T. M. SKINNER.

STEAM PILE-DRIVER.

No. 185,458. Patented Dec. 19, 1876.

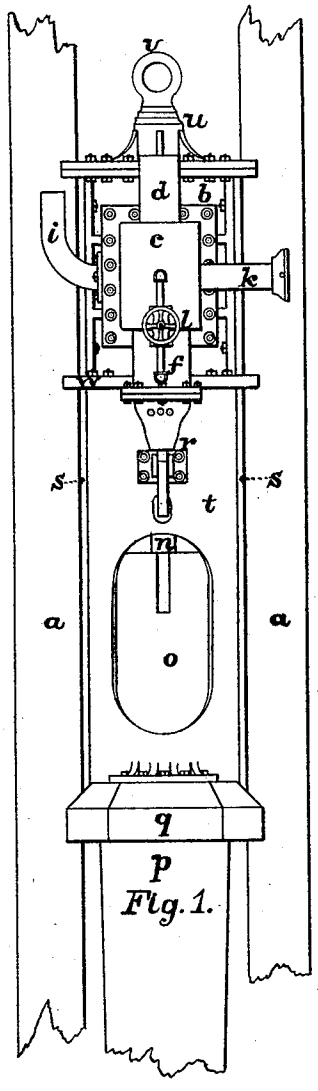

Fig. 1.

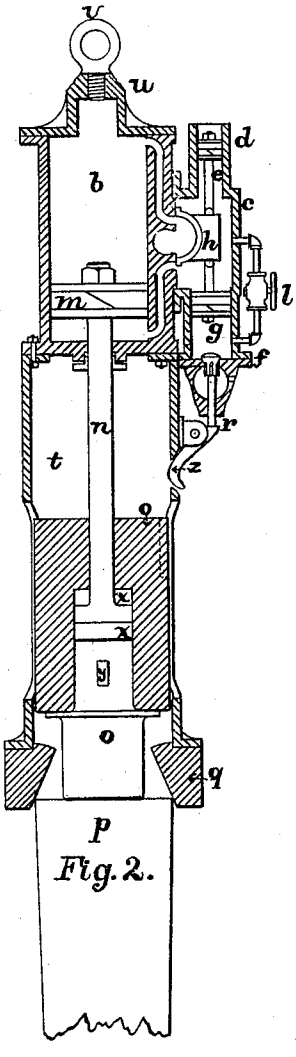

Fig. 2.

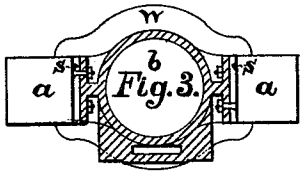

Fig. 3.

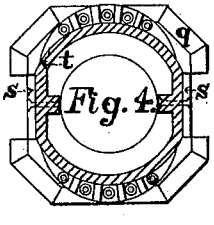

Fig. 4.

Witnesses.

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UNITED STATES PATENT OFFICE.

THOMAS M. SKINNER, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN STEAM PILE-DRIVERS.

Specification forming part of Letters Patent No. **185,458**, dated December 19, 1876; application filed September 28, 1876.

To all whom it may concern:

Be it known that I, THOMAS MINER SKINNER, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Pile-Driving Machines, which improvement is fully set forth in the following specification, reference being had to the accompanying drawings.

The object of my invention is the improvement of that class of pile-hammers in which the direct action of steam is used by attaching hammer to the piston-rod of a steam-cylinder, suspended in leaders of ordinary pile-drivers.

First, by using a hammer which receives its impetus both from its own weight and by the direct downward pressure of steam on the piston attached, the reaction of steam-pressure being overcome by the weight of metal in cylinder and frame, said weight being greater than steam-pressure on piston, and such as to prevent frame of hammer lifting from pile at the termination of the downward stroke.

Second, by the use of a cast or wrought iron (or other metal) ring or base attached to frame of steam pile-hammers, said ring or base having a conical or tapering hole through center, which, fitting or resting on head of pile, forms a support for hammer, and protection to pile from splitting, and obviates the use of the usual wrought-iron pile-band and all trimming or chopping on head of pile.

Third, in the combination, with steam pile-hammers, of a valve motion, having no levers, cams, or other appliances liable to disorder from the excessive jarring to which they are subject, and whose motion is positively regulated by the valve or cock *l*, (shown on drawing,) thereby enabling the operator to strike light or heavy blows at pleasure.

Fourth, by the tubular form of frame and arrangement of connections with cylinder, insuring the greatest strength, and preventing all twisting, springing, or binding of piston, piston-rod, or hammer, and holding the pile in the exact position where needed.

By using steam both at the downward as well as the upward stroke of the piston I am enabled to use a lighter hammer at shorter stroke, greater speed, and in a position farther from vertical than where action of gravity alone is relied upon, the force of the blow being only limited by the amount and weight of metal in the frame and cylinder.

By connecting cylinder and frame to the iron stay running from top to bottom of same the entire machine is firmly held together, relieving all excessive strain on bolts connecting bottom of cylinder and frame, and by the manner in which said stay is connected to cylinder by means of bolts the same can be readily disengaged when required.

The operation can be seen by reference to the accompanying drawings.

Figure 1 represents a full front view of hammer resting on pile *p* and sliding in leaders *a*.

Fig. 2 represents a vertical section through same, showing arrangement of valve motion, steam-cylinder, &c., and manner of connecting piston-rod *n* to hammer *o* made in two parts, and held together by key *y*, piston-rod having two wooden rings, *x*, or other elastic material, placed above and below, to relieve jar upon piston *m*.

Fig. 3 is a horizontal section through cylinder *b*, showing manner of connecting same to stay *s* by means of bolts; also, lower cylinder head or flange *w*, forming guides to retain hammer in leaders *a*.

Fig. 4 is a horizontal section through tubular frame *t*, showing manner of connecting same to stay *s* by means of rivets having countersunk heads at either end, and running through to inside of guides, upon which the hammer slides in its movement; also, shows top view of cone or base *q*, and manner of bolting same to frame, said cone being also riveted by means of countersunk rivets to stays *s*.

The entire machine being raised to top of leaders by a rope passing from ring *v*, attached to top cylinder-head *u* to the drum of an ordinary hoisting-engine, allows the pile *p* to be placed in position by means of a line running to winch. The hammer is then carefully lowered until cone *q* rests on pile. The rope or hammer line is then relieved of all strain, and allowed to hang loose in position. The steam-pipe *k* having been connected to boiler by means of rubber hose, or a flexible jointed pipe, steam is turned on, filling steam-chest

c at top and bottom, of which are two cylinders, *d* and *f*, the smaller cylinder *d* being closed by small plunger *e*, having an open air connection on top side, and the larger cylinder *f* being closed by plunger *g*, whose area shall be about twice that of *e*. Said plunger *y* has two connections from lower side of same, one by means of small pipe and cock *l*, with steam-chest, and the other by means of valve *r* with open air. The plungers *e* and *g* are connected by a rod which is secured to slide-valve *h*, an upward or downward movement of plungers being communicated by means of said rod to slide-valve. On steam entering steam-chest *c*, the cock *l* being partially open, steam is admitted to lower side of plunger *g*, thereby equalizing pressure on top and bottom sides of said plunger, which therefore exerts no influence on slide-valve, but, there being a strong upward pressure on plunger *e*, said plunger rises, carrying with it slide-valve *h* and plunger *g*, thereby opening lower steam-port of cylinder *b*, and admitting steam on lower side of piston *m*, which, by means of piston-rod *n*, raises hammer *o* until said hammer comes in contact with lever *z*, which, raising valve *r*, releases pressure from lower side of plunger *g*, and said plunger being of double the area of plunger *e*, and consequently having double the pressure on its upper side, causes *e* to follow it to bottom of cylinder *f*, thereby drawing down valve *h*, admitting steam to upper side of piston *m*, and exhausting steam on lower side through pipe *i*, causing said piston *m*, piston-rod *n*, and hammer *o*, all attached, to drop suddenly on head of pile. As hammer *o*, on its downward stroke, passes below lever *z*, releasing said lever and allowing valve *r* to drop to its seat, thereby shutting off all communication between the open air and lower side of plunger *g*, it causes the steam, which is passing through the pipe *l*, to again equalize the pressure on both sides of plunger *g*, and, as before, plunger *e* exerts its influence and raises valve *h*, admitting steam for another upward movement of piston *m*.

By admitting a larger amount of steam through cock *l* the cylinder *f* may be more quickly filled, causing valve *h* to shift to its upward position, thereby cushioning with steam-hammer *o* before it has struck pile *p*, by which means a lighter blow is struck without reducing rapidity of movement of hammer, thereby enabling the operator to vary his blow for different classes of work.

I claim as my invention—

1. The metal frame *t*, constructed as described, in combination with the cylinder *b* and valve *g h e*, when arranged and operated as shown and specified.

2. The conical base or ring *q* for supporting the pile-driver on the pile and protecting the same, in combination with the frame *t* and cylinder *b*, substantially as specified.

3. The valve *g h e* operated by steam-pressure, in combination with cylinders *d f* and pipe and cock *l* on the steam-chest *c*, for regulating the force of blow of the pile-driver, all constructed and arranged substantially as shown and specified.

4. The tubular frame *t*, connected with the cylinder *b* and ring *q*, constructed and arranged substantially as shown, and for the purpose set forth.

THOS. M. SKINNER.

Witnesses:

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