C. J. NOEL.

PUMP.

APPLICATION FILED MAY 19, 1921.

1,435,547. Patented Nov. 14, 1922

2 SHEETS—SHEET 1.

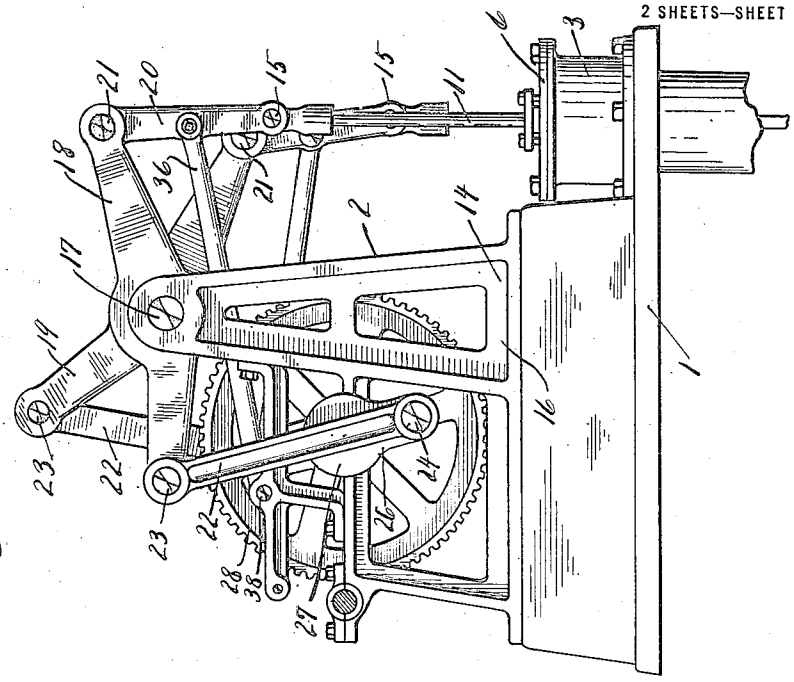

Fig. 2.

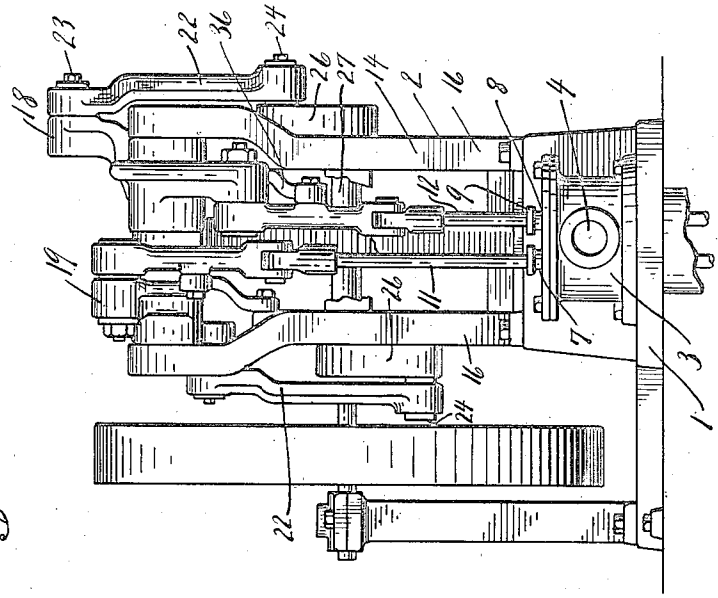

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 3.

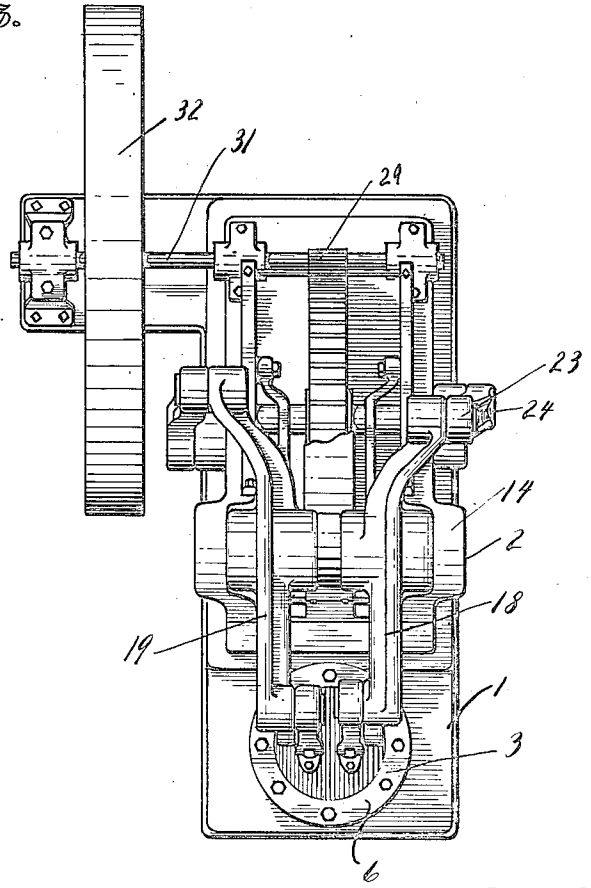


Fig. 4.

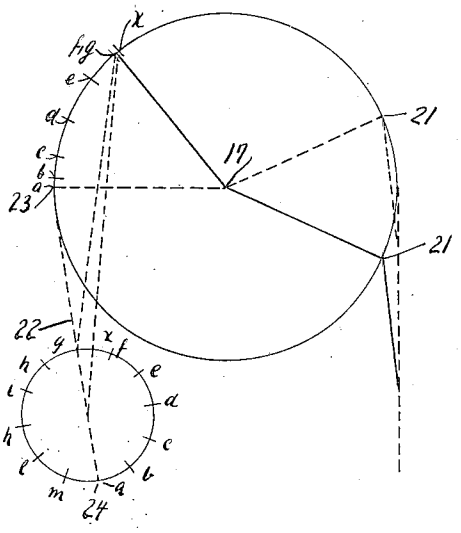
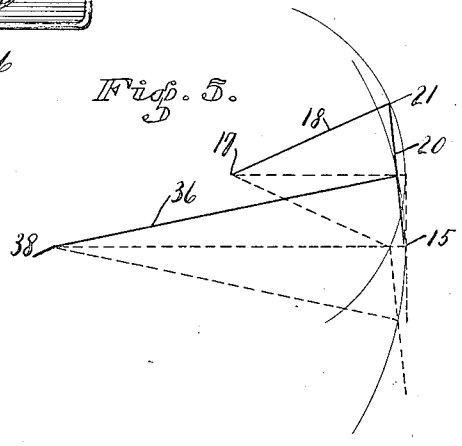


Fig. 5.



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Patented Nov. 14, 1922. 1,435,547

UNITED STATES PATENT OFFICE.

CLARENCE J. NOEL, OF ORANGE COVE, CALIFORNIA.

PUMP.

Application filed May 19, 1921. Serial No. 470,747.

To all whom it may concern:

Be it known that I, CLARENCE J. NOEL, a citizen of the United States, and resident of Orange Cove, county of Fresno, and State of California, have invented a new and useful Pump, of which the following is a specification.

The present invention relates to improvements in pumps and more particularly in pump head arrangements to be used in connection with double plunger pumps, in which two plungers work in the same cylinder one above the other, in opposite direction. To get a continuous flow of liquid in pumps of this type, it is desirable to arrange the mechanism actuating the plungers in such a manner that the strokes of the plungers overlap, that is, that the upward stroke of one plunger begins before the upward stroke of the other plunger ceases. In my mechanism I provide a pump head and actuating means for the plunger that will accomplish this object. My device being so constructed that the plungers are acted on by rocking beams in which the points supporting the plungers do not reciprocate vertically but along a circular curve. I also provide means in my mechanism to convert this curve-like motion of the supporting points into a vertical motion before they actuate the plungers.

I attain these objects by means of the mechanism illustrated in the accompanying drawing in which Figure 1 represents an end view of my pump head, Figure 2 a side view of the same, Figure 3 a plan view, and Figures 4 and 5 graphic illustrations of the operation of the pump head.

Referring to the drawing in detail, the base plate (1) of my pump head (2) is supported over the well in such a manner that the T (3) having the discharge (4) therein, is positioned vertically over the well. The cap (6) of the T has two perforations (7) and (8) through which, secured in proper stuffing boxes (9), extend two rods (11) and (12), carrying at their lower ends the plungers, not shown in the drawing. The problem I solve in the present invention is, to impart vertical reciprocating motion in opposite direction to these two plunger rods in such a manner that each upward stroke of one rod overlaps the upward stroke of the other rod.

The base plate supports a frame (14) comprising two similar longitudinal side members (16) and suitable connecting transverse members acting as braces or struts for the side members. The front part of the frame, that is, the part next to the plunger rods, is taller than the rear part and carries a transverse shaft (17) on which the central parts of two walking beams (18) and (19) are pivotally supported. The front ends of the beams are pivotally connected to the links (20) by the pins (21), the other ends of the links engaging the plunger rods as shown at (15), while the rear ends of the beams are worked by the connecting rods (22), one end of which is pivotally secured to said walking beams, as shown at (23), while the other ends are pivotally secured to the crank pins (24) positioned at the ends of two arms (26) extending from the crank shaft (27) in opposite direction. The crank shaft is rotated by the gear wheel (28) mounted on the same and adapted to be engaged by the pinion (29) secured to the shaft (31). Rotary motion is transmitted to the latter shaft by any suitable power actuating the pulley (32).

To obtain from this arrangement the proper overlapping strokes of the plunger rods, two rules should be observed. Firstly, the forward arm of the walking beams should be bent upwardly so that, when the rear arm is horizontal, the working center of the forward arm (i. e. pin 21) is above the pivoting center of the walking beams by one half the total stroke of the plunger rod, and secondly, the center of the crank shaft (27) should be forward of the working center of the rear arm of the beam when the latter is in its horizontal position by about one-fourth the maximum throw of the crank shaft.

The manner in which overlapping reciprocating motion is transmitted to the plunger rods by this arrangement, is graphically illustrated in Figure 4, in which the large circle represents the path of the working centers (21) and (23) of the walking beams, while the smaller circle represents the path of the crank pin (24). The smaller circle is divided into twelve equal parts, designated *a*, *b*, *c*, etc. It will be seen that in this circle the letter *g* designates the point diametrically opposite to *a*. On the larger circle, above (23), are indicated, by corresponding letters, the various positions occupied by the pin 23 while 24 travels along the circle *a*, *b*, *c*, etc., which represents the downward stroke of the plunger rod. It will be seen that 23

travels upward on the large circle as (24) travels on the smaller circle, first slowly, then increasing in speed, reaching its highest point, not at g, but at x, a point between f and g and situated on a line connecting (23) at its highest point with the center of the small circle. Immediately upon passing x (23) goes downward again, starting pin (21) on its upward stroke. Thus the latter pin and the plunger actuated by its start on the upward stroke before (24) has passed g, while the other plunger actuated by a crank pin 24 travelling from g to a, does not begin its downward stroke until the point a has been passed. By this arrangement each upward stroke overlaps the upward stroke of the other plunger and takes over its load before the other plunger lets go of it.

The reciprocating motion thus imparted to the pin (21) runs along the curve of a circle and, to render the device more effective, it is necessary to change this curved motion into a straight vertical motion, before it is transmitted to the plunger rod. This change I attain by subjecting the link (20) connecting the pin (21) with the plunger rod to the action of the toggle (36), which is substantially twice as long as the forward arm of the walking beam, all distances being counted from center to center, is pivotally secured in the frame at (38), a point, the vertical distance of which from the center of the walking beam is equal to one-half the length of the connecting link, center to center, while its horizontal distance from said center, is equal to one-half of its own length. The length of the arms of the crank shaft should be so proportioned that the stroke of the plunger does not exceed 85% of the length of the forward arm of the walking beam.

In Figure 5 is shown a graphic illustration showing the operation of the toggle. The top position is shown in full lines. The vertical distance between the center points (17) and (38) being equal to one-half the length of the link (20), it will be seen that when the forward arm of the beam is in a horizontal position, the toggle will also be horizontal. Since the toggle is twice as long as the forward arm and the horizontal distance between (17) and (38) is equal to one-half the length of the toggle, the point (17) must be perpendicularly over the center of the toggle, as indicated by the dotted line, and the point (21) perpendicularly over the point (15), that is, the connecting link is then in a vertical position. In this position it is straight over the center of the plunger rod. When arm (18) is rocked upwardly, its tendency to pull the plunger rod sideways is counteracted by the toggle and since the latter is twice as long as the arm (18) and the circle described by its supporting point twice as large as the circle described by the point (21) of the arm of the walking beam, it will cause the point (15) to move vertically in a substantially straight line. In the same way in rocking downward will the toggle secure a straight vertical path for the pivot (15) actuating the plunger.

I claim:

1. In a pump, in means for securing for a reciprocating plunger an advanced working stroke, a frame, a bent walking beam presenting a rear arm disposed horizontally when in one extreme position and a slanting front arm pivotally mounted in the frame, an operative connection between the front arm and the plunger, and rotary driving means for rocking the horizontal arm in a vertical plane substantially limited by the horizontal plane of the beam pivot disposed at a horizontal distance from the end of the horizontal arm by substantially one-fourth of its maximum throw.

2. In a pump, in means for securing for two plungers working in combination an overlapping working stroke, a frame, two symmetric walking beams each presenting a rear arm disposed horizontally when in one extreme position and a slanting front arm pivotally and co-axially mounted in the frame, operative connection between the front arms and the plungers, and rotary driving means for rocking the horizontal arms in opposite direction in vertical planes substantially limited by the horizontal plane of the beam pivot disposed at a horizontal distance from the ends of the horizontal arms by substantially one-fourth of its maximum throw.

3. In a pump, in means for securing for a reciprocating plunger an advanced working stroke, a frame, a bent walking beam presenting a rear arm disposed horizontally when in one extreme position and a slanting front arm pivotally mounted in the frame, a connecting link between the front arm and the plunger, rotary driving means for rocking the horizontal arm in a vertical plane substantially limited by the horizontal plane of the beam pivot disposed at a horizontal distance from the end of the horizontal arm by substantially one-fourth of its maximum throw and a toggle mounted in the frame engaging the connecting link for imparting straight vertical motion to its lower end.

4. In a pump, in means for securing for a reciprocating plunger an advanced working stroke, a frame, a bent walking beam presenting a rear arm disposed horizontally when in one extreme position and a slanting front arm pivotally mounted in the frame, a connecting link between the front arm and the plunger, rotary driving means for rocking the horizontal arm in a vertical plane substantially limited by the horizon-

tal plane of the beam pivot disposed at a horizontal distance from the end of the horizontal arm by substantially one-fourth of its maximum throw and a toggle mounted in the frame engaging the connecting link for imparting straight vertical motion to its lower end having substantially twice the length of the front arm.

5. In a pump, in means for securing for a reciprocating plunger an advanced working stroke, a frame, a bent walking beam presenting a rear arm disposed horizontally when in one extreme position and a slanting front arm pivotally mounted in the frame, a connecting link between the front arm and the plunger, rotary driving means for rocking the horizontal arm in a vertical plane substantially limited by the horizontal plane of the beam pivot disposed at a horizontal distance from the end of the horizontal arm by substantially one-fourth of its maximum throw and a toggle mounted in the frame engaging the connecting link for imparting straight vertical motion to its lower end having substantially twice the length of the front arm, and being secured at a point substantially distant from the beam center vertically by one-half the length of the connecting link and horizontally by one-half of its own length.

6. In a pump, in means for securing for a reciprocating plunger an advanced working stroke, a frame, a bent walking beam presenting a rear arm disposed horizontally when in one extreme position and a slanting front arm pivotally mounted in the frame, a connecting link between the front arm and the plunger, rotary driving means for rocking the horizontal arm in a vertical plane substantially limited by the horizontal plane of the beam pivot disposed at a horizontal distance from the end of the horizontal arm by substantially one-fourth of its maximum throw and a toggle mounted in the frame engaging the connecting link for imparting straight vertical motion to its lower end, the torque arm of the rotary means being so proportioned that the plunger stroke does not exceed 855 of the length of the front beam arm.

CLARENCE J. NOEL.