To all whom it may concern:

Be it known that I, WILLIAM PARIS BARCLAY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Power-Head Pumping Machinery, of which the following is a specification.

This invention relates to power-heads for pumps, in which two reciprocating pump plungers are operated in conjunction, and a principal object of my invention is to provide a pump with a power-head that will maintain a constant and uniform force of motion upon the column of water that is being pumped, or raised by the pump plungers connected with the power-head, so that a uniform and continuous flow of water will be maintained.

The improvement is susceptible of slight changes in the form and proportion of the details of construction without departing from the principle of the invention, and a full disclosure of the invention and an adaptation thereof, is shown in the accompanying drawings, in which:

- Figure 1, shows a side elevation of the improved power-head.
- Fig. 2, shows a plan view of the same.
- Fig. 3, shows an enlarged view taken longitudinally through one section of the pump power-head.
- Fig. 4, shows an end view of the same.
- Fig. 5, shows an assembled diagram view of the pump power-head in connection with two valved plungers arranged one above the other in the same cylinder. Fig. 6, illustrates diagrammatically the continuity of the water flow delivered by the pump plungers.
- Fig. 7, illustrates diagrammatically by a circle, the degree of a revolution passed through by the pitmen of the power-head during an up and down stroke of the pump plungers.
- The same reference letters denote corresponding and like parts in all the figures of the drawings.

A further development of the invention has for its object a high rate of plunger speed during the down strokes of the pump plungers, by the power-head compelling a more rapid velocity of the pump plungers during their down strokes than when moving upward.

A pump power-head constructed in accordance with my improvements is particularly adapted for use with pumps having two valved plungers, situated in the same cylinder, one above the other. Pumps of this kind are frequently employed in Artesian wells and the cylinder of the pump extends from the bottom of the pipe that is suspended in the well and forms the discharge pipe from the pump cylinder.

With pump cylinders located in wells of a small area, it is of the highest importance that their plungers are operated at as high speed rate as possible, as the dimensions of the pump are necessarily limited, so that speed in the pump machinery is a factor of the greatest importance in relation to the amount of water pumped from such wells.

The bed plate a, supports primarily, the operative mechanism of the power-head, and may be of any desired and suitable construction, and as shown, is of a rectangular and box form, and provided with bearing boxes a', that hold in position the shafts b. Gear wheels c, of an equal diameter, are rigidly secured to the shafts b, and mesh with each other, so that each revolution of the said shafts is performed in a definite and constant manner, one with the other, and in equal periods of time. The shafts b, are provided with drive-arms b', that are constructed to retain and allow slide-blocks to have a reciprocating movement lengthwise of their arms, and the said shafts are tubular. Rigid stems d, take longitudinally through each shaft b, and the said stems are clamped and held so that they cannot revolve, and are prevented from revolving by the bracket e.

The stems d, are provided with off-set pivots d', for pivotal connection to the links f. The slide-blocks g, are adapted to the drive arms b' of the shafts b, and each slide-block has a projecting gudgeon g', from which a pitman is suspended, and the said slide-blocks are adapted to be operated back and forth lengthwise of the drive arms. The links f, are pivoted to the slide-blocks g, by the center pins r, and the said links also connect with and revolve around the off-set pivots d', as a center. The pitmen h, j, are suspended from the projecting gudgeons g', of the slide-blocks, and the lower ends of the said pitmen connect to the cross-heads k, n. The cross-heads k, n, are each adapted to a guide frame o, so that a reciprocating motion of the said cross-heads will be produced when acted upon by the pitmen h, j, respectively joined thereto. The guide frame o, is of a length that both of the cross-heads k, n, are retained and permitted to have a reciprocating
ing motion given them, and said frame may be of any suitable construction to guide the cross-heads. The upper cross-head \( k \) connects with the lower end of the pitman \( j \), and the said cross-head suspends the inner pump rod \( v \), that connects with the lower plunger \( g \). The lower cross-head \( n \), connects with the lower end of the pitman \( h \), and the said cross-head suspends the outer pump rod \( v \), that connects with the upper plunger \( q \). The lower cross-head \( n \), is provided with a stuffing box gland \( w \), to allow the inner pump rod to work through it. The plungers \( p_2 \) and \( q \), are shown of avalved pattern, and such valves as give the full area of the pump cylinder with the least lift of valve are preferred, in preference to single disk valves. The hood \( w_2 \), is provided with a stuffing box gland \( x \), to allow the outer pump rod to work through it, and from the bottom end of the said hood is suspended a pipe \( y \), that takes into the wall bore, and from the lower end of the said pipe is suspended the pump cylinder \( c \). The pipe \( y \), forms the discharge pipe from the pump cylinder, and generally is composed of several lengths of pipe connected together, so that the pump cylinder will be immersed a greater or less distance in the water of the well. The hood \( w_2 \), also connects with the delivery pipe \( x \), and the said hood is shown resting upon the well casing \( y \) which is usually a pipe driven into the well bore to prevent surface water from percolating through the upper strata direct into the well from above.

The driving power is applied in any suitable manner so, for example, by a belt pulley \( c \), and the direction of rotation is such that pinion \( t \), to mesh with one of the gear wheels \( c \), and the direction of rotation is such that the gear wheels \( q \) move upwardly upon their inner faces and adjacent sides.

The operation of the pump with its peculiar differential movement adapted to operate the plungers of a pump, whereby the column of water acted upon by the pump plungers has communicated to it a continuous and uniform force of motion is as follows:—The gear wheels \( c \), are caused to rotate in the direction indicated by the arrows, and in doing so revolve the shafts \( b \), to which they are attached and their drive-arms \( b' \) conjunctively in a definite manner, one with the other; and the slide-blocks \( g \), attached to the drive-arms \( b' \), being controlled by two forces of motion, one a revolving force of the drive-arms \( b' \), and the other a propelling and pulling force by the action of the links \( f \), revolving around the off-set pivots \( d' \) as a center, causing the slide-blocks \( g \), to move outwardly and lengthwise of their drive-arms \( b' \) a definite amount, with a corresponding return movement during each and every revolution of the drive-arms, produces a variable revolving movement of the slide-blocks \( g \); or in other words, equal degrees of a revolution by the slide-blocks \( g \), are not gone through in equal periods, and such circular movement of the slide-blocks being communicated to the ends of the pitmen \( h, j \), connected therewith, effects the movement of the pump plungers accordingly, so that their up and down strokes are performed in different periods of time and parts of a revolution, so that there is an overlapping movement of the plungers at the end of their strokes, each plunger taking the load prior to the completion of the stroke of its neighbor plunger. The several revolving parts of the power-head are rotated to give the up movement of the pump plungers the greater period and part of a revolution in which to perform their strokes, and gives an upward movement to the pump plungers, so that the load is raised uniformly throughout each upward stroke. In Fig. 6, is represented a diagram showing the comparative velocities of the water throughout the stroke of the pump plungers, such water velocity being represented by the length of the several vertical ordinates \( i \), at corresponding positions of the plunger stroke.

In Fig. 7, is represented by a circular diagram the comparative portions of a revolution occupied during the performance of an up and down stroke of the pump plungers.

While the improvements set forth in the pump power-head are particularly adapted to a duplex system of pump plungers situated one above the other in a continuous cylinder and provided with valve plungers, the pump power-head is also applicable to mine pumps with a duplex system of pump cylinders, with plungers of the solid type, operated by pump rods free from each other; and a half section of the said pump power-head can be advantageously applied to a single plunger pump, especially as it increases the velocity of the down stroke, compared with the up stroke of the pump plunger, thereby permitting a higher average plunger speed, and which in effect is the equivalent of a greater amount of water pumped during a stated time.

Having described the invention, what is claimed as new is:

1. A power-head for operating pump plungers, comprising a bed plate \( a \), provided with bearing boxes \( a' \), tubular driving shafts supported in the bearings, drive-arms \( b' \) carried by the shafts, gear wheels \( c \) mounted upon the shafts, pivot stems \( d \) taking into the tubular shafts and provided at one end with off-set pivots \( d' \), a bracket \( e \) connecting the opposite ends of the pivot stems, slide-blocks \( g \) within the drive-arms \( b' \) provided with center pins \( \tau \), links \( f \) piv.
oted to pins r and off-set pivots d', projecting gudgeons g' formed on the slide-blocks
and devices connected with the gudgeons, to be operated thereby.

2. A power-head for double plunger pumps, comprising gear wheels of equal di-

meter, tubular shafts upon which the gear wheels are mounted, drive-arms carried by
the shafts, slide-blocks cooperating with the

drive-arms, devices to be operated suspend-
ed from the slide-blocks, non-revoluble stems taking through the tubular shafts,
and provided with off-set pivots, a bracket affixed to the stems, and links connecting the
off-set pivots with the slide-blocks.

3. A power-head for a reciprocating plunger pump, comprising a gear wheel a

pinion gear meshing therewith, a tubular shaft upon which the gear wheel is mounted,
a drive-arm carried by the shaft, a slide-

block cooperating with the drive-arm, a pit-
man suspended from the slide-block, a non-
revoluble stem taking through the tubular shaft and provided with an off-set pivot, a

bracket affixed to the stem, and a link con-
necting the off-set pivot with the slide-block.

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

WILLIAM PARIS BARCLAY.

Witnesses:

CHAS. W. BOCKHOLT,
SMITH M. HURD.