C. M. SMITH.

PUMP.

APPLICATION FILED APR. 26, 1909.

974,837.

Patented Nov. 8, 1910.

3 SHEETS—SHEET 1.

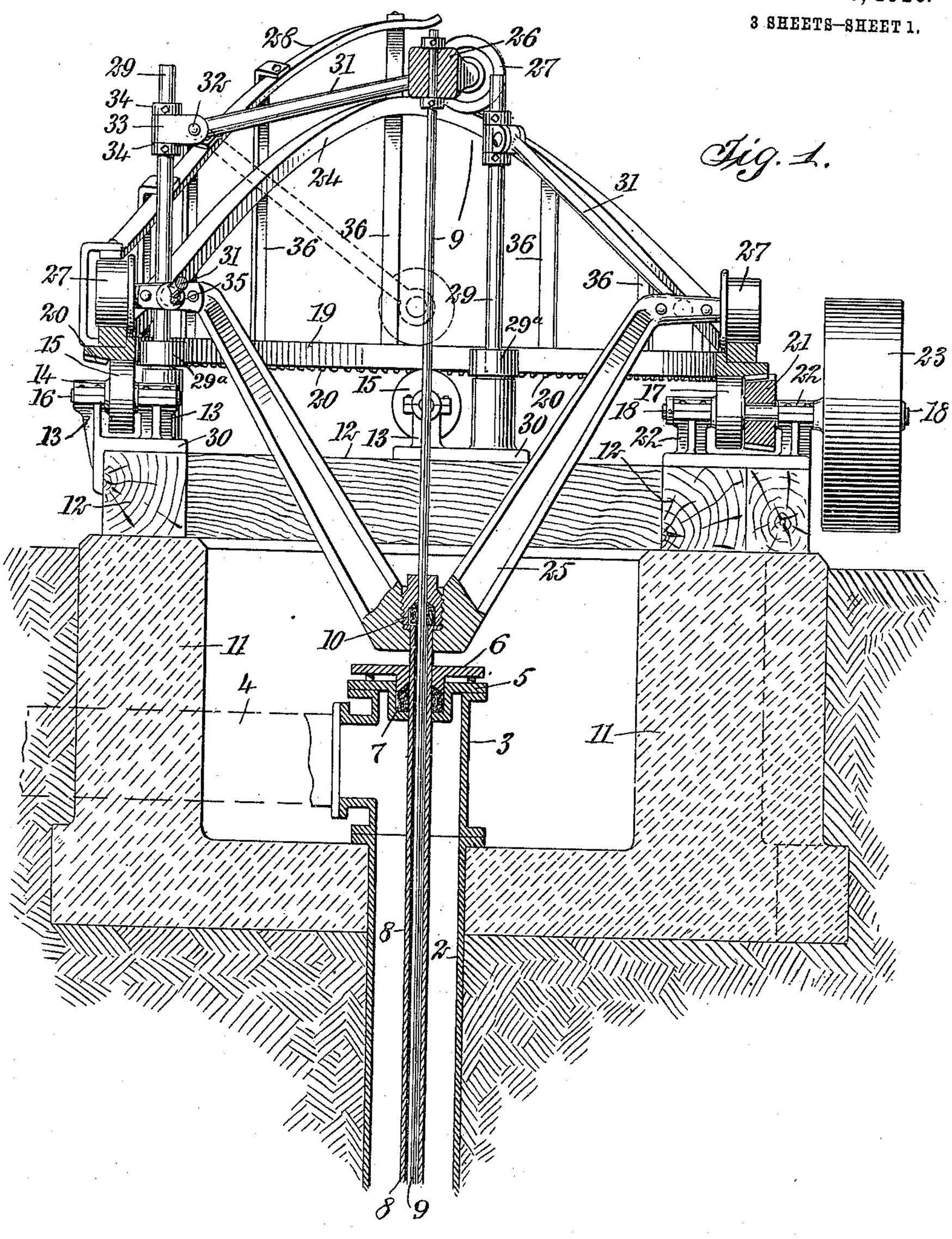

Fig. 1.

WITNESSES

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3 SHEETS—SHEET 2.

Fig. 2.

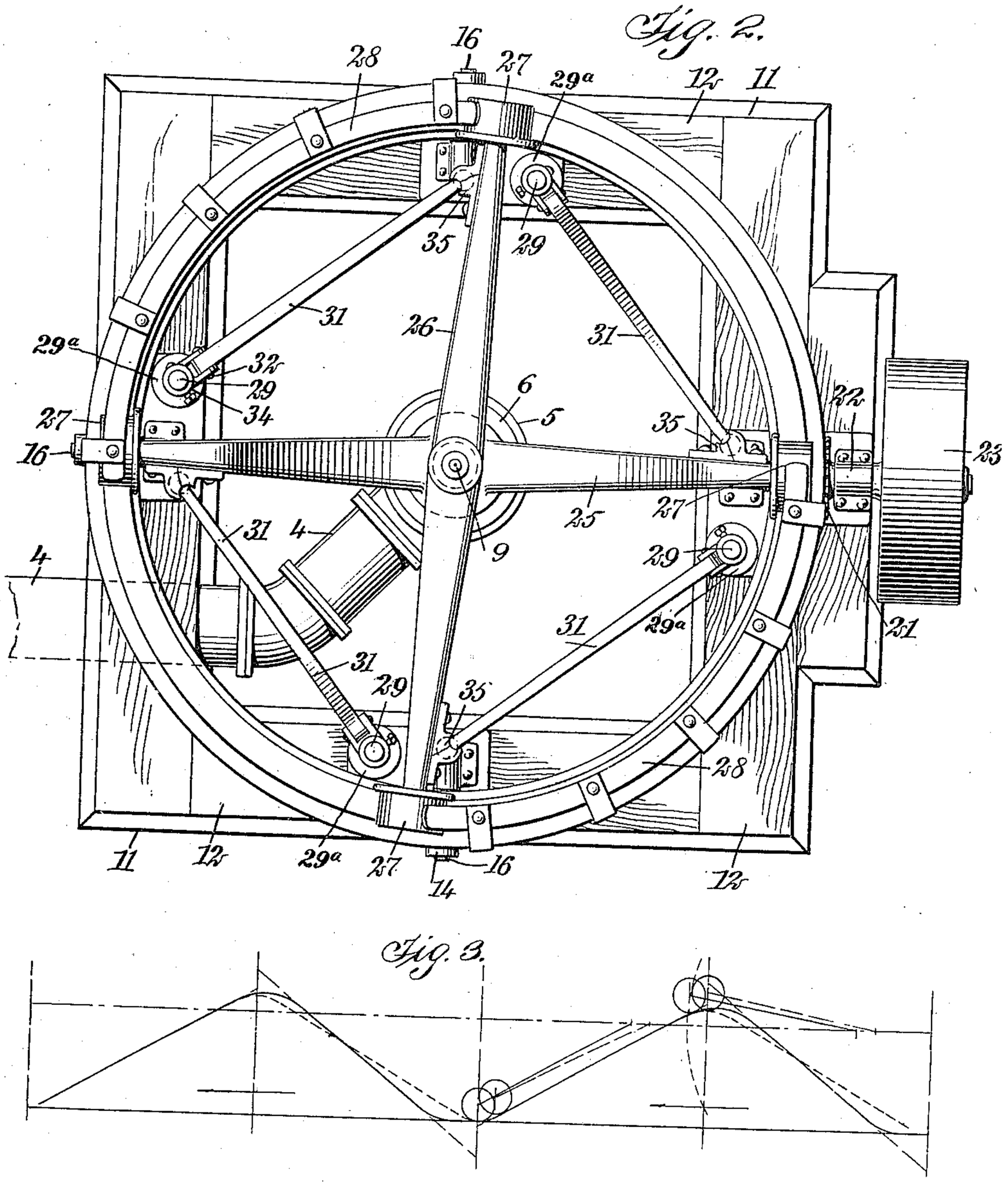

Fig. 3.

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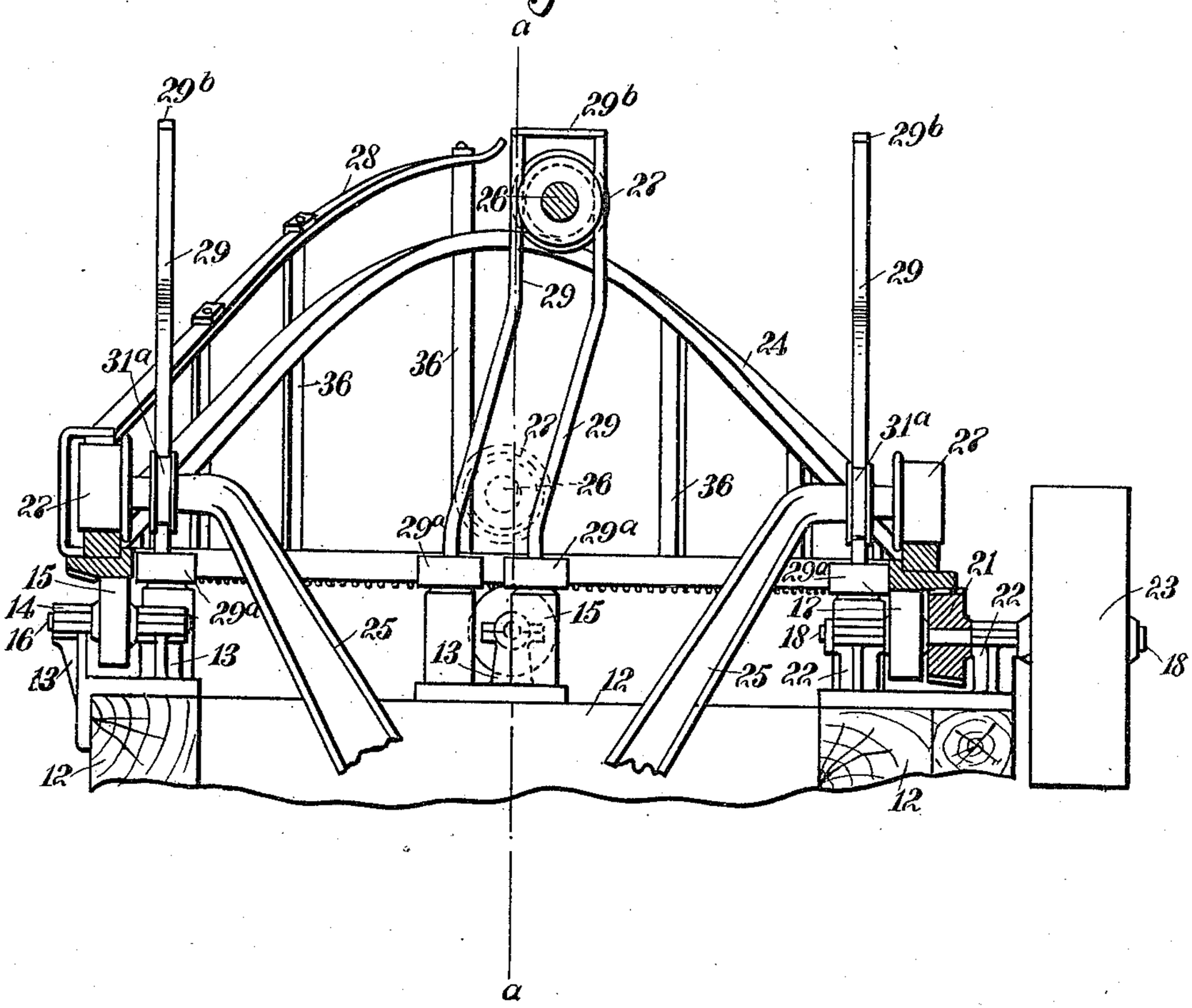
3 SHEETS—SHEET 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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PUMP.

974,837. Specification of Letters Patent. Patented Nov. 8, 1910.

Application filed April 26, 1909. Serial No. 492,283.

To all whom it may concern:

Be it known that I, CASSIUS M. SMITH, a citizen of the United States, and resident of the city of Los Angeles, county of Los Angeles, State of California, have invented a certain new and useful Pump, of which the following is a full description.

The principal objects which this invention has in view are to produce a pump which may be operated as a single acting or as a double acting pump; to provide a pump which may be operated by man, horse or engine power at will; to provide a pump wherein the flow is even and continuous without pulsation or break; and to provide a plunger lead whereby there is no suspension of the lifting action.

In the drawings:—Figure 1 is a vertical section of a pump mechanism constructed in accordance with this invention; the pulleys and wheels being shown in full lines. Fig. 2 is a plan view of the mechanism shown in Fig. 1. Fig. 3 is a diagrammatic view of the path of the cams. Fig. 4 is a vertical section of the pumping mechanism constructed in accordance with this invention, the pulleys and wheels being shown in full lines, the construction being a modification of that shown in Fig. 1.

The pump casing —2— is provided with the head —3—. The head —3— is connected to the delivery pipe —4—, which leads to any suitable point of delivery. The cap —5— is recessed to receive the boss of the disk —6—. Between the disk —6— and the cap —5— is formed the stuffing box —7—. The hollow pump rod —8— passes through the stuffing box —7— to the upper plunger of the double acting pump at the bottom of the casing —2—. It is within the hollow rod —8— that the solid rod —9— is mounted. The rod —9— is connected with the lower plunger of the pump. Where the rod —9— passes out of the rod —8— a stuffing box —10— is formed. The well casing —2— extends within the foundation walls —11—. On the crown of these walls are laid heavy wood sills —12—. Upon the sills —12— are mounted the bearing brackets —13— which form the bearings —14— for the shaft of the rollers —15—. The rollers —15— are fixedly mounted on the shaft —16—. In the construction shown in the drawings there are three such rollers and their mountings. The fourth roller —17— is loosely mounted on the shaft —18— and forms the fourth bearing for the table —19—. The "bull wheel" or table —19— is a large ring on the under face of which beyond the path of the rollers —15— and —17— is provided the gear toothed section —20—, which is engaged with the pinion —21—. The pinion 21 is fixedly mounted on the shaft —18—. The shaft 18 is carried in bearings formed in the bearing brackets —22— and is provided on the outer end with a fixed driving belt pulley —23—.

Upon the table —19— is mounted the cam track by which the rods —8— and —9— are reciprocated. The cam track —24— is platted to the shape substantially as shown in Fig. 3 of drawings. The distance between the lowermost level and the highest level of the cam is the measure of the stroke of the rods —8— and —9—. To the rod —8— is secured the yoke —25—. The yoke —25— is V-shaped, the center portion being depressed below the level of the lowest portion of the track —24—, a distance slightly more than the rise of the highest point of said track above said lowest level. The cause for this shape of the yoke —25— is that it is by these means that the said yoke avoids the yoke —26— which carries the pump rod —9—. The yoke —26— is straight, as shown in Fig. 2 of the drawings. Both yokes —25— and —26— are provided with, and carried by the rollers —27—. The rollers —27— are flanged to maintain them on the track —24—.

It will be observed that if the yokes —25— and —26— are held against rotary motion, while the table —19— is rotated, the wheels —27— carrying the yokes —25— and —26— must be first raised the full height of the cam track —24—, and then lowered to the lowest portion of the same. The high points on the cam track are accurately and oppositely disposed, and the wheels —27— on both yokes are maintained horizontally level. In every complete rotation of the table —19— the yokes —25— and —26— are raised twice.

To insure alternation in the reciprocation of the rods —8— and —9— the yokes —25— and —26— are diametrically oppositely disposed. By this arrangement, when the yoke —25— is at its lowest position, and with it the rod —8— at its lowest position, the yoke —26— is at the highest point of the lifting action of the said yoke. From this point the two yokes reverse their positions, the

yoke —25— being carried to the top of its stroke and to the top of the cam track —24—, while the yoke —26— is depressed to the lowest part of the track —24— and of its stroke.

The action thus far described is compelled by restraining the yokes —25— and —26— from rotary action. Many ways may be provided for accomplishing this. That shown in the drawings consists in placing a standard —29— upon the base plates —30— that carry the brackets —13— and —22— forming the bearings for the wheels —15— and —17—. The yokes —25— and —26— are connected to the standards —29— by the lead rods —31—31—. The standards —29— which are connected to the yokes are disposed in rear of the yoke to which each is connected. It thereby receives the strain of the said yoke where moved by the track —24—. The lead rods —31— are pivotally mounted at —32— on the collars —33—. The standards —29— carry rollers —29ª— which serve to hold the table —19— in place to prevent lateral movement. The collars —33— are adjustable on the standards —29— by means of the adjustment rings —34—. That end of the lead rods —31— which is removed from the collar —33— has a ball shaped end. These ball shaped ends extend into sockets —35— which permit a flexible action of the joint. The object in thus mounting the rods —31—31— is to permit the yokes —25— and —26— a certain amount of rotary swing. In the construction shown in the drawings there is about 5% of this swing.

A desired result in double acting pumps is to produce a "lead" in the plunger which is starting on its up stroke. In the present invention this result is produced by the arrangement of the lead rods —31— upon the standards —29—. As the rings —34— are raised above the median line of the swing of the said lead rods the distance between the collar —33— and the low portions of the track is greater than between the said collar and the high portions of the track. The rods —31— being constant in length this is compensated for by the rods —31— pushing the yokes from the said standards, or drawing the yokes toward the same. Thus when a yoke is at its lowest point on the track —24— the arms —31— draw the end of the yoke toward the standard —29—, to compensate for the difference in the distance. In practice the result of this construction is to quickly draw the yoke which is at, or approaching, the lowest extreme of its stroke, in a rotary direction and in starting it on the upward incline of the cam track —24—. Simultaneously the yoke which is approaching the highest point of the track (which is near the level of the collar —33—) is being forced away from the standard, and thereby retarded in its travel over the cam track —24—. The dual action has the effect of withholding the one yoke from beginning the descending stroke, while advancing the other yoke upon its ascending stroke. By this means the lifting impulse is constantly maintained on the column of rising water. At no time is there a period when the two plungers are simultaneously at rest or descending. This construction avoids pulsations or water hammers in the casing —2—.

The above described construction is sometimes replaced by a construction using the rods 29 as fender rods. These rods are preferably bent, as shown in Fig. 4 of the drawings, to produce the action whereby the plunger rod to which the yokes are attached are slightly rotated, sufficiently to prolong the period of the wheels 27 rising to the full height of the cams 24. The period of the fall of the said yokes is obviously shortened in direct proportion as the period of the rise is lengthened.

While I have shown the use of the two rods 29, 29 secured at the top by cross braces 29ᵇ, it will be understood that one of the said rods (that not receiving the thrust or push of the moving cams) may be dispensed with. The action, however, is improved by the use of the two rods, between which the roller 31ª is held.

A further modification of the structure just described is sometimes employed by me. This modification consists in straightening the vertical rod 29, controlling the rise and fall of the yoke to a vertical path. The cams 24 are shaped to produce, on what may be termed the rising side of the cam, a long side, and on the falling side of the cam, a short side. The inclinations of these sides necessarily differ. They form operative periods of different durations, the falling period being subsequently shorter than the rising period, as is seen in Fig. 3 of the drawings.

The result of these various constructions is that the lifting or upward stroke of each of the yokes and plunger rod connected therewith, starts in advance of the beginning of the falling stroke of the companion yoke and plunger rod.

The track —24— is supported by the stanchions —36—. On the following side of the cam track —24— the stanchions —36— are extended to support the overhead guard rail —28— which is provided to force the yokes down should they hesitate. or should the rods —8— and —9— be held in their bearings, thus making the action of the said rods mechanically more positive.

While I have herein described and shown this invention as arranged to be operated by motor power, it is evident that the table —19— could be provided with suitable sweeps, to which horses might be harnessed

and the table rotated. When thus constructed the pulley —23— and pinion —21— are removed.

The cams may be regular in shape, but I prefer the form wherein the latter half of the cam is so shaped as to produce a sharper angle for the drop of the yokes than for the rise of the same. The shape of the following or rear half of the cam I prefer to form substantially as shown in Fig. 3 of drawings.

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

1. A pump comprising a plurality of plungers and pump rods connected therewith; a reciprocating mechanism embodying a series of cams mounted on a rotary member to extend under the said rods to lift the same successively; suitable means for rotating the said rotary member; and means for shifting the said rods in the path of the said cams to alter the synchronized action of the rods.

2. A pump comprising a plurality of plungers and pump rods connected therewith; a rotary member having a series of cams formed thereon; suitable means for rotating said rotary member; connecting devices for connecting the said rods with the said cams and in successive arrangement thereon; and suitable means for shifting the said connecting devices on the said cams in the rotary path thereof.

3. A pump comprising a plurality of plungers and pump rods connected therewith; a rotary member mounted horizontally and concentric with said rods, said rotary member having a series of vertically extended cam surfaces formed thereon; suitable means for rotating said rotary member; a plurality of laterally extended arms each connected with one of the said rods, said arms being adapted to ride on the said cams; and means for rotating the said arms about the said rods to change the relation of each of the said arms to the said cams at predetermined times in relation to the rise and fall of said rods.

4. A pump comprising a plurality of plungers and pump rods connected therewith; a rotary member mounted horizontally and concentric with said rods and having a series of vertically extended cams; suitable means for rotating said rotary member; laterally extended arms each connected with one of the said rods, said arms being adapted to ride on said cams; and means for moving the said arms on their vertical axes during the lift of the said rods and in the direction of the travel of said rotary member to retard the movement of the said rods at a predetermined period in their lift.

5. A pump comprising a plurality of plungers and pump rods connected therewith; a rotary member mounted horizontally and concentric with said rods and having a series of vertically extended cams; suitable means for rotating said rotary member; laterally extended arms connected to said rods and adapted to ride on said cams; a stationary frame structure; hinged arms connecting the said laterally extended arms with the stationary structure; and vertically adjustable connections for said hinged arms with said structure.

6. A pump comprising a plurality of plungers and pump rods connected therewith; a rotary member mounted horizontally and concentric with said rods; a series of cams vertically extended from said rotary member; suitable means for rotating said member; laterally extended arms each connected to one of the said rods and adapted to ride on the said cams, said arms being formed to avoid each the other in their operation; a stationary frame structure; hinged connections flexibly attached to the said arms and the stationary structure; and means for adjusting vertically the stationary end of the hinged connections.

7. A pump comprising two plungers and two pump rods, one within the other, said rods being connected to said plungers in suitable arrangement; two laterally extended arms each connected to one of the said rods, and bowed at the center to permit the extremities of said arms to pass in different planes; a stationary frame structure; swinging connections between the said arms and stationary structure adapted to maintain said arms at substantially an angle of 90 degrees each from the other; a rotary member mounted horizontally and concentric with said rods; two vertically extended cam surfaces mounted on said member arranged at the extremes of one diameter thereof and adapted to carry the said laterally extended arms; and suitable means for rotating the said rotary member.

8. A pump comprising a plurality of plungers and pump rods connected therewith; a plurality of laterally extended arms each connected with one of the said rods; a rotary member having a series of cams formed thereon and adapted to raise and lower the said arms in relatively accelerated and retarded time periods; and guide members for said arms mounted to control the path of the rise and fall of the ends of the said arms.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CASSIUS M. SMITH.

Witnesses:
ARTHUR G. BAKER,
F. M. BALLARD.