(No Model.)

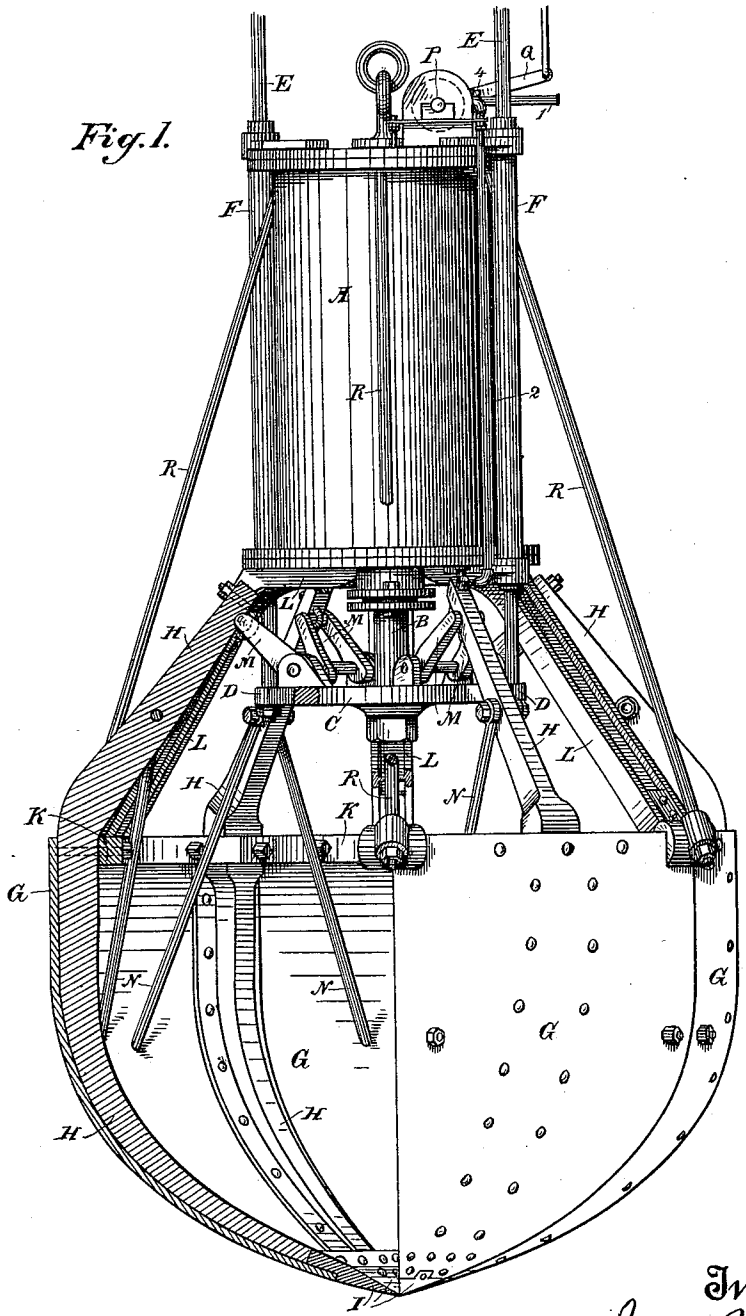
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I. P. LAMBING.

EXCAVATOR.

No. 403,762. Patented May 21 1889.

Fig. 1.



Witnesses,
Geo. H. Strong.
F. H. Howson.

Inventor,
Isaac P. Lambing.
By Dewey & Co.
attys

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.)

3 Sheets—Sheet 2.

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Fig. 2.

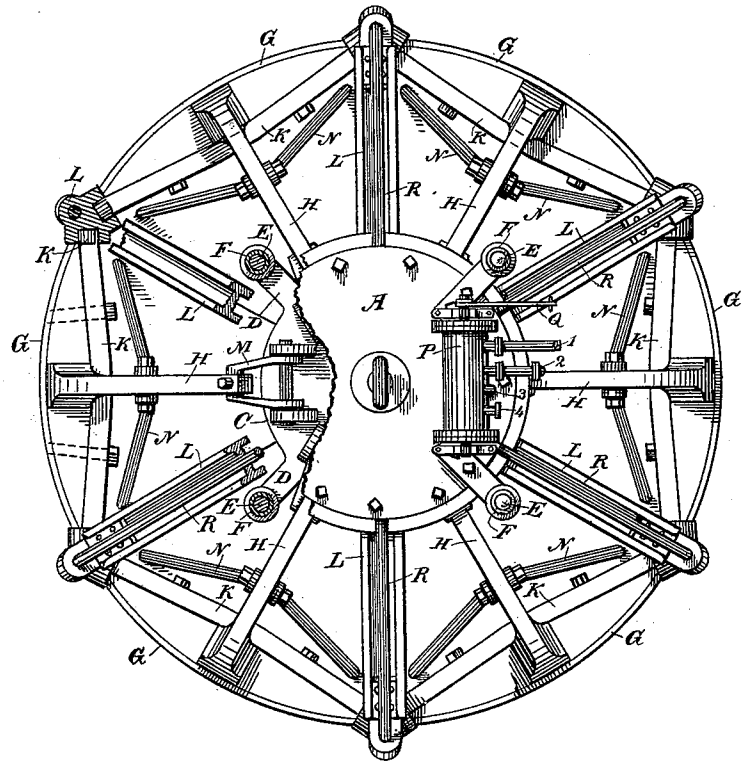
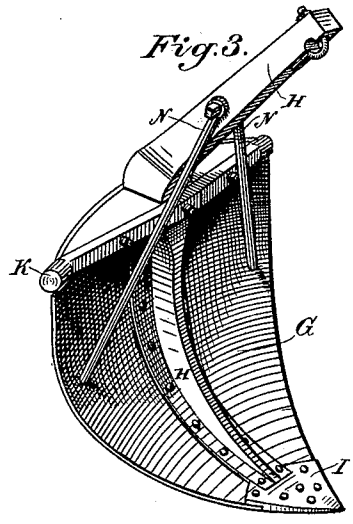


Fig. 3.



Witnesses,
Geo. H. Strong.
J. L. Bourse.

Inventor
Isaac P. Lambing.
By Dewey & Co.
Attys

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.)

3 Sheets—Sheet 3.

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Fig. 4.

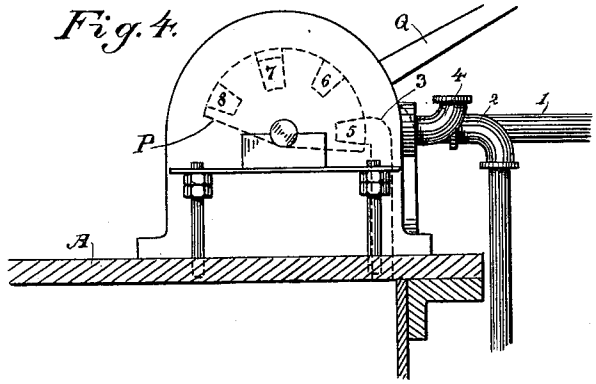


Fig. 5.

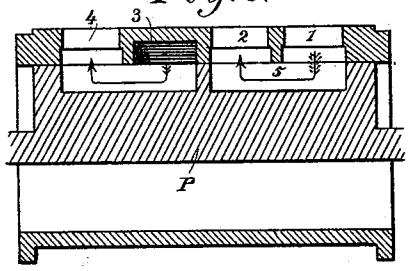


Fig. 7.

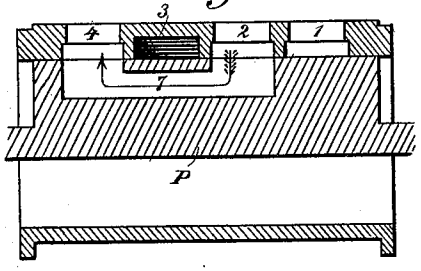


Fig. 6.

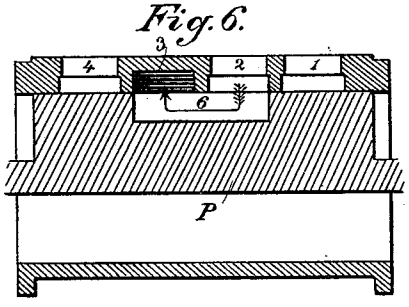
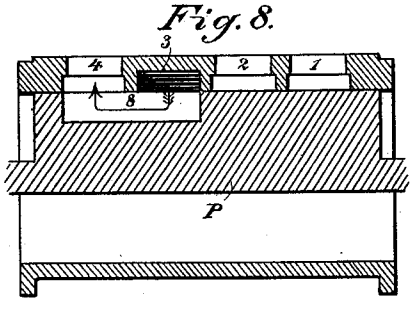


Fig. 8.



Witnesses,
Geo. H. Strong.
J. H. Mourse.

Inventor,
Isaac P. Lambing
By Dewey & Co.
attys

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

ISAAC P. LAMBING, OF IONE, CALIFORNIA.

EXCAVATOR.

SPECIFICATION forming part of Letters Patent No. 403,762, dated May 21, 1889.

Application filed August 30, 1888. Serial No. 284,151. (No model.)

To all whom it may concern:

Be it known that I, ISAAC P. LAMBING, of Ione, Amador county, State of California, have invented an Improvement in Excavators; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to an improved excavating-bucket and mechanism for opening and closing the same; and it consists in an improved form and construction of the bucket-sections, means for journaling, bracing, and operating same, and in certain details of construction, all of which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is an elevation of my excavator, showing one bucket-section in cross-section. Fig. 2 is a plan view of the excavator. Fig. 3 is a perspective view of one of the bucket-sections. Fig. 4 is an end view of the valve. Figs. 5, 6, 7, and 8 are horizontal sections of the valve and chamber, showing their different relative positions.

In a patent issued to S. N. Knight and myself July 10, 1888, No. 385,759, we have shown a dredging-bucket composed of sections, which, when closed together, form a hollow hemisphere, these sections being opened and closed by means of a piston within a steam-cylinder and certain connecting rods and links. Certain objections have arisen in the actual operation of this apparatus, which it is the object of my present invention to overcome.

A is a cylinder of any suitable dimensions, suspended so as to hang vertically from tackle which is connected with a hoisting-derrick, so that the cylinder and its attachments can be raised and lowered by the derrick and swung to any other point where the load is to be deposited when operating. The opening and closing of the bucket is effected by pressure of steam, air, or other medium acting upon a piston which moves vertically within the cylinder. The piston-rod B extends downwardly through a stuffing-box in the lower head of the cylinder, and is strongly connected with a cross-head, C, which is fixed to its lower end. This cross-head has extensions D projecting outwardly beyond the periphery of the cylinder-head, and through these extensions pass guide-rods E, which extend upward parallel with the cylinder and slide up and down within the guides F, which thus serve to steady the movements of the cross-head.

The excavating-bucket is formed of sections G, which, when closed together, form a cup or continuous vessel, shaped something like a flattened hemisphere. The object of these variations from the hemispherical form will be more fully described hereinafter. Each of these sections (which together form a complete bucket) has a strong heavy central rib, H, extending from the point or shoe along the inside and up to the upper end of the section, from which an arm or continuation extends upwardly to a point above the cross-head C. A shoe or point, I, made of heavy steel, is fitted to the point of each of the segments, abutting against the ends of the strengthening-ribs H, and serving to dig or excavate the material to be operated upon. These shoes may be removed to sharpen and replaced when worn out with little trouble.

Shafts K extend horizontally across the top of each segment, and a solid filling of iron is fitted between these shafts and the upper edges of the sections, through which they are strongly bolted. These shafts are preferably curved inwardly, as shown in the plan view, Fig. 2, so as to act as trusses to brace and strengthen the segments. To the lower end or head of the cylinder A are cast or secured the arms L, which extend outwardly and downwardly at an angle from the cylinder, as shown, and on their outer ends are formed journals, into which the ends of the shafts K enter, these shafts being turned so as to fit the journal-boxes and rotate in them when the bucket-sections are opened or closed. These journal-boxes may be adjusted upon the arm L, to stand nearer to or farther from the center, and the amount of opening of the bucket-sections is thus controlled.

The central strengthening-ribs, H, are extended above the upper edges of the sections, as previously described, being bent inwardly, as shown in Figs. 1 and 3, and by means of the connecting-rods M their upper ends are united with the cross-head C, so that as the latter is depressed by the downward movement of the piston and piston-rod these extensions or arms H are drawn downwardly and inwardly, throwing the bucket-sections outward and opening

them about the journals upon which they turn. When pressure is applied beneath the piston in the cylinder to force the piston up, it carries with it the cross-head C, and, acting through the connecting-rods M, it forces the arms H first upwardly and finally outwardly, thus closing the bucket-sections and forcing the points together. The action of the inwardly-bent arms H and the connecting-rods M is similar to that of a toggle-joint, because as the cross-head rises the connecting-rods M come more nearly into a position perpendicular to the arms H, which incline inwardly from the top of the bucket-sections, and thus exercise a powerful direct pressure, which is exerted upon the bucket-sections to force the points together. Owing to the changing position of the connecting-rods M, the power to force the sharp-pointed sections through hard material increases as the sections penetrate deeper and at the same time when the greatest power is required. This construction differs from that of the former patent, in which the bucket-sections are drawn toward each other, and the power exerted is less when the sections are nearly closed, whereas in my present invention it is greater and insures the perfect closing of these sections in hard material.

In order to overcome the tendency of the bucket-sections to twist out of shape when power is applied to them and when working in hard or rocky ground, I employ brace-rods N, the lower ends of which pass through the bucket-sections near the outer edges at the abrupt bend in the segments, and the upper ends are bolted to the arms H, as shown.

Experience has shown that a segment of a perfect globe or hemisphere does not do satisfactory work, because the excavated material piles up in an irregular manner when the sections are closed together. For this reason the sections of my bucket are formed as shown in Figs. 1 and 3, the upper portion extending downwardly from the upper edge in a nearly vertical direction when the sections are closed together, curving gradually toward the center and extending from this point toward the shoe in a more flattened curve, as is plainly shown in the drawings, Figs. 1 and 3. This construction allows the excavated material to slide well up from the point toward the sides, thus filling the bucket more evenly than when hemispherical sections are used. The connecting-rods M, which unite the cross-head C with the inwardly-inclined arm H from the bucket, are V-shaped in form, the united end or point of the V connecting with the arm, while the open or separate ends are journaled upon shafts upon the cross-head C, thus making strong and rigid connection between the two. The arms L, extending out from the bottom of the cylinder, and which carry the journal-shafts of the bucket-sections, are strongly braced from the upper flange of the cylinder by brace-rods R.

Steam or compressed air is brought from the operating-cylinder through a flexible, jointed, or telescopic pipe, which will allow the apparatus to move freely as desired, and in order to utilize the expansive force to the fullest extent within the cylinder I employ a four-way rotary valve, P, which turns within a valve-chamber upon the top or upper head of the cylinder. This valve-chamber is constructed with four ports, which are marked 1, 2, 3, and 4, respectively, No. 1 (at the right) receiving steam or air, No. 2 connected with the bottom of the cylinder, No. 3 with the top of the cylinder, and No. 4 with the exhaust. Steam or compressed air is first admitted through the ports 1 and 2 by turning the valve so that these ports correspond with the passage 5 in the valve, and it passes thence into the bottom of the cylinder and forces the piston to the top, (the upper end of the cylinder being connected with the exhaust,) thus acting through the piston-rod to close the bucket-sections, in which condition they remain until the apparatus has been hoisted by means of the derrick and turned to the place where it is desired to discharge the load. The valve is then turned by the lever Q until the ports 2 and 3 are connected by means of the passage 6 in the valve, and this allows steam or air to pass from the bottom to the top of the cylinder, and, relieving the piston from pressure below, the bucket-sections will then partly open by the weight of their load. Another turn of the valve connects the port 2 from the bottom of the cylinder and the exhaust-port 4 by means of the passage 7, thus allowing the steam or air to exhaust from the bottom of the cylinder, while the portion remaining above the piston expands and forces the piston down and throws the bucket well open. A still further movement of the valve connects the ports 3 and 4 by the passage 8, thus allowing steam or air to exhaust from the upper end of the cylinder. The valve being again returned to its first position after the apparatus has been placed ready to take another load, the bucket-sections will again be closed, as above described. By this construction the air or steam which is admitted below the piston to close the bucket-sections is transferred to the upper end of the cylinder, where it acts expansively to force the piston down and open the sections to discharge the load, thus doing double service and economizing the air or steam. I have also greatly strengthened the bucket-sections, improved their form and capacity for entering and excavating dry or hard material, and improved the mechanism by which they are closed, making it more direct and operative.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an excavator, the concave spheroidal segments having their upper edges journaled on supporting-shafts about a horizontal circle and their points presented downwardly,

so as to be opened and closed with a common center, said sections having the portion nearest the shafts approximately vertical, and continuing from the shoulder in the form of a flattened curve toward the point, substantially as herein described.

2. In an excavator, the flattened segments having their bases upward and suspended upon journal-shafts about the periphery of a horizontal circle, the points presented downwardly so as to close at a common center, in combination with the removable shoes, dovetailed or attached to the points, substantially as herein described.

3. In an excavator, the sections journaled upon horizontal shafts around a circle, with the points presented downwardly so as to close toward a common center and form a flattened hemisphere, with central ribs extending from the points up to the upper edges of the sections, and having the arms or continuations H extending inwardly, in combination with the vertically-moving cross-head and the connecting-rods uniting said cross-head with the inwardly-inclined arms, substantially as and for the purpose herein described.

4. The segments forming the excavator, having journal-shafts extending across the upper edges and turning in journal-boxes in arms which extend downwardly and outwardly from the lower cylinder-head, curved strengthening-ribs extending from the point to the top of each section, and having inwardly-projecting extensions H, in combination with the cylinder A, piston and piston-rod, the cross-head secured to the lower end of the piston-rod, and the connecting-rods M, uniting the cross-heads with the arms, substantially as and for the purpose herein described.

5. The bucket-sections having their points presented downwardly and their bases supported upon horizontally-journaled shafts turning in boxes in arms which extend downwardly and outwardly from the lower cylinder-head, said journal-shafts having the centers bent inwardly and secured to the top of the sections, so as to act as truss-braces to strengthen the upper edges of the buckets, substantially as herein described.

6. The vertically-suspended cylinder with the piston, piston-rod, cross-head, and guides, the radial arms projecting downwardly and outwardly from the lower end of the cylinder, and the journal-boxes fixed to the arms, as shown, in combination with the flattened hemispherical sections having shafts the journals of which turn in these boxes, and the extension-ribs H, together with the connecting-rods M, whereby the arms H are actuated with a resultant motion derived from the vertical movement of the cross-head, substantially as herein described.

7. The connecting-rods M, made V-shaped and having the apex connected with the arms H and the open ends fulcrumed or journaled to the cross-head, substantially as herein described.

8. The circularly-arranged segments journaled at the top so that their points meet at a common apex at the bottom, the arms or extensions H, connecting-rods M, and the cross-head, in combination with the cylinder A, piston, and piston-rod by which the cross-head is actuated, and a valve whereby air or steam is admitted to act successively below and above the piston and close and open the bucket-sections, substantially as herein described.

9. A dredger or excavator consisting of the segments journaled to open and close about a common apex at the bottom, lever-arms H, and connecting-rods M, in combination with a vertically-suspended cylinder, a piston, and piston-rod having at its lower end a cross-head, to which the connecting-rods M are journaled, and a valve mechanism whereby steam or air is first admitted below the piston to close the bucket-sections, and is then transferred above the pistons to open the bucket-sections, substantially as herein described.

In witness whereof I have hereunto set my hand.

ISAAC P. LAMBING.

Witnesses:
S. H. NOURSE,
H. C. LEE.