(No Model.)

3 Sheets—Sheet 1.

A. A. WOOD.

HYDRAULIC MOTOR.

No. 535,568. Patented Mar. 12, 1895.

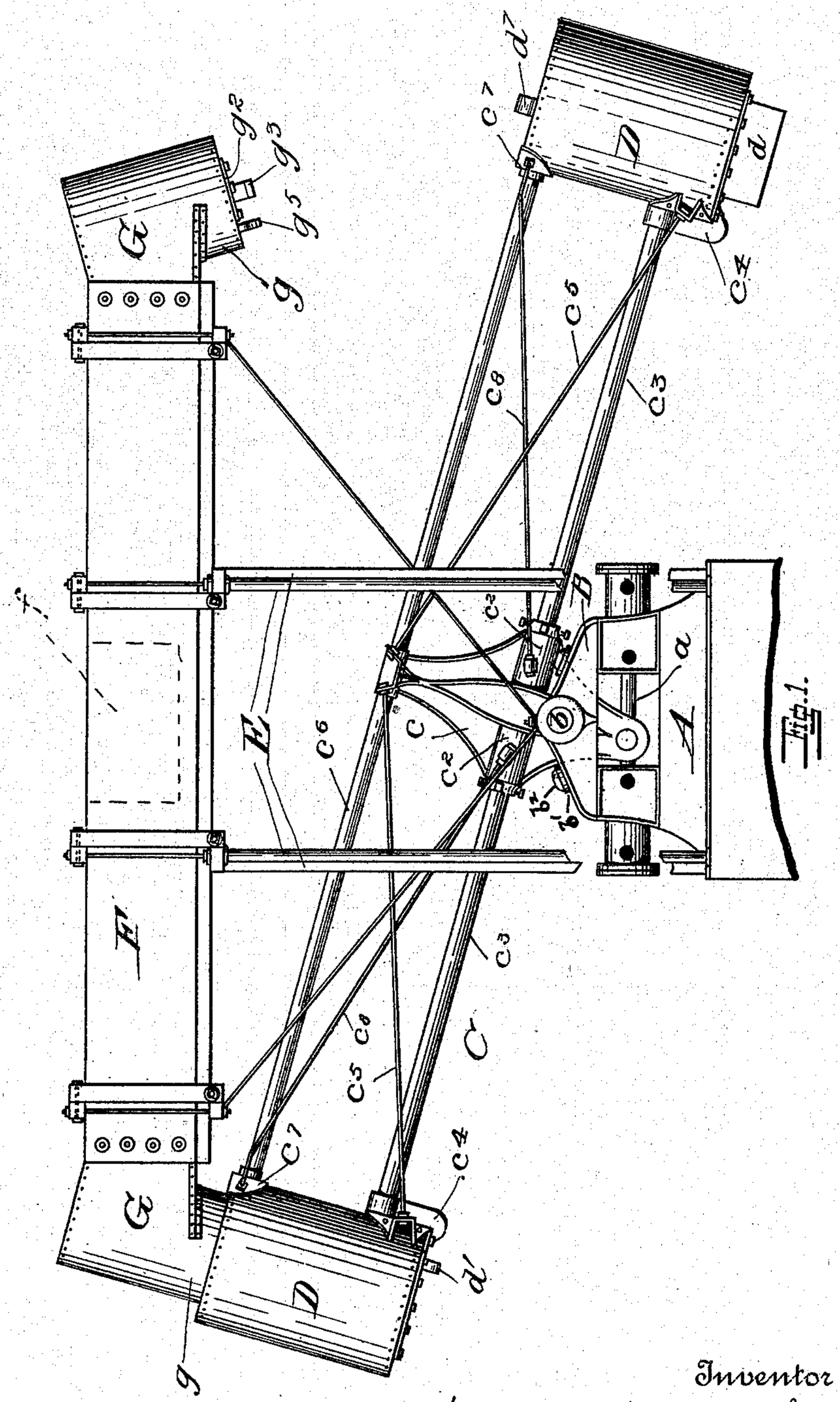

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

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HYDRAULIC MOTOR.

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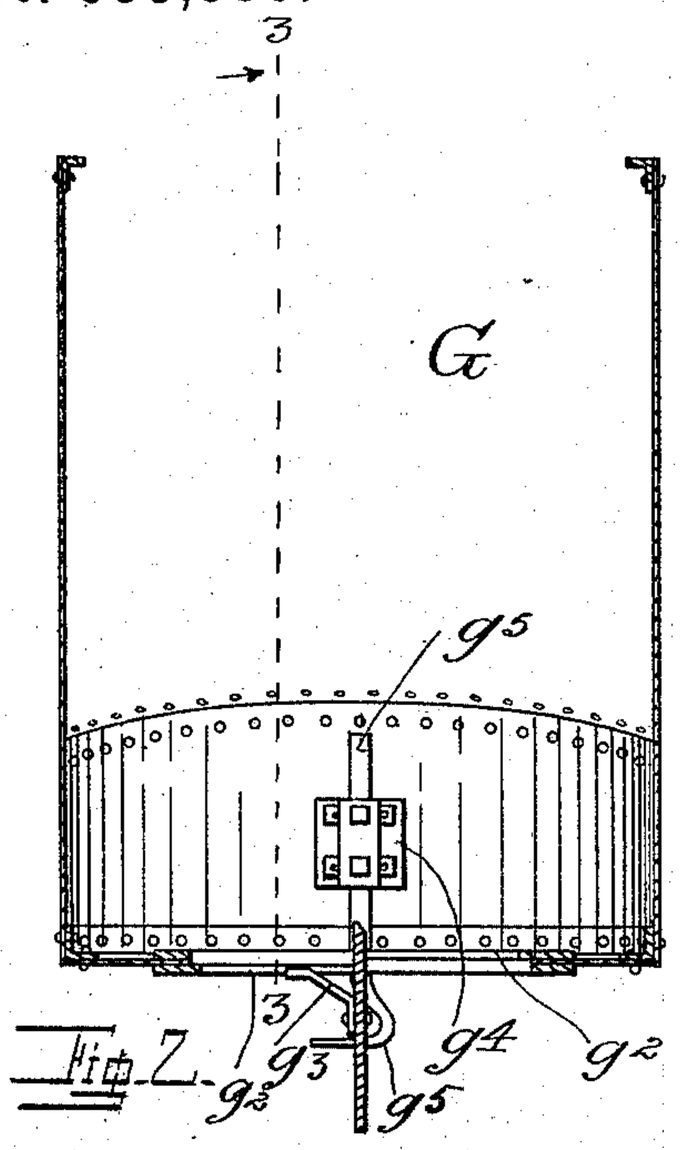

Fig. 2.

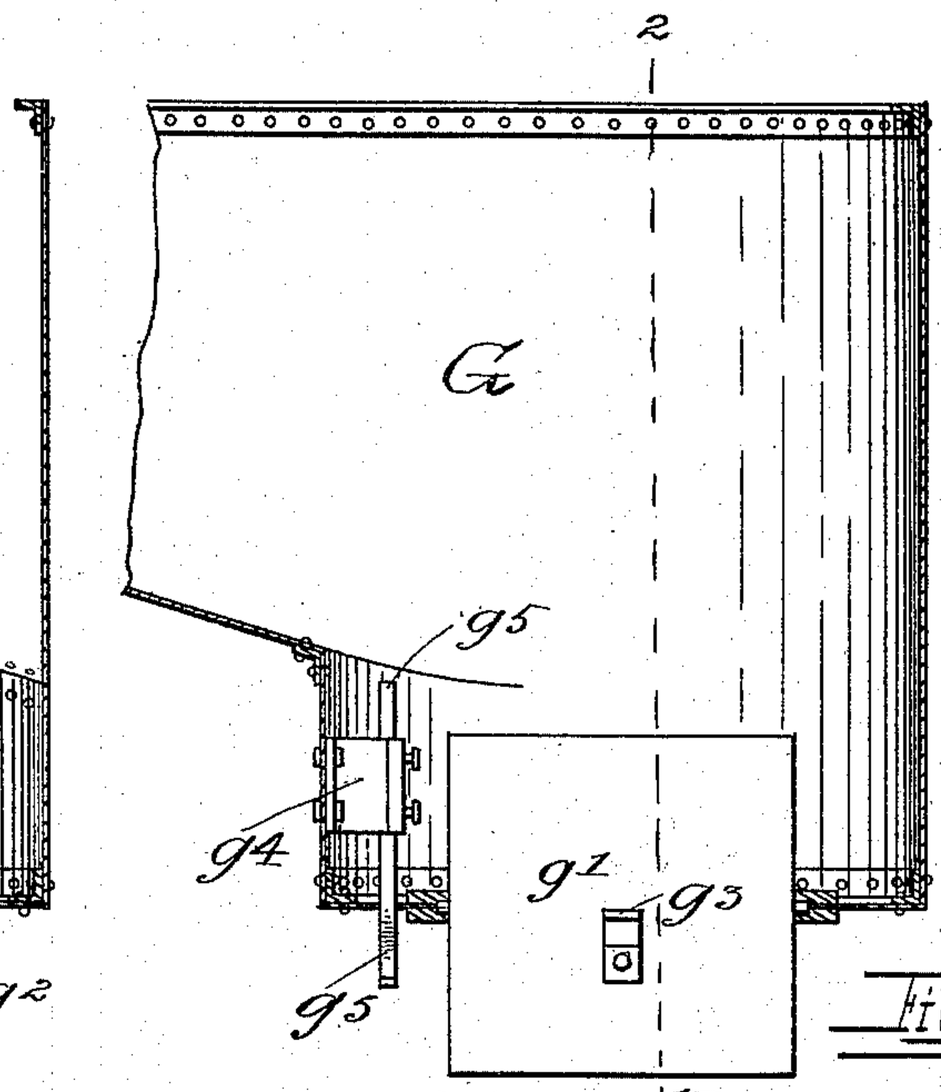

Fig. 3.

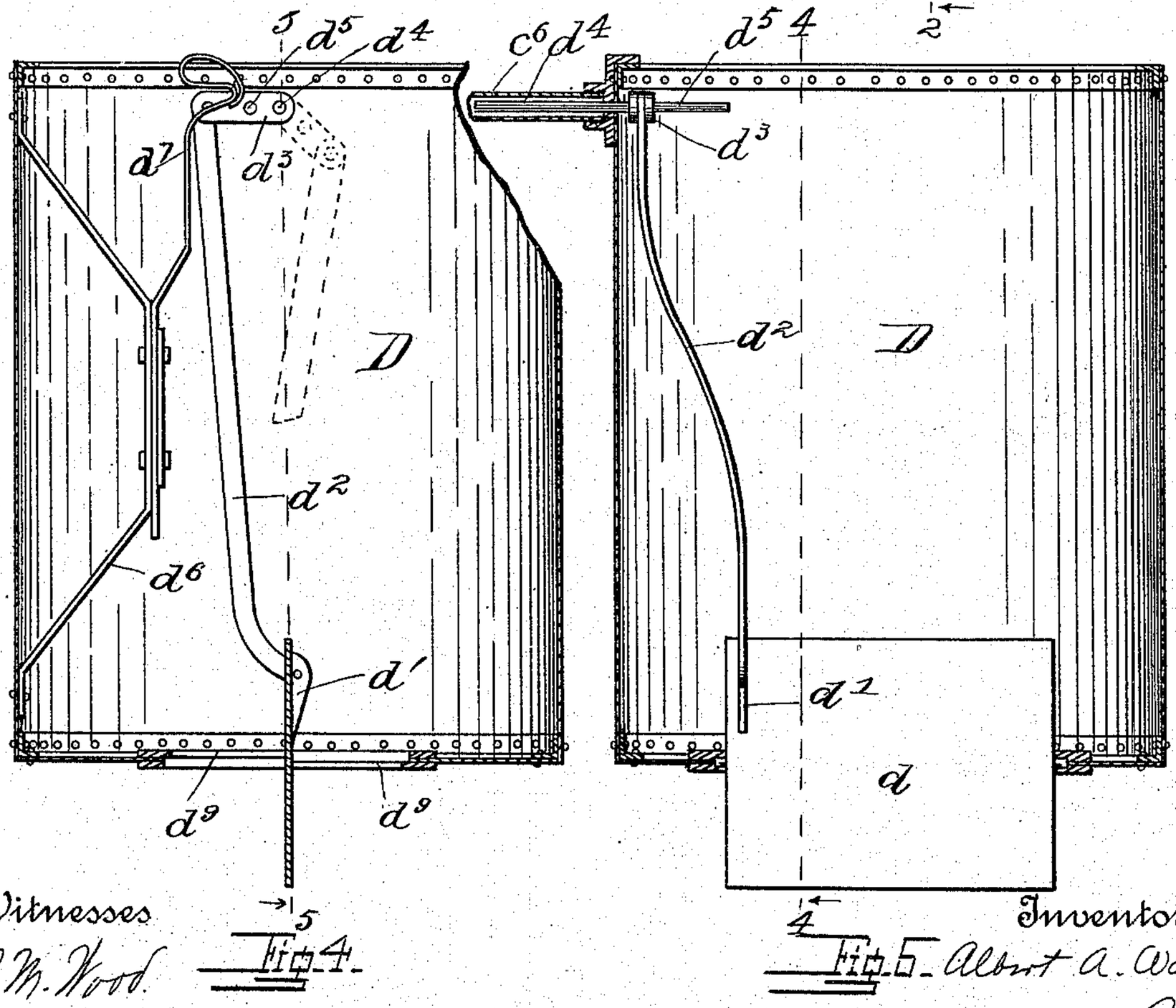

Fig. 4.

Fig. 5.

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(No Model.) 3 Sheets—Sheet 3.

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HYDRAULIC MOTOR.

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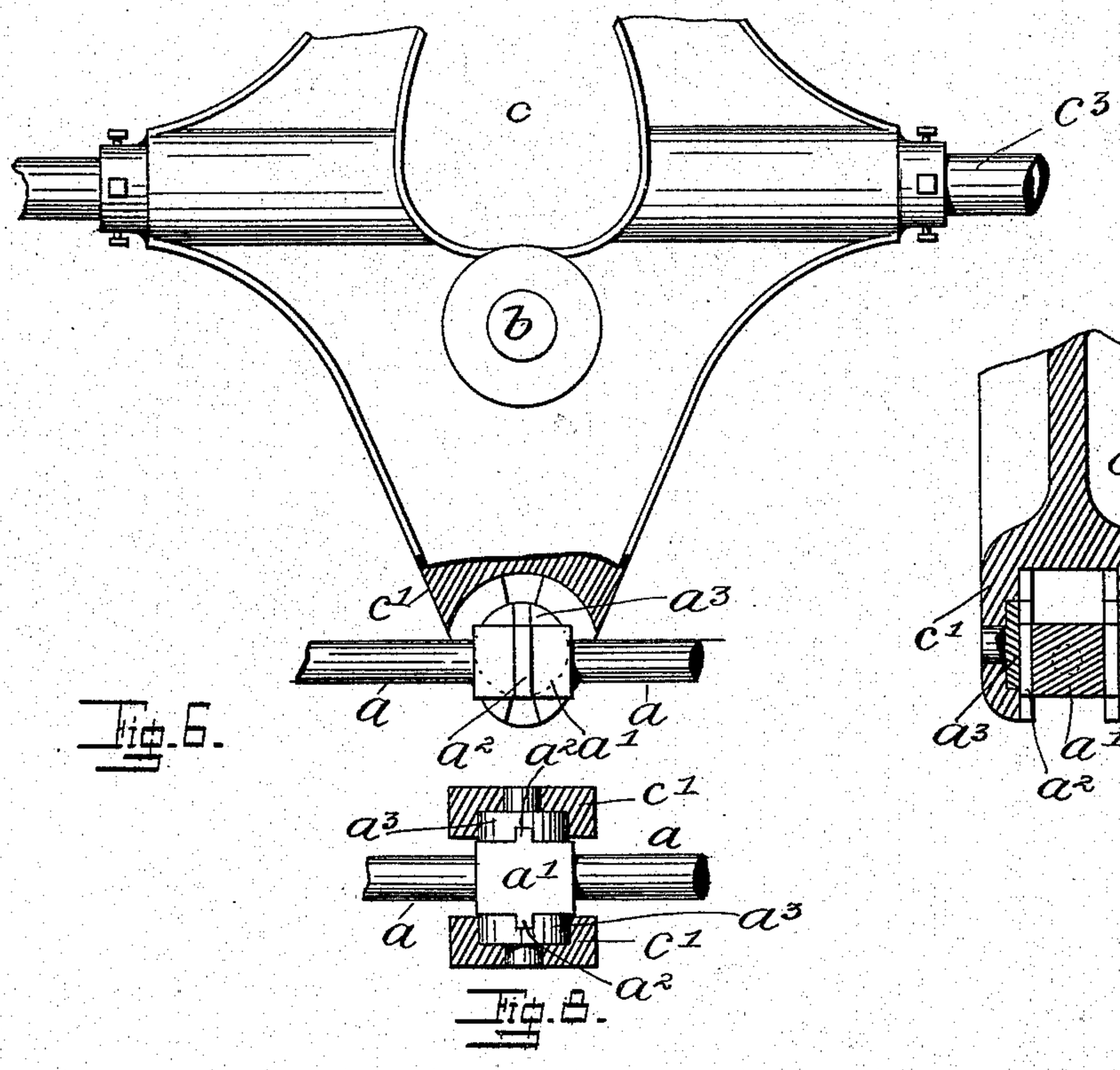

Fig. 6.

Fig. 8.

Fig. 7.

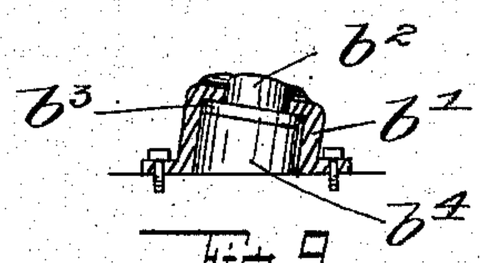

Fig. 9.

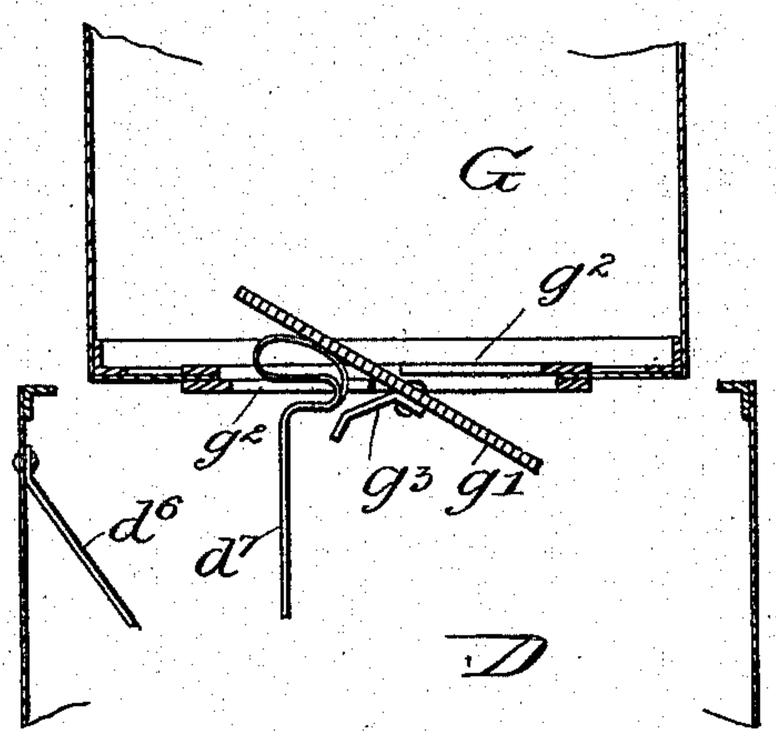

Fig. 10.

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UNITED STATES PATENT OFFICE.

ALBERT A. WOOD, OF ATLANTA, GEORGIA.

HYDRAULIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 535,568, dated March 12, 1895.

Application filed January 2, 1894. Serial No. 495,447. (No model.)

To all whom it may concern:

Be it known that I, ALBERT A. WOOD, a citizen of the United States, and a resident of the city of Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Hydraulic Motors; and I do hereby declare the following to be a full, clear, and exact description of my invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to motors in which the actuating element is the gravity of water, the object of the invention being to so improve this class of inventions as to render the use therein of a vibrating working-beam practical, and reliably efficacious; the invention consisting of the device hereinafter described, and of the operative combinations of the elements thereof, enumerated in the claims.

In the accompanying drawings, Figure 1 is a side-elevation of the device, showing it operating a pump, the parts being shown as they would appear at the time of the ending of one stroke and the beginning of the next. Fig. 2 is a transverse section on the line 2—2, Fig. 3, of the chute, and the valve mechanism used for delivering the water from the flume to the elevated bucket. Fig. 3 is a longitudinal section on the line 3—3, Fig. 2, further showing the elements therein shown; the valve in both figures being shown closed. Fig. 4 is a section on the line 4—4, Fig. 5, of the bucket, on each end of the working-beam, showing the valve therein open, part of the operating mechanism thereof, and the spring abutment for opening and closing the chute-valve. Fig. 5 is a section, parallel to the working-beam of the said bucket, showing the parts in the position in which they are seen in Fig. 4. Fig. 6 is a fragmentary detail of the frame of the working-beam; its lower end being in section, and showing the means for obtaining a sliding, pivotal connection to the reciprocating piston-rod. Fig. 7 is a vertical section of the lower end of the middle portion of the working-beam, showing further, the construction at that point. Fig. 8 is a horizontal section thereof. Fig. 9 is a view of the buffer. Fig. 10 is a view, in vertical section, of the bucket and the chute, showing the same in juxtaposition, and illustrating the manner whereby the spring abutment opens the valve in said chute.

In the figures like reference marks are uniformly employed in the designation of corresponding elements of construction.

A is a pump, which may be of any construction, provided with an horizontal reciprocating piston-rod *a*. On the upper side of this pump is a pillow-block B, provided with a central transverse shaft *b*, and a vertical aperture in its center under said shaft, and over the pump piston-rod. Pivoted on the shaft *b* is the central frame *c* of the working-beam, which vibrates in a vertical plane on its shaft *b*, and is connected with the pump piston-rod, in such a manner that said piston-rod derives a reciprocating motion therefrom. In order to properly convert this oscillating motion of the frame *c* into the proper reciprocating motion, it is necessary that the piston-rod be not only pivoted to the part *c*, but also have a sliding connection therewith. By reference to Figs. 6, 7, and 8, it will be seen that the piston-rod, *a*, is provided at its middle portion with the cross-head a', having a vertical tongue a^2 on each side. Seated within suitable recesses on the inner side of the lugs forming the bifurcated lower end of the frame C, are disks a^3 which have diametrical extending grooves across their inner faces, said grooves receiving the tongues a^2 on the cross-head. As shown in the figures, these disks are provided on their back sides, with trunnions a^4, but it is obvious that these trunnions may be dispensed with if desired, inasmuch as they only add to the reliability of the bearing. The disks form a pivotal bearing, and by means of the co-operating tongues a^2 and grooves therein, all effect of the vertical movement of said pivotal point is obviated. Just above the pivotal point of the frame *c* are sockets, c^2, for the pipes, c^3, which are secured therein in any suitable manner and project in opposite directions the desired distance, carrying on their distal extremities, in the construction shown, castings c^4, adapted to be secured to the lower corner of the bucket D, and to receive one end of the truss-rods c^5, the other ends whereof

are secured to the upper end of the part *c*. It is obvious that the rods c^3 may be solid if desired, although pipe is lighter and stronger. The upper end of the frame *c* carries a socket through which the pipe c^6 extends being connected at each end to the upper corner of the buckets, D, by castings c^7, which also receive one end of the truss-rods c^8, the inner ends of which pass through lugs on the sockets c^2. On the upper side of the pillar-block B, in such a position as would form an abutment for the working-beam to strike on, is screwed a cap b', which is perforated in its upper portion or top, and a metal piece b^2 is inserted therein, an annular flange b^3 limiting its protrusion. In the cavity in the cap below this piece b^2 is a rubber piece b^4, which is seen to be incased and thus protected from disintegration, and effects of the weather, and also applied in a manner that will produce the best results as an elastic resistance to the depression of the piece b^2 upon the impact of the working-beam thereupon.

Posts E typifying a suitable sub-structure, support a flume F preferably situated directly over the pump or motor, and having an opening *f* (shown by broken lines in Fig. 1), through which a race may be turned into the flume. This flume is composed of a bottom and sides, suitably bolted together and braced and open at its ends, chutes G being bolted therein, in such a manner that water may freely flow through the horizontal portion of said chutes into the cylindrical portions *g*, in the bottom of which cylindrical portion is a valve g', pivoted on its central portion across the center of an opening in the bottom of said chute in such a manner as to swing in a vertical plane in opening and closing. Plates g^2, arranged as shown in Fig. 2 of the drawings limit the motion of said valve in closing, and form angle joints to prevent leakage. An arm g^3 is secured to the under side of said valve the purpose of which will be described hereinafter. A clip or bracket g^4 is secured to the inner side of the chute, and a bar g^5 slides vertically in a socket therein, its lower end projecting through the bottom of the chute and being shaped to form preferably a resilient abutment, the purpose of which will be presently seen. Set-screws should be provided in the bracket g^4 whereby said abutment may be vertically adjusted.

In the bottom of the buckets D are apertures and valves *d* constructed and mounted substantially the same as the valves g' with the exception that in the valves *d* is a depressed seat d', for the connection of a pitman d^2, the other end of which is connected to the distal extremity of the crank d^3. This construction is duplicated in both buckets, and these cranks are secured to and connected operatively by a shaft d^4 which passes continuously between said cranks through the pipe c^6. The relative positions of these two cranks will be found compared by the solid and broken lines in Fig. 4, whereby it is seen that when the crank shown by solid lines is in the position shown in said figure, and the valve connected therewith is open, as also shown, the crank in the opposite bucket will have turned downwardly nearly a quarter of a revolution, and closed the valve connected therewith. The partial revolution of the shaft d^4 and hence the operations of the cranks just described is effected by a stud d^5, set in each crank, coming into contact with the spring-abutment on the rod g^5, when the bucket is elevated; the elevation of each bucket thus reversing the relative positions of the valves in the bottom thereof, the depressed bucket having its valve open, and the elevated bucket contrariwise.

Secured to the inner side of the bucket is a bracket d^6 having on its face means for securing the standard d^7 in a vertical position. Said standard should be so shaped or the bracket should be so extended as to bring its upper end into a position in which it will when the bucket is elevated, contact, forcibly with the under side of the correlative valve g', near the arm g^3 thereon. In order to make a spring abutment on said standard d^7 its upper end is bent in the form of a letter **S**, with its free end extended and curved downwardly into contact with the front of the bottom curve of said letter **S**. As shown in Fig. 10, this abutment contacts with the valve g' as stated, and opens same by means of a rolling contact, the arm g^3 swinging under same, as shown in said figure, by means of which engagement the valve will be closed during the initial portion of the downward movement of the bucket D.

The operation of this device is as follows: The bucket D (left) Fig. 1, being elevated is supposed to be filling, its valve being closed, and the correlative chute-valve being open, while the contrary is the position and case of the bucket D (right). As soon as the bucket D (left) is filled, it begins its descent, closing the chute-valve, through the standard d^7, and arm g^3, as previously described. The initial movement of the working-beam is resisted by the increased resistance thereto due to the fact that the weight of said working-beam is above the pivotal point thereof, which would cause the elevated end of the working-beam to be more out of the line of its direct downward pressure, than the lower end would be. This gives a sufficient preponderance of weight of the depressed bucket over the elevated one to allow the elevated bucket to be completely filled and the depressed one to be completely discharged of its contents, before such initial movement takes place. On the same line, the effective force of the descent of the filled bucket increases as the said bucket descends to the horizontal. As soon as the bucket D (right) has reached approximately its highest limit of elevation, the abutment on the upper end of the standard d^7 opens the valve g', as described, and the stud d^5 comes into contact with the spring abutment on the rod g^5

which closes the valve *d* (right), and opens the valve *d* (left), whereupon the parts are in reversed position from their starting-point and the same operation is gone through as before.

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

1. In a hydraulic motor, the combination of the working-beam, the buckets attached to the ends thereof and provided with valve-controlled openings in their bottoms, the flume having ports adapted to fill the said buckets, the shaft extending between the buckets carrying oppositely projecting cranks, one on each of its ends, the pitmen connecting the cranks with their correlative valves, and means for rotating the shaft to open the valve of each bucket on its depression, substantially as described.

2. In a hydraulic motor, the combination of the working-beam, the buckets secured to the ends thereof and having valve controlled openings formed in their bottoms, the flume having ports adapted to register with the said buckets on their elevation, the shaft extending between the buckets carrying oppositely projecting cranks, one on each end, the pitmen connecting the said cranks with their correlative valves, and means for rotating the shaft to open the valve of each bucket on its depression, consisting of a stud projecting from each of the said cranks and a stationary abutment seated near the point of highest elevation thereof, so as to contact with the stud to turn the shaft, substantially as described.

3. In a hydraulic motor, the combination of the working-beam composed of a metallic framework, its upper bar being a pipe, the buckets secured to the ends thereof and having valve controlled openings in their bottoms, the flume having ports adapted to register with the said buckets, the shaft extending between the buckets through the pipe forming part of the framework, the cranks secured to the said shaft, one at each end, and the pitmen connecting the cranks with the valves controlling the openings in the said buckets, substantially as described.

4. In a hydraulic motor, the combination of the working-beam, the buckets secured to the ends thereof, and having valve controlled openings in their bottoms the flume having valve controlled ports adapted to register with the said buckets, and the mechanism for operating the valves controlling the ports of the said flume, consisting of the standards carried by the said buckets having their upper ends hook-shaped, and the abutments secured to the valves adapted to be pressed upon by the standards on the upward movements of the latter and to be engaged with on the downward movement of the said standards, substantially as described.

5. The combination of an oscillating lever, and means for actuating same, the bifurcated arm projecting from the middle thereof, a grooved disk set in the inner face of each lug, a piston rod and a tongued cross-head set therein, its tongues adapted to slide in the said grooves, substantially as and for the purpose specified.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

ALBERT A. WOOD.

Witnesses:

ALBERT P. WOOD,

S. M. WOOD.