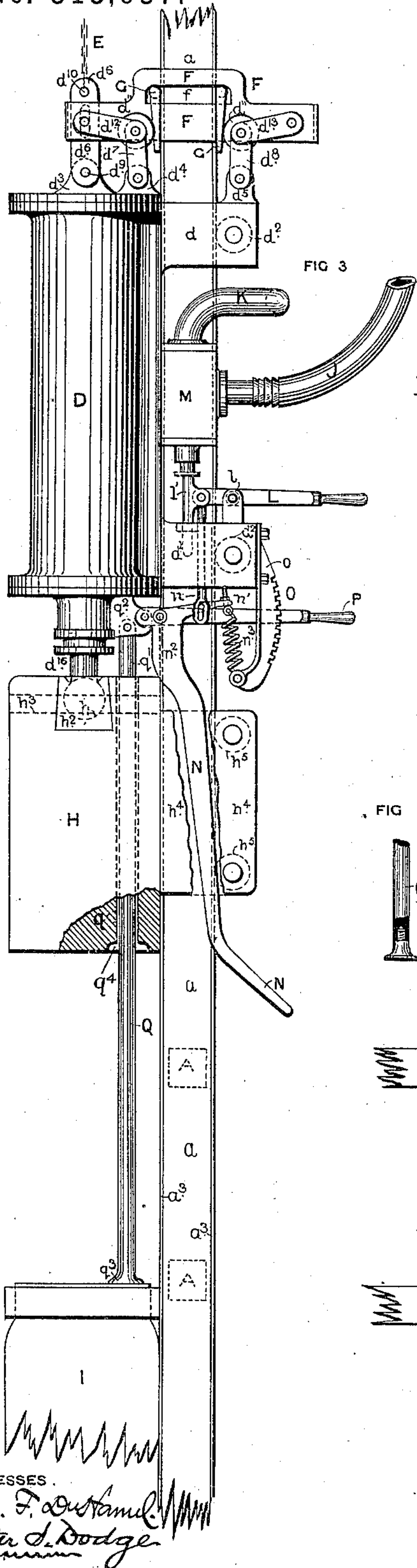


FIG 3

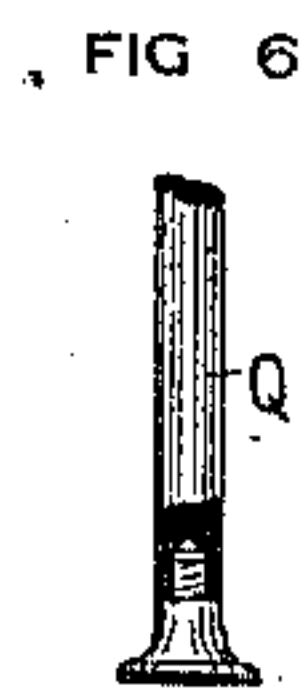


FIG 6

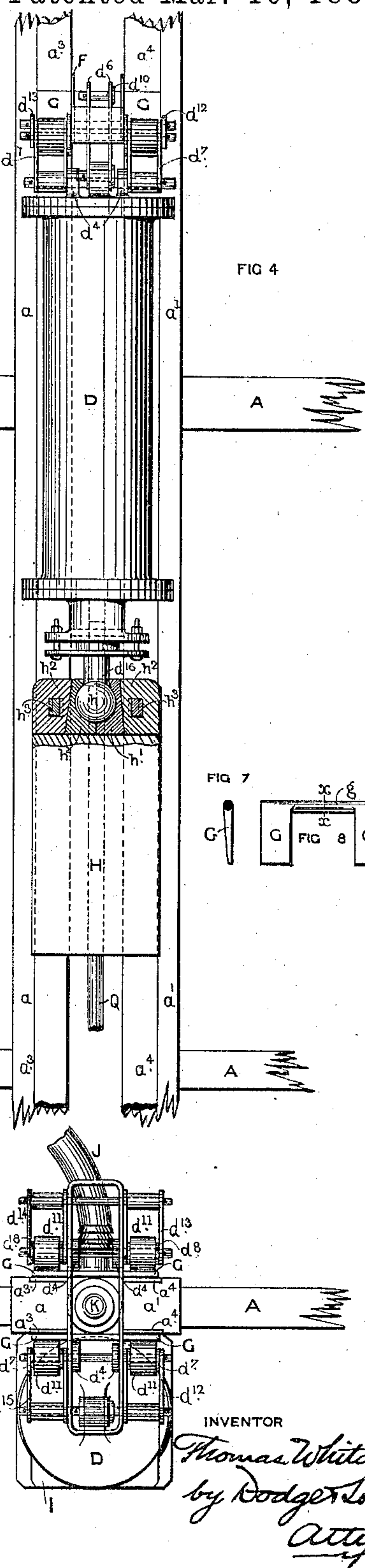


FIG 4

FIG 7

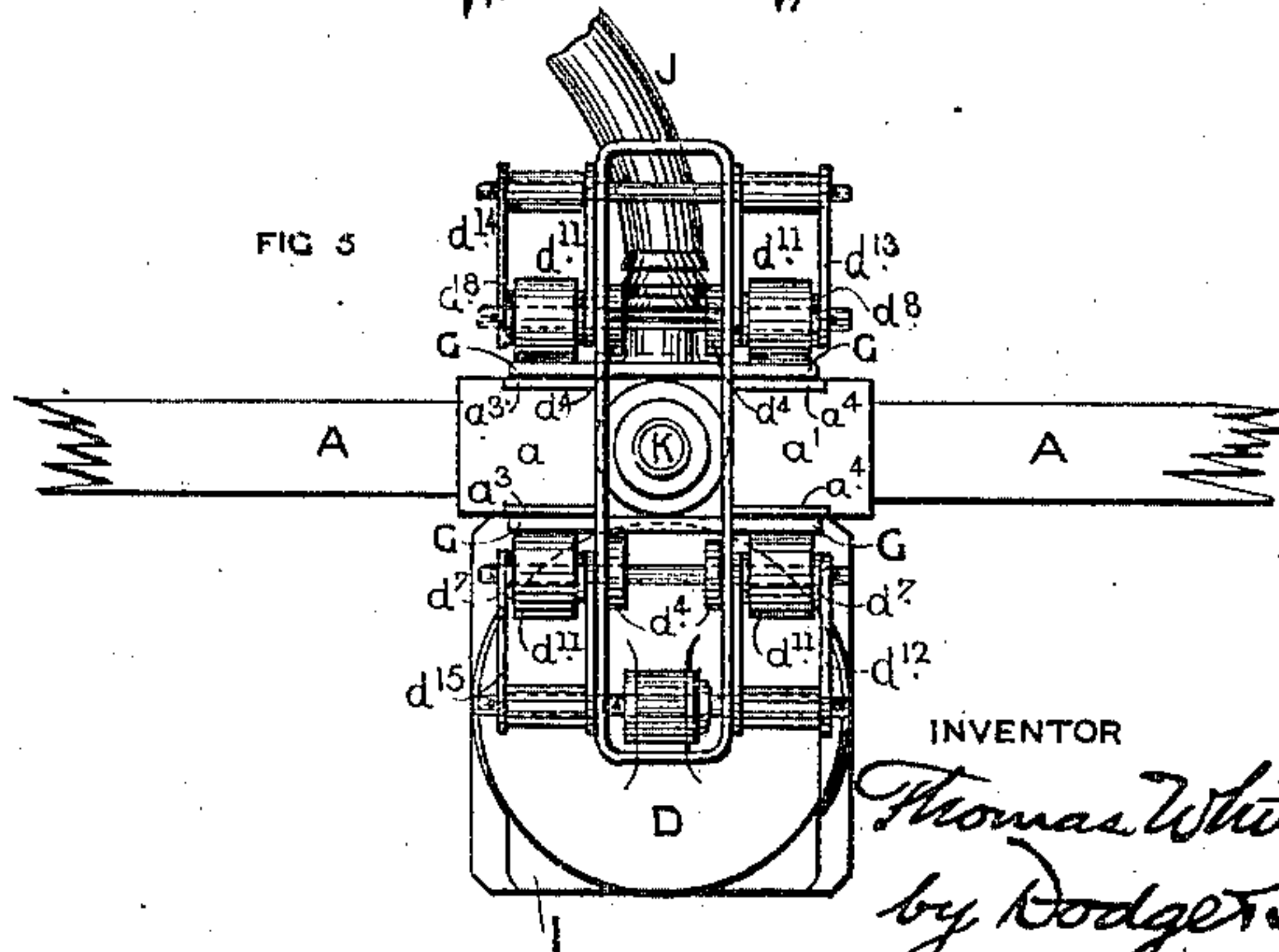
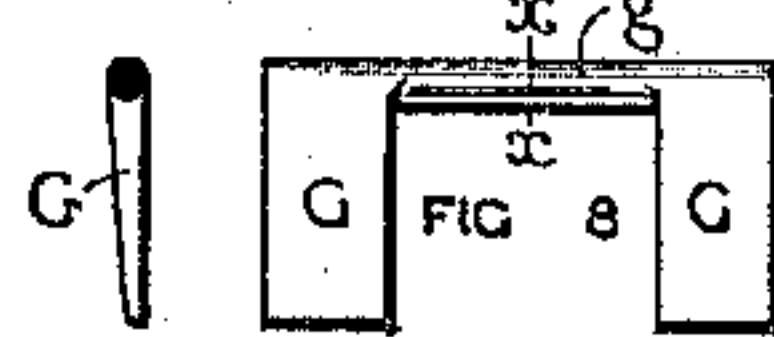


FIG 5

INVENTOR

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WITNESSES.

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UNITED STATES PATENT OFFICE.

THOMAS WHITAKER, OF HORSEFORTH, COUNTY OF YORK, ENGLAND.

PILE-DRIVING MACHINE.

SPECIFICATION forming part of Letters Patent No. 313,637, dated March 10, 1885.

Application filed January 5, 1885. (No model.) Patented in England February 9, 1884, No. 3,027.

To all whom it may concern:

Be it known that I, THOMAS WHITAKER, a subject of the Queen of Great Britain, residing at Horseforth, in the county of York, Kingdom of England, have invented certain new and useful Improvements in Pile-Driving Machines, (for which I have applied for Letters Patent in England, dated 9th of February, 1884, No. 3,027, and in France on the 17th of December, 1884,) of which the following is a specification.

This invention relates to improvements in pile-driving machines in which the whole of the parts of the engine are supported on the pile itself, and as the pile is driven into the soil the engine follows the pile, and occupies the same position with regard to it at every blow. My invention also does what I believe no other invention has yet done. It enables me to bring the full driving-power of the steam to bear upon the head of the pile at each stroke as by means of apparatus above the cylinder, wedging the latter tight to the guides, to prevent any upward movement while allowing free downward movement. My invention provides a strong abutment for the upward pressure of the steam on the cylinder-cover, while allowing the cylinder to sink and follow the pile freely as it descends.

In order that my invention may be better understood, reference is given to the accompanying drawings, in which Figure 1 is a front elevation. Fig. 2 is a side elevation. Figs. 3, 4, and 5 are respectively enlarged side elevation, front elevation, and plan of parts of pile-driving apparatus. Figs. 6, 7, and 8 are details.

A is the frame-work of the pile-driving machine, provided with the central upright leaders, a a , on which the pile-driving mechanism works. The framing A is mounted on wheels a^2 , so as to be easily removed from one place to another.

In the drawings, Figs. 1 and 2, I have shown a vertical boiler, B, for supplying steam to the pile-driver, fixed to the lower portion of the framing A, so as to move with it; or, when preferred, it may be fixed permanently and pipes be carried to the pile-driving apparatus.

C is a crane or winch for raising the piles

and engine into position. It may be worked by steam or other motive power. The upright leaders a and a' are plated with iron, as shown at a^3 and a^4 , to reduce the wear and tear, and for more conveniently showing the working parts of the pile-driving apparatus. In Fig. 3 I have removed the upright leader a' .

D is the cylinder, like that ordinarily used on a steam-hammer, (and may be either single or double acting,) fitted with the requisite piston, covers, glands, and valves. I would here remark that almost any of the cylinders, pistons, and valve-gear now used on steam-hammers would be suitable. I therefore do not make any claim for a special kind of cylinder-piston and valve-gear, and in the drawings have shown this portion without going much into detail.

On the cylinder D is cast the projections or lugs d d' , which pass through and fit so as to slide freely between the upright leaders a a' , and on these projections are mounted the runners d^2 . These are made to work against the iron plates a^3 and a^4 , fixed to the back of the upright leaders a a' , and thereby retain the cylinder D against the front or face of the upright leaders, as shown, at the same time allowing the cylinder to freely slide up and down. On the top of the cylinder are cast to the cover the lugs d^3 and d^4 , and to the projection d the lugs d^5 , to which are respectively attached the links d^6 , d^7 , and d^8 . The links d^6 are attached to the lug d^3 by means of a pin, d^9 , and through their upper ends pass a second pin, d^{10} , to which a chain, E, may be hooked or fastened for raising the cylinder and pile-driver independently of the framing (to be hereinafter described) which is carried by the links d^7 and d^8 . This chain E passes over a sheave or pulley mounted on the top of the framing A to the winch C. Slot-holes are provided in the links d^6 , to allow of the rod or pin carrying the links d^{12} and d^{15} to pass through.

F is a framing passing between the two guides or upright leaders, a a' , and is provided with a slot, f , in each side for retaining in position the double wedges G. (Shown also at Figs. 7 and 8, in which Fig. 7 is a section on line x x , Fig. 8.) These wedges are made to

work in pairs against the iron facing a^3 and a^4 , and are attached together by means of a connecting-piece, g , stretching across the opening or space between the two guides or upright leaders a and a' , and also passing through the two slots f in the sides of the frame F , thereby preventing the wedges G from rising or falling. The links d^7 and d^8 are attached in pairs to the lugs d^4 and d^5 by means of pins, and at the opposite ends of and between each set of links is mounted a runner, d^{11} , made to bear against the double wedges G by means of a second set of links, d^{12} , d^{13} , d^{14} , and d^{15} . These links d^{12} , d^{13} , d^{14} , and d^{15} are pivoted at one end to the frame F and at the other end to the same pins on which the runners are carried. The links d^{12} , d^{13} , d^{14} , and d^{15} are arranged at an angle, as shown, and by their combination with the rollers d^{11} and links d^7 and d^8 , cause the links d^7 and d^8 to press the rollers d^{11} with great force against the double wedges G upon the slightest upward movement of the cylinder D , thereby resisting, effectually, any farther upward movement of the cylinder. At the same time the cylinder D is free to slide down the guides or upright leaders a and a' , carrying with it the links d^7 and d^8 and rollers d^{11} , and thus relieving the pressure from the double wedges G and leaders a and a' .

J is the pipe through which steam is supplied to the cylinder D from the boiler B . This pipe is flexible for portions of its length, to enable the cylinder D to slide from the top to the bottom of the guides or leaders a and a' without any cessation of the action of the motive power. At Fig. 2 I have shown this pipe J supported and balanced by means of a rope, j , passing over a pulley or sheave, j' , and weighted at j^2 . This permits of the pipe J adjusting itself to the varying positions of the cylinder D .

K is the exhaust-pipe.

L is a lever pivoted at l , and connected to the valve-spindle at l' for working the equilibrium-valve in case M by hand, when required.

N is a tappet-lever carried on a pin on lever P , and geared to the valve-spindle by means of a link, n , one end of the link being attached to the valve-spindle at l' on the same pin that receives the lever L , while the other end is attached to a pin on the heel n' of the lever N , as shown. The lever N is bent in order to make the apparatus automatic, and that the action of the steam on the top of the piston may continue to the end of the stroke, and thus give what is known as a "dead-blow" to the pile I . The monkey H , in ascending, forces the tappet-lever N out as it approaches the completion of its upward stroke by coming in contact with the projecting part n^2 of the bent lever N , and thus lifts the equilibrium-valve. A strong spiral spring, n^3 , (attached at one end to the heel n' of the lever N , and at the other end secured to a quadrant, O ,) is employed for pulling the equilibrium-valve quickly down, and also for forcing the lever

N in toward the monkey H when the monkey descends for driving the pile.

P is a lever by which the action of the steam in the cylinder may be varied to suit circumstances. This lever P is attached to lugs on the cylinder-bottom by means of a pin, and by moving the lever P up or down in the quadrant O the lever N is raised or lowered, and the action of the valve regulated to the movement of the monkey H . The notches in the quadrant O are employed for retaining lever P in any desired position. The end of the piston-rod d^{16} is enlarged, and formed into a ball, h , to which the monkey or pile-driver H is attached by means of the bushes h' , which are dovetailed into the monkey H , and retained in position by means of the blocks h^2 and cot-85 ters h^3 , and by this means the monkey H is enabled to slightly adjust itself to the inequalities of the top of the pile I .

On the monkey H is cast the projection h^4 , which passes through and fits so as to slide freely between the upright leaders a and a' , and on this is mounted four runners, h^5 , made to work against the iron plates a^3 and a^4 on the back of the upright leaders. By this means the monkey is kept up to the face of the leaders and free to slide up and down as required.

Q is a strong rod, which passes through a hole, q , in the monkey H . The upper end, q' , is attached to lugs q^2 on the cylinder-cover D , and carries the cylinder and its appendages, while the lower end, q^3 , rests upon the pile I . By this arrangement it will be readily seen that the whole of the parts of the engine and pile-driving apparatus are supported by the pile itself, and as the pile is driven into the soil the engine follows, and consequently the pile occupies the same position with regard to the engine at every blow. The engine may be carried by more than one rod, answering to that marked Q ; or the rod or rods may pass outside the monkey H , if preferred. The rod Q may be made in two or more pieces screwed into each other, as shown at Fig. 6, or the length varied in order that with a short stroke of the piston a longer pile may be placed in position, if required.

I prefer to enlarge the end q^3 of the rod Q , as shown, to prevent it entering the pile; or a plate of iron may be inserted onto the top of the pile I to prevent the rod Q penetrating. When the end q^3 of the rod Q is enlarged, as shown in Figs. 1, 2, 3, and 6, it will be found necessary to countersink the opening in the lower face of the monkey H , so as to form a recess, q^4 , in which the splayed or enlarged end q^3 may fit when the monkey descends upon the pile.

A platform or stage may, when required, be attached to the cylinder, on which the attendant may stand to work the valve-levers; or a rope may be attached to these levers so that they can be operated from the bottom of the pile-driving frame A .

I would here remark that hot air or gas may

be used in lieu of steam, and also that when it is required to shorten the pile-driving frame A the cylinder may be fixed alongside the monkey, and the monkey may be carried by a strong projecting arm from the piston-rod, which may be carried through the top of the cylinder. I prefer, however, to place the cylinder above the monkey, as described and shown. The framing A of the pile-driving apparatus may also be constructed so as to drive the piles at any angle.

The mode of action is as follows: The pile is raised into position by means of the chain E, and the cylinder and monkey having previously been raised to the top of the leader a by the same chain, they are supported on the top of the pile by the rod Q. Steam is admitted to the cylinder from boiler B, which causes the piston to rise or fall (as the valves are worked) carrying with it the monkey H, and, as each blow of the monkey drives the pile into the soil, the cylinder and its appendages follow the pile until the pile is "driven home" by successive blows from the monkey. When the pile has been driven home, the cylinder is again raised to the top of the pile-driving frame by chain E and winch C, ready for the next operation.

Preparatory to raising cylinder D to the top of the frame, it is necessary, in order to release the wedges G, that the frame F be attached to chain E, so that the frame may be raised bodily with the cylinder, and at the same time, or that the pins connecting the links d^{12} d^{13} d^{14} d^{15} with frame F be temporarily removed.

I am aware it is not new to support the cylinder upon a leg passing through the monkey and resting upon the pile, and hence do not claim such idea, broadly.

I claim as my invention—

1. A pile-driving machine in which the cylinder rests by means of a support on the pile-head, and is double acting, the upward pressure of the steam in the cylinder-head being taken up by wedge apparatus, substantially as described.

2. The combination, in pile-driving engines, of a double-acting cylinder, D, capable of sliding freely downward as far as allowed by the pile upon which it rests, but prevented from rebounding upward by wedging apparatus with the piston-rod and monkey H, substantially as described.

3. The leg Q, supported on the pile-head and having a splayed end, q^3 , in combination with the monkey H, bored or cored out to allow the leg to pass through, and having a recess, q^4 , cut out to avoid the splayed end of the leg when the monkey falls upon the pile.

4. The combination of the cylinder D with

the flange q^2 and the leg Q, pivoted to it as near as practicable in the vertical axis of the center of gravity of the cylinder, and its appendances sliding with it, by which means the minimum of unbalanced pressure is brought to bear on the lateral supports of the cylinder.

5. The combination of the piston-rod d^{16} , having the spherical end h and the spherical bearing h' h^2 , with the monkey H, by which means the monkey is free to hang and strike slightly out of the perpendicular without bringing a severe cross-strain on the rod.

6. The combination of the spherical piston-rod end h , bearings h' , and side blocks, h^2 , with the cotters h^3 , binding them to the monkey, all substantially as described.

7. The combination of the monkey H, bearing against the front of the vertical iron-shod guides a , the flange h^4 , bearing against the side of the guides, the rollers h^5 , bearing against the back of the guides, and the piston-rod ball h , attached to the top of the monkey, whereby the monkey is guided in every direction laterally, and forced down by a steady guided force vertically, substantially as described.

8. In combination, a double-acting steam or other motive-power hammer forming a pile-driver resting on the head of a pile, a wedging device, G, preventing the cylinder from rising, yet leaving it free to sink with the pile, substantially as described.

9. The combination of the frame F cut away to admit of the wedges G, with the wedges G cut away in the center to pass through and be held in place by the frame F, substantially as and for the purposes described.

10. The combination of the wedges G, with the rollers d^{11} , and the sustaining-link d^7 , d^8 , d^{12} , and d^{13} , by means of which a heavy pressure is brought to bear on the wedges by any rising motion of the cylinder, while the wedges are deprived of pressure and are free to slip by any falling motion of the cylinder.

11. The combination of the plate F, levers d^{12} d^{13} , sloping downward at an oblique angle from F, and levers d^7 d^8 , linked to the cylinder D with the wedge G and abutment a , by which means, when the cylinder falls the strain is taken off the wedge and it and the plate F fall, but when the cylinder attempts to rise a strain is brought upon the wedge, at the same time holding stationary the wedge and with it the plate F and cylinder D.

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

THOMAS WHITAKER.

Witnesses:

R. STANLEY WHITE,
EDWARD WHITELEY.