

F. E. SICKELS.

Pile Driver.

No. 99,360.

Patented Feb. 1, 1870.

Fig. 2

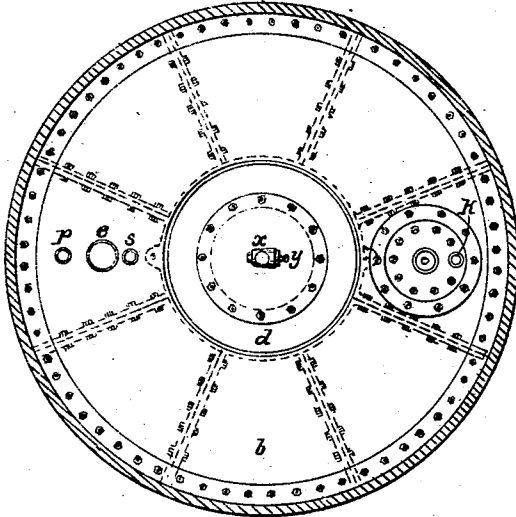


Fig. 3.

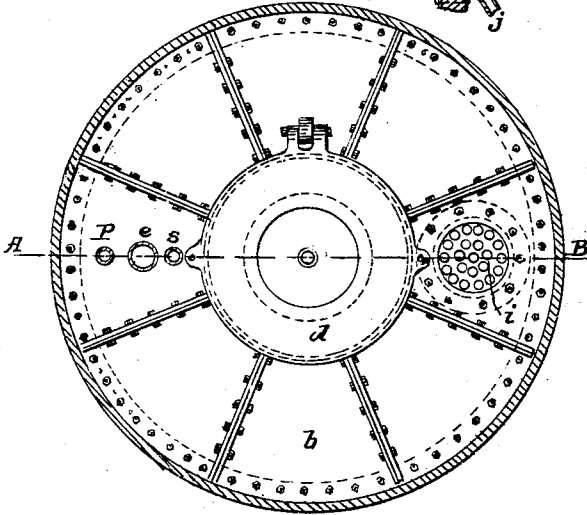


Fig. 4.

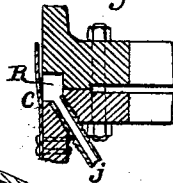
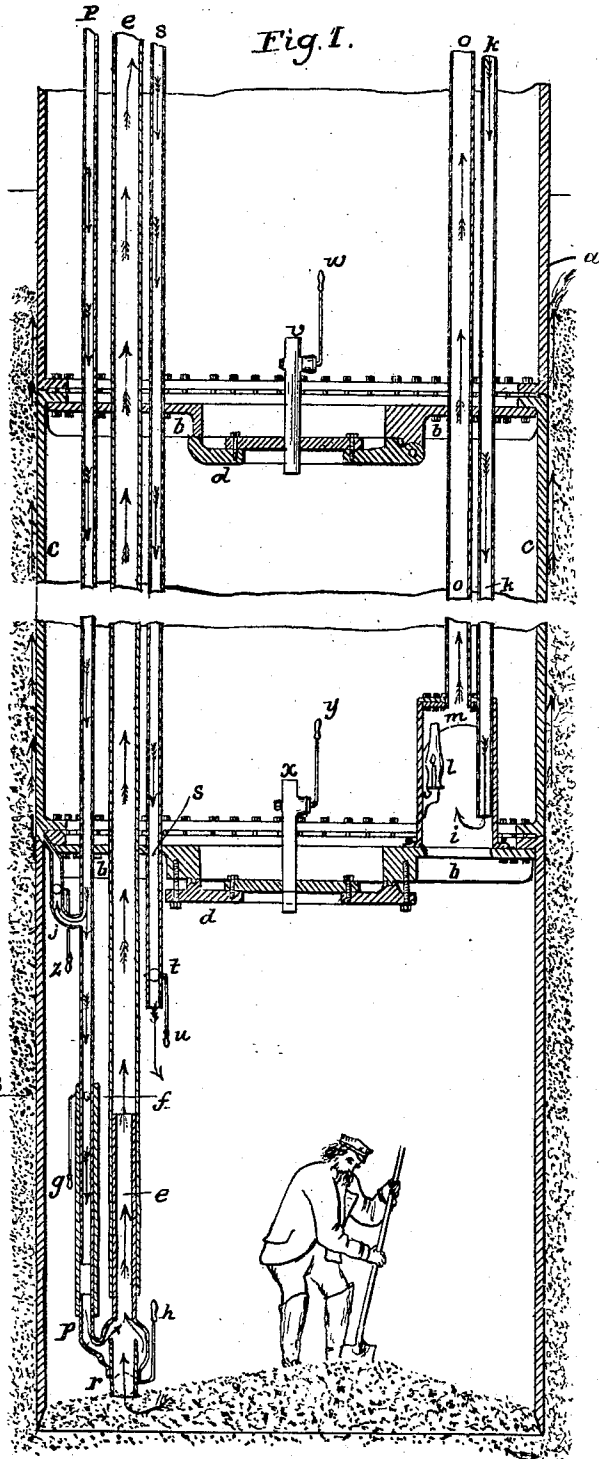


Fig. 1.



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FREDERICK ELSWORTH SICKELS, OF CHICAGO, ILLINOIS.

Letters Patent No. 99,360, dated February 1, 1870.

IMPROVEMENT IN APPARATUS FOR SINKING PNEUMATIC PILES.

The Schedule referred to in these Letters Patent and making part of the same.

To whom it may concern:

Be it known that I, FREDERICK ELSWORTH SICKELS, of Chicago, Cook county, and State of Illinois, have invented a new and useful Improvement in the Apparatus for Sinking Pneumatic Piles; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

I will now state the usual method of construction and mode of using the air-lock, and the usual method of expelling the excavated material, and relieving the friction on the outside of the pile, so as to explain the difference between the usual apparatus, and my improved apparatus for sinking pneumatic piles.

In sinking pneumatic piles, as heretofore practised, the air-lock is made separate from the pile, so as to be removed bodily, either to be reconnected to the same pile, after additional lengths had been placed on top, or connected to another pile, as might be required, or the air-lock has been constructed permanently with the pile, so that a separate and complete lock was required for each pile.

In excavating by air-pressure, as heretofore practised, the pressure supplied to the workmen was depended upon exclusively to force out the excavated materials, thus making it necessary, at times, to put an undue pressure upon the workmen, so as to be sure to have sufficient power to force out these materials, this excess of pressure rendering it difficult to obtain workmen who are constitutionally able to endure the great pressure, and the great pressure sometimes required, forced the air out under the bottom edge of the pile, and while a portion of the air thus escaping had a tendency to loosen the materials around the pile, and lessen the resistance to its descent, a larger portion of air, in escaping downward, traversed laterally the seams of material, and rose to the surface at such a distance from the pile as to be inoperative in lessening the friction in its descent.

I will now explain my improved apparatus.

First, in my improved air-lock, the cost of construction of the air-lock is reduced by temporarily using a portion of the pile to aid in forming the air-lock, and the cost of using the air-lock is also reduced at the same time, as it is placed wholly within the pile, and need not be disconnected and reconnected to lengthen the pile, as is now practised, and after the pile has been sunk, and the bottom closed, the parts made in addition to the sides of the pile, to form the air-lock, may be removed to aid in forming an air-lock in another pile.

Second, in my improvement for forcing out the excavated materials, by using two different pressures of air, acting in combination, one pressure being greater than the other, the lesser pressure only is supplied to

the workmen, while the greater pressure is prevented from acting on them, and only employed to act after the materials to be excavated have been put in motion by the lesser pressure, within a pipe or enclosure.

Third, to lessen the resistance to the descent of the pile, by the discharge of the least possible amount of air, it is delivered in a thin stream upward along the sides of the pile, from the extra-pressure pipe.

In the accompanying drawing, the same letters refer to the same part in each figure.

a a a, Figure 1, is a transverse section of the pneumatic pile, shown in the process of sinking, with the upper end omitted.

b b, Figures 1, 2 and 3, are the diaphragms, which, with the doors *d d*, figs. 1, 2, and 3, and the sides *c c*, fig. 1, of the pile, form the air-lock.

z, figs. 1 and 2, is the supply-cock, opened by the handle *y*, to fill the air-lock with the required pressure of air before opening the lower door, the upper door being then closed.

v, fig. 1, is a discharge-cock, opened by the handle *w*, to discharge the pressure from the air-lock before opening the upper door, the lower door being then closed. These doors admit the passage of men and materials without releasing the pressure on the bottom of the pile, as one door can be closed before the other is opened, as is usual in air-locks.

All parts of the air-lock, excepting the part *c*, which forms a portion of the pile, can be removed, so as to be placed in other piles, and used as often as required, the diaphragms *b b* being made in pieces, and jointed, so as to be readily taken apart and put together. Thus, a commodious air-lock is formed in each pile, at substantially only the expense of the diaphragms *b b* and doors *d d*.

e, figs. 1, 2, and 3, is the excavating-pipe, up which the materials are to be removed or projected by the combined action of the two currents of air.

r is a valve in the excavating-pipe, operated by a handle, *h*.

p, figs. 1, 2, and 3, is the extra pressure-pipe, conveying air at a greater pressure than is supplied to the workmen, and blowing up the excavating-pipe through a circular opening surrounding the excavating-pipe.

f is a valve in the extra-pressure pipe, operated by the handle *g*.

The excavating-pipe *e*, and the extra-pressure pipe *p*, are provided with slip-joints, so as to adjust their lower ends to the surface of the material to be removed.

s is the supply-pipe, to furnish fresh air to the workmen, and maintain sufficient pressure at the bottom of the pile to keep out the water.

t is a valve in the supply-pipe, operated by the handle *u*, to prevent the escape of air upward, in case of accident to this pipe, above the air-lock.

When the pressure of air, furnished to the workmen, forces the sand or other materials to be excavated in at the bottom of the pipe *a*, they are still further impelled by the current of air rushing up the same pipe, supplied by the extra-pressure pipe *p*, and this extra pressure may be as much greater than the pressure supplied to the men as may be found necessary.

The diamond-shaped arrows, fig. 1, designate the line of motion of the excavated materials, and the barbed arrows signify the air-currents.

By closing the valve *r* in the excavating-pipe, and fully opening the valve *f* in the extra-pressure pipe *p*, any desirable pressure can be applied to force out the materials to be excavated, that might otherwise stick in the pipe, without letting this extra pressure act on the workmen. By using the extra-pressure pipe, in combination with the supply-pipe, the men are relieved of the excessive pressure, as a pressure is only supplied to them sufficient to keep out the water, and this pressure is, at the same time, used to force the materials within a pipe or enclosure, so as to come within the range of the greater pressure that fully expels them upward.

The supply-pipe *S* and the extra-pressure pipe *P* should have safety-valves applied to them, to limit the pressure in each case, as may be desired. The upper end of the supply-pipe and extra-pressure pipe should be connected to the machinery supplying the air-pressure, by means of couplings, so as to be readily connected and disconnected, as required in lengthening the pile.

J, fig. 1, is a pipe, with a valve, *q*, operated by a handle, *z*, leading from the extra-pressure pipe to a recess, *R*, Figure 4, extending around the outside of the pile, at the lower joint. This recess is covered by a thin ring of metal, *C*, fig. 4, fastened, at its lower edge, to the pile, and open around its upper edge, so as to permit the air to escape upward along the sides of the pile, and loosen the materials, and thus diminish the resistance to the descent of the pile.

Fig. 4 shows a section of a portion of the pile, at the lower joint, on an enlarged scale, so as to exhibit the different parts.

C, fig. 4, is the thin plate to deflect the current upward as it issues out of the recess, extending around the pile.

J, figs. 1 and 4, is the pipe coming from the extra-pressure pipe to feed this recess with air.

The valve *q*, fig. 1, in this pipe, is to control the amount of air supplied to the recess, to be blown up around the outside of the pile. If the air is delivered with considerable force upward, it will keep close to the pile, and tend to greatly lessen the friction in its descent.

The arrows on the outside of the pile, fig. 1, show the line of motion of the air, when blown out with great force. The piles can be loaded to force them down, and material that cannot be economically blown out through the excavating-pipe, may be passed up through the air-lock.

O, figs. 1 and 2, is an exit-tube, to allow the gases from the lamp *l* to escape.

m is a reflector, to throw the light downward to the workmen through the glasses *i*, figs. 1 and 3.

K is a tube, to supply air to the lamp.

What I claim as new, and desire to secure by Letters Patent, is—

1. Forming an air-lock within the pile, by using, temporarily, a portion of the sides of the pile, to aid in making the air-lock, substantially as herein described.

2. Excavating the material, by using two different pressures of air in combination, substantially as herein described.

3. Lessening the friction in the descent of the pile, by blowing a current of air upward along its sides, substantially as herein described.

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