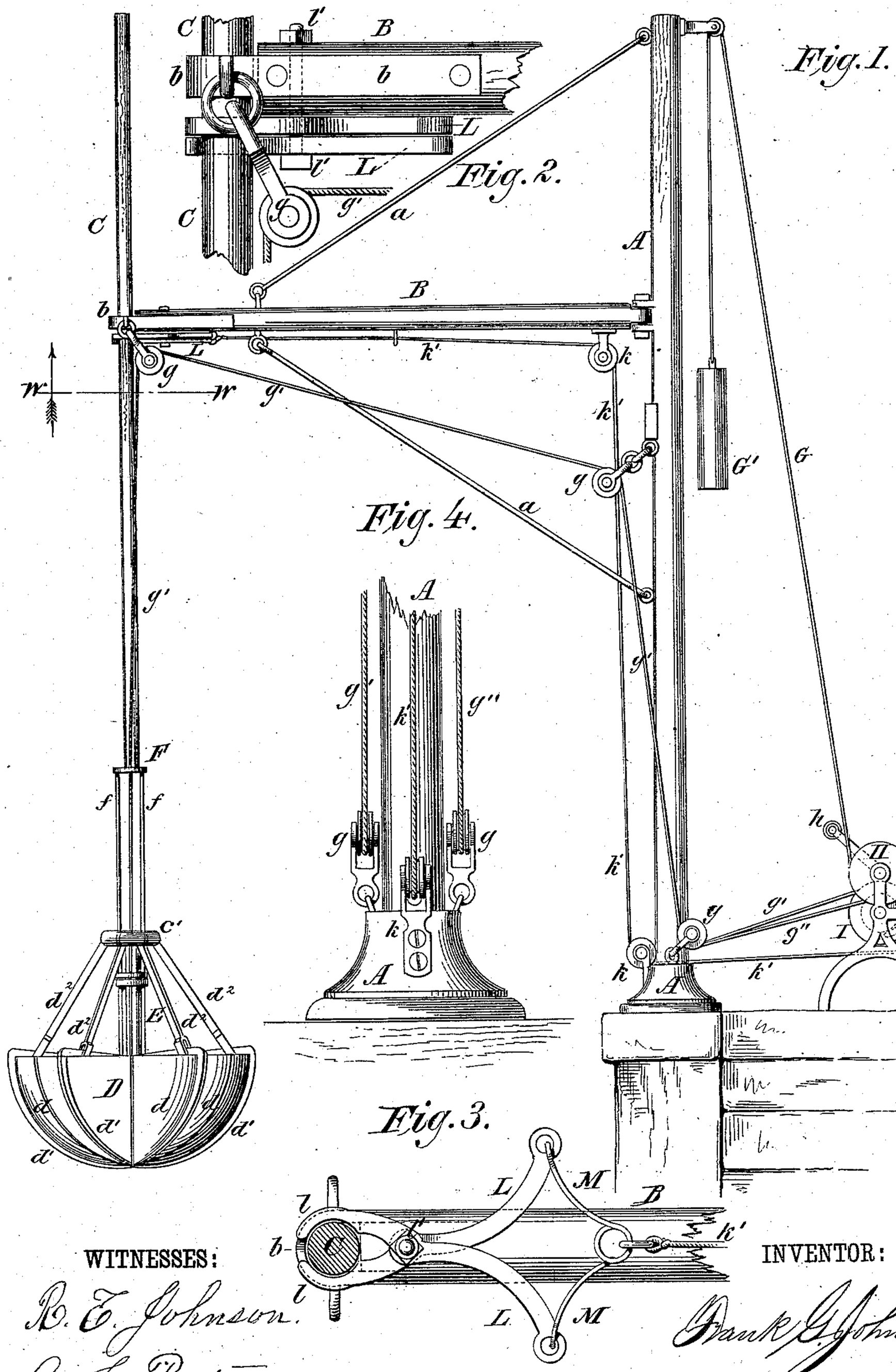
(No Model.) 3 Sheets—Sheet 1.

F. G. JOHNSON.

Grappling Bucket.

No. 238,293. Patented March 1, 1881.



WITNESSES:

R. E. Johnson.

A. L. Bates.

INVENTOR:

Frank G. Johnson.

(No Model.)

3 Sheets—Sheet 2.

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Fig. 5.

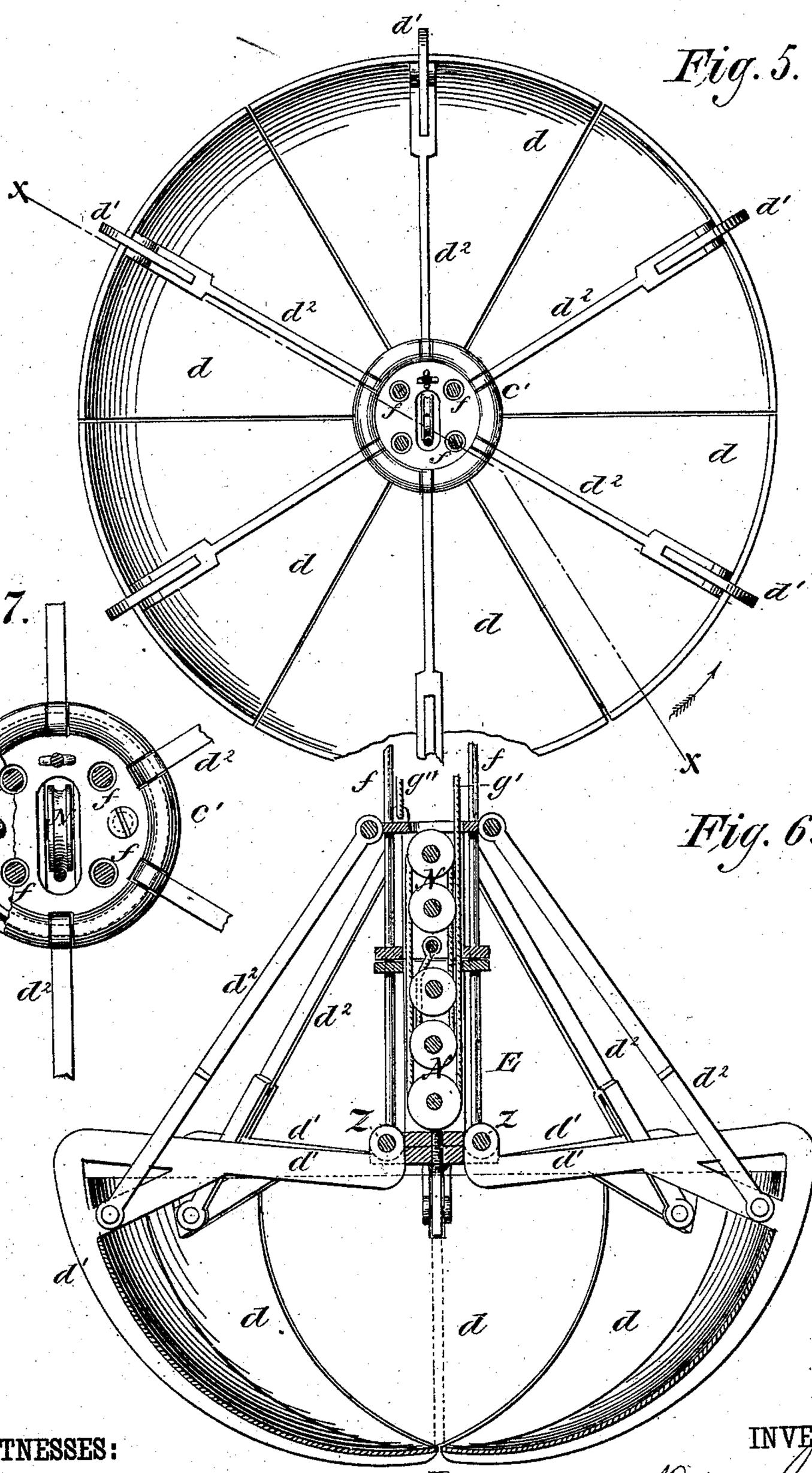

Fig. 7.

Fig. 6.

WITNESSES:

R. E. Johnson.

A. L. Bates.

INVENTOR:

Frank G. Johnson.

(No Model.) 3 Sheets—Sheet 3.

F. G. JOHNSON.

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Fig. 8.

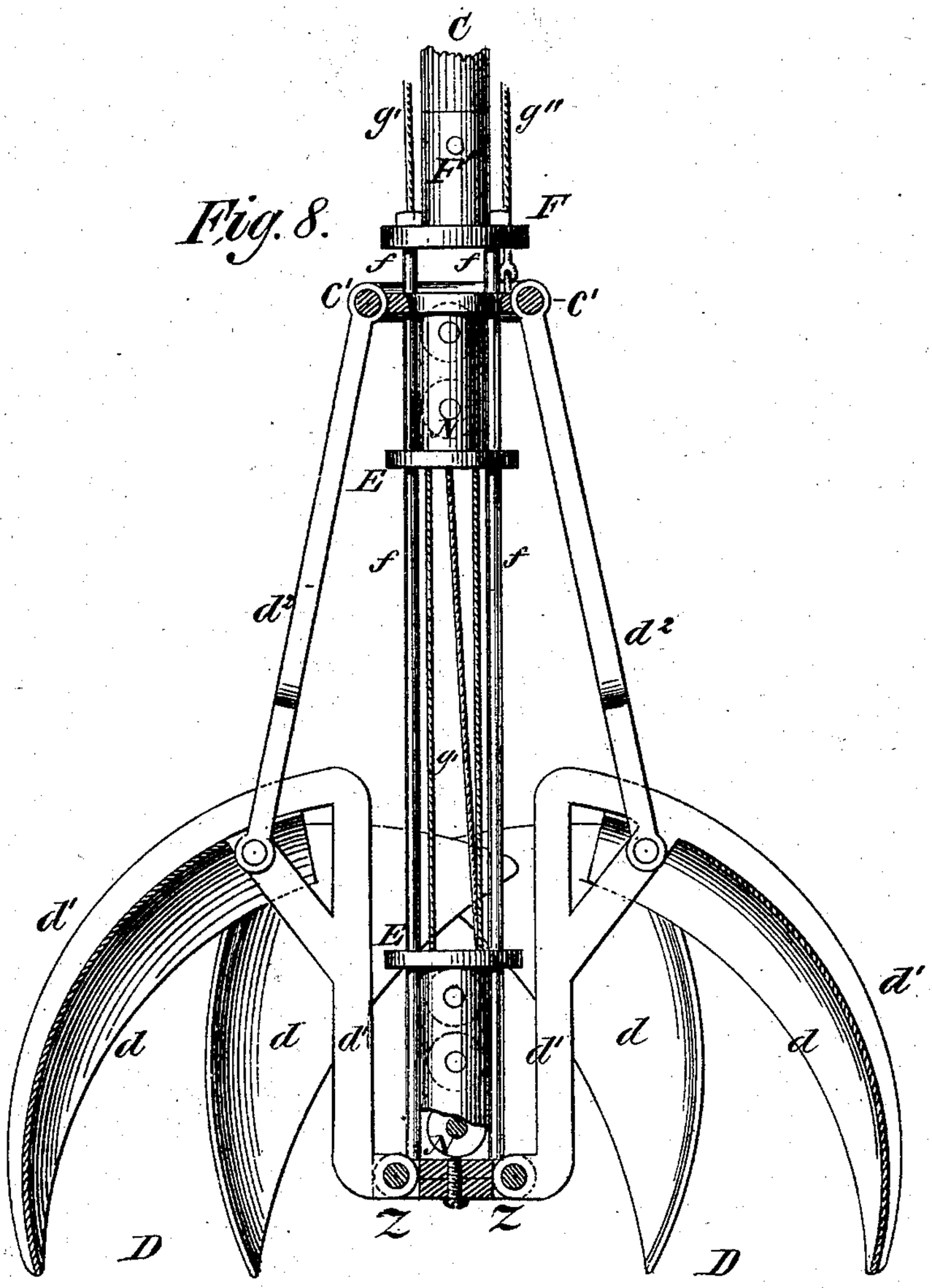
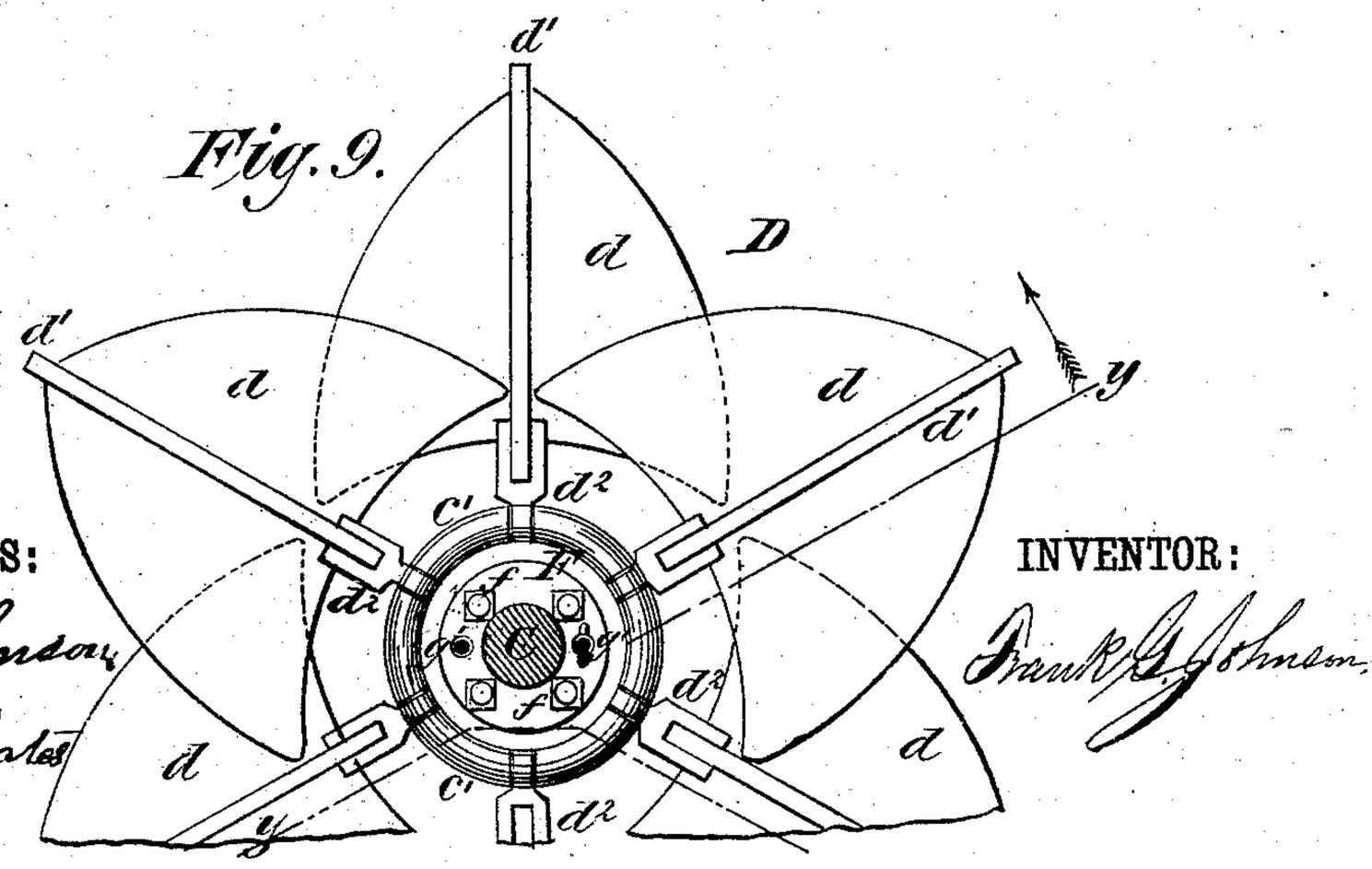


Fig. 9.



WITNESSES:

R. E. Johnson

A. L. Bates

INVENTOR:

Frank G. Johnson.

UNITED STATES PATENT OFFICE.

FRANK G. JOHNSON, OF BROOKLYN, NEW YORK.

GRAPPLING-BUCKET.

SPECIFICATION forming part of Letters Patent No. 238,293, dated March 1, 1881.

Application filed July 30, 1880. (No model.)

To all whom it may concern:

Be it known that I, FRANK G. JOHNSON, of the city of Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Automatic Grappling-Buckets, which improvements are fully set forth in the following specification, reference being had to the accompanying drawings.

The object of my invention is to provide an automatic grappling bucket or apparatus constructed and operated in such a peculiar manner that it will automatically penetrate, grasp, and hoist a great variety of unlike materials—such, for instance, as the heterogeneous mass of city refuse, composed of ashes, straw, garbage, street-sweepings, &c., common dirt, sand, roofing-gravel, coal, manure, submerged oysters, &c.

The following is a full, clear, and exact description of the construction and operation of my invention.

Figure 1 is a general representation of the entire apparatus as mounted on the mast A, ready for use. Figs. 2 and 3 are partial and enlarged representations of Fig. 1, showing the connection between the boom B and the bucket D. Fig. 4 illustrates the rendering-pulleys g, g, and k of the operating-ropes g', g'', and k' and their attachment to the foot of the mast A. Fig. 5 represents a horizontal view of the grappling-bucket when it is closed. Fig. 6 represents a vertical view of the bucket when it is closed, with a portion of the front removed to give a view of the sheaves N N. Fig. 7 is an enlarged view of the central part of Fig. 5. Fig. 8 represents a vertical view of the bucket as it appears when open, with a portion in front removed. Fig. 9 illustrates a horizontal view of the bucket when it is open.

The bucket, when it is closed, is in the form of a hollow half-globe, as seen in Fig. 1, and it is constructed by combining together any suitable number (according to the nature of the work to be performed) of equal and similar sections of a half-globe, as shown by d d d, so that when they are placed in order adjacent to each other, as in Fig. 1, they will complete or form an entire half-globe, except it is not essential for some uses that these sections quite meet each other at their adjacent edges. In the drawings the half-globe is divided and the bucket composed of six sections. These several sections of the half-globe, which preferably would be made of plate-steel, are each riveted or bolted to suitable carrying arms or ribs d' d' d', which extend over the outer surface and in the central line of the sections d d d, tapering more or less to a point as they reach the points of the sections, that they may be more easily thrust into the material to be grasped. The inner surface of these arms or ribs has the same curve as the outer surface of the half-globe sections. Each of these arms or ribs, at the upper or broad end of the sections d d d, is bent at such an angle and extended in such a direction and to such an extent, Figs. 8 and 6, as to be terminated and hinged at the center of the vertical circle, in whose plane a vertical central section of its bucket-section would lie, so that the ring-journals at z z will be the centers of the circles of which d d are segments, so that when the several sections enter the material to be hoisted the force employed in working the bucket will be expended in penetrating the blades of the bucket into, rather than compressing or otherwise disturbing, the material. These several centers of motion z z, Fig. 8, of the several sections of the half-globe fall in a comparatively small circle. The manner of securing and hinging these arms or ribs d' d' d' at their several centers of motion is hereinafter described.

E E are a pair of sheave-blocks, the sheaves N N being placed one above another. The lower block contains three sheaves and the upper one two. The sheaves vary in diameter to allow the hoisting-rope g' to clear itself as it passes around the several sheaves. The sheaves are inclosed within their blocks, to protect them from dirt. The lower sheave-block is stationary, the lower end of which is extended into a flange, and serves for securing and hinging the central ends, z z, Figs. 6 and 8, of the carrying arms or ribs d' d' d'. The top of the bottom sheave-block is also provided with a flange. The upper sheave-block is movable, and provided with a flange at the top and bottom. Passing through these several flanges are four similar frame-rods, f f f f, set at right angles to each other. These rods are rigidly fastened in the bottom flange of the

lower sheave-block. The upper ends of these frame-rods *f f f f* are securely held in their relative positions by being fastened into a suitable cap-plate, F. It will now be seen that the upper sheave-block, E, will slide up and down on the four frame-rods *f f f f*.

To operate the several sections *d d d* of the bucket to open and close them, each of the carrying arms or ribs *d' d' d'* is connected to the top flange, *c' c'*, of the upper sheave-block by means of connecting-rods d^2 d^2 d^2. Fig. 7 illustrates the manner of connecting the connection-rods d^2 d^2 d^2 to the upper flange of the upper sheave-block, and the central ends of the working arms or ribs *d' d' d'* to the lower flange of the lower sheave-block.

Referring to Fig. 7, *c' c'* is extended in diameter and enlarged into a circular rim and horizontally cut in two halves, so that the upper part or half can be removed. This upper half of the flange is secured to the lower part by means of suitable screws or bolts *s*. Between and into the two halves of this rim of the flange *c' c'* is turned or provided a circular and continuous hole, into which is clamped between the two halves of the rim *c' c'* an iron or steel ring, upon which, before it is clamped in position, are slipped the several connecting-rods d^2 d^2 d^2. To enable these rods to perform their motion as the movable sheave-block is worked up and down, slots or openings are cut through the rim of the flange *c' c'*, to allow the connecting-rods d^2 d^2 d^2 to pass through and work on the ring clamped between the two halves of the rim. By this means of constructing the working-joints I am enabled to secure necessary strength and to increase the number of sections in the half-globe-formed bucket to adapt it to a great variety of work. A similar ring and clamp-plates secure the arms *d'* as their journals, (see Figs. 6, 8, between *z z*, partly in section, and in enlarged plan view at C, Fig. 7.) These plates at *z z* are held together by a vertical screw-bolt, *y''*, in same, Figs. 6, 8.

To fully open this half-globe-shaped bucket, so as to give the lower points the proper spread or expansion, as shown in Figs. 8 and 9, it becomes necessary that the lateral or upper corners of alternate sections pass by each other—that is, alternate ones under and over each other, as shown in Fig. 9. To accomplish this I simply make the shank end of the alternate working arms or ribs *d' d' d'* a little longer than the intermediate ones, which of course will allow the lateral corners of alternate sections *d d d* to pass each other, and the bucket to be thus opened to its fullest capacity.

The opening and closing of the bucket are performed by means of two ropes, one of which, *g''*, Fig. 8, I will term the "opening and discharging rope;" the other *g'*, Fig. 8, the "closing and hoisting rope." The opening and discharging rope *g''* (best seen in Fig. 8) is fastened to the upper end of the upper or movable sheave-block E. The closing and hoisting rope *g'* (best seen in Fig. 6) is fastened to the lower end of the upper sheave-block. This closing and hoisting rope may be woven or passed around one, three, or five (or any number that may be provided) of the sheaves N N, according to the greater or less resistance of the material to be penetrated and grappled. After passing around a suitable number of the sheaves this closing and hoisting rope *g'* passes up through the upper sheave-block and the cap-plate F.

C is a light, straight pole, the bottom of which is secured to the top of the cap-plate F by means of a socket and key-pin, F', Fig. 8. The object of this pole (which I will term the "counteraction-pole") is to hold the bucket down while the closing-rope *g'* closes and fills it. To prevent this counteraction-pole C from rising when the bucket is being filled, I employ a clamping device, (shown by Fig. 3,) which is bolted on the lower side of the end of the boom B. This clamping device (referring to Fig. 3) consists of a pair of crossed levers, the long arms of which, L L, are connected by a spring cross-tie, M M, to keep the clamp open when not acted upon, and, in connection with the clamping-rope *k'*, to draw the clamp together. The short arms *l l* of this lever-clamp are bent into a semicircular form to fit closely around the counteracting-pole C. These levers are joined together and to the boom B by a suitable swivel-bolt, *l'*. This counteraction-pole is further secured to the end of the boom by a suitable bracket, *b b*, through which it slides in its upward and downward action.

Referring to Fig. 1, A is a mast rigidly set on a dock, or it may be erected on a scow or other vessel. To this mast is attached a horizontally-swinging boom, B, rigidly held vertically by the braces *a a*.

Attached to the spring M M of the clamping device is a rope, *k'*, which passes along under the boom B, and turns over the fixed pulley *k* on the lower side of the butt of the boom, then passes down to the fixed pulley *k* at the bottom of the mast A, then to the short arm of the lever k^2, to which it is fastened. By the movement of the long arm of this lever k^2, (which I will term the "clamping-lever,") the clamping device can be made to grasp and hold the counteraction-pole C at any point, and instantly liberate it by reversing or letting go of the lever.

The closing and hoisting rope *g'* passes over a swinging pulley, *g*, attached to one side of the end of the boom B, and passes over the swinging pulley *g*, attached to a short arm fastened to the mast A, then down to the swinging pulley *g*, attached to one side of the bottom or near the bottom of the mast, and then over the hoisting-drum H, which is worked by the hoisting-engine or other power, which may be applied to the crank *h*. The opening and discharging rope *g''* passes over a swinging pulley on the opposite side of the end of

the boom B, and over a swinging pulley opposite to the pulley *g* on the opposite end of the cross-bar on the mast A, and down over the swinging pulley *g* on the opposite side of the foot of the mast, (seen in Fig. 4,) and then over the loose drum I. When the bucket is being raised by the hoisting-drum H the opening and discharge rope *g''* will become slack. To take up the slack of this rope when the bucket is being raised, the loose drum I is revolved by means of the rope G reversely wound around the loose drum I. This rope G is actuated to take up the slack of the opening and discharging rope *g''* by means of a suitable weight, G', the rope G for this purpose passing over a fixed pulley at the top of the mast. This loose drum I is controlled in its reverse action by means of the brake-lever *i* acting upon one end of the loose drum.

The operation of my invention is described as follows: Referring to Fig. 1, I will suppose the bucket to be full. If now the brake *i* be forced against the loose drum I, and preventing it (the drum) from revolving, and liberating the hoisting-drum H, the weight of the bucket and its load will be taken off of the closing and hoisting rope *g'*, and thrown upon the opening and discharging rope *g''*, which will raise the upper sheave-block, and so open the bucket and discharge its contents. To lower the open bucket, as seen in Fig. 8, it is only necessary to ease up on the brake *i*. As the bucket is thus lowered to the material to be hoisted the rope G will be wound around the loose drum I. When the open bucket is lowered and falls on the material to be raised the brake *i* is removed. The brake k^2 is now applied, which clamps the counteraction-pole C to the boom B, when the power is applied to the closing and hoisting rope *g'*. As the power is applied the several sections of the bucket are driven into the material to be hoisted until their lower points practically meet, and the bucket is closed and filled. By now letting go of the brake k^2 the counteraction-pole C will be liberated from the clamping device on the boom, and the continued application of the power to the hoisting-drum H will raise the loaded bucket to the desired height.

The object of employing several sheaves in the sheave-blocks E E is to increase the clamping and penetrating force. By the employment of a suitable number of these sheaves, together with the counteraction-pole C, and the movement of the several sections of the bucket being in the direction of their own curvature, the bucket is made to penetrate very resistant material.

The object of making the bucket in the form of a half-globe is to provide pointed sections *d d d* for penetrating the material to be hoisted.

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

1. An automatic grappling-bucket, D, consisting of equal and similar sections *d d d* of a half-globe, the alternate sections being slightly farther from their centers of motion than their adjacent sections, in combination with the working arms or ribs *d' d' d'* and the connection-rods d^2 d^2 d^2, substantially as and for the purposes set forth.

2. In an automatic grappling-bucket, the combination of the connection-rods d^2 d^2 d^2, the split flange and rim *c' c'*, and its contained pivot-ring *c''*, Fig. 7, substantially as and for the purposes described.

3. In combination with the bucket D, the loose drum I, brake-lever *i*, rope G, weight G', and rope *g''*, substantially in the manner and for the purposes set forth.

FRANK G. JOHNSON.

Witnesses:
A. L. BATES,
R. E. JOHNSON.