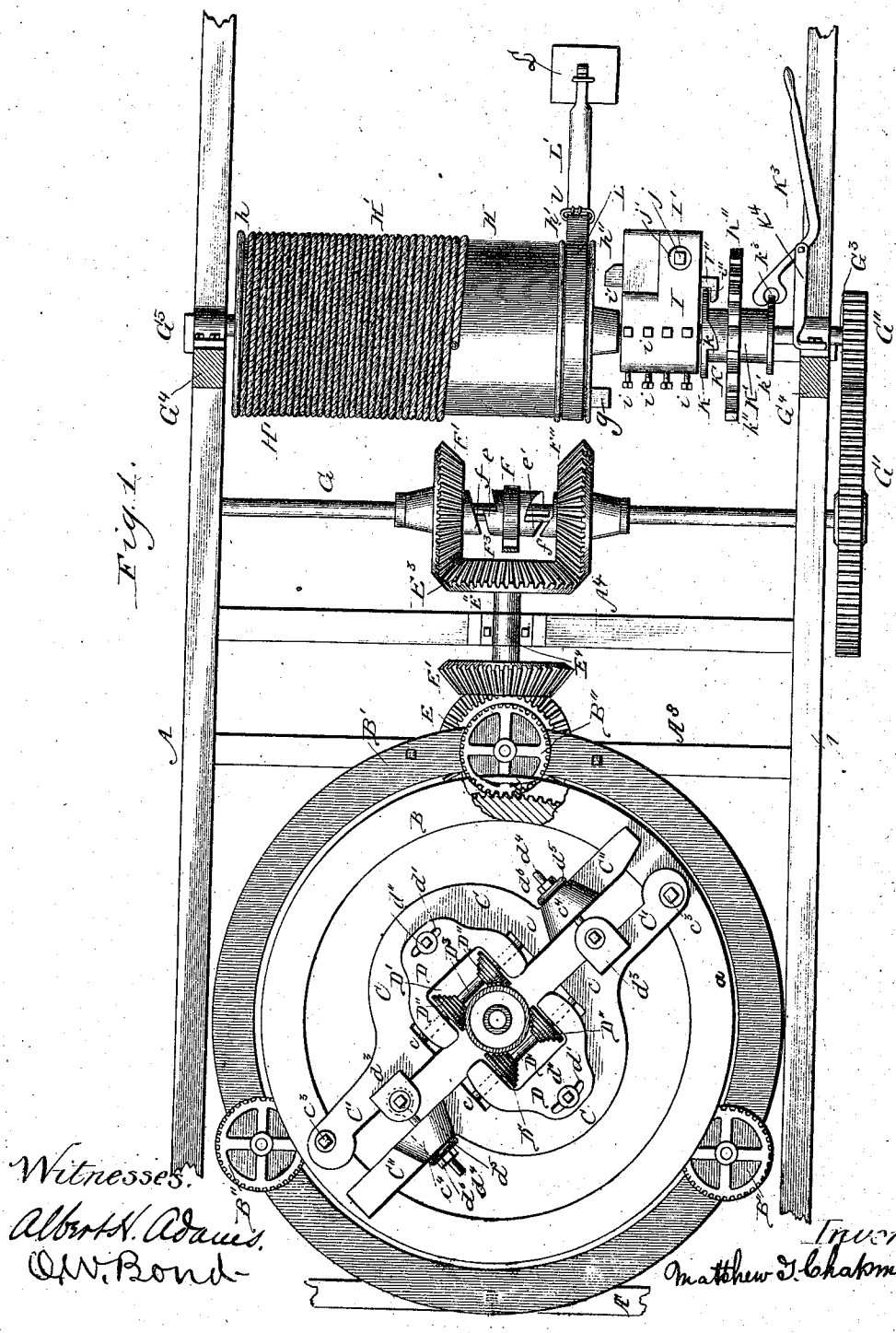
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7 Sheets—Sheet 1.

M. T. CHAPMAN.

APPARATUS FOR SINKING WELLS.

No. 382,689. Patented May 15, 1888.



Witnesses:
Albert N. Adams.
C. W. Bond.

Inventor:
Matthew T. Chapman.

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APPARATUS FOR SINKING WELLS

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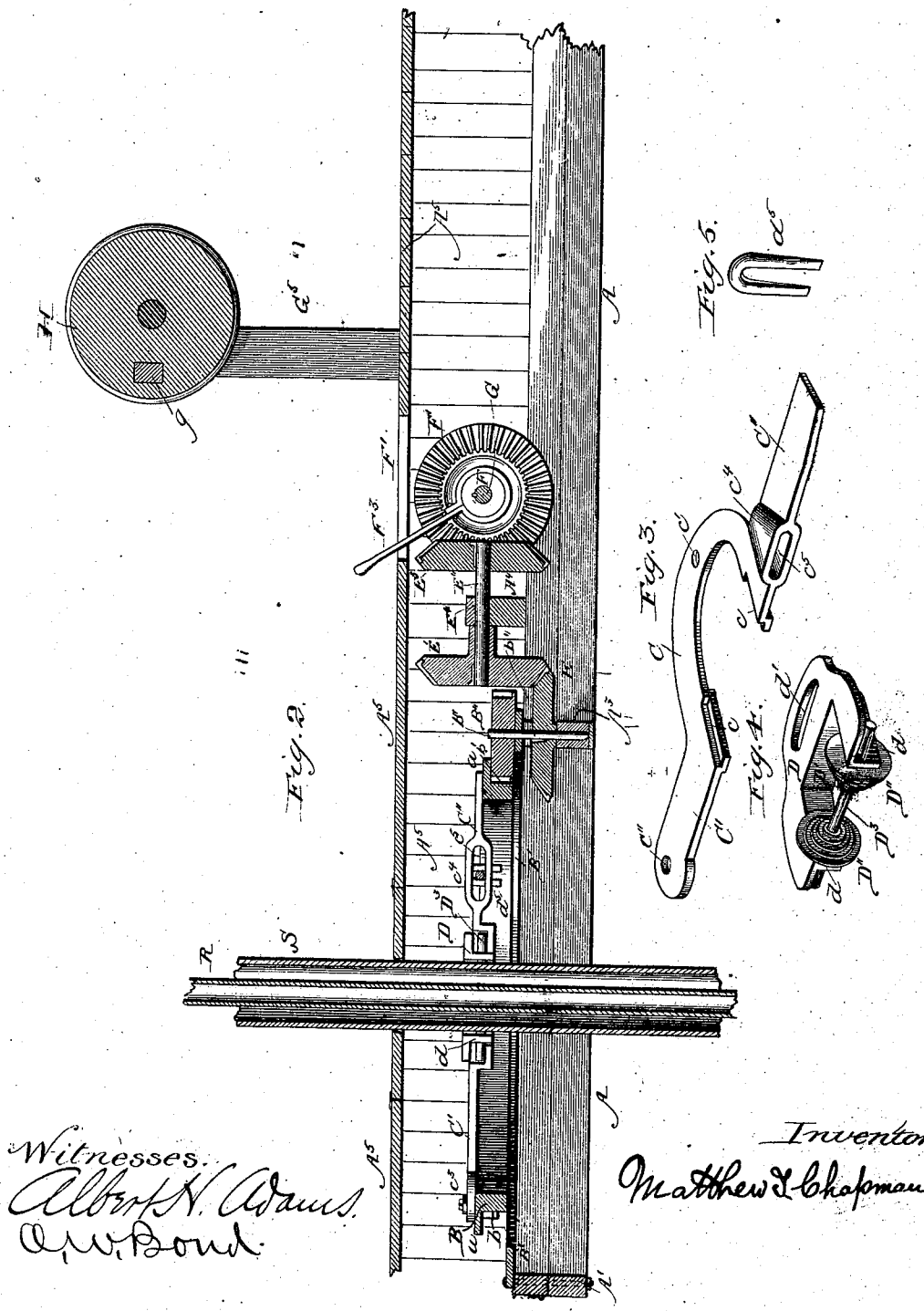


Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Witnesses.
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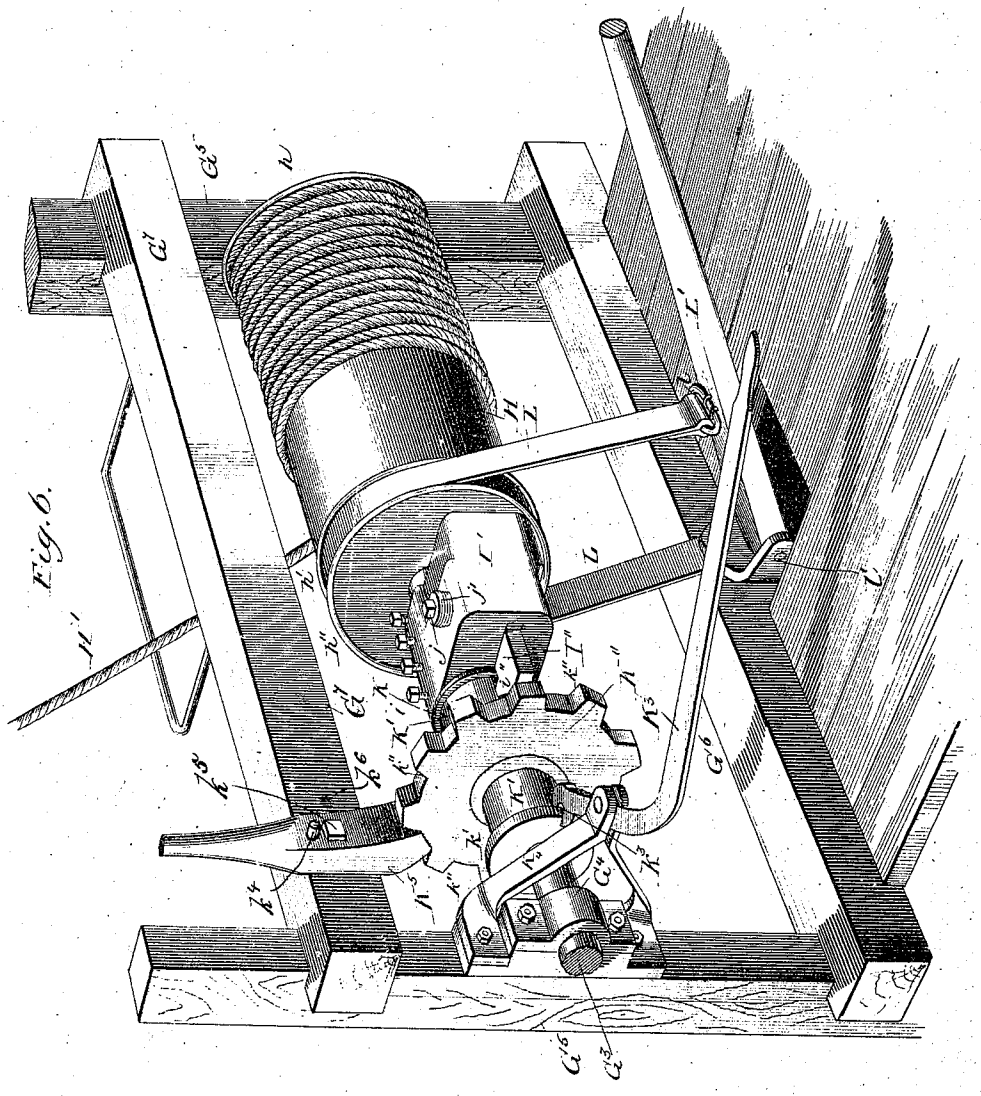


Fig. 6.

Witnesses.
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APPARATUS FOR SINKING WELLS.

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Fig. 7.

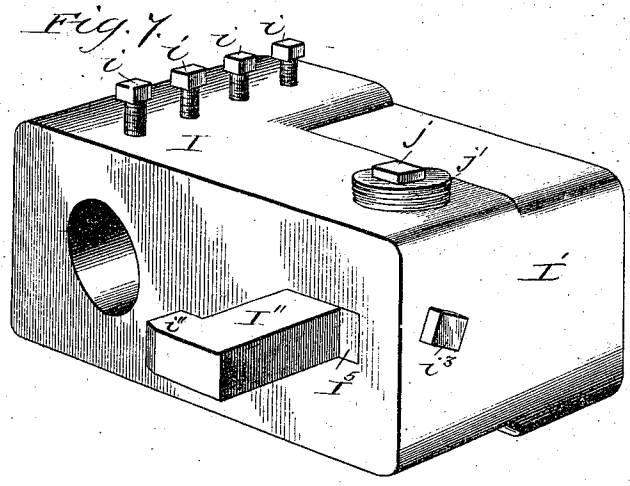


Fig. 8.

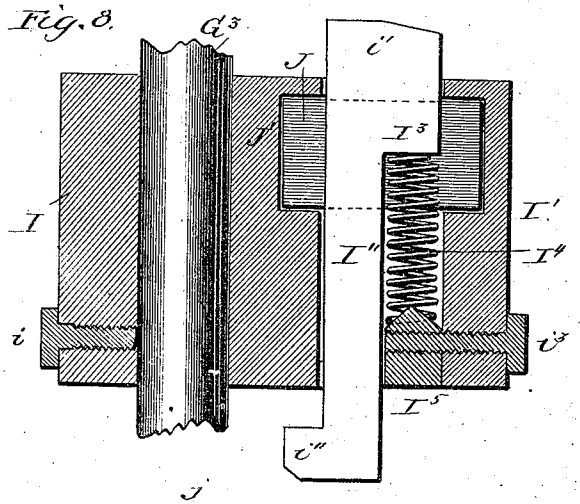
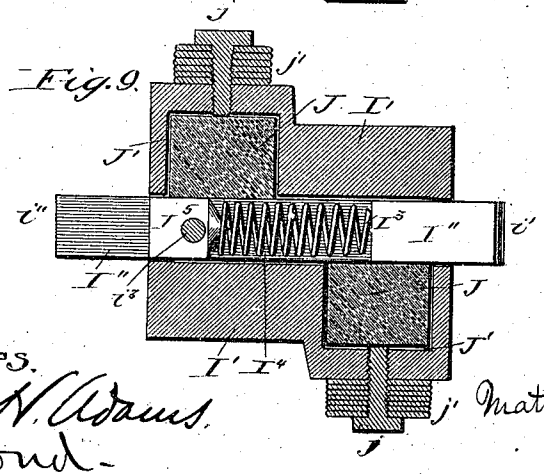


Fig. 9.



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Fig. 10.

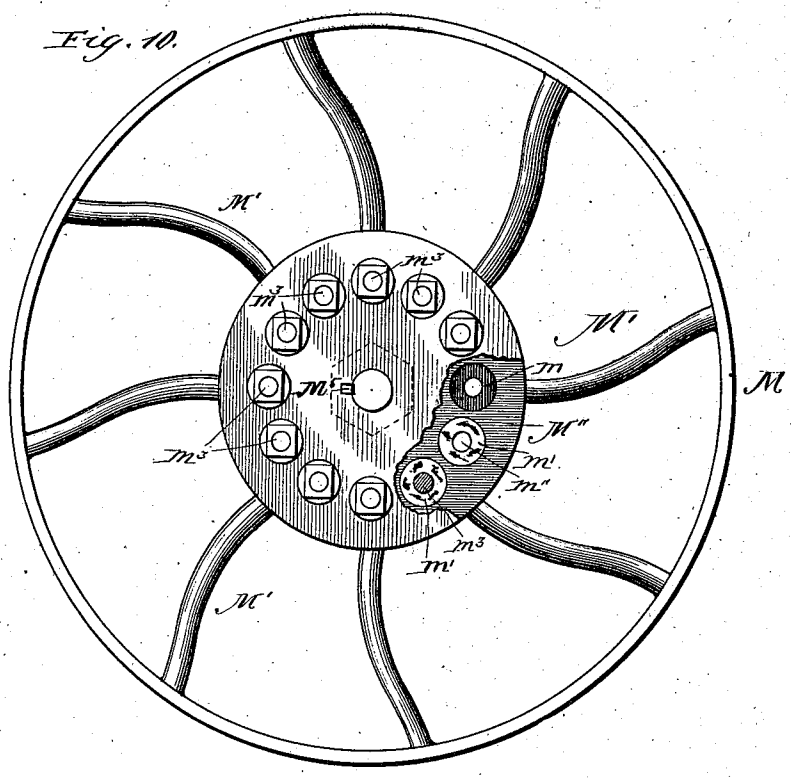


Fig. 11.

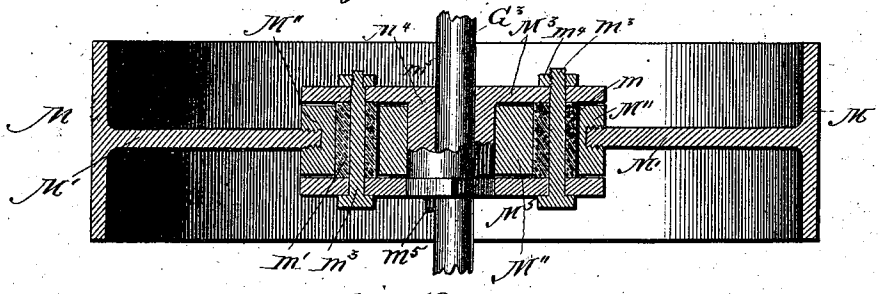
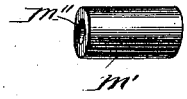


Fig. 12.



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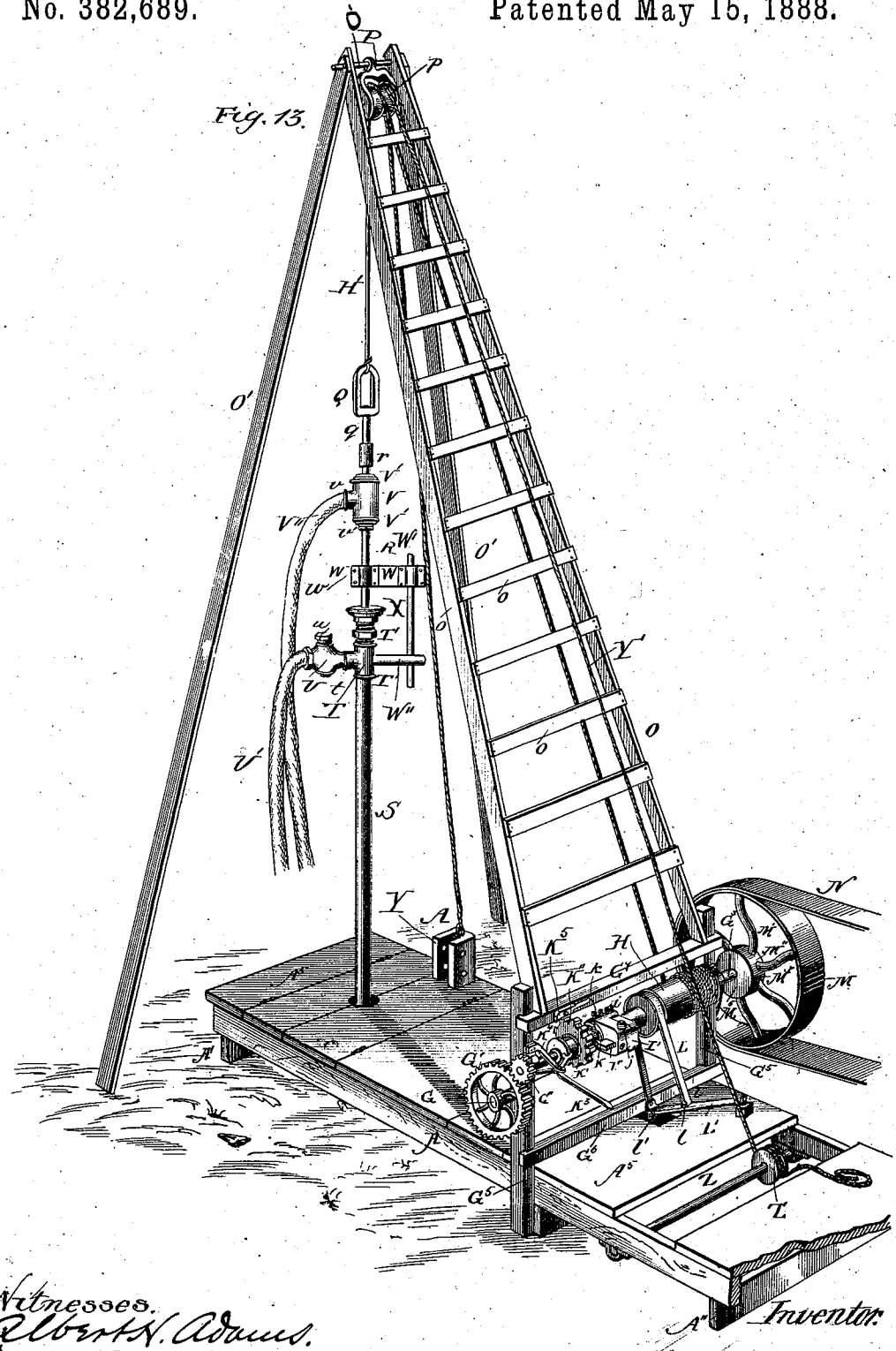
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M. T. CHAPMAN.

APPARATUS FOR SINKING WELLS.

No. 382,689. Patented May 15, 1888.

Fig. 13.



Witnesses.
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Fig. 14.

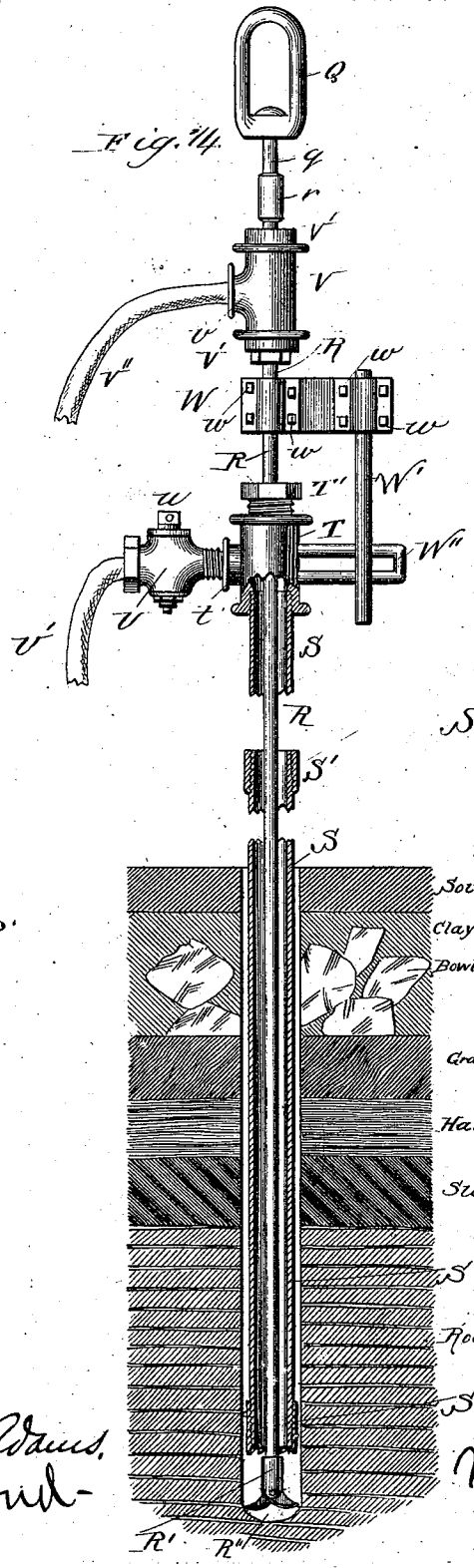


Fig. 16.

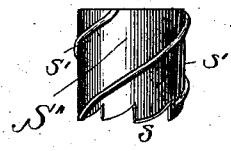


Fig. 15.

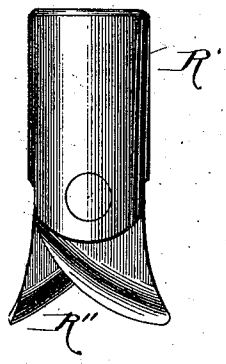
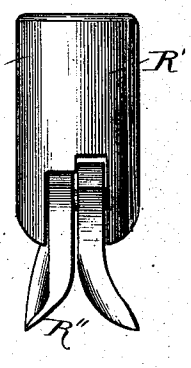


Fig. 17.



Witnesses.
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UNITED STATES PATENT OFFICE.

MATTHEW T. CHAPMAN, OF AURORA, ILLINOIS.

APPARATUS FOR SINKING WELLS

SPECIFICATION forming part of Letters Patent No. 382,689, dated May 15, 1888.

Application filed October 30, 1885. Serial No. 181,386. (No model.)

To all whom it may concern:

Be it known that I, MATTHEW T. CHAPMAN, residing at Aurora, in the county of Kane and State of Illinois, and a citizen of the United States, have invented a new and useful Improvement in Apparatus for Sinking Wells, of which the following is a full description, reference being had to the accompanying drawings, in which—

Figure 1 is a top or plan view of the gripping and turning table and its actuating devices and the loose winding-drum and its actuating devices; Fig. 2, a sectional elevation of the parts shown in Fig. 1; Fig. 3, a detail in perspective of the clamp for the support of the gripper; Fig. 4, a detail in perspective of the gripper and its frame or support; Fig. 5, a detail in perspective of the key for locking the gripping-cones; Fig. 6, an elevation in perspective of the loose winding-drum and its actuating devices; Fig. 7, a perspective view of the revolving clutch-block; Fig. 8, a transverse section of the revolving clutch; Fig. 9, a cross section through the revolving clutch; Fig. 10, an elevation of the driving-wheel for the drum; Fig. 11, a sectional elevation of the driving-wheel of Fig. 10; Fig. 12, a detail of the cushion around the bolts connecting the hub of the wheel with the spokes; Fig. 13, a perspective view of the apparatus; Fig. 14, an elevation showing the devices for sinking the hole for the well; Fig. 15, a detail of a cutter applied to the lower end of the tube being sunk; Figs. 16 and 17, details of one form of drill to be used in sinking the hole.

This invention relates to machinery or mechanism primarily designed for use in sinking wells, and with that class of wells in which a hole is sunk and a tube carried down to form the wall of the well, but which can be used for other purposes, and has for its objects to give the tubing a rotary motion without interfering with its progressive motion downward, by which the tubing can be used for cutting its own hole; to improve the construction and operation of the mechanism by which the drill-rod, when a drill is used, is controlled in rising and falling; to improve the devices which control a loose winding-drum in winding and unwinding the rope or cable thereof, and to improve generally the construction and operation of the mechanisms by which the tubing is handled and the hole sunk; and its nature consists in the several parts and combinations of parts, hereinafter described, and pointed out in the claims, as new for attaining the objects sought.

In the drawings, A represents the side pieces of a frame, A′ A″ end pieces, and A^3 A^4 cross-pieces. The side pieces, A, are of sufficient depth to furnish a space underneath the floor for the location of the gripping-table and its actuating mechanism in the arrangement shown, and the end pieces and cross-pieces for the frame are to be located and arranged to furnish a connection for the side pieces and a support for the gripping mechanisms and its operating devices and other parts pertaining to the apparatus as a whole, and, as shown, a covering or floor, A^5, is provided to rest on the top of the side pieces over the gripping-table and under the loose winding-drum, the sections of which flooring or covering can be hinged one to the other, so as to be capable of rising to permit access to the gripping-table and its actuating devices, and such flooring or covering can be made up in sections, so as to be removable for this purpose, or, if desired, the cover, as a whole, can be omitted; and it is to be understood that the frame-work is to be made to furnish a support for the turning devices and a loose winding-drum and its devices, and its form therefore can be changed or modified from that shown.

B is a ring having on the exterior face leaves or cogs *b* located beneath an upper outward-extending flange, *a*, into which leaves or cogs the leaves or cogs of gear-wheels B″ mesh, which wheels are mounted on suitable studs or shafts extending up from an annular rim, B′, within the opening of which the cogged ring B is located, and this rim B′ is bolted or otherwise firmly secured to the end piece, A′, and cross-piece A^3, or to other suitable supports attached to the frame-work. As shown, one of the wheels B″ is located on the line of a longitudinal center of the frame, or nearly so, and the shaft *b*″ of this wheel extends down and has its bearings in the cross-piece A^3; the shaft passing through the ring B′, and this wheel B″ in the arrangement shown is the driving-wheel for rotating the cogged ring B.

C C′ C″ represent a support, the portion C of which is curved and the portions C′ C″ straight and standing at right angles, or nearly so, to the portion C, and at the inner end of each part C′ C″, in the edge of the circular portion C, is a depression or recess, *c*. The part C has a hole, *c′*, for the passage of a bolt, and the end of C′ has a hole, *c″*, for the passage of a bolt or pivot by which the support as a whole is pivotally attached to the ring B, and, as shown, the part C″ has an enlarged portion, c^4, in which is a tapering slot, c^5, the taper running from the inner edge of the part C″ to the outer edge. Two supports C C′ C″, exactly similar in construction, are provided, which lie adjacent to each other when the parts are together, the ends being reversed.

D is a plate having a rectangular opening, D′, on its inner edge, on three sides of which is a depending flange, *d*, the end flanges of which support a shaft, D^3, on which, within the opening D′, is mounted two cone-shaped pieces, D″, circular in cross-section, each having its exterior face provided with a series of teeth or ledges. The outer end of the plate D has a slot slightly curved, through which and the opening *c′* a bolt, *d″*, passes, for attaching the plate D to the support C C′ C″, and when in place the ends of the shaft D^3 lie within the depression or recess *c*, while the flanges abut against the square end of the opening in the support C C′ C″ and prevent side turning or twisting of the plate D with the clutch-cones D″. Two of these plates D, each of a similar construction, are provided, one for each support C C′ C″. The free end C″ of each support is connected with the pivotal end of the other support by means of an adjusting-bolt, d^4, the head end of which is pivoted between ears d^3 on the pivoted end C′ of the respective supports, the stem of the bolt passing through the slot c^5 and receiving on its end a nut, d^5, and, as shown, in order to secure a quick tightening and loosening of the supports a wedge-shaped staple, d^6, (shown in Fig. 5,) is forced down between the nut and the edge or end of the enlarged portion c^4, by which a wedging action is produced to bring the supports closer together. The supports C C′ C″ and plates D are in fact two pivoted jaws carrying the gripping-cones, between which cones the tubing is caught and impinged, so as to be held sufficiently firm for rotation and at the same time sufficiently free to be forced downward, and these jaws can be adjusted as required to suit different-sized pipes by throwing the free ends apart to leave the required space within the cones for the passage of the tubing.

E is a beveled gear, keyed or otherwise fastened to the shaft *b″* below the gear-wheel B″, with which beveled wheel E a beveled wheel, E′, meshes, which wheel is keyed or otherwise fastened to a shaft, E″, to the opposite end of which is secured a beveled gear, E^3, and, as shown, the shaft E″ is mounted in a journal-box, E^4, on the cross-piece A^4.

F is a sliding clutch located between two beveled gears, F′ F″, both of which mesh with the beveled gear E^3, which gears are loose upon the driving-shaft, to which the clutch F is connected by a spline, so as to rotate with the shaft and at the same time have a free end movement, and, as shown, this clutch F is operated through a lever or rod, F^3, and the clutch at one end has a tooth, *e*, to engage with a tooth, *f*, on the hub of the gear F′, and its other end has a tooth, *e′*, to engage a tooth, *f′*, on the hub of the wheel F″, and the clutch is of such length in relation to the space between the hubs of the wheels F′ F″ that it can be set midway between the two and stop the rotation of the wheels, or be thrown into engagement with either gear to rotate them, and through the gear E^3, shaft E″, and gear-wheels E′ E drive the shaft *b″* to rotate the gear B″ and impart rotation to the cogged ring B in either direction.

G is a shaft on which is mounted the clutch F and beveled gear F′ F″, which shaft at one end is provided with a gear, G′, which meshes with a gear, G″, on the end of a shaft, G^3, supported in suitable boxes, G^4, on uprights G^5, on which shaft G^3, as shown, is mounted the loose winding-drum. This shaft G^3 can be driven by steam or other power through a belt, or by a tumbling-rod or other device operated by some motive power. As shown, it is driven by a belt.

H is the winding-drum loosely mounted on the shaft G^3, except when connected therewith through the clutch device, on which drum the operating rope or cable H′ winds and unwinds, and this drum, as shown, has at one end a flange, *h*, and at the other end flanges *h′ h″*, between which and around the end of the drum is a brake-band, and the end of this drum H adjacent to the clutch is provided with a catch or projection for engagement with a catch or projection on the clutch.

I is a head firmly secured to the shaft G^3 by means of set-screws or bolts *i*, or in any other suitable manner. This head has a side extension, I′, in which is located a sliding bar or latch, I″, the end *i′* of which, when projected, engages a projection, *g*, on the drum, connecting the drum with the shaft G^3, and the other end of this latch is provided with a hook, *i″*, for withdrawing the latch to have the end *i′* clear the projection *g* and allow the drum H to run loose backward, or in a reverse direction from the rotation of the shaft. As shown, the latch is thrown forward or into engaging position by a spring, I^4, located between a shoulder, I^3, on the latch, and a block, I^5, inserted in the end of the opening for the latch or bolt I″, and held in place by a screw or bolt, i^3, as shown in Figs. 7 and 8.

J represents pieces of rubber or other elastic material inserted in recesses J′, formed in the extension I′ at opposite corners, as shown in Fig. 9, to have the face of the rubber come in contact with the faces of the sliding latch or dog I″, and the amount of pressure or re-

sistance of the bumpers J is controlled, as shown, by set-screws or bolts *j*, which pass through to have their ends engage the face of the bumper, and, as shown, between the head of the screw or bolt and the face of the extension is a series of washers, *j'*, to regulate the distance the end of the screw projects. These bumpers J are for the purpose of receiving the shock when the drum is engaged by the clutch and prevent the transmission of the shock to the drum or to the clutch.

K is a disk, the face of which when the clutch is in position to lock and unlock the drum lies adjacent to the end face of the head I, and the periphery of which comes within the space between the end face of the extension I and the hook *i''* of the latch or dog I'', and on the inner face of this disk at the periphery is an incline, *k*, which as the head rotates brings the hook *i''* into contact with the incline *k* and withdraws the dog or latch I'' to release the drum and allow it to run loose in a reverse direction. The width of the disk and its diameter is one that fits within the space between the extension and the hook *i''* and the circle described by the dog or catch in its rotation, and the incline or cam *k* is sufficient to withdraw the latch or dog I'' the distance required for its end *i'* to clear the projection *g* on the drum. This disk is formed with or suitably secured to a hub or center, K', on which is also formed or firmly secured a circular plate, K'', the periphery of which is provided with a series of notches, *k''*, and the end of the sleeve or hub K' beyond the face of the plate K'' is provided with a flange, *k'*, over which fits a notch, k^3, in the end of a lever, K^3, pivotally mounted on a support, K^4, secured to the upright or post G^5. This lever K^3 enables the operator to withdraw the hub or sleeve K' and the cam-disk K to withdraw the latch I'', so that its end will be held clear from engagement with the projection *g*, allowing the drum H to run loose in a reverse direction to the rotation of the shaft F^3 for any length of time desired, or until the rope H' is completely unwound, for which purpose the sleeve or hub K' is loose upon the shaft G^3, so that it can be moved forward and back thereon by the lever K^3, which lever also advances the hub or sleeve to bring the cam disk K into a normal position for use in locking and unlocking the latch I'' with the drum. The cam-disk K is held stationary by a latch, K^5, the end of which enters a recess, *k''*, on the plate K''. This latch K^5 is pivoted by a bolt or pin, k^4, to a cross piece, G^7, running from upright to upright G^5, and, as shown, a pin, k^4, passes through the body of the latch K^5 and enters holes k^6 in the cross-piece G^7, by which the latch can be held in engagement with the notch *k''*, or be carried to one side and locked and held out of engagement. This notched plate K' also furnishes the means for adjusting the cam-disk in its relation to the rotation of the head I to unlock the clutch from the drum at any required point to increase or decrease the wind and unwind of the rope or cable H' on the drum. The rotation of the notched plate forward, or in the direction of the rotation of the shaft G^3, increases the wind of the rope onto the drum by bringing the end *i'* and stop *g* into engagement before the drum has discharged the full amount of the wind previously made, which engagement rotates the drum H, with the shaft G^3 winding the rope or cable thereon, until the latch or dog I'' is withdrawn by the cam-disk releasing the stops *i' g*, to allow the drum to run loose in the reverse direction; and as the point of release has been advanced in relation to the point where the prior disengagement occurred, it will be seen that an increase in the wind must be had equal to the distance of rotation of the drum over that which it previously had. The decrease in the wind is had by turning the notched plate back, or against the rotation of the shaft G^3, which brings the end *i'* of the latch or dog I'' into engagement with the stop *g* at a point back of the one previously had, which causes an increased amount of unwind before the drum is again rotated, and a consequent decrease in the wind as the cam-disk has been receded, in relation to the point where the former disengagement occurred, causing a change in the time of unlocking and a decrease in the wind equal to the distance the cam has been receded, there being that decrease in the rotation of the drum when the disengagement takes place. This arrangement can be used for any purpose where the rotation and release of the drum are desired automatically at stated intervals, to wind thereon and to unwind therefrom, and by its use an increase or decrease in the wind is produced by simply changing the position of the cam in relation to the former point of release. The drum can be made to wind without tripping at each revolution of the shaft by releasing the plate K'' from its holding-latch K^5, which leaves the cam-disk free, so that as the hook *i''* strikes the base of the incline *k* the cam-disk will rotate with the head continuously without producing a withdrawal of the latch or dog I'' to release the drum, and the drum can be left free to run backward by withdrawing the latch or dog I'' from engagement with the stop *g* through the lever K^3, which withdraws the hub or sleeve K' and the cam disk K.

L is a brake-band encircling the drum H on its upper traveling surface, the band lying within the space between the flanges *h'* and *h''*. This band at one end is firmly secured, as shown, to a plate, *l'*, attached to a cross-bar, G^6, and its other end is attached to a loop, *l*, on a lever, L', which lever is pivotally attached between ears to the plate *l'*, and its free end has mounted thereon, so as to be adjustable forward and back, a weight, L''. The drum can be held stationary at any desired point in its rotation by withdrawing the latch or dog I'' from engagement and applying the brake-band L through the lever L', the operator bearing down on the lever with the ar-

rangement shown, and by means of the weight L″ the speed of the drum in unwinding can be regulated to suit the amount of blow when the apparatus is used for driving or other similar purposes, to do which the weight L″ is adjusted forward, releasing the pressure which it naturally has on the brake-band, allowing the drum to increase its speed and produce a heavier blow, a lighter blow being produced by moving the weight backward, increasing the pressure of the brake-band on the surface of the drum and checking its speed.

M represents the rim or tire of a wheel, the spokes M′ of which, as shown, are curved, with their upper ends riveted or otherwise firmly secured in the rim M, and their inner ends inserted in the periphery of a ring or center, M″, which ring or center M″ is provided with a series of transverse openings, *m*, to receive each a rubber sleeve or packing, *m′*, each having a hole, *m″*, for the passage of the stem of a bolt, m^3. This ring is located loose around a circular projection or hub, M^4, extending out from the center of an annular plate, M^2, its outer end, as shown, being formed sexagonal to receive an annular plate, M^5, corresponding to the plate M^2, and the ring M″ lies between the plates M^2 M^5, around the hub M^4, as shown in Fig. 11. The plates M^2 M^5 are provided with a series of holes corresponding in number to the number of holes *m* in the ring M″, through which holes and through the holes *m″* in the packing *m′* the bolts m^3 are passed and drawn up by nuts m^4. The plates M^2 M^5 and hub M^4 have a central opening for the passage of the shaft G^3, and the plates are locked to the shaft by a key, m^5, or in any other secure manner, so as to rotate the plates with the shaft. The ring M″ being free from the collar or hub M^4 and being held in position in a yielding manner by the sleeves *m′* around the bolts m^3, it will be seen that this ring M″ can yield or give to receive the effects of a shock or partial stoppage of the shaft G^3, allowing the rim M and spokes M′ to be unaffected to an extent to cause injury, thus preventing the transmission of any shock to the working parts to an extent to produce injurious effects.

The shaft G^3, when the drum is running loose, will have an increased speed, which speed, as the drum is caught by the rotating head, will be checked, causing a recoil on the shaft if not overcome; but this recoil is prevented to an extent that will not cause injurious effects by the cushioning-wheel constructed as described, as the increased momentum or speed of the shaft as caught by the engagement of the drum is transmitted to the plates M^2 M^5 of the wheel-hub and carried to the cushioning-sleeves *m″* around the bolts m^3, and thereby is not transmitted to the hub itself nor to the rim and spokes, the force passing to the cushioning-sleeves.

N represents the belt passing around the rim M of the cushioning-wheel for driving the shaft G^3, the belt being driven from an engine or other motive power.

Fig. 13 shows the devices in use for sinking a well, and Figs. 14, 15, 16, and 17 show the sinking-tools; and in these figures O represents the side pieces of a derrick, the lower ends of which, as shown, rest upon the cross-bar G′ and are secured to the uprights G^5, and, as shown, the side pieces have cross-slats *o* to form a ladder. At the upper end of the side pieces, O, is a cross-rod, *o′*, to which the upper end of the remaining pieces O′ of the derrick are attached.

P is a pulley-block hung to the rod *o′* and having, as shown, two wheels, *p*, over one of which the rope H′ of the drum runs.

Q is a swivel-eye to which the end of the rope H′ is secured, the bolt or pivot *q* of the swivel-eye entering a coupling, *r*, on the end of the drill-rod.

R is a hollow drill rod carrying at its lower end a drill-head, R′, in which, as shown, expansible blades or cutters R″ are pivoted. This rod is made up of sections secured together by suitable couplings, *r*, and any ordinary drill-head and drill may be attached to the lower end of the rod.

S represents the tubing or pipe to be sunk, which pipe may be made up of sections connected by suitable couplings, S′, and, as shown in Fig. 14, the lower end of this pipe is provided with a cutter, S″, (shown in Fig. 15,) having a serrated cutting-edge, *s*, and its exterior face has a worm, *s′*, thereon, to draw the pipe down. This pipe is clamped between the jaws of the turning table B, so as to be rotated by the turning of the table, and where the nature of the soil will permit the tube itself is made to cut its own hole by the cutter S′, in which case the drill-rod and drill are dispensed with.

T is a chamber attached to the upper end of the tube S, and, as shown in Fig. 14, a stuffing-box, T′, is screwed into the end of the chamber for the passage of the drill-rod.

U is a valve having a plug, *u*, to open and close it, and connected to an extension or coupling, *t*, on the side of the chamber T, to which valve is attached the end of a hose or pipe, U′, by which water can be supplied to the hole or withdrawn therefrom through a suitable pump or other supply. (Not shown.)

V is a chamber located around the drill-rod R, having communication with such rod and having its end closed by suitable stuffing-boxes, V′, through which the rod R passes. This chamber at one side has a coupling, *v*, to which is attached one end of a hose, V″, by means of which water can be supplied to the chamber and drill-rod or be drawn from the hole through the drill-rod and chamber, as may be desired, and, as shown, around the drill-rod at the end of the lower stuffing-box

of the chamber is a bumper or cushion, *v'*, to take the effect of the blow when the drill-rod is dropped in use.

W is a clamp made of two pieces and adapted to fit around the drill-rod and be firmly clamped thereon by suitable bolts, *w*, and receiving in its outer end a rod, W', which engages with an arm, W'', extending out from the chamber T, by which devices the rotation of the tube S is imparted to the drill-rod R.

X is a driving-head (see Fig. 13) around the drill-rod above the chamber T, to receive the blow of a driving-block or hammer when required to force the tube S down.

Y is a driving-block having a slot to receive the drill-rod R, and attached to the end of a rope, Y', which extends up and over the other wheel, *p*, of the pulley P, and thence down to the platform, by means of which rope the block can be raised and dropped on the drill-rod to strike the driving-head X and force the tube S down.

Z is a shaft mounted in suitable bearings on the side pieces, A, of the frame and having thereon a spool, Z', for the rope Y'.

The operation in sinking a well is as follows: The tube S to be sunk is clamped between the serrated cones D'' and the table, and the ring B rotated, and the driving-gear B'', as hereinbefore described, carrying around the clamping-jaws and the tube S, causing the cutter S'' to perform its work, and where the resistance is not too great the tube will be drawn down by the screw *s'*, and during this operation, where the tube is made to do its own cutting, the drill is left idle and the winding-drum is disengaged from its clutch and operating mechanism by throwing the clutch back, as hereinbefore described. The drill is brought into use when the material being passed through is too hard for the pipe S to do its own cutting, and for this purpose the clamp W is connected, through the rod W', with the arm W'', to have the tube, as it is rotated by the turning table, rotate the drill-rod, and the drill-rod is raised and dropped, through the medium of the winding-drum H and rope H', at each revolution of the drum by throwing the clutch into engagement in the manner before described, and such working of the drill rod is continued until the well is sunk.

The tube S is forced down by slipping the block Y onto the drill-rod R, first removing the connection W W' and then raising the block Y through the rope Y' and allowing it to fall and strike the head X, and the block is held on the drill-rod by passing pins through the holes in the block to confine the rod in the slot of the block, which leaves it free to be raised and dropped. The cones D'', with their serrated edges, grip the pipe with sufficient tightness to cause the rotation of the table to rotate the pipe, and at the same time the grip is one which will allow the sliding of the pipe through the cones, and these cones can be used in connection with the rotating table for any purpose where it is desired to turn a pipe or other article or device, and at the same time not prevent a free advance or withdrawal of the article through the holding-cones.

I am aware that in a well-drilling apparatus a loosely-mounted winding-drum has heretofore been combined with a clutch mechanism comprising a sliding latch for rigidly connecting said drum with the shaft on which it is mounted; but this I do not broadly claim.

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

1. A rotating ring or table, B, carrying clamping devices consisting of two arms, each carrying a support having cone-shaped clamps, substantially as and for the purpose specified.

2. The arms C C' C'', plates D, cones D'', and shafts D^3, for forming clamping-jaws, substantially as and for the purpose specified.

3. The arms C C' C'', plates D, cones D'', and shafts D^3, in combination with drawing and tightening bolts operating the arms for clamping the cones onto the article to be held, substantially as specified.

4. The combination, with a rotating ring, B, of the arms C C' C'', plates D, cones D'', shafts D^3, and tightening-bolts d^4, substantially as and for the purpose specified.

5. The combination, with pivoted arms, of a plate carrying the clamping-cones, drawing-bolts, and tightening-wedges for readily opening and closing the arms for clamping purposes, substantially as specified.

6. A loose winding-drum provided with a stationary stop, in combination with a rotating head carrying a sliding latch, and a cushioning device for the latch, substantially as and for the purpose specified.

7. A loose winding-drum provided with a catch or stop, in combination with a rotating head provided with a catch or stop, and a cushioning device for the catch or stop for preventing injurious effects from the engagement of the rotating head with the drum, substantially as specified.

8. The head I, having an extension, I', carrying a sliding latch, I'', cushion J, and cam-disk K, for operating the head as a clutch, substantially as and for the purpose specified.

9. The combination of a rotating head, I, having an extension, I', carrying a sliding latch, I'', bumpers or cushions J, cam-disk K, stop-plate K'', and a loose winding-drum for engaging and disengaging the rotary head, substantially as specified.

10. The combination, with a power-shaft, of a cushioning-wheel consisting of a rim and a yielding ring or center connected with the rim by spokes, substantially as and for the purpose specified.

11. The rim M, spokes M', and ring M'', in combination with the plate M^3, center M^4, plate M^5, yielding sleeves *m'*, and bolts m^3, for cushioning the shock, substantially as specified.

12. A rotary clamp adapted to grasp a round article and rotate with the endwise movement of the article clamped independent of the rotary movement which carries said article around, and having jaws of a circular form provided with sharp angles, substantially as described.

13. A rotary clamp having jaws of a circular form with sharp angles adapted to grasp a round article to rotate with the endwise movement of the article independent of the rotary movement which carries said article around, in combination with a rotary ring for carrying said clamp, and gearing for driving said ring, substantially as described.

MATTHEW T. CHAPMAN.

Witnesses:
ALBERT H. ADAMS,
HARRY T. JONES.