No. 665,682.

Patented Jan. 8, 1901.

O. HETLESAETER.

EXCAVATOR BUCKET.

(Application filed Jan. 5, 1900.)

(No Model.)

2 Sheets—Sheet 1.

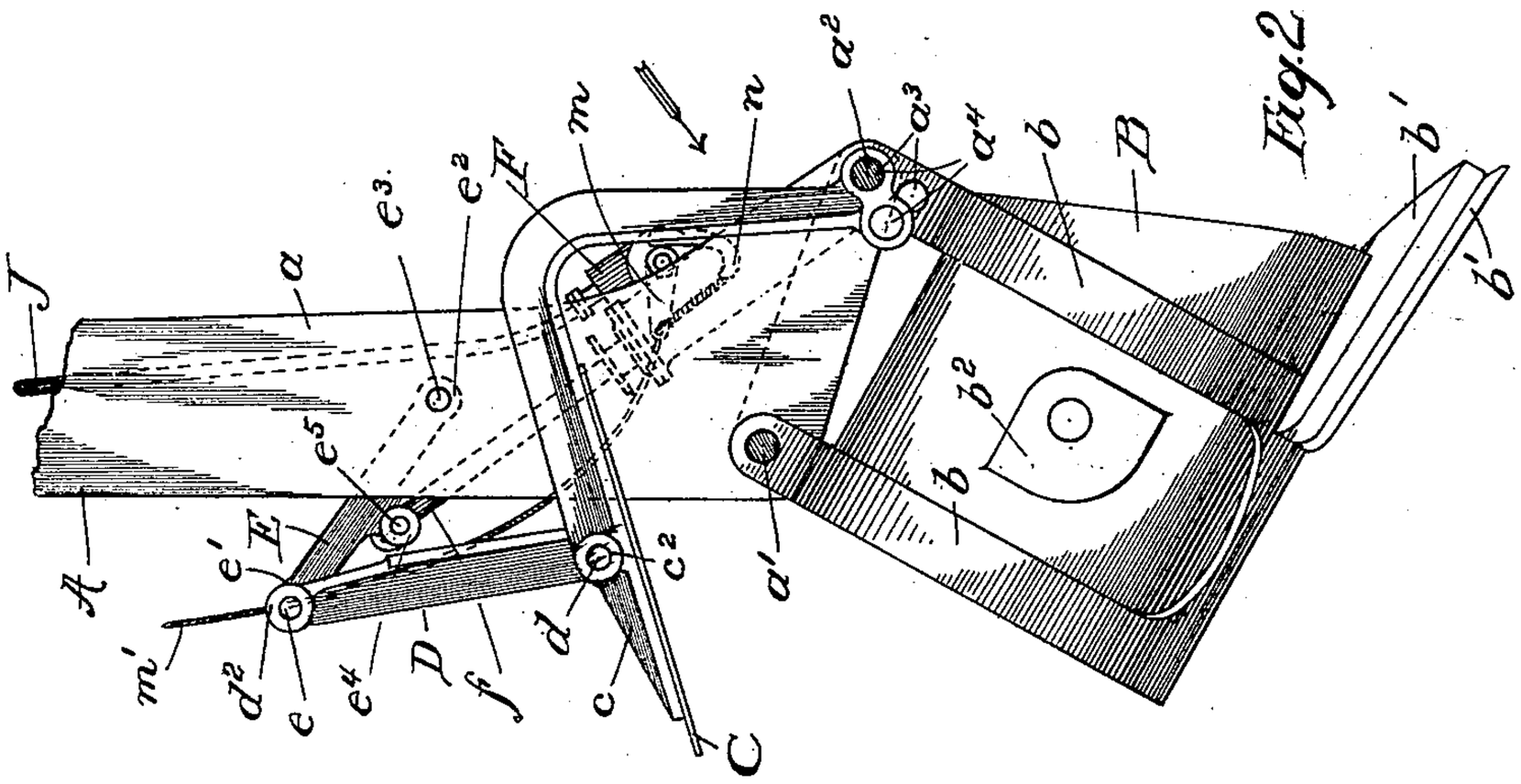

Fig. 2.

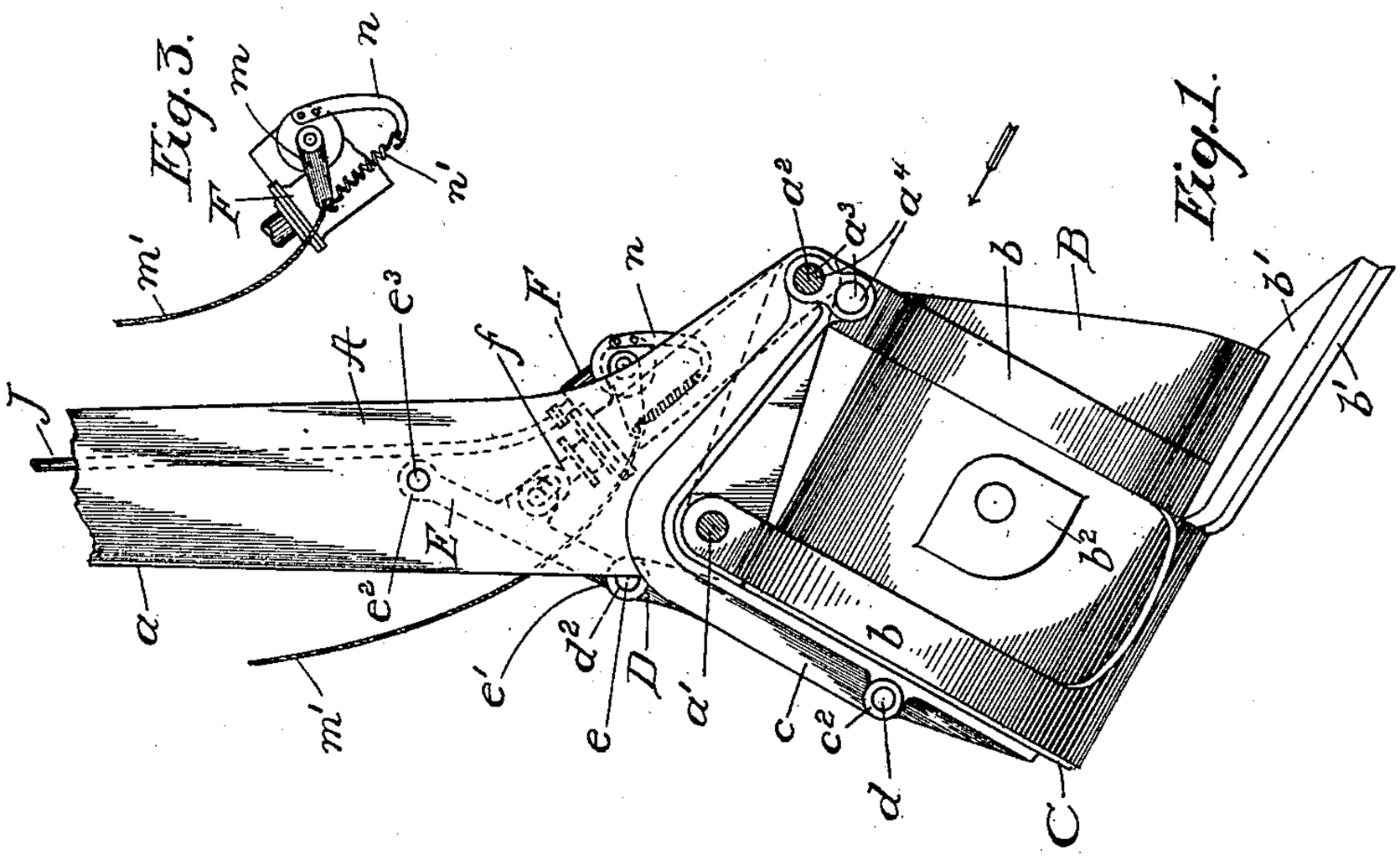

Fig. 3.

Fig. 1.

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Fig. 12

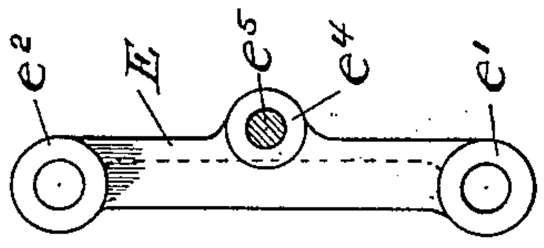


Fig. 11.

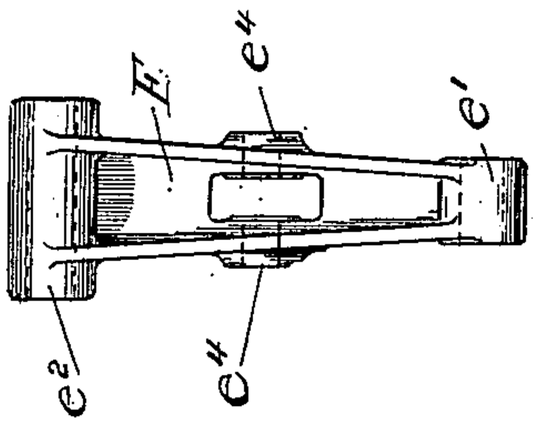


Fig. 6.

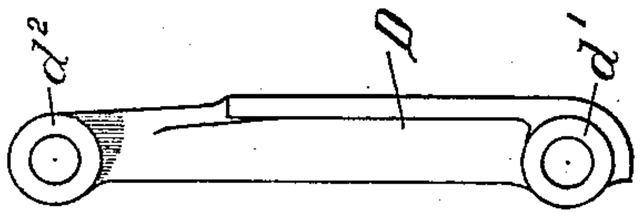


Fig. 5

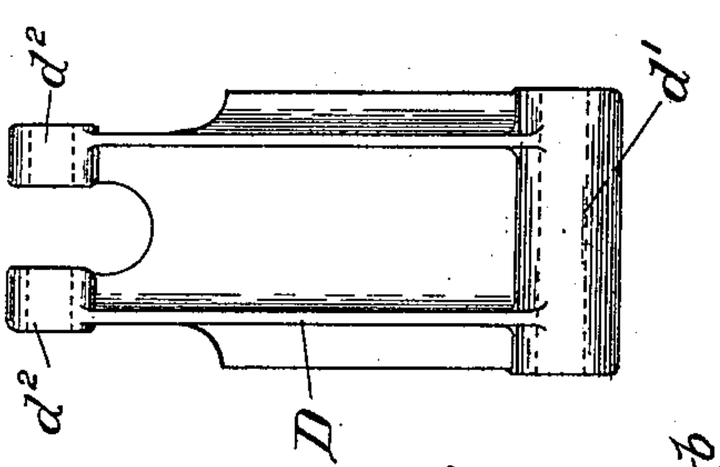


Fig. 4

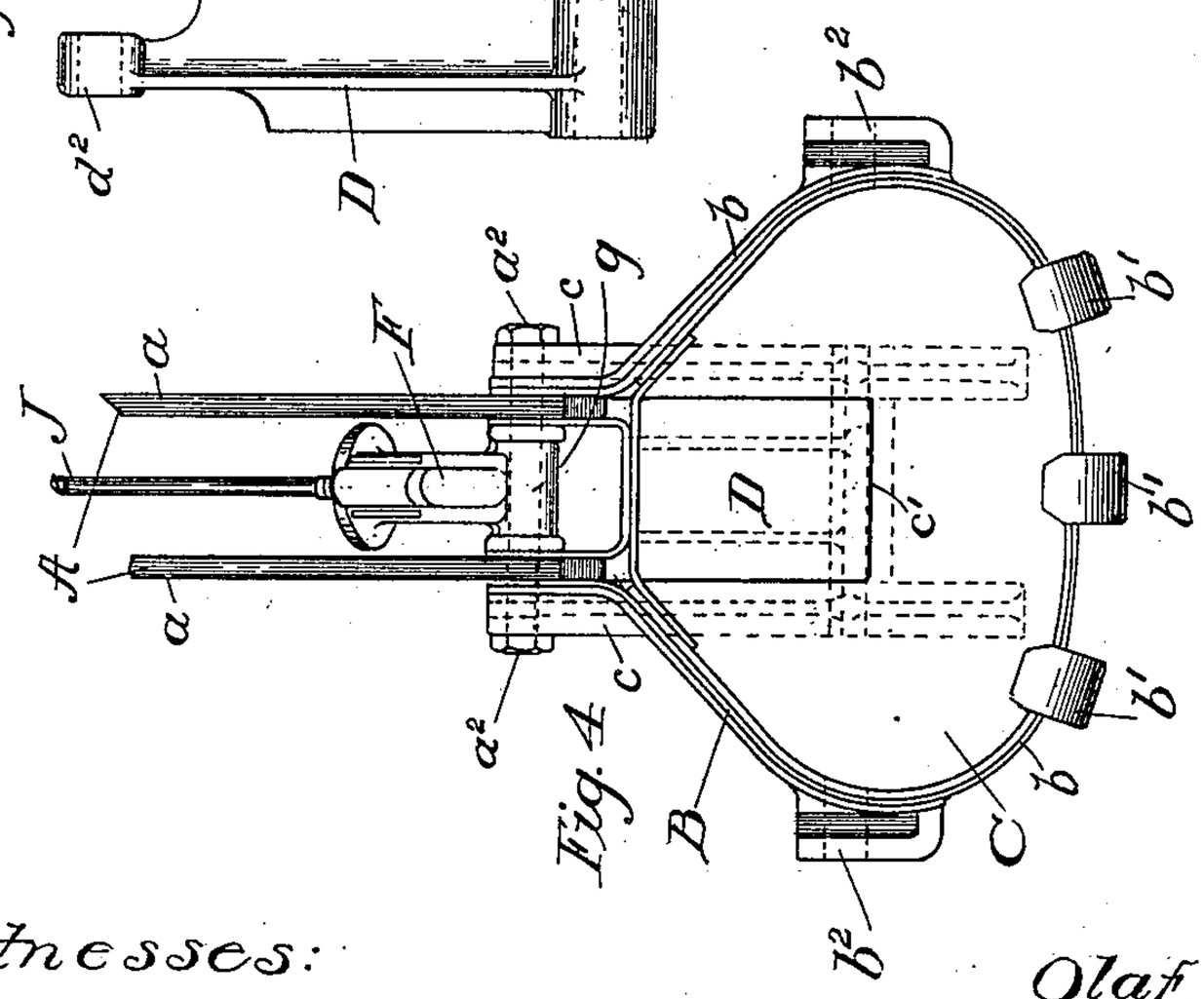


Fig. 10.

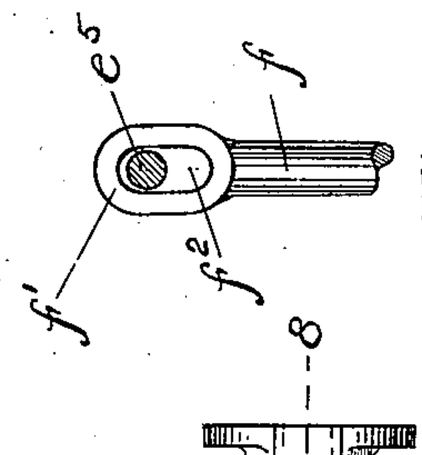


Fig. 7.

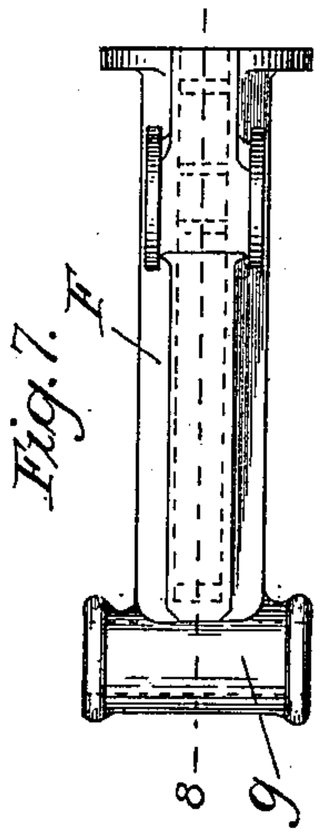


Fig. 8.

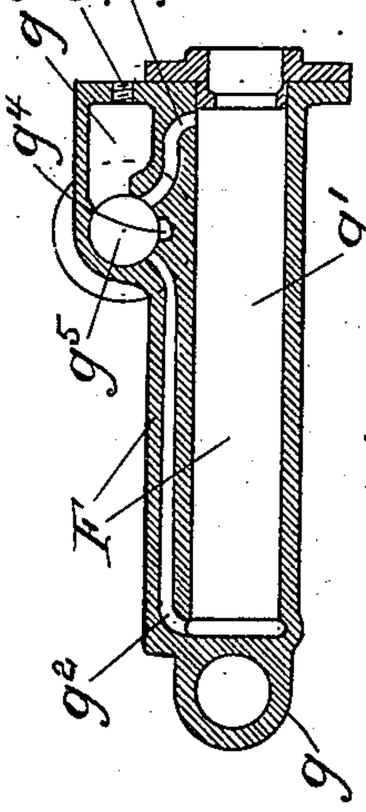
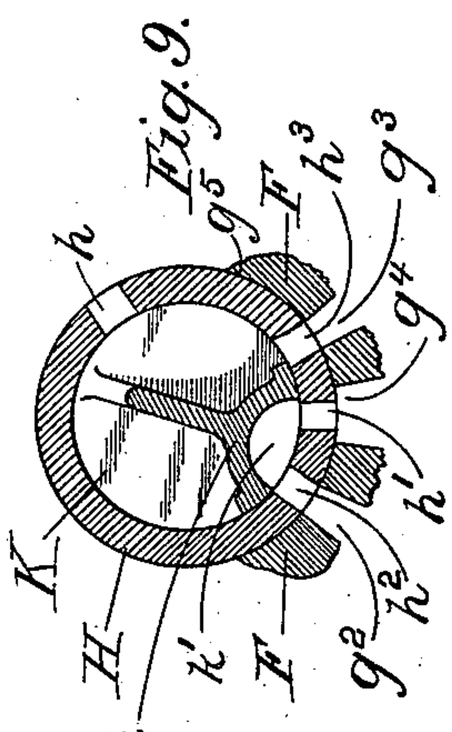


Fig. 9.



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UNITED STATES PATENT OFFICE.

OLAF HETLESAETER, OF CHICAGO, ILLINOIS.

EXCAVATOR-BUCKET.

SPECIFICATION forming part of Letters Patent No. 665,682, dated January 8, 1901.

Application filed January 5, 1900. Serial No. 469. (No model.)

To all whom it may concern:

Be it known that I, OLAF HETLESAETER, a citizen of the United States, residing in the city of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Excavator-Buckets, of which the following is a specification.

My invention relates to excavator buckets or dippers, especially of the type used in connection with steam shovels and dredges wherein a bucket is carried by a handle of considerable length.

The objects of my invention are, first, to provide a bucket door or bottom which shall be positive, acting in all positions of the bucket and in all positions of the said door or bottom relatively thereto; second, to provide means for imparting to the door at the commencement of its motion to open a slight shock or jar for the purpose of insuring the prompt action of the moving parts and for facilitating the discharge of the contents of the bucket; third, to provide a door or bottom of such construction that when open it may occupy a position remote from the bucket and at the same time be compact in form with no part projecting any considerable distance from the bucket or bucket-handle, and, fourth, to provide the other details hereinafter set forth. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a side view of a bucket and adjacent portion of the handle thereof, showing my invention, the bucket door or bottom being shown in a closed position. Fig. 2 is a side view of the bucket and handle, as in Fig. 1, showing the door or bottom in an open position. Fig. 3 is a detailed view of a portion of the door-operating cylinder, showing the exterior parts of the valve mechanism. Fig. 4 is a view of the bucket and handle looking in the direction of the arrow, Fig. 1. Fig. 5 is a view in detail of the supplementary door-section looking in a direction opposite to that of the arrow, Fig. 1. Fig. 6 is a side view in detail of the said door-section as shown in Fig. 5. Fig. 7 is a detailed view of the operating-cylinder looking in the direction of the arrow, Fig. 2. Fig. 8 is a sectional view of the operating-cylinder, taken on the line 8 8, Fig. 7. Fig. 9 is a sectional view, on an enlarged scale, of the valve, valve-seat, and portion of the cylinder, taken on the line 8 8, Fig. 7. Fig. 10 is a detail view of a portion of the operating-cylinder piston, showing the link at the outer extremity thereof. Fig. 11 is a view in detail of the lever looking in a direction opposite to that of the arrow, Fig. 1. Fig. 12 is a side view in detail of the lever as shown in Fig. 11.

Similar letters refer to similar parts throughout the several views.

The bucket-handle A comprises the side plates *a a*, which are suitably fastened together and are preferably parallel and constructed of metal. The bucket or dipper B is adjustably attached to the lower extremity of the bucket-handle A by means of the pins or shafts a' and a^2, said shafts extending through the said side plates *a a* and through the extended portions of the reinforcing bucket straps or bands *b b*. Said shaft a' occupies a position near the rear, and the shaft a^2 a position near the front, of the lower extremity of the handle A. The forward one of said straps or bands bearing upon the said shaft a^2 is preferably provided with a plurality of apertures a^3 in its said extended portion in order to afford means for varying the rake of the bucket relatively to the bucket-handle A. Said bucket is of the ordinary construction, consisting of, preferably, metallic plates and provided with the cutting-teeth b' b' and also provided with the laterally and symmetrically located suspension-lugs b^2 b^2, whereto a bail or bucket-links may be attached.

The door whereby the rear extremity of the bucket may be closed is of peculiar construction, and consists of two separate but coacting parts. The major part of the bucket-door consists of the plate C, which conforms in outline to the bottom of the bucket B and is secured to the hinges *c c*. A portion of said door-plate C is cut away, so as to leave the recess c', whereby said door is enabled to swing through a large arc and occupy a position remote from the bucket without interference with said bucket-handle A. Said hinged arms *c c* carry said swinging door-plate C and are so formed that when said plate is in a closed position said hinged arms lie upon the under side thereof and extend a sufficient dis-

tance to clear the side of the bucket nearest the bucket-handle A. Said hinged arms then make a bend at approximately right angles to said plate and extend to and have a bearing upon the shaft a^2. Said hinged arms are preferably provided with a plurality of apertures a^4 a^4 for bearing upon the shaft a^2, thereby affording means of angular adjustment with reference to the bucket-handle A.

It is preferable that the swing of the door-plate C be such that when the bucket B is in a vertical position for discharging no part of said plate shall lie vertically beneath said bucket, thereby preventing the contents when discharging from coming into contact with said plate.

The hinged arms c c are symmetrically located on opposite sides of the handle A and are provided with the lugs c^2 c^2, which form bearings for the pin d. Said lugs c^2 c^2 are located adjacently to the inner extremity of the recess c' in the door-plate C.

The door-section D is preferably of cast metal and is designed to fill the recess c' in the door-plate C when the latter is in a closed position. Said door-section (shown in detail in Figs. 5 and 6) has a bearing d', whereby it is hinged upon said pin d. At its extremity opposite to said bearing d' said door-section D has the bearings d^2 d^2, which support the pin e, whereby said section is pivotally connected with the lever E. Said lever (shown in detail in Figs. 11 and 12) is preferably of cast-steel and has at one extremity thereof the bearing e', wherein the said pin e rests. At the opposite extremity of said lever E is the bearing e^2, which is pivotally supported on the shaft e^3, said shaft being securely fixed in the lower portion of the side plates a a of the bucket-handle A, as shown in Figs. 1 and 2. At a point preferably between its extremities said lever has the bearings e^4 e^4, wherein the piston-rod pin e^5 is secured. The shafts e^3 and a^2 are both fixed relatively to the said bucket-handle, and the lever E, door-section D, door-plate C, and hinged arms c c are so connected and related that when said lever E rotates upon the shaft e^3 the motion of said lever is communicated to said door-section D and through said section D to the door-plate C, causing said door-plate and hinged arms to swing about the shaft a^2. The lever E and section D constitute a toggle mechanism, the shaft e^3 being the fixed fulcrum and the pin e forming the hinge.

The lever E, door-section D, and hinged arms c c are so proportioned that when the door-plate C is in a closed position the door-section D is also in a closed position, and said plate and section in conjunction cover the entire area at the bottom of the bucket. Said parts E, D, C, and c c are preferably so constructed that when the bucket-door is closed, as above described, the axes of the pins or shafts d, e, and e^2 lie approximately in the same plane, the said pin e, however, lying slightly out of said plane in the direction in which said pin e will advance when the bucket-door is opening. By this construction the toggle is nearly extended when said door parts are closed, and therefore a very slight force exerted to hold the lever E will serve to maintain said door parts in a closed position against great pressure.

The relative lengths and positions of the lever E and door-section D are such that when the door-plate C is open to its fullest extent said section D moves upward adjacently to but clear of the bucket-handle A.

The toggle-operating mechanism consists of the cylinder F and piston-rod f. At the outer extremity of said piston-rod and forming an integral part thereof is the link f', whose slot f^2 extends lengthwise with said rod and is of a sufficient width to permit free travel of the pin e^5 longitudinally therein. The advantage of the slotted construction of the piston-rod f is twofold. When the door parts C and D are closed, the lever E and said part D are approximately in line, and the co-related parts may under certain conditions become slightly "set" in their positions. The piston-rod f, acquiring some momentum while traveling the length of its slot f^2, strikes a slight blow upon the pin e^5 when the extremity of said slot is reached, and the force of the blow loosens said parts. Also when excavating in plastic and adhesive material, which is commonly the case in dredging, the load adheres to the bucket, and the jar due to the impact of the piston-rod against the pin e^5 tends to loosen the material from the sides and door of the bucket, and thus facilitates the discharge of the load. The distance between the bearings e^4 and e' of the lever E may be decreased indefinitely until the axes of the hinge-pin d and piston-rod pin e^5 become coincident. In the latter instance the mechanism herein described would assume a common form of toggle, wherein the power is applied at the moving hinge. I prefer, however, to place the said bearings e^4 e^4 nearer the fulcrum e^3 in order to reduce the necessary travel of the piston-rod f.

The cylinder F (shown in detail in Figs. 7, 8, and 9) is pivotally supported upon the bucket-handle A, between the side plates a a thereof, by means of the bearing g, which for simplicity of construction is mounted upon the shaft a^2, above described. Said cylinder has the center bore g', the outboard-port g^2, the inboard-port g^3, and the exhaust-port g^4. Said ports communicate with the cylindrical chamber g^5, which receives the removable valve-seat H. Said chamber g^5 communicates with the steam-chamber g^6, the latter receiving the steam or other operating fluid through the aperture g^7, suitably tapped to receive the coupling of the pipe J. Said pipe supplies the operating fluid to said cylinder F and consists, preferably, of flexible armored steam-hose. The said valve-seat H (shown in section in Fig. 9) fits within the chamber g^5 of the cylinder F and is provided with the inlet h, which

communicates with the chamber g^6 when said seat is in position. Said valve-seat is also provided with the apertures h', h^2, and h^3, which communicate with the ports g^4, g^2, and g^3, respectively, in the cylinder F. The chief advantages in providing a removable valve-seat lie in the greater ease and accuracy with which it may be constructed and the facility of renewal.

The rotary valve K fits within the valve-seat H and has a wall k so constructed that the chamber or passage k' formed thereby may connect the aperture h' with the aperture h^2 or may connect the aperture h' with the aperture h^3 in the said valve-seat H. The steam or other operating fluid admitted into the valve-seat H through the inlet h is prevented by said wall k from entering such one of the apertures h^2 and h^3 as is for the time being in communication with the exhaust-aperture h'. At the same time the other one of said apertures h^2 and h^3 is in communication with the live-pressure side of said wall k of the valve K. By this construction under normal conditions of operation the full pressure of the operating fluid is at all times exerted upon one side of the piston within the cylinder F, and therefore tends to securely hold the bucket-door in either a completely-closed or a wide-open position, depending upon the position of the valve K. Said valve K is controlled by the valve-lever m, whereto is attached the operating-rope m'. The spring-arm n is rigidly fixed to a convenient part of the cylinder F and affords means of attachment for the helical spring n'. Said spring n' is attached at one extremity to said arm n and at the other extremity to said lever m and tends to hold the latter at one end of its throw. Said spring n', arm n, lever m, and rope m' are so arranged that when said rope is under tension said lever m will so set said valve K that the piston-rod f will be forced outward and the door parts C and D will be caused to open. When said rope is slackened, the spring n' causes said lever m to so set said valve that the piston-rod f will be forced into said cylinder and said door parts will be closed. Therefore the tendency is for the said door parts to be kept continually closed under pressure, except when the operator exerts tension upon the rope m'. This construction has another important advantage in its simplicity, for the rope and valve-operating mechanism cannot easily get out of order and are operative in all positions of the bucket, both in the air and under water.

In the operation of the device when it is desired to discharge the contents of the bucket a pull is exerted upon the rope m'. This moves the valve-lever m and valve K, so that the operating fluid passes through the aperture h^2 in the valve-seat H and into the port g^2 in the cylinder F, thus forcing the piston f outward. The port g^3 is at the same time opened to exhaust. When the outward motion of said piston causes the inner extremity of the slotted link f' to come into contact with the pin e^5, said pin receives a slight jar, which starts the lever E from its position and also tends to overcome the adhesion of the material within the bucket to the bucket sides. The continued outward motion of the piston f swings the lever E about its fulcrum e^3, thereby moving the door-section D upward and causing the door-plate C and hinged arms c c to swing to an open position, as shown in Fig. 2. To close the bucket-door, the rope m' is slackened, thus permitting the spring n' to so set the valve K that the piston f is forced into the cylinder E. The motion of the parts will then be the reverse of that which occurs when the said door is opened.

One of the most important features of my invention is what may be termed the "folding" or "collapsing" feature of the swinging bottom or door of the bucket. By means of my invention the door when open is remote from and clear of the bucket and at the same time is in a compact form, no part projecting any considerable distance in any direction from said bucket or bucket-handle. Another very important feature of my invention is the door-operating power device or engine mounted adjacently to the bucket and affording means whereby the bucket-door may be positive acting in all positions thereof.

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

1. In an excavator-bucket the combination, with the bucket-handle, of a door divided into a plurality of parts, one of said parts being hinged on an axis fixed relatively to said bucket; and the second of said parts having a hinged connection with said first part, at or near the outer or lower extremity of said second part.

2. In an excavator-bucket the combination, with the bucket-handle, of a door divided into a plurality of parts, one of said parts being hinged on an axis fixed relatively to said bucket; and the second of said parts having a hinged connection with said first part, at or near the outer or lower extremity of said second part; and mechanism lying wholly outside of said bucket for operating said door parts.

3. In an excavator-bucket the combination, with the bucket-handle, of hinged arms lying on opposite sides of said handle, a door-plate secured to said hinged arms and having a recess therein for receiving said handle when said plate is in an open position; and a supplementary door-section hinged to said door-plate for entering said recess thereby completing the bucket-bottom when said door parts are closed.

4. In an excavator-bucket, the combination of a swinging door-plate having a recess therein for avoiding interference with said handle when said plate is in an open position; a supplementary door-section for filling said recess; a hinged connection between said plate and said door-section; and a member having

a hinged connection with said supplementary section for operating the same.

5. In an excavator-bucket, the combination with the bucket-handle, of a swinging door-plate recessed for said handle; a supplementary door-section; a hinged connection between said door-plate and said door-section; a member for operating said door parts, said member having a hinged connection with said supplementary door-section; and means for operating said member.

6. In an excavator-bucket, the combination of a door, a toggle mechanism for operating said door, and means for operating said toggle mechanism.

7. In an excavator-bucket, the combination of a door, a toggle mechanism for operating said door, and a mechanical power device for operating said toggle mechanism.

8. In an excavator-bucket, the combination of a door, a door-operating cylinder, and connections whereby said cylinder may operate said door.

9. In an excavator-bucket, the combination of a door, a toggle mechanism for operating said door, and a piston and cylinder for operating said toggle mechanism.

10. The combination, with an excavator-bucket, of a bucket-handle; a swinging bucket-door; and a toggle mechanism for operating said door, said mechanism consisting of a lever, a fulcrum for said lever fixed relatively to said handle, and a connecting part hinged to said door and hinged to said lever; and a power device for operating said toggle mechanism.

11. In an excavator-bucket, the combination of a door, and door-operating mechanism comprising a link-and-pin device for imparting a jar to said door and to said bucket.

12. In an excavator-bucket, the combination of a swinging door-plate, a toggle mechanism for operating said plate, a link-and-pin mechanism for operating said toggle mechanism, and means for operating said link-and-pin mechanism.

13. The combination of an excavator-bucket; a swinging bucket-bottom; a cylinder and piston for operating said bucket-bottom; connections between said bottom and said piston; and a cylinder-valve-operating device, consisting of a valve-lever, and a spring suitably supported and attached to said valve-lever, for operating the same.

14. In an excavator-bucket, the combination with said bucket and the bucket-handle, of a swinging door-plate recessed for said handle, a door-section for filling the recess in said door-plate, a hinged connection between said door-plate and said door-section, a toggle-lever, a hinged connection between said lever and said door-section, a fulcrum for said lever secured to said bucket-handle, a piston-rod pin secured to said toggle-lever, a piston-rod having a slotted link at its extremity for engaging said pin, a cylinder for operating said piston-rod, and cylinder-valve-controlling mechanism, comprising a valve-lever, valve-lever spring, and means of attachment for said spring.

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