A. C. TERKELSON.

PUMP HEAD.

APPLICATION FILED APR. 21, 1914.

1,159,620.

Patented Nov. 9, 1915.

4 SHEETS—SHEET 1.

Fig. 2.

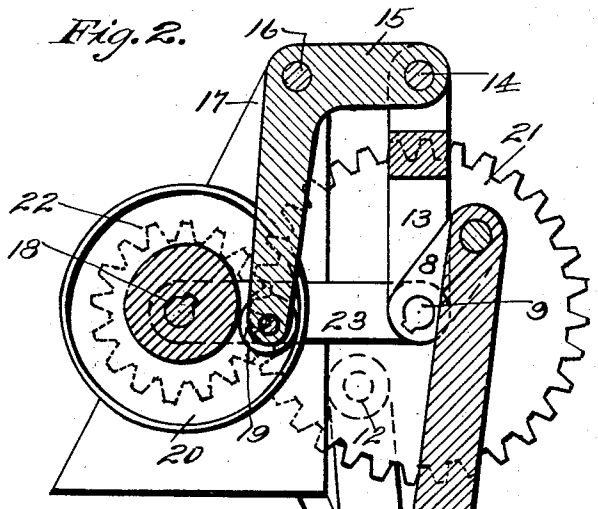



Fig. 1.

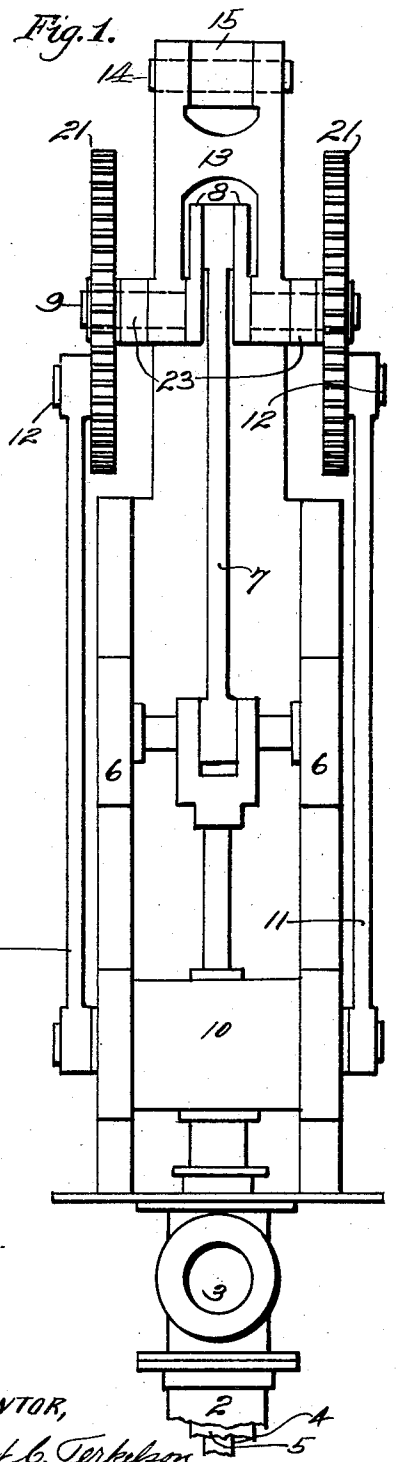
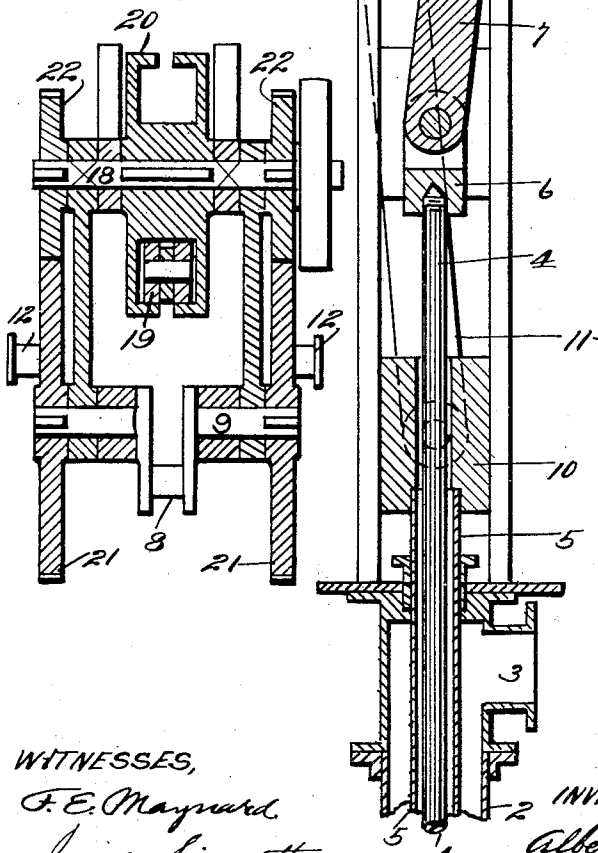



Fig. 3.

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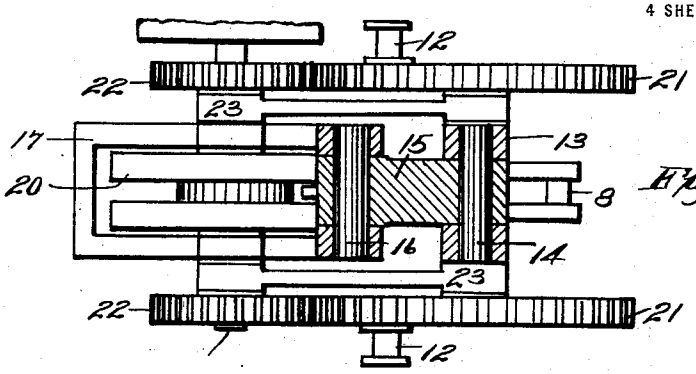



Fig. 4.

Fig. 6.

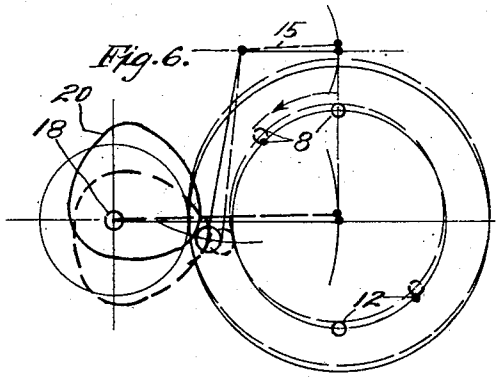



Fig. 7.

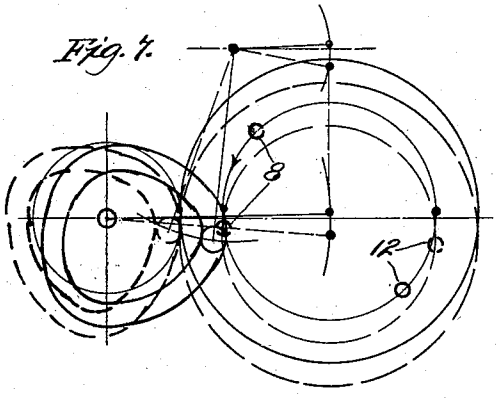



Fig. 8.

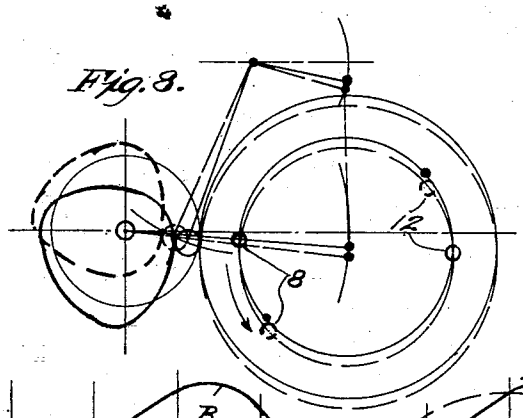
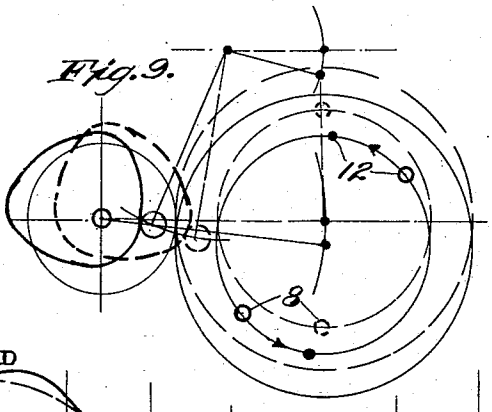



Fig. 9.



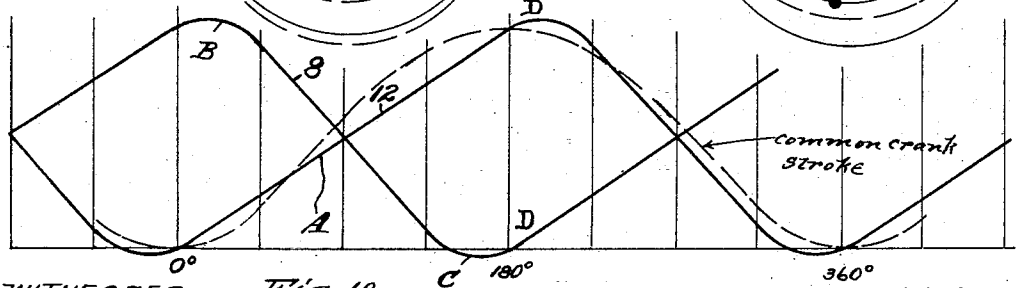




Fig. 10.

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4 SHEETS—SHEET 3.

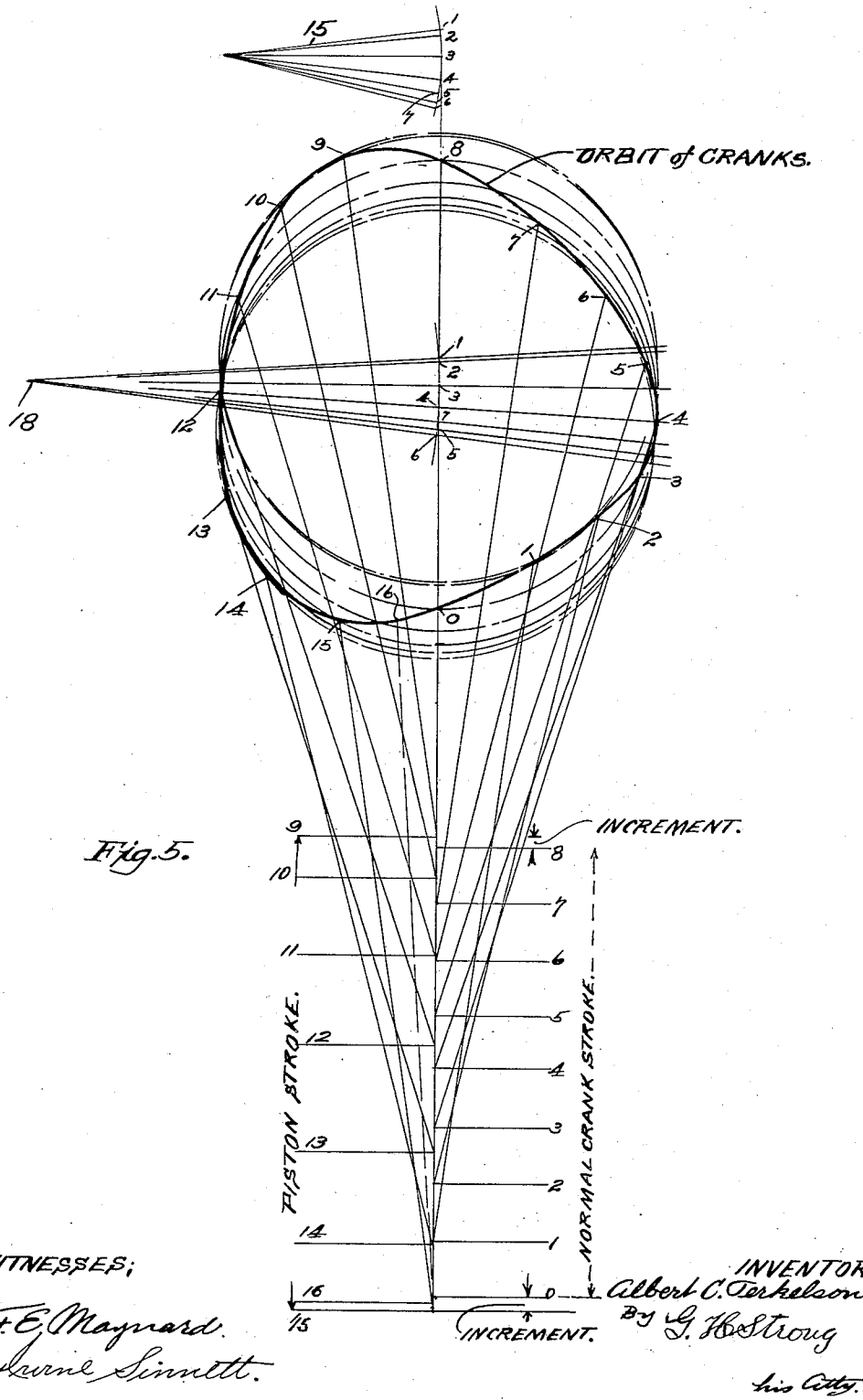


Fig. 5.

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4 SHEETS—SHEET 4.

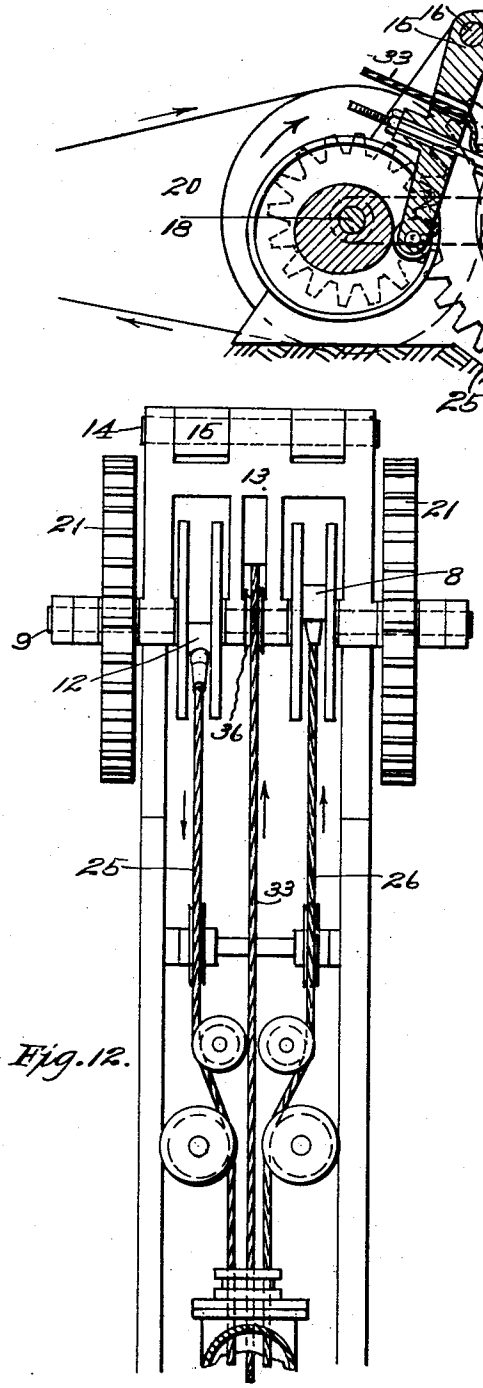


Fig. 12.

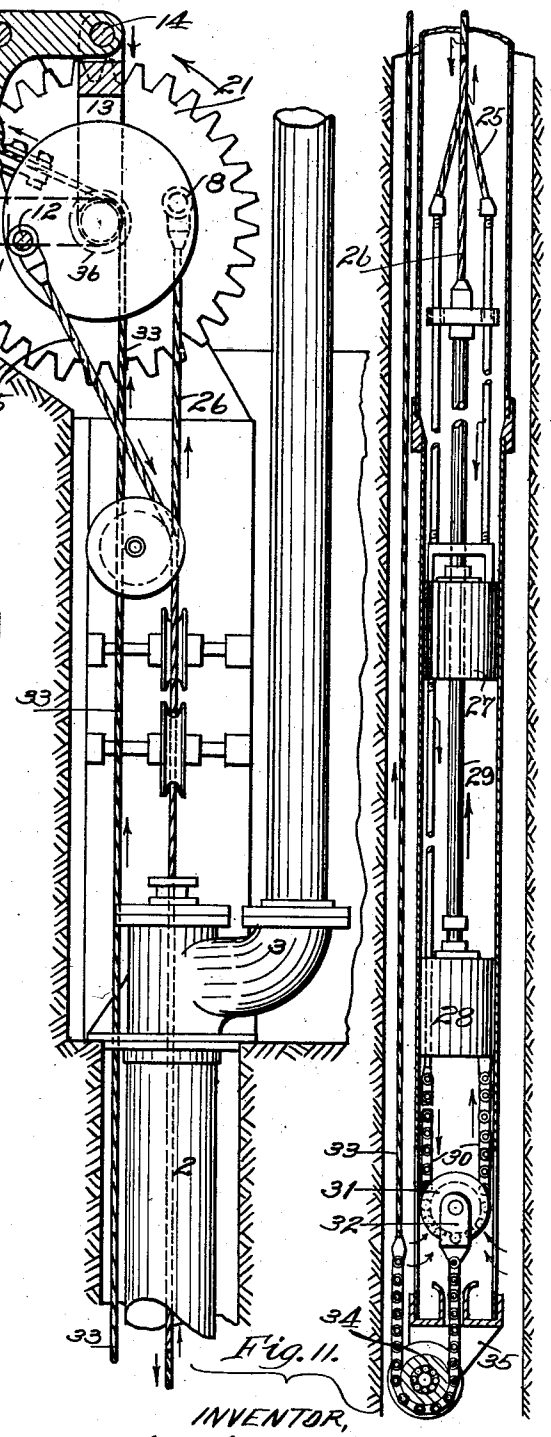


Fig. 11.

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# UNITED STATES PATENT OFFICE.

ALBERT C. TERKELSON, OF OAKLAND, CALIFORNIA.

## PUMP-HEAD.

1,159,620. Specification of Letters Patent. Patented Nov. 9, 1915.

Application filed April 21, 1914. Serial No. 833,334.

*To all whom it may concern:*

Be it known that I, ALBERT C. TERKELSON, a citizen of the United States, residing at Oakland, in the county of Alameda and State of California, have invented new and useful Improvements in Pump-Heads, of which the following is a specification.

This invention relates to power transmission mechanism, and particularly to pump heads.

It is an object of the present invention to provide an improved pump head whereby double-piston deep well pumps may be operated to produce a more uniform rate of discharge and avoid the fluctuations produced by plain crank-driven pistons.

A further object of the invention is to provide a power head of greatly simplified construction; which is of few parts, most of which are duplicate and interchangeable, and are common stock pieces, and therefore, by eliminating special design, reducing initial cost.

The head is provided particularly for operating the pistons of the pump with slow, uniform rate of speed upward and fast speed downward, and to move them upward in coincidence as the cranks approach their limits of throw vertically, so that instead of the pistons constantly moving in opposite direction and resulting in suddenly throwing the load from one to the other alternately as one starts up, in this invention, the pistons will be brought into coincident movement upward as one approaches its lowermost position and the other its uppermost.

It is an important object of this invention to provide a pump head which is so designed as to translate rotary motion into reciprocating motion with a predetermined characteristic, and to utilize in doing this the most economical and reliable means.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a front elevation of the apparatus. Fig. 2 is a central, vertical section thereof. Fig. 3 is a horizontal section on the plane of the cam-shaft. Fig. 4 is a plan view partly in section in the plane of the lever pivot. Fig. 5 is a diagrammatic view showing the orbit of the crank when combining the crank motion with the vertical shifting action. Figs. 6, 7, 8 and 9 illustrate diagrammatically the positions of the cranks at four successive 90° movements of the cam. Fig. 10 is a comparative time and stroke chart, showing the normal crank stroke of a piston in a dotted curve and the stroke as produced by the combination in full line. Fig. 11 shows a complete pump as provided with novel head. Fig. 12 is a front elevation of the head connection.

2 shows a well casing with a discharge pipe 3, and 4—4 are piston rods moving pistons in the well.

Rod 4 is connected to a cross head 6 having pitman 7 connected to a crank 8 of crank shaft 9, while rod 5 is connected to cross head 10 having double pitmen 11 connected to axially alined cranks 12, turnable with crank shaft 9, and at 180° from crank 8.

The invention in this case consists of providing means for reciprocating, oscillating or otherwise moving the crank shaft and its connections so as to impart to the piston rods and their pistons a motion independent of and coincident with the strokes derived from the rotation of the cranks on their own axis.

To that end, my invention in one embodiment is shown as including a journal or support 13 for the crank shaft 9, which is suspended at its upper end by a pivot 14 of a short arm of an angular lever 15. This lever is pivoted at 16 upon a suitable head frame 17 in which is mounted a shaft 18 driven by a suitable source of power.

It will be seen that oscillating the lever 15 will cause it to move the crank-shaft hanger 13 in a vertical plane. This oscillating the lever is accomplished through means of engagement by a roller 19 on the lever, engaging an internal cam 20, secured upon the cam-shaft 18.

For the purpose of rotating the crank-shaft 9 there is secured upon it gears 21 which mesh with pinions 22, of a ratio 1 to 2 with gears 21, secured on the cam-shaft 18. The gears and pinions are held in constant and proper mesh during the oscillation of the crank-shaft by reciprocating actuator 13, through means of radius links 23 connecting said crank-shaft and the cam-shaft so that the gears have a planetary movement as to their sun pinions when the cam-shaft operates and through it the crank-shaft is revolved. Hence, in its illustrated

embodiment, the invention includes a rotary crank-shaft for reciprocating pump pistons, and means for shifting the crank-shaft laterally simultaneously with its rotation.

The shifting means for the crank-shaft is so designed and disposed that it will operate to lift the crank-shaft at such a moment as the cranks 8—12 are passing the normal dead centers, and thus operate to lift the latter coincidentally as they pass the dead center and would ordinarily be moving in opposite directions prior to and after passing the dead center.

My invention eliminates the usual dead stop and constant reverse travel of the pistons, and results in so moving the pistons that as one approaches the lower limit of stroke, and while the other piston is near the end of up stroke, both will be lifted independently of crank-motion, and one will be gradually relieved of its load by the other starting its upward stroke with crank-action and cam action.

By providing a cam as the medium for controlling the shift of the crank-shaft the rate of speed and relative time of coaction with the crank motion may be readily and precisely determined.

The cam shown in Figs. 6 to 9 is designed to produce a piston stroke, when combined with the crank stroke, clearly shown in Fig. 10 in dark full lines. With the cranks set at 180°, and the cam and its connections with the crank-shaft set as shown; when the lower crank passes dead center it will be moved up a uniform rate of speed for 180° as shown by straight line A; meanwhile, the other piston will move from high dead center slightly up, as shown at B simultaneously with stroke A; thereafter the down stroke commences and is accelerated over the rate of the up stroke A. Toward the end of down stroke from B, the cam acts to commence a reverse and up stroke at C before the piston on stroke A is at the high dead center of the usual crank action. As the cranks pass dead center they are being lifted by the cam at uniform speed at D—D just past the 180° line on the diagram.

Thus I provide a means for moving a piston on its up-stroke at a desired or arbitrary rate of speed, varied from a crank-motion stroke. Practically the up-stroke of a piston carrying the load should be slower than the down-stroke of an unloaded piston, and this is had by designing the cam to act through the lever and hanger to control the shift of the crank-shaft.

Since the cranks are at 180° relatively, the decrement of speed on the up-stroke of one is simultaneous with the increment of speed of down stroke of the other. This is clearly shown in Figs. 7 to 9, in which the full lines indicate the starting positions respectively, and the dash lines the finish positions of the cranks for each one-eighth turn of the crank-shaft. The cam makes two revolutions to one of the crank-shaft, so that as each crank approaches the high dead center it is lifted from its position at dot, Fig. 9 to position small dotted circle. The lifting function of the cam is performed at the time the cranks approach and pass dead center, and the lowering function is performed during the remaining one-half cycle, or less, of the crank-shaft, and at which time the pistons are on their strokes.

It is understood that the invention involves the provision of means whereby the crank-shaft driving a pump may be so actuated in conjunction with its rotation that the rate of speed and stroke of the pump pistons may be varied from the usual and common crank stroke speed and motion. Therefore, while I have shown a cam as the controlling and actuating medium for so moving the shaft, I may utilize other means for accomplishing this function, and the medium may be variously designed, proportioned, related and timed as may be required.

In Fig. 11, to the cranks 8 and 12 are connected cables 25 and 26, one of which is connected to a piston 27, and the other to lower piston 28 by a rod 29 passing through the upper piston. The pistons are connected together by a flexible means shown as a chain 30 which passes around a guide pulley 31. By means of the connection 30 either piston when lifted by its pitman or cable and crank will pull the other piston downward, keeping its cable taut. To permit the synchronous upward movement of the pistons without breaking the reversing connection 30 the pulley 31 is hung in a bearing 32 which is vertically movable, and connected to it is a draft or compensating cable 33 which passes over a guide sheave 34 on stationary bearings 35 of the well tube. The drag and release cable 33 extends up to the head and is connected to an arm of lever 15, so that when the lever lifts the crank hanger 13 the cable 33 is released or lengthened and passing over a guide roller 36 on crank shaft 9 and around pulley 34 permits the sheave 31 to rise with the unidirectionally moving pistons. Conversely, when the crank-shaft hanger is lowered by the lever 15, the drag cable is shortened, and the pulley bearing 32 retracted to lower position.

The compensating connection 33 is preferably of length approximately equal to twice the depth of the bearing pulley 34 in the well, thus permitting the removal of the pump pistons and their connections, and leaving the drag cable still rove in its lower guide 34.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A power transmitting mechanism for deep-well, double-piston pumps, including in combination with the pump pistons, a crank-shaft for reciprocating said pistons, and means for laterally shifting the shaft synchronously with its rotation.

2. A power transmitting mechanism for deep-well, double-piston pumps, including in combination with the pump pistons, a crank-shaft for reciprocating said pistons, and means for laterally shifting the shaft synchronously with its rotation, whereby the pause of the pistons as their cranks pass dead center is eliminated, and the pistons are moved unidirectionally, said means including a floating bearing for the crank shaft.

3. The combination in a pump with double pistons, of means for reciprocating the pistons in opposite direction during the major part of their cycles and during a portion thereof unidirectionally, including a laterally shiftable crank shaft with opposed cranks, movable in similar, irregular curved orbits.

4. The combination in a power head of reciprocating pump pistons, a crank-shaft, means for driving the crank-shaft, connections between the cranks and the pistons, and means whereby during one cycle of a crank the crank-shaft is oscillated so as to change the rate of travel of its connected piston as to the ordinary rate of motion transmitted by the crank turning in a circular orbit about its center.

5. The combination with the pistons of a pump, of a power head for translating rotary motion into rectilinear motion, of a crank-shaft with oppositely disposed cranks to which are connected the pistons to be reciprocated, and a support in which the crank-shaft is turnably journaled, whereby it may be shifted laterally, so that the rotary motion of the cranks about the axis of the crank-shaft is combined with a lateral shifting motion of the crank-shaft.

6. The combination with the pistons of a pump, of a power head for translating rotary motion into rectilinear motion, of a crank-shaft with oppositely disposed cranks to which are connected the pistons to be reciprocated, a support in which the crank-shaft is turnably journaled whereby it may be shifted laterally, so that the rotary motion of the cranks about the axis of the crank-shaft is combined with a lateral shifting motion of the crank-shaft, and means for laterally shifting the support for the crank-shaft.

7. The combination with a pump, having pistons, means connecting said pistons so that during their operation one piston acts to operate the other in an opposite direction of motion, a crank-shaft and connections between the cranks of the shaft and said pistons for moving the pistons in opposite direction, and means for shifting the shaft to move the pistons in unidirection during a portion of their cycles.

8. The combination with a pump, having pistons, means connecting said pistons so that during their operation one piston acts to operate the other in an opposite direction of motion, a crank-shaft and connections between the cranks of the shaft and said pistons for moving the pistons in opposite direction, means for shifting the shaft to move the pistons in unidirection during the operation of their cycles, and a compensating device connected to and controlled by said means for relaxing and retracting the said connecting means of the pistons.

9. The combination with a crank-shaft, of a pump having pistons and means for moving the crank-shaft from one position to another parallel to the first during the rotation of the shaft, said pistons operated by the cranks of the shaft so that they will reciprocate unidirectionally for a period of their cycles.

10. In a deep well pump, shafting with cranks at approximately 180° apart, the pump pistons, connections between the pistons and the cranks, and means for laterally shifting the shafting during rotation so that the cranks, will at each revolution of the shafting, have a simultaneous unidirectional movement, whereby a continuity of flow from the pump will be produced.

11. A power transmitting mechanism for pumps, composing in combination with the pump piston, a rotary drive shaft with a sun gear, and an oscillating device, including a planetary gear meshing with the sun gear, said device connected to and operating the piston, and means for oscillating the device about the axis of the shaft.

In testimony whereof I have hereunto set my hand in the presenuce of two subscribing witnesses.

ALBERT C. TERKELSON.

Witnesses:
IRVINE SINNETT,
W. W. HALEY.