F. E. SICKELS.

Sinking Pneumatic Piles or Caissons.

No. 138,945. Patented May 13, 1873.

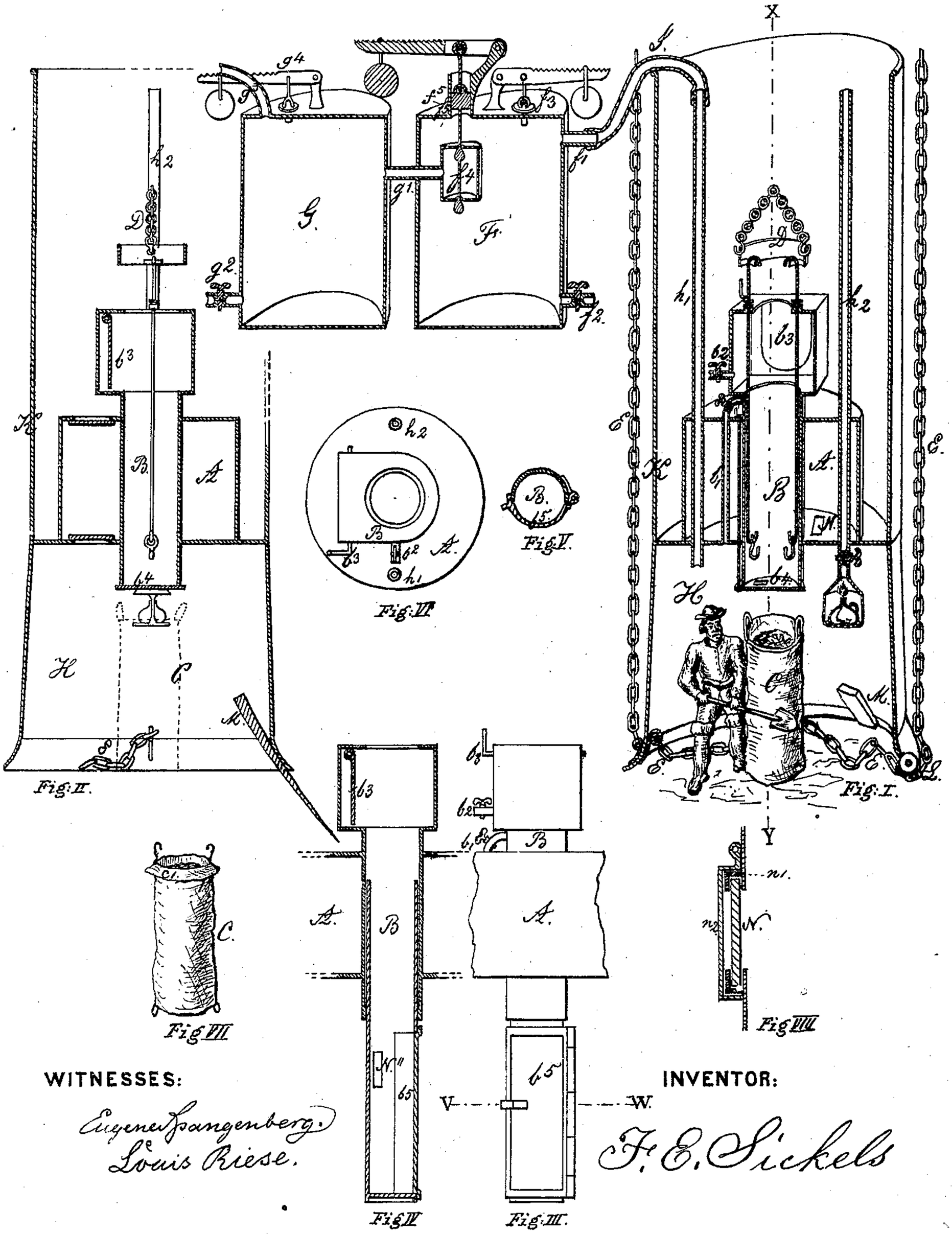

Fig. I. Fig. II. Fig. III. Fig. IV. Fig. V. Fig. VI. Fig. VII. Fig. VIII.

UNITED STATES PATENT OFFICE.

FREDERICK E. SICKELS, OF MARSHALL, TEXAS.

IMPROVEMENT IN SINKING PNEUMATIC PILES OR CAISSONS.

Specification forming part of Letters Patent No. **138,945**, dated May 13, 1873; application filed October 15, 1872.

To all whom it may concern:

Be it known that I, FREDERICK E. SICKELS, of Marshall, in the county of Harrison and State of Texas, have invented certain Improvements in Sinking Pneumatic Piles or Caissons; of which the following is a specification:

The nature of this invention consists in the improvements in sinking and securing of pneumatic piles or caissons, as follows: In sinking pneumatic piles or caissons of sufficient size to contain an air-lock, my air-lock is made of smaller diameter than the pile or caisson, with its under surface at or near the upper surface of the air-chamber, so as to be convenient for the workmen in the air-chamber, and so as to enable them, after the pile is sunk, to fill up the lower air-chamber with masonry or cement to a greater uniform depth before it becomes necessary to interfere with the air-lock than if it projected within the air-chamber, as heretofore practiced. It also consists in interposing between the air-pumps and air-chamber a reservoir which shall control and regulate the admission of air to the workmen, and thus prevent the pulsations of pressure arising from the intermittent delivery of air by the pumps, which irregularity of pressure acts injuriously on the workmen. It also consists in carrying down below the surface of the earth with the pneumatic pile or caisson chains or guys, which can be used to control the pile in its descent and also subsequently used as anchorages to hold the upper end of other contiguous piles in their descent and after they have reached their right position. It also consists in securing the lower edge of the pile, after it has reached its position, by means of staves driven close to the edge of the pile in a slanting direction in the ground so as to aid in holding the pile when it is not founded on rock. It also consists in the removing the matter excavated from the air-chamber by means of tubes or pipes placed below the upper surface of the pile or caisson. The excavated matter will be placed in bags or buckets and drawn up into the tube, when the lower valve in the tube is closed; and, after the pressure is released from the upper valve communicating with the open air, will be opened and the bags or buckets drawn up by any suitable hoisting arrangement. It also consists in causing the bags or pieces connected with them to fit the tube so as to prevent the air in the air-chamber from escaping while they are being hoisted out of the air-chamber, one bag being left in the tube to close it while the other is being hoisted out of the upper end of it. It also consists in fixing eye-glasses for looking into the air-chamber, so that the state and progress of the work in it can be inspected from above while the top of the air-chamber is below the top of the pile.

The accompanying drawing will show the arrangement.

Figure I is a longitudinal section with perspective projection, showing the pile and pressure-regulating reservoirs. Fig. II is a longitudinal section through X Y of Fig. I. Fig. III is an outside view of one arrangement of the pipe through which the bags are hoisted. Fig. IV is a longitudinal section of the same. Fig. V is a cross-section through V W of Fig. III. Fig. VI. is a top view of the device shown in Figs. III and IV. Fig. VII is a perspective view of the bag, showing the collar for closing the pipe while being drawn through it; and Fig. VIII is a sectional view of the eye-glass.

A is the air-lock, and B is the pipe through which the bags are raised. C are the bags filled with the excavated matter to be raised through the pipe B. D is a hoisting arrangement to hoist up the bags into the pipe. E are the stay-chains carried down with the pile or caisson, as it is sinking, while the lower end may pass over a roller, L. The objects and purposes of these stay-chains are to form guys and anchorages for holding the succeeding or contiguous piles or caissons in their proper positions while they are being sunk. F is the reservoir containing the air under a regulated pressure; G is a reservoir receiving air from the pumps, through the pipe g^3, and, under a varying pressure due to the delivery of the pumps, is furnished with a safety-valve, g^4, to relieve it of pressure when it is excessive. H is the air-chamber. h^1 is the pipe leading to the air-chamber H from the reservoir F. h^2 is a pipe to regulate the ventilation and to carry up the smoke from

the lamp. b^1 is a pipe to put the pressure on the pipe B after the upper valve b^3 is closed. b^2 is a pipe to release the air out of the pipe B when the lower valve b^4 is closed. f^1 is a pipe which connects the reservoir F by means of a flexible tube I and the pipe h^1 with the air-chamber H. f^2 is a release-pipe for the water which may be delivered from the air-pump, as I sometimes work with water to cool the air supplying the workmen and to seal the valves of the pump. f^3 is a safety-valve. f^4 is a valve arrangement for regulating the air-supply to the reservoir F, the piston f^5 being exposed on its lower surface to the pressure in the reservoir F, and thereby raising and closing the valves that admit the air through the pipe g^1 so as to limit the pressure in the reservoir F as desired. g^2 is a pipe to discharge water out of the air-receiver G. Figs. III, IV, V, and VI show an arrangement by which the lower valve b^4 is dispensed with and a door b^5, opening sidewise, may be used. The pipe is made in two pieces so that it can be extended to the bottom of the air-chamber H by one part sliding in the other. In this pipe the bags C, shown in Fig. I as well as in Fig. VII, may be used.

I will now describe the operation of drawing one of the bags C through the pipe B, shown in Figs. I and II: As soon as the bag is filled the upper valve b^3 is closed and pipe b^1 is opened to give the pipe B the same air-pressure that is in the chamber H; then the lower valve b^4 is opened and the bag is hoisted into the pipe B by means of any hoisting apparatus, D; then the lower valve b^4 as well as the pipe b will be closed and the pipe b^2 opened. As soon as the pressure has escaped through this pipe the upper valve b^3 is opened, allowing the bag to be hoisted up. In using the pipe B, shown in Figs. III, IV, V, and VI, the pressure in the pipe B will be supplied or discharged as before, and when the door b^5 is open the bag may be placed in the pipe B by the workmen without using the hoisting apparatus. After closing the door b^5 and releasing the pressure in the pipe B and the upper valve b^3 is opened, any hoisting apparatus may be used to hoist the bag out of the upper end of the pipe B.

In using bags shown in Fig. VII, the lower valve b^4, or the door b^5, will not be used continuously, and the upper valve b^3 may be allowed to remain open as the bag C fits the tube B by means of the collar c^1, and one bag after the other may be hooked to the first, always leaving one bag in the pipe B to keep it closed.

N is a glass for inspection of the air-chamber. By maintaining a strong light in the chamber while the place of observation is comparatively dark, objects within the air-chamber H will be plainly visible through the glass. Glasses may be placed so as to inspect through them all parts of the air-chamber, care being taken to insert the glasses so as to resist the pressure of the air within the air-chamber by means of the frame n^1.

When the glass N is not in use a door, n^2, may close tight over it as a security against accidents. The air-lock A may be in any of the ordinary forms of construction, as may be the pumps and other appliances commonly used in pneumatic piles or caissons, it only being necessary to make the air-lock smaller in diameter than the pneumatic pile or caisson K, and to have its lower surface at or near the upper surface of the air-chamber H, and below the top of the pile or caisson K. M are the staves shown driven into the ground to increase the effective bearing-surface of the pile downward and sidewise.

The piles or caissons, as well as the other parts of the apparatus may be made of iron or any other suitable material.

Having thus fully described my invention, I would state that I am aware that guys have been used in sinking piles and caissons to guide such piles or caissons to their proper places. This I do not claim; nor do I claim observation-glasses, *per se;* but

What I claim as my own invention, and desire to be secured by Letters Patent, is—

1. The combination of the air-lock A, the caisson or pile K, and the air-chamber H, as and for the purpose described and represented.

2. The reservoir F, with a regulating-valve, f^4, interposed between the air-pumps and the chamber H, as and for the purposes described.

3. The guys E, carried down with, and held by the pile or caisson being sunk, so as to serve as anchorages for subsequent or contiguous piles or caissons that are to be sunk to steady them in their descent, as described.

4. The staves M, in combination with the pile or caisson, substantially as and for the purpose described.

5. The combination of the pipe B with the bags or buckets C, formed as herein described, to co-operate with the same, for the purpose of removing the excavated matter and keeping said pipe always closed, as described.

6. The observation-glass N, arranged between the air-lock A and the air-chamber H, as and for the purpose described and represented.

FREDERICK E. SICKELS.

Witnesses:
EUGENE GUNGENBERG,
LOUIS RIESE.