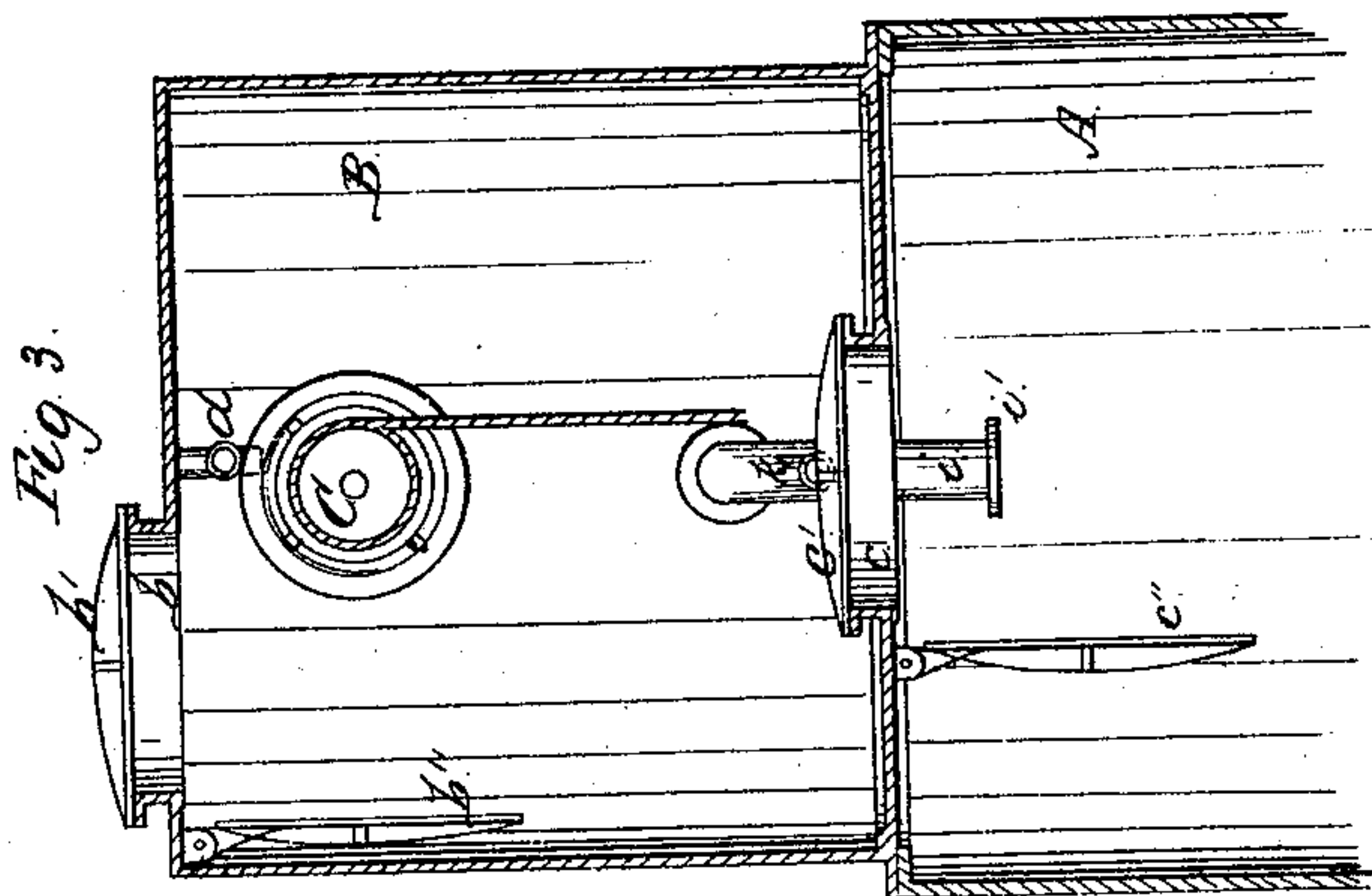
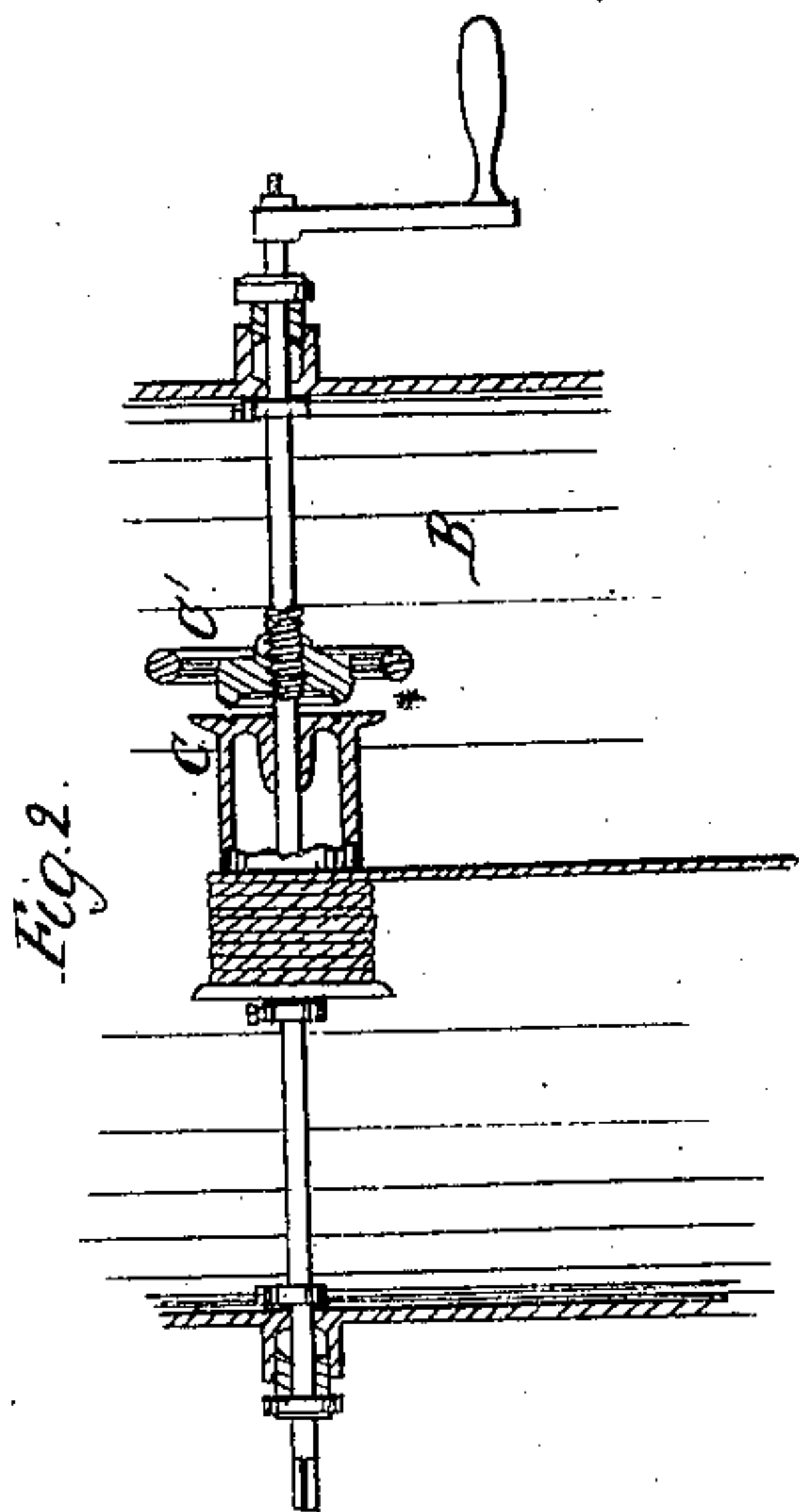
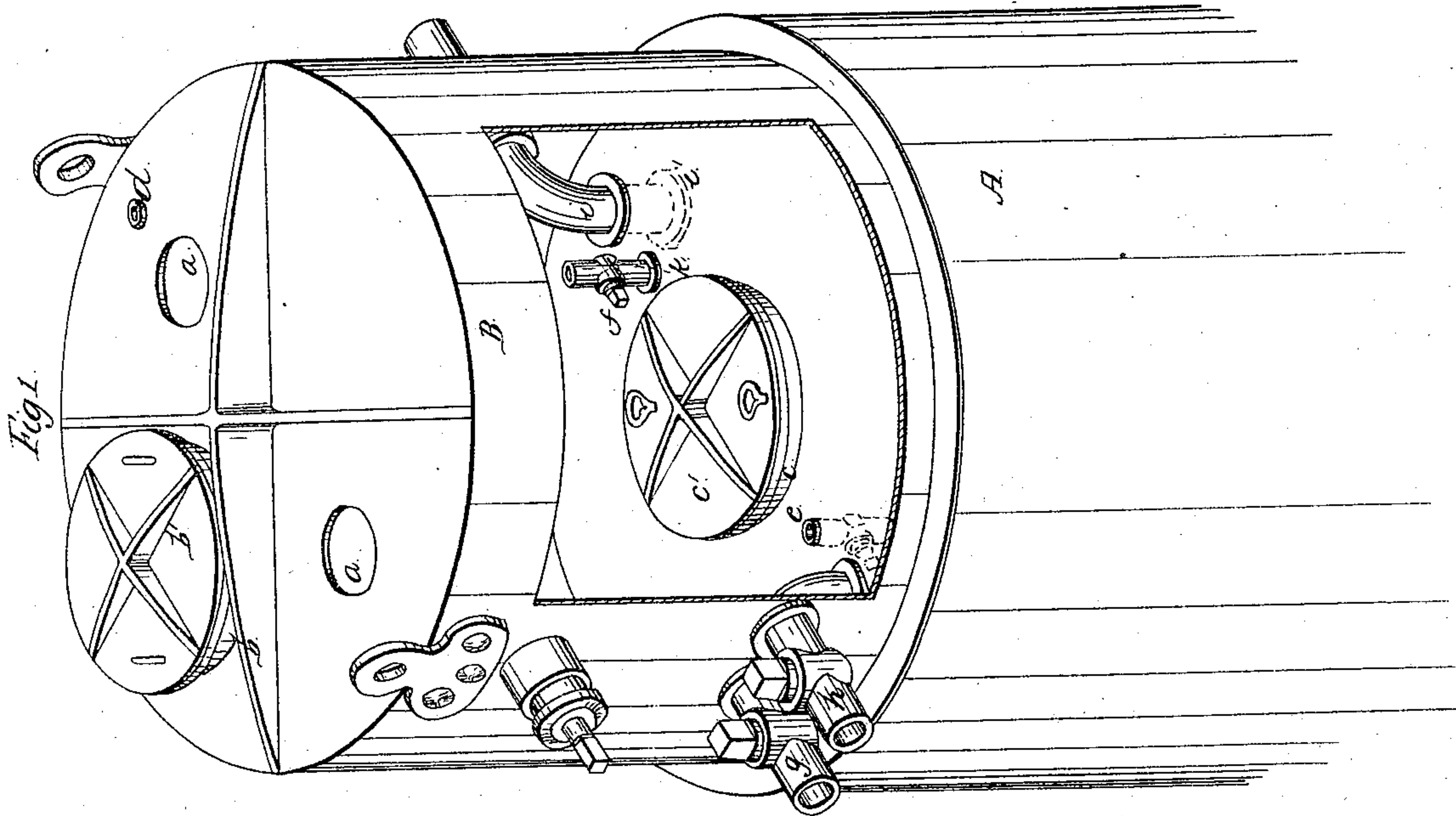


A. Holmstrom.

Pile Driver

N^o 12,130.

Patented Jan. 2, 1855.



UNITED STATES PATENT OFFICE.

ALEXANDER HOLMSTROM, OF NEW YORK, N. Y.

APPARATUS FOR ATMOSPHERIC PILE-DRIVING.

Specification of Letters Patent No. 12,130, dated January 2, 1855.

To all whom it may concern:

Be it known that I, ALEXANDER HOLMSTROM, of the city, county, and State of New York, have invented certain new and useful
5 Improvements in Apparatus for Atmospheric Pile-Driving; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being made to the annexed drawings, making a
10 part of this specification, in which—

Figure I is a perspective view showing partly the interior; Figs. II and III are sections in detail; and similar letters refer to similar parts throughout.

15 My invention is for certain improvements in the pneumatic process for driving hollow piles or cylinders in the construction of hydraulic works of various kinds, said process being known as "Potts's."

20 I call my invention an "air-lock," and the object of it is to enable all the various operations of taking in materials, exhausting, or forcing air, &c. to be performed without discharging the workmen and by which also the
25 said workmen have complete control of the pneumatic apparatus from within, so that they can apply the pressure, or the vacuum, or regulate the same as may be required, and can also govern the valves for ingress or
30 egress; whereas in the old plan these have to be varied by signals to others outside.

By means of my improvement the amount of work which can be performed in a given time is much greater than by the other plans,
35 while the safety is not only much increased but it is also found that the men will work much better under the sense of security given by their possession of the entire control of the apparatus from within.

40 The manner of constructing and operating my said air-lock is as follows: At A is a portion of a metal cylinder or pile intended to be sunk in the ground beneath the water, as usual by the air pump. The air-lock is
45 bolted fast upon the top of the pile and the joint made air-tight in the same manner as if the common cap or plate were used. The air-lock is shown at B, and as represented, consists of a strong air-tight cylindrical
50 chamber. This ought to be of a sufficient height to allow men to stand upright to work therein—the side in Fig. I is shown, as if partly cut away, merely to exhibit the interior). Upon the top at (a, a) are two or
55 more lights of strong glass, and at (b) is a man-hole. This is capable of being closed

by two covers, one of which is on the outside at (b'), and the other opening inward at (b''), Fig. III, where it is shown open and hanging by its hinge. Through the bot- 60 tom of the lock there is a second man-hole, precisely like that just described, of which (c, c', and c'') Figs. I and III, will indicate the relative parts.

At C there is a windlass, the shaft of 65 which is supported in bearings in the sides of the lock, the ends passing through so as to be operated by a winch or otherwise from the outside, and the joints being kept tight by stuffing boxes as shown in Figs. I and II. 70 The windlass is so contrived that its shafts may rotate without also turning the barrel except at the option of those inside. This is accomplished by means of the pinch-nut C', Fig. II, which when screwed up against the 75 windlass causes that to turn with the shaft, while if unclamped, the windlass remains stationary, in which latter position it is shown in Fig. II. The position of the wind- 80 lass is directly over the lower manhole (c) leading into the hollow pile.

The several pipes are situated and operated as follows: (d) Figs. I and III is an air pipe forming a communication from the in- 85 side of the air-lock to the outside, the cock or valve being inside. When there is a greater pressure in the inside than outside the man-hole cover (b'') is always closed and is kept up by said pressure. (It may be remarked that all the covers are either ground or gum 90 joints and keep tight by mere contact of surfaces.) When therefore a workman on the inside wishes to get out he first opens this pipe (d), when as soon as the pressure is equalized, the cover (b'') falls upon its 95 hinge, as shown in Fig. III, and thus opens a passage, the cover (b') not being on in any case except there is a vacuum within when of course there will be no workman there. At (e) is another air pipe and cock, serving 100 a purpose somewhat like that at (d) viz. to effect from the inside of the hollow pile an equalization of the pressure between it and the air-lock from within the former, and at (f) is another air pipe leading to the pile, 105 and as represented, is to be operated from within the air-lock.

At (g, h) are two pipes which have communication with the interior of the hollow pile A, from without the air-lock, the dis- 110 charge being through the floor as shown. One of these (g), leads to and terminates in

a receiver connected with the air-exhausting pumps, as usual, and the other (*h*) leads to and is connected with air-forcing-pumps. At (*i*) is also a pipe which communicates from within the pile to the outside of the air-lock. This is a discharge pipe. It has on the inside a flange as seen at (*i'*) to which additional length of pipe may be added, whereby it can be extended down to the bottom of the pile.

Having now described the several parts of the air-lock, the use of the same can be more fully ascertained by the following description of its operation in connection with the sinking of the pile; and first to show its use more completely I will briefly state the mode of Potts. In the first place in sinking the pile a cap must be put on the upper end and made air-tight; from this a pipe leads either to an exhausted receiver, or to an air-pump; if to the former, as soon as the communication is made, a partial vacuum is formed within the pile which causes the water, sand, &c., to rush violently out by the connecting tube, while it is at the same time forced down by the external pressure thus obtained. When it has been driven deep enough the interior is to be filled with mason work to give it weight and stability, and it is here that my improvement comes chiefly into play to facilitate the working and reduce both the time and expense as well as perform a superior quality of work. It is known that both vacuum and compressed air are used in this mode of performing submarine works. The compressed air is brought into play at such times as it is necessary for men to work within and near or upon the bottom, as for instance, if before the pile has been sent down to the intended depth it shall be opposed by some obstructions, as rocks or trunks of trees, then these must be cleared out of the way. For this purpose the pile must be kept free from water, or if sent down to its proper depth, then in order to carry on the laying of the mason work it must also be kept free from water. To accomplish this the cap is put on, (the men and materials being within), enough air is forced in to counter-balance the pressure of the water from the outside, and hence as none can enter, the workmen may operate free from that obstruction. Now it will be seen that as soon as the materials are used up, (which can be put in but in very limited quantities,) the cap must be taken off, the men get up and take in the supply and the operation of forcing out the water be gone over. There is also a certain amount of danger, for the lives of the workmen are wholly dependent on those without, or on the perfection of the pumping-apparatus, or of the system of signals. Hence they always work with more or less of fear.

Now by my improved "air-lock" as be-

fore mentioned it is wholly controlled from within and it has also this advantage, the materials may be constantly supplied to the pile without taking off the necessary pressure required to keep it free from water. In the first place I will suppose that the hollow pile A has been sent down to a certain depth by the vacuum, and has been arrested by an obstruction, as a rock. The base of the air lock B being bolted upon the head of the pile forms the cap equivalent to the old mode. The force of compressed air is now to be employed to empty the water and leave the rock bare for the operation necessary to remove it. The cover (*b'*) is taken away from the man-hole (*b*) and as many men enter as are required for the work, taking in also such tools and materials as are necessary. The cover (*c'*) is next taken off of the man-hole (*c*) and a length of pipe sufficient to reach to or near the bottom is bolted upon the flange (*i'*) of the discharge-pipe (*i*). The cover (*b''*) is then raised and the man-hole (*b*) closed from within. The compressing-air-pumps are then set in motion, and air forced in through (*h*) and inasmuch as the man-hole (*c*) is open the pressure extends throughout both the air-lock and the pile, the upper or top becoming the cover. This pressure keeps up the cover (*b''*). The pressure upon the surface of the water begins to force it out through the discharge pipe (*i*) in a continuous jet or stream, the operation being continued until the interior of the pile is free. The workmen can then descend being lighted by the glass (*a*) or by artificial means as required. The operation on the bottom now commences. The shaft of the windless C is to be kept in continued rotation from without. Any weights can be raised from the bottom of the pile by throwing the barrel of the windlass into gear. The stone forming the obstruction to the descent of the pile, as fast as quarried, is thus brought up and piled upon the floor of the air-lock. As soon as the quantity raised has filled the air-lock as far as can be conveniently done it must be emptied. This can accordingly be done without disturbing the men at work in the bottom of the pile, for they can go on and get stone ready for hoisting. In order however to be able to open the cover (*b''*) the pressure of the air within must be made the same as that without, and this must be so done as not to relieve the pressure within the pile. The cover (*c''*) is therefore shut up against (*c*), the cock (*d*) may then be opened and the compressed air rushing out, an equilibrium will be produced, at which moment the cover (*b''*) falls open, the pressure of the air being still maintained within A by the continued working of the force-pumps. The stone and other matter excavated is then taken out, and anything re-

quired within may be received. The cover (b'') is once more closed against (b), the air-cock (f) opened, and the pressure within the air-lock and pile equalized, at which moment the lower cover (c'') falls open and the communication is once more restored. The work of raising the accumulated stone, &c., then goes on as before. It will be seen that the men in the pile can work with perfect security for should anything occur whereby it was rendered necessary for them to come out all that would be required would be to open the air-cock (e) when the pressure would soon be taken off and the cover (c'') thereby opened. It is now supposed that the obstruction which prevented the descent of the pile has been removed; it is then ready to receive the effect produced by the vacuum. The men all come up into the air-lock and the cover (c') is put on to (e). The pipe (i) being closed from the outside, the cock (g) leading to the exhausted receiver, or directly to the air-pumps, (as may be requisite to produce a sudden or a gradual descent,) is opened and the vacuum in A produced, the pile descends as usual. Of course the air-lock is never to go below the surface of the water. As soon therefore as the top of A approaches the surface as near as deemed safe the air-lock must be unbolted from the flange and hoisted out of the way by a crane, and another joint of the pile put on; the air-lock is then raised to the top of this last and made fast as before, descending with it to the water's edge.

When the pile has been driven to the intended depth and the interior is to be filled with masonry the same general plan before described is to be followed. Materials are to be put into the air-lock in such quantity as may be convenient and they are to be replenished from time to time without interruption to the workmen in the hollow pile, by cutting off the communication with said pile and the air-lock during those intervals.

What I claim as of my invention and desire to secure by Letters Patent is—

1. Constructing the "air-lock" in such manner that the pressure of the air, either within the lock or within the hollow-pile, may be governed by the workmen inside, whereby they are thus enabled wholly to control the means of escape for themselves.

2. I claim combining with the air-lock a hoisting apparatus to which the moving power is given from the outside of the lock, but the application of that power to the windlass is made by the workmen within whenever the same may be required, whereby those men are not only relieved from any extra exertion but the ability is also maintained of applying greater force than could be done were the motive power given from within, the whole being constructed and operating substantially as set forth herein.

ALEX. HOLMSTROM.

Witnesses:

S. H. MAYNARD,
JAMES L. ROBERTS.