995,060.

C. P. DOWNING.

AIR LOCK FOR CAISSON SHAFTING.

APPLICATION FILED JUNE 24, 1909.

Patented June 13, 1911.

5 SHEETS—SHEET 1.

Fig. 1.

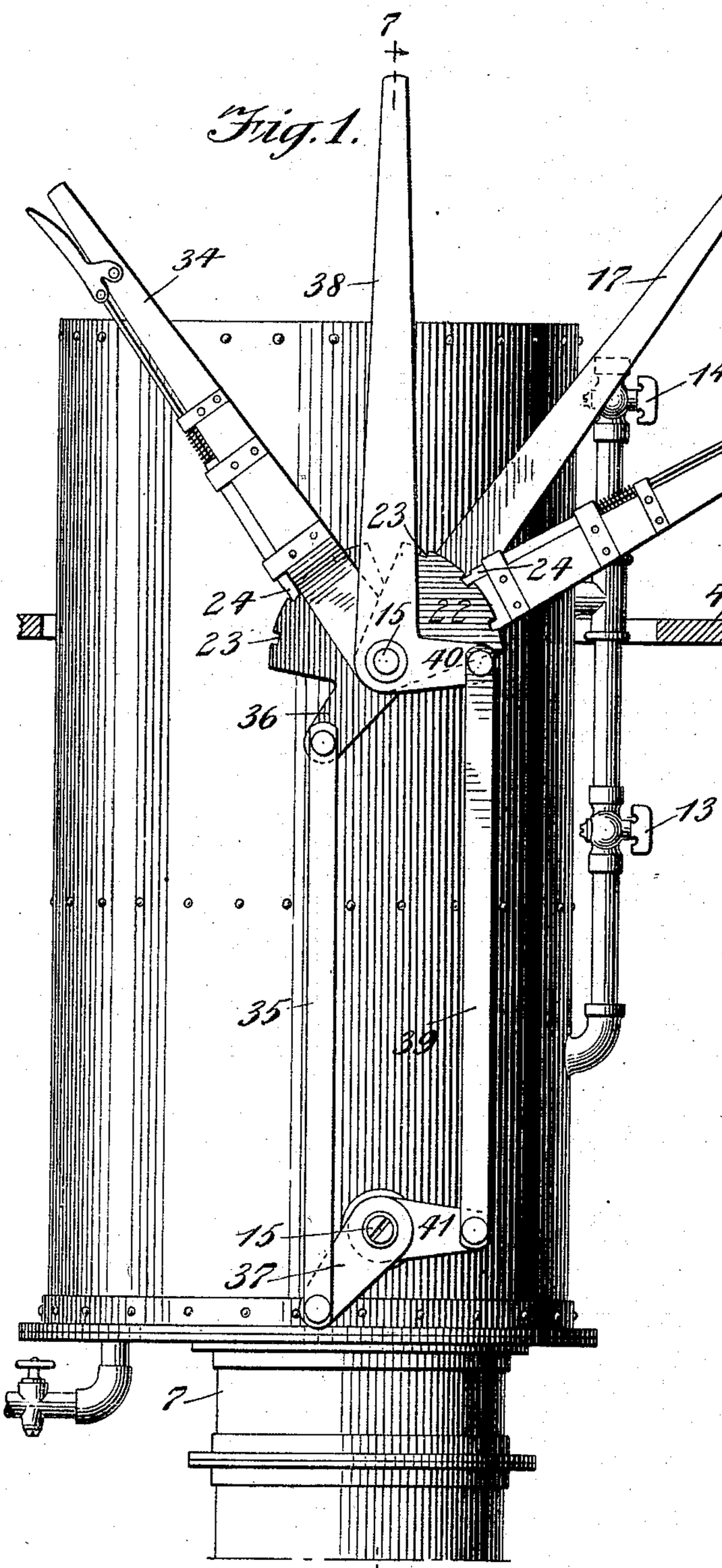
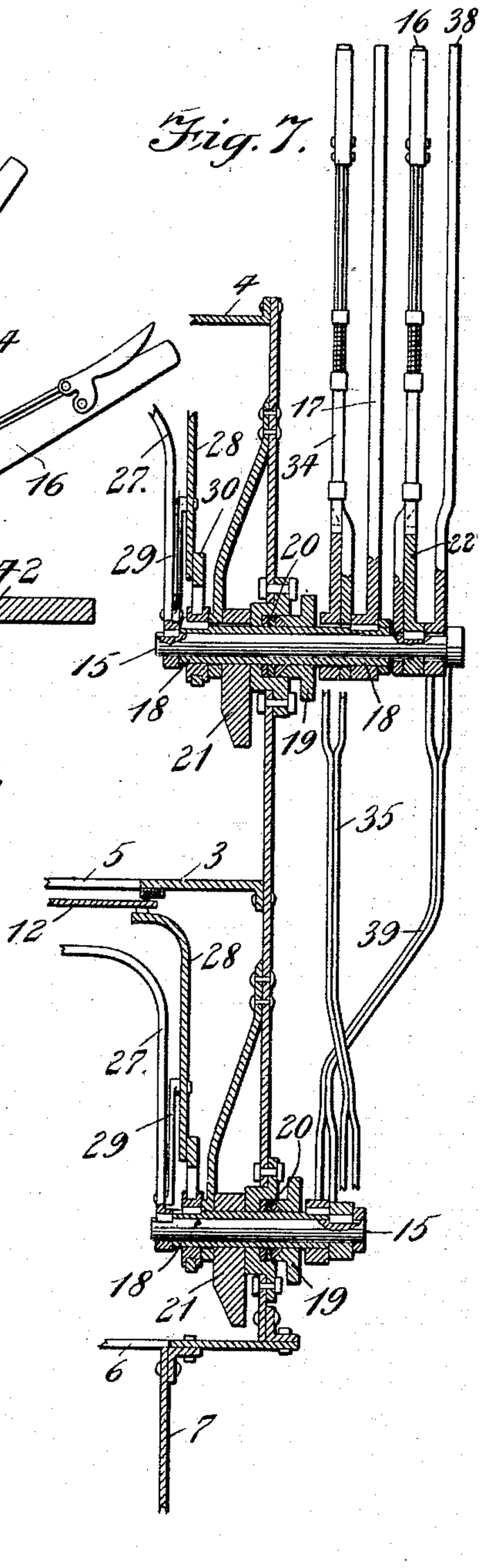


Fig. 7.



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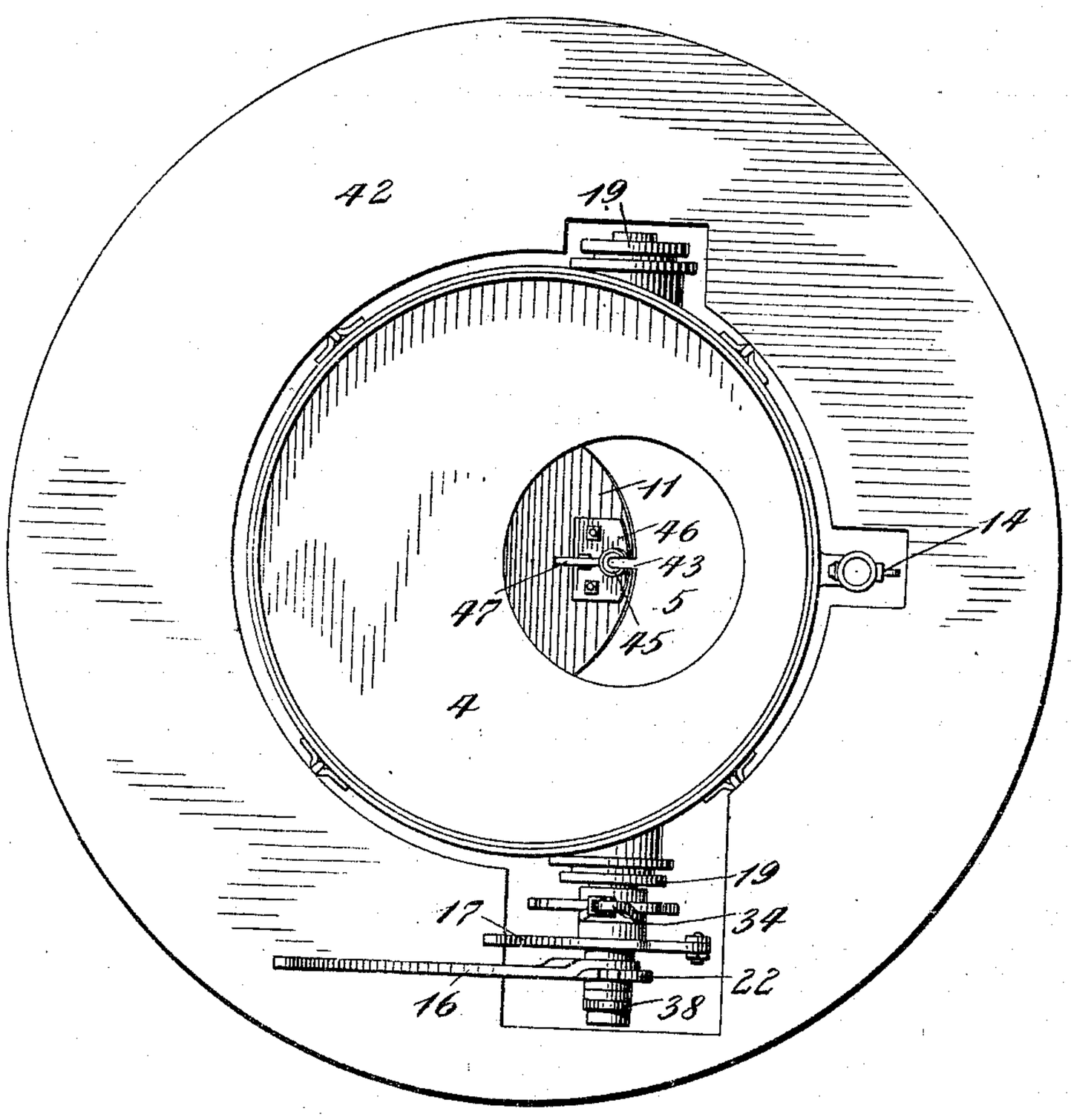
5 SHEETS—SHEET 2.

Fig. 2.



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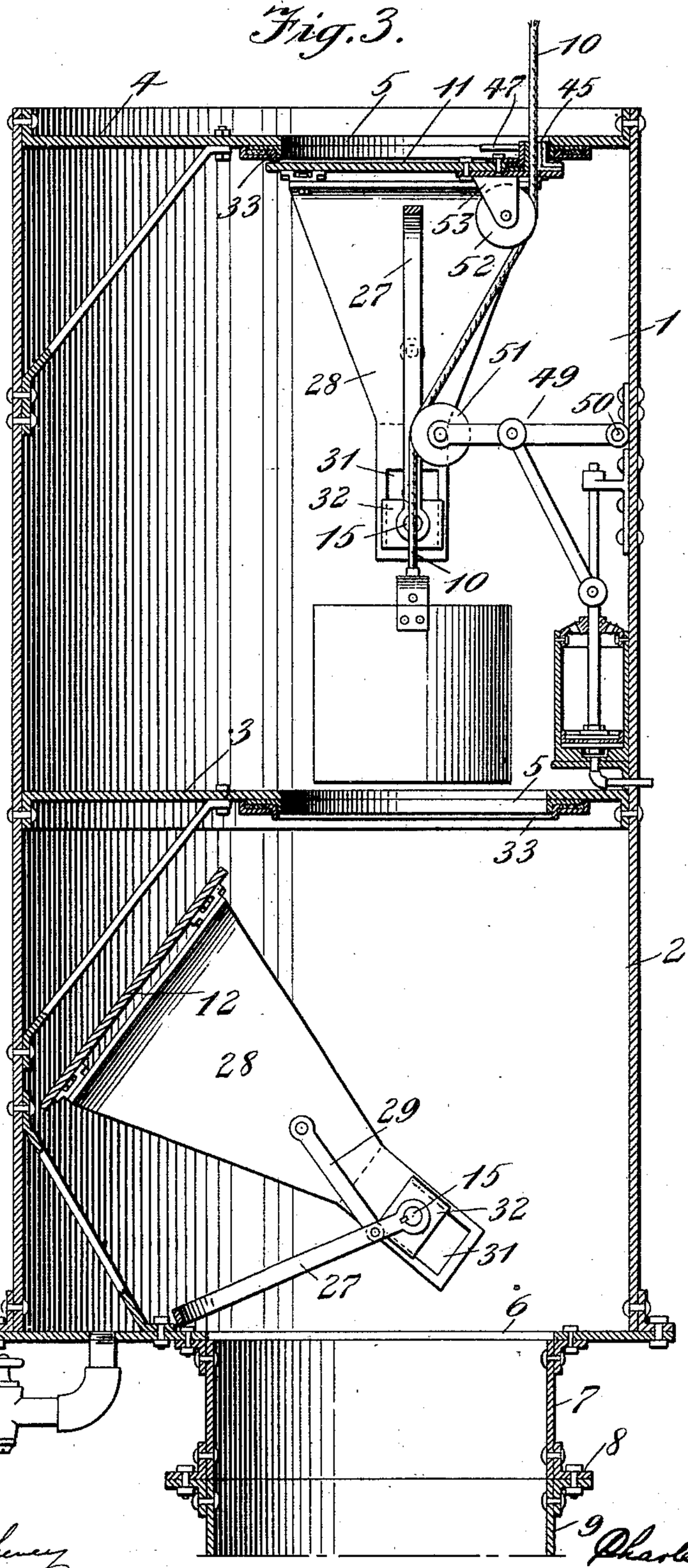
5 SHEETS—SHEET 3.

Fig. 3.



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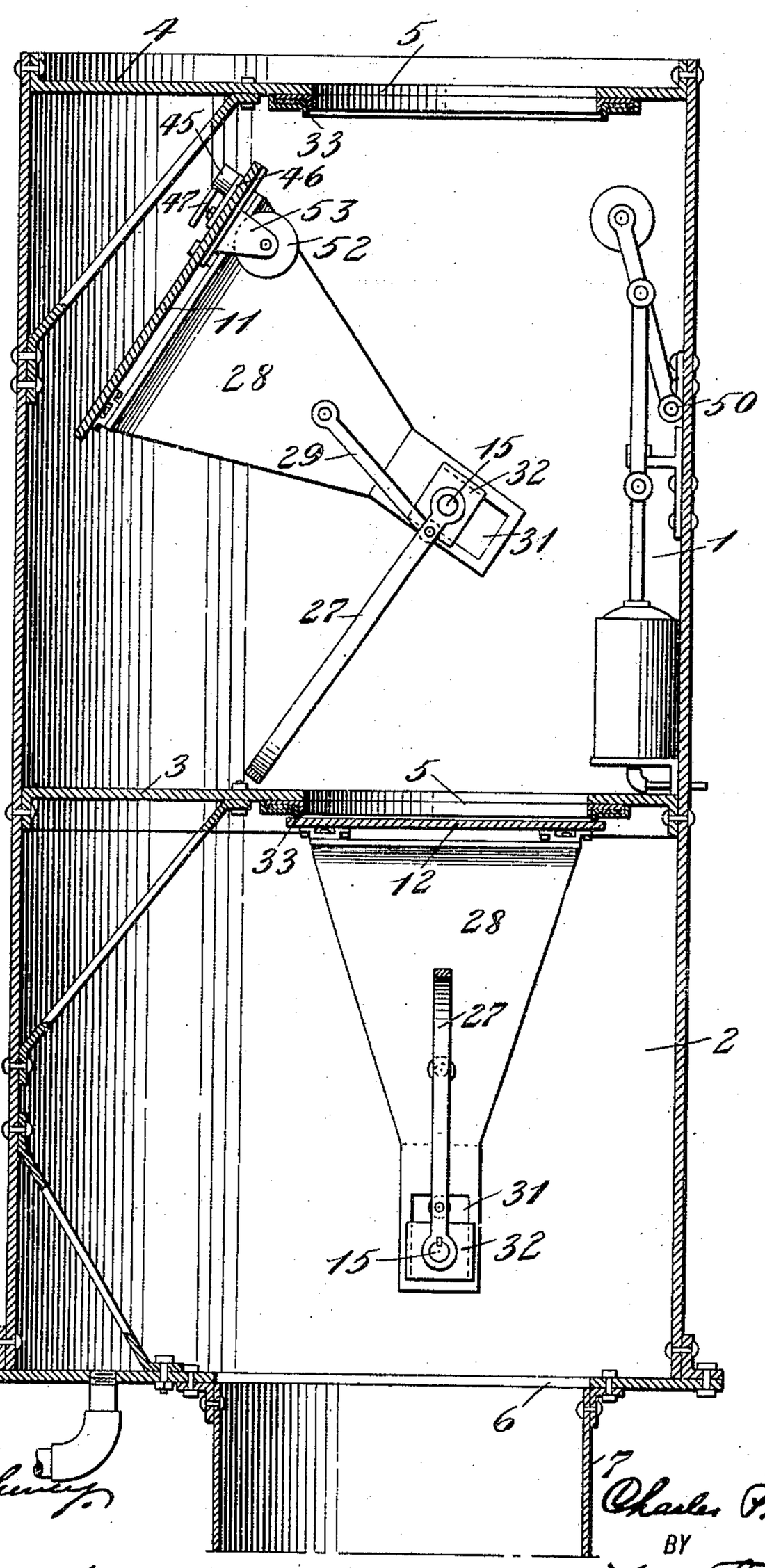
5 SHEETS—SHEET 4.

Fig. 4.



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5 SHEETS—SHEET 5.

Fig. 5.

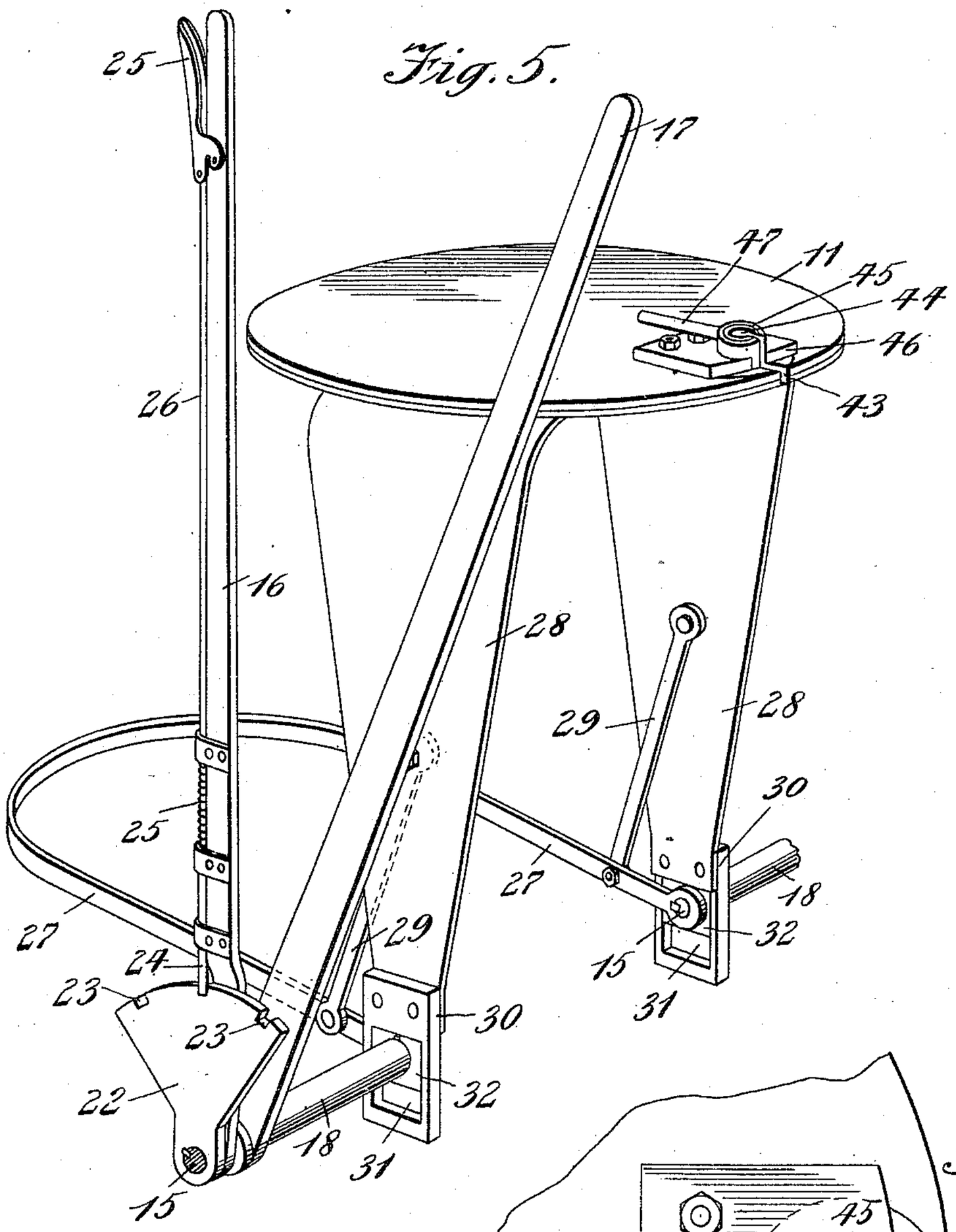
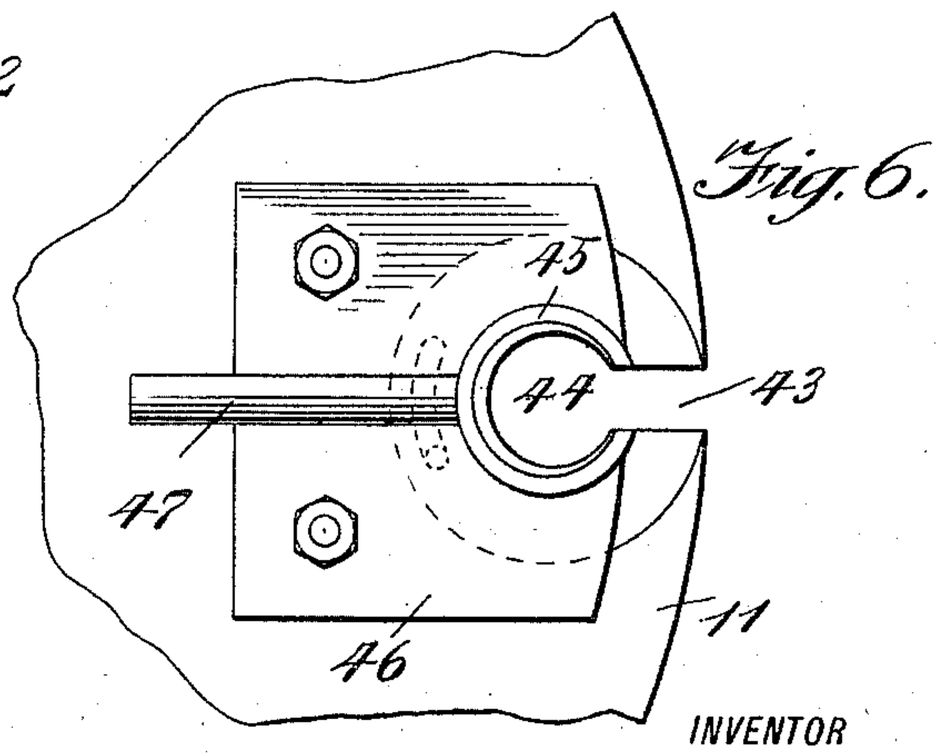


Fig. 6.



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UNITED STATES PATENT OFFICE.

CHARLES P. DOWNING, OF NEW YORK, N. Y.

AIR-LOCK FOR CAISSON-SHAFTING.

995,060. Specification of Letters Patent. Patented June 13, 1911.

Application filed June 24, 1909. Serial No. 504,022.

To all whom it may concern:

Be it known that I, CHARLES P. DOWNING, a citizen of the United States, and resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Air-Locks for Caisson-Shafting, of which the following is a specification.

This invention relates to improvements in air locks for caisson shafting.

In the drawings: Figure 1 is a side elevation of a lock for caisson shafting constructed in accordance with this invention. Fig. 2 is a plan view of the top of the lock, the door being shown in its partly closed position. Fig. 3 is a vertical section showing the two doors, the bucket and guiding devices in their operative position. Fig. 4 is a vertical section showing the doors in the open position assumed prior to receiving the bucket in the upper chamber. Fig. 5 is an isometric perspective of the upper door and the parts for operating the same. Fig. 6 is an enlarged view in plan of the stuffing-box through which the cable passes the upper door. Fig. 7 is a vertical section taken on the lines —7—7— in Fig. 1.

Some of the objects which the present invention has in view are: to produce an air lock for caisson shafting wherein the space within the chambers is economized; to produce a door for closing the manholes, which is easy of operation and is adapted to secure a firm closure; to provide against leakage of air around the hoisting cable; to simplify the construction of the doors.

With these objects in view, the construction as illustrated in the drawings, is substantially as follows:—The head is formed to provide two chambers —1— and —2—. These are cylindrical in shape, and are divided by the partition —3—. The partition —3— and the top —4— are similar in construction in that each is provided with a circular manhole —5—. The man-holes —5—5— are alined each with the other. In the bottom of the chamber —2— there is an opening —6— formed by the collar —7— at the bottom of which are provided outwardly extending flanges —8— to receive the top flanges of the caisson shafting —9— to which it is securely fastened, thus holding the head in position on the shaft. It will be understood that all joints are properly calked, or otherwise rendered air tight. It will also be understood that the structure is suitably braced.

The operation of the "lock" is that usually followed in the present constructions, the object being to maintain an even air pressure in the caisson shaft, and the chambers —1— and —2— when in communication therewith. The lower chamber is open to the caisson shaft —9— only when the hoisting bucket with its cable —10—, or the operators are descending or ascending the said shaft. During this period the upper door —11— is closed while the lower door —12— is thrown to its open position, as shown in Fig. 3 of drawings. When the bucket or mechanics have passed from the chamber —2— into the chamber —1—, the door —12— and the valve —13— are closed, shutting off the communication between the chamber —2— and the chamber —1—. The valve —14— is opened gradually, letting the compressed air in chamber —1— escape into the outer atmosphere. When the pressure in the chamber —1— is balanced with the pressure of the atmosphere, the door —11— is opened, and the bucket or mechanics is passed or pass through the manhole —5—. By this manipulation of the two doors, the compression of the air in the caisson shaft is maintained without any serious diminution.

The operation of each of the doors —11— and —12— is in all respects similar. I will confine myself to the description of the operation as applied to the door —11—. There is imparted to the door two successive actions. The first operation draws the door directly down from the manhole —5—, and in its lowered position the second operation swings it on its pivots to one side. In Figs. 3 and 4 are shown the successive positions. That shown in Fig. 3 is the closed position wherein the door —11— is raised relative to its pivot —15—, and that shown in Fig. 4 illustrates the position wherein the door is lowered relative to the pivot —15—. The manipulation whereby these successive actions are imparted is through the levers —16— and —17— respectively; the former lowering the door and the latter swinging it upon its pivot.

The mechanism for accomplishing the above described actions is shown most clearly

in Figs. 1, 3 and 5 of the drawings. The pivot —15— is extended through hollow sleeves —18—18—, which are mounted in suitable bearings —19— formed in the side wall of the head. The bearings —19— are provided with suitable stuffing-boxes to carry the packing —20—. The sleeves —18— are provided with a counter-weight —21— so disposed that when the sleeve is rotated the counter-weight —21— will balance the weight of the door, when in its opened position, as illustrated in Fig. 4. The pivot —15— is loosely engaged by the lever —16—. The pivot rod —15— has rigidly mounted thereon, the quadrant —22—, mounted beside the lever —16—, and provided with the nicks —23— to be engaged by the bolt —24— carried by the lever —16—. By means of the spring —25ª— the bolt —24— is caused to fall into the said nicks. The bolt is raised from engagement with the nicks —23— by means of the hand grip lever —25— and its connecting rod —26— operating to raise the bolt out of engagement against the expansion of the spring —25ª—.

The operation of the pivot —15— when rotated is to swing on its center the yoke —27— which is connected at both ends of the yoke to the pivots —15— on both sides of the chamber in which the door is mounted. The yoke —27— is connected to the arms —28—28— through the links —29—29—, the said links being pivotally attached to the said yoke and arms. The arms —28— are rigidly secured to the platform, or door —11—. At the lower end of the arms they are provided with guide frames —30— in which are formed rectangular slides —31—. These slides are provided with grooves, or other suitable devices for maintaining in guided position the bearing blocks —32—32— mounted therein. The bearing blocks —32—32— are rigidly attached to the sleeves —18—18—. The lever —17— is rigidly attached to the sleeve —18—.

With a device constructed as thus described, and as shown in the drawings, the operation is as follows:—The lever —16— is adjusted with regard to the quadrant —22— by placing the bolt —24— in the nick —23—, which will give the first part of the necessary throw. The lever is then thrown to the left. The quadrant —22— being rigidly attached to the pivot —15— on the one side of the head, and the pivot —15— being connected with the yoke —27— on the inside of the head, the yoke is swung on the pivot toward the opening direction of the door. The initial position of the yoke —27— is shown in Fig. 3 in the chamber —1—. The final position of the yoke —27— is shown in Fig. 3 in the chamber —2—. The yoke —27— in traveling away from the arms —28— draws upon the links —29—, and depresses the arms —28—, and the door —11— carrying the same downward guided in the action by the guide blocks —32—. It will be noticed that the blocks —32—32— not having changed from their initial vertical position, the arms—28——28— are maintained in their vertical position. The throw of the lever —16— is continued until the yoke —27— is carried to the position shown in Fig. 5. This may require two successive engagements of the quadrant —22— by the lever —16—. If so, the bolt —24— is released from the forward nick —23— and swung to engage the last nick —23—. When the yoke —27— has reached its full position at substantially an angle of 90% from the central line of the arms —28—28—, the arms will have been depressed from the manhole —5— until the guide blocks —32—32— rest in the upper portion of the rectangular slides —31—31—. In this position the door has been depressed from the opening several inches, sufficient under all conditions to permit the edge of the door to pass the gasket —33— with which the manhole is provided. This gasket is of any material suitable to form a joint between the door —11— and the edge of the manhole —5—. The method of construction whereby this packing is held in position is fully shown in the drawings. Any other suitable construction would serve the purpose as far as this invention is concerned. When the door —11— and arms —28— are in the depressed position above described, the operator grasps the lever —17—, which is rigidly attached to the sleeve —18—, which carries the guide block —32—. By throwing the lever —17— over to the left, the sleeve —18—, and guide block —32— are rotated upon the pivots —15— swinging the arms —28— and the door —11— to the open position shown in Fig. 4. During this operation, it will be noticed that the yoke —27— has remained stationary due to the fact that the lever —16— has remained stationary. The result of such action has been that the yoke —27— and the arms —28— have approached a parallel position, and through the interposed links —29—29— have shifted the arms —28—28— outward from the pivots —15—, extending the door —11— toward the side of the chamber in which the door is mounted and thereby more fully clearing the passage away for the passage of the bucket, or mechanics.

When it is desired to close the door, the above described action is reversed. The lever —17— is primarily thrown back to its initial position swinging upon the pivot —15—, the sleeve —18— and guide blocks —32— and the arms —28— and door —11—: while the lever —16— with the

quadrant —22—, pivot —15— and the yoke —27— remain stationary. In this action the yoke —27— and the arms —28— are again separated, and through the interposition of the links —29—29—, the arms —28— are drawn toward the pivot —15— thereby causing the arms —28— and the door —11— to assume the vertical position in the opening —5— several inches below the same. The lever —17— becoming fixed in this position, the lever —16— is swung over, rotating the pivot —15—, and with it the yoke —27—, causing the same to approach the arms —28—, and through the interposition of the links —29—29— to raise the arms —28— and the door —11— vertically away from the pivot —15— and upward, rigidly against the gasket —33— surrounding the manhole —5— and thereby forcing the door into air tight relation with the said manhole.

The action described as the operation of the door in the upper chamber —1— is duplicated in the operation of the door —12— in the lower chamber —2—. The pivot —15— in the chamber —2— is connected to the lever —34— through the interposition of the connecting rod —35— between the bell-crank extensions —36— and —37— whereby is imparted the action of the lever —34— to the pivot —15— in the lower chamber —2—. The lever —34— in its relation to the door in the lower chamber —2— corresponds to the lever —16— in its relation to the door in the upper chamber —1—. The lever —38— is connected through the rod —39— and the bell-cranks —40— and —41— to the sleeve —18— in the lower chamber —2—. The lever —38— in its relation to the sleeve —18— and the door in the lower chamber corresponds to the lever —17— and the sleeve —18— in the upper chamber. Both levers —34— and —38— are loosely mounted in bearings on the sleeve —18— at the upper chamber, and swing independently of the sleeve —18— in the upper chamber. They are so mounted that the operator standing on the platform —42— may operate both doors without changing his station.

It is deemed unnecessary to describe the successive movements of the operator in successively opening and closing the upper and lower doors —11— and —12—, it being understood that these two doors are never open at the same time.

The regulation of the valves —13— and —14— whereby the air is equalized in the two chambers, and from the upper chamber to the outer air has been described; this is likewise a part of the operation performed by the attendant on the platform —42—.

It is deemed necessary that the door —11— should be constructed as nearly as possible a one piece member. In order to accomplish this, I have provided the recess —43— as close to the edge of the door as possible. At this point there is mounted a thimble —44—, which is semi-circular, and of a diameter equal to the hoisting cable for carrying the bucket. The thimble —44— is provided with an outwardly extending plate for bolting the same on the top —11—, preferably from underneath the said top. Surrounding the thimble —44— is a sleeve —45—, likewise semi-circular, and having an opening in the side wall, sufficient to pass the hoisting cable. The sleeve —45— is provided with guide flanges that extend under, and find a bearing in the plate —46—. The sleeve is provided with the handle —47— whereby it may be rotated on its center, passing around the cable and securing the opening against any escapement of air around the same. When desired, the thimble —44— and the sleeve —45— may be provided with suitable packing to prevent the escape of the air. But I have found that a smooth metal bore of the correct dimensions is best suited to the purpose for which this is designed. In the operation of this door, the stuffing-box, which is formed by the thimble —44— and sleeve —45— is in line with the derrick fall of the hoisting cable —10—. The bucket in being lowered is swung to the center of the manhole —5—, and lowered through the same, and then allowed to swing to the position wherein the cable —10— falls in a direct line from the derrick fall through the stuffing-box. In its present position it is to one side of the center of the manhole —5—. In the outer end of the arm —49— is mounted a sheave wheel —51—, which engages the cable when thrown in the position as shown in Fig. 3 in the chamber —1—. The arm 49 is pivotally mounted upon the side wall of the upper chamber at 50. Near the end bearing the sheave 51 is pivotally attached, the link arm 54. The pitman 54 is pivotally connected to the piston rod 55 which is rigidly attached to the piston 56. The piston 56 is mounted in the cylinder 57 which is provided with a bottom 58 through which is extended to the outer air the pipe 59. By this construction the under side of the piston has the atmospheric pressure at all times. The piston rod 55 is guided by a central perforation formed in the open casting or spider 60 and the perforated end of the bracket 61. The cylinder 57 is fixedly mounted on the side of the chamber 1. It will be observed that the sheave —51— when thrown outward will assume a position where its grooved periphery is centrally located above the lower manhole —5—. In this manner the travel of the bucket is controlled relative to the center of the manhole —5— in the partition —3—. The hoisting cable —10— it will be observed

assumes the bent position as shown in Fig. 3. It is prevented from rubbing on the side of the stuffing-box formed by the thimble —44— by a sheave —52— which is rotatably mounted in bracketed bearings —53— on the under side of the door —11—. The grooved periphery of the said sheave —52— is in line with the opening in the thimble —44—. When now the door 11 is closed by manipulating the valves 13 and 14 the air pressure in the chamber 2 and in the shaft is gradually formed in the chamber 1. The pressure of air in excess of atmospheric pressure in said chamber 1 now depresses the piston 56 until the same rests on the bottom 58. The piston in descending carries downward the piston rod 55 and pitman 54. The pitman 54 descending carries down the free end of the arm 49, causing the sheave 51 to engage the cable 10 to force the same toward the center of the chamber and over the center of the lower manhole 5 and of the shaft 9. In this position the arm 49, sheave 51 and cable 10 and held so long as the pressure remains on the top of the piston 56. When now the bucket ascends and arrives in the chamber 1 the bucket is stopped by the arm 49. If through inattention the engine driver draws the bucket too high the arm 49 and pitman and piston will yield sufficiently to prevent breakage. When the door 12 is closed the valves 13 and 14 are manipulated to establish atmospheric pressure in chamber 1. In doing this the pressure is removed from the piston 56 so that the same offers no resistance to the lift of the arm 49 when now the bucket is raised after the door 11 has been thrown back. The bucket moves the arm 49 to the position illustrated at Fig. 4 of drawings.

Having thus described this invention, what is claimed is:—

1. An air lock for caisson shafting comprising; a chamber having top and bottom openings disposed in line with each other; a yielding continuous ring gasket adapted to form an air tight joint; a door mounted to swing bodily below the said openings; pivoted arms fixedly connected to said doors and pivoted in line with the center of said openings upon the sides of the said chamber and below the said openings; means for rotating the said door to a position below the openings; and means for raising the door against the said gasket to close the said openings.

2. An air lock for caisson shafting comprising; a chamber having top and bottom openings disposed in line with each other; a door mounted within said chamber to swing on pivots below the upper of said openings, said door being provided with a housing to receive the hoisting cable, said housing consisting of a stationary metallic thimble the wall whereof forms a run-way for the hoisting cable, said wall being formed with surfaces eccentric to each other and converging to form a gap in the said wall sufficient to pass the hoisting cable; and a circular collar concentric with the outer surface to said thimble adapted to pivot on the same, and having an opening in the side adapted to pass the said cable, and adapted to close upon the same after the said cable is in the said thimble; and means for closing the said door against the said upper opening.

3. An air lock for caisson shafting comprising; a chamber having top and bottom openings disposed in line with each other; an uplifting door adapted to close the lower of said openings and pivotally mounted below the said opening; a plurality of pivot blocks mounted within said chamber and on opposite sides thereof; a door having supporting arms pivotally connected with the said pivot blocks, said door being provided with a guide perforation for the hoisting cable near the edge of said door; a manually controlled mechanism to reciprocate said blocks to and from the upper of said openings; a rocking lever having a grooved pulley adapted to be moved to aline with the center of the lower of said openings to form a guide for the hoisting cable; and means for rocking said lever to shift the said wheel subsequent to the closing of the upper of said openings.

4. An air lock for caisson shafting comprising; a chamber having top and bottom openings disposed in line with each other; an uplifting door adapted to close the lower of said openings and pivotally mounted below the said opening; a plurality of pivot blocks mounted within said chamber and on opposite sides thereof; a door having supporting arms pivotally connected with the said pivot blocks; said door being provided with a guide perforation for the hoisting cable near the edge of said door; a manually controlled mechanism to reciprocate said blocks to and from the upper of said openings; a rocking lever having a grooved pulley adapted to be moved to aline with the center of the lower of said openings to form a guide for the hoisting cable; and means for rocking said lever embodying an engine operated by the air pressure produced in said chamber subsequent to the closing of the upper of said openings.

5. An air lock for caisson shafting comprising; a chamber having top and bottom openings disposed in line with each other; an uplifting door adapted to close the lower of said openings and pivotally mounted below the said opening; a plurality of pivot blocks mounted within said chamber and on opposite sides thereof; a door having supporting arms pivotally connected with the said pivot blocks; said door being provided with

a guide perforation for the hoisting cable near the edge of said door; a manually controlled mechanism to reciprocate said blocks to and from the upper of said openings; a rocking lever having a grooved pulley adapted to be moved to aline with the center of the lower of said openings to form a guide for the hoisting cable; and a pneumatic engine embodying an open ended cylinder open to the pressure of the air in the chamber, and having a piston operatively connected with said lever, said piston being adapted to be moved by the air pressure produced in the said chamber.

6. An air lock for caisson shafting comprising; a chamber having top and bottom openings disposed in line with each other; a plurality of pivot blocks movably mounted below each of said openings; a plurality of doors having depended arms pivotally connected with said blocks and adapted to be rotated to a vertical position below said openings; yielding gaskets surrounding said openings in the path of said doors; a plurality of levers connected with said blocks for raising the same to compress the said doors against the said gaskets, said levers being pivoted from without said chamber.

7. An air lock for caisson shafting comprising; a chamber having top and bottom openings disposed in line with each other; a plurality of pivot blocks movably mounted below each of said openings; a plurality of doors having depended arms pivotally connected with said blocks and adapted to be rotated to a vertical position below said openings; yielding gaskets surrounding said openings in the path of said doors; a plurality of levers connected with said blocks for raising the same to compress the said doors against the said gaskets, said levers being pivoted from without said chamber, and guides mounted within said chamber for the hoisting cable to lead same through the upper of said openings at near the edge of said opening and through the lower of said openings at near the center of the said opening.

8. An air lock for caisson shafting comprising a chamber having top and bottom openings disposed in line with each other; a door for closing the upper of said openings having yoke-like supporting arms, the ends whereof are separated to form a passage for a hoisting bucket therebetween; pivot shafts mounted in said chamber at opposite sides of the lower of said openings to support said door; a lever connected with said shafts for rotating the same; a plurality of guide loops connecting said doors and said shafts; and a hoisting lever connected with said arms for raising the same when rotated on the said shaft vertically in line with the upper of said openings.

9. An air lock for caisson shafting comprising a chamber having top and bottom openings disposed in line with each other; a door having yoke-like extended supporting members, said members being separated to form a passage for a hoisting bucket employed in said caisson; said arms being provided at the extremities thereof with guide loops; a plurality of tubular pivoted shafts mounted in said chamber and having rectangular guide blocks disposed at the ends thereof; a plurality of rocking shafts mounted within said tubular shafts; a yoke fixedly connected with said rocking shafts; a plurality of links connecting said yoke and said supporting members; a plurality of levers operatively disposed at the outer side of said chamber, one of said levers being connected with each of said tubular shafts and said rocking shafts; and a yielding gasket to receive the said door.

Signed at New York in the county of New York and State of New York this 10th day of June A. D. 1909.

CHARLES P. DOWNING.

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