

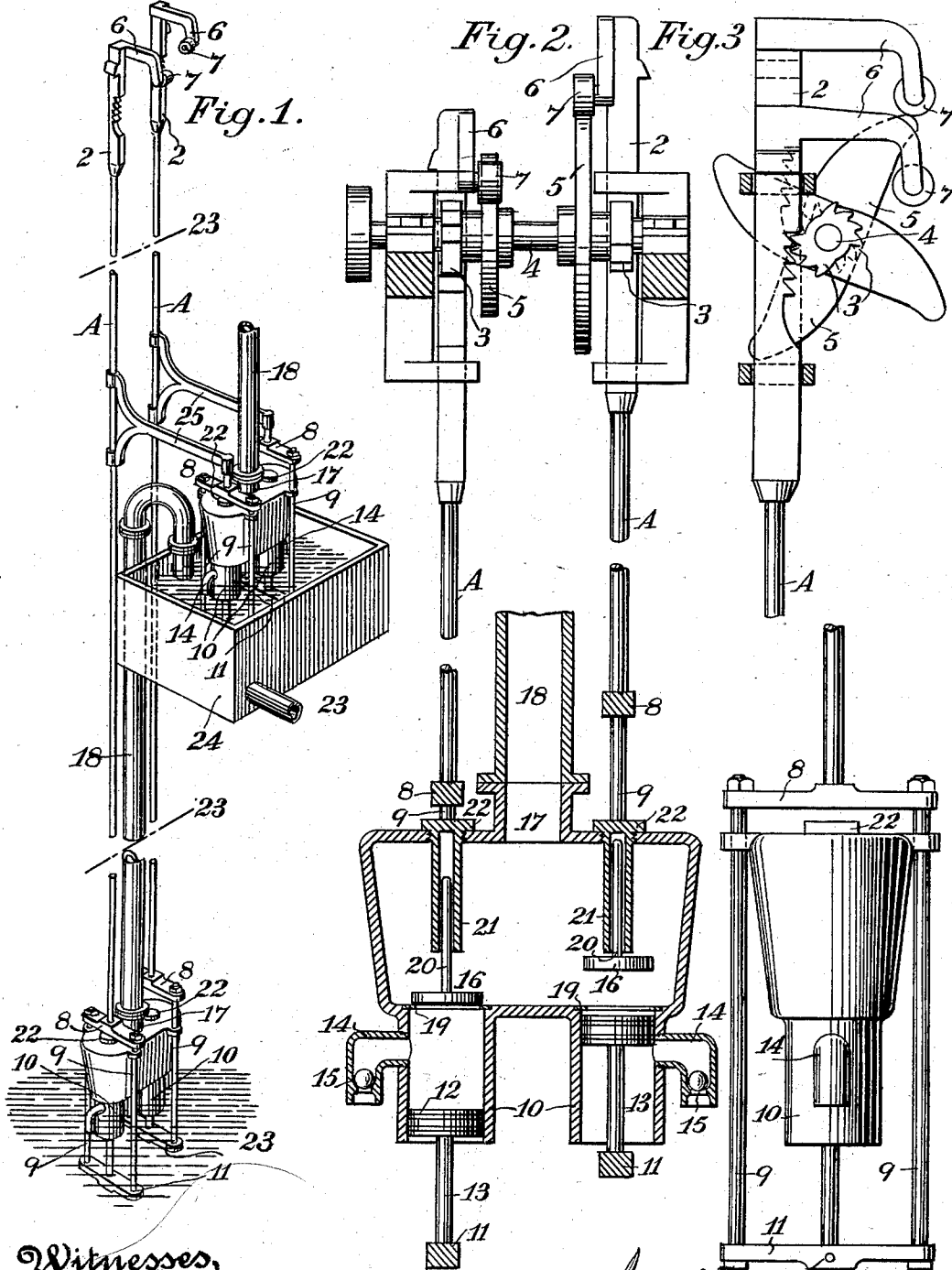
No. 717,852.

PATENTED JAN. 6, 1903.

J. K. HOGAN.  
MINING PUMP.

APPLICATION FILED APR. 21, 1902.

NO MODEL.



Witnesses,

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# UNITED STATES PATENT OFFICE.

JOHN K. HOGAN, OF PLACERVILLE, CALIFORNIA.

## MINING-PUMP.

SPECIFICATION forming part of Letters Patent No. 717,852, dated January 6, 1903.

Application filed April 21, 1902. Serial No. 103,881. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN K. HOGAN, a citizen of the United States, residing at Placerville, county of Eldorado, State of California, have invented an Improvement in Mining Pumps; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to improvements in pumps of that class designed for use in mines or wherever water is to be raised to a considerable elevation.

It consists of the parts and the constructions and combinations of parts which I will hereinafter describe and claim.

Figure 1 is a perspective view of my invention. Fig. 2 is a longitudinal section through the pump and a front view of the operating mechanism. Fig. 3 is a side view.

The object of my invention is to so construct the pump as to avoid the use of all leathers, valves in the plungers, and generally such parts as are liable to wear and deterioration by the constant action and lifting of a heavy column of water, a means for connecting a series of pumps with pump-rods or pitmen common to all of the series, and in so arranging the alternate movements of the pair of pump-rods through which motion is communicated that the weight of each descending rod is transferred to assist in operating the ascending rod and the plungers actuated thereby.

A A are two parallel pump-rods extending down to the point from which the water commences to be raised. These rods are connected at the upper end with rack-bars 2, and these rack-bars are engaged by segmental gears 3, mounted upon a power-shaft 4. These two segments are so disposed with relation to the rack-bars that one segment engages its rack and commences to lift it and the pump-rod with which it connects an instant before the other rod and its load has ceased to rise by the disengagement of its actuating toothed segment with its rack. Thus the movements of the pumps are made continuous, so that the upward movement of the column of water never ceases. Fixed upon the shaft 4 and with suitable relation to the toothed segments are cams 5. The upper ends of the rack-bars have arms or

bearers, as at 6, at the lower end of which are located antifrictional devices, such as pulleys or rollers, at 7. These rollers are in the plane of rotation of the cams 5, and these cams are set with such relation to the toothed segments and to the arms or brackets carrying the rollers 7 that when one of the rack-bars and its connected pump-rod have been raised to the highest point and the last tooth of the segment disengages from the rack the cam will have arrived in such position that it will receive the roller 7, and thus support the pump-rod and the weight carried thereby. The curvature of this cam is such that as the shaft continues to rotate the roller travels on the cam toward the center, and thus allows the pump-rod to descend. At the same time the weight of the pump-rod acting upon this cam assists to rotate the shaft and applies this power to the raising of the other rack-bar and pump-rod, thus acting in a measure as a counterbalance for the weight being raised by this other pump-rod. When this latter rack-bar and pump-rod have reached the highest point of the stroke, the toothed segment which has actuated it is disengaged from the rack, and the roller 7 of this rack-bar is received upon the other cam 5, and the pump-rod is gradually let down, its weight then acting to counterbalance the first-named pump-rod.

There are two oppositely-projecting cams for each rack-bar and pump-rod, and it will be seen that by this construction each complete revolution of the shaft makes two complete strokes of each pump-rod. The shaft may thus be run at a comparatively low rate of speed, and the pumps will be operated as rapidly as the water can be disposed of.

The pump-rods A connect at the bottom with cross-heads 8. Rods 9 extend from these cross-heads down upon each side of the pump-barrels 10 and at the bottom are connected with other cross-heads 11, extending beneath the cylinders 10. These cylinders are open at the bottom, and the plungers 12 are connected by rods 13 with the cross-heads 11, so that the alternate reciprocations of the rods A will act to alternately reciprocate the plungers. These plungers have packing-rings or other suitable means for forming tight joints for the interior of the cylinder, but no valves.

Near the top of each cylinder is an inlet-opening, as at 14, having in it an inwardly-opening valve of any description, as at 15, so that the pumps or the inlet-openings 14 being submerged each downward stroke of the plunger allows water to flow in and fill the cylinder. When the plunger rises by reason of its connection with a reciprocating pump-rod, it lifts this body of water, closing the valve 15 and opening a valve 16, which admits the water into a common chamber 17, and from this chamber the water is delivered into the main conducting-pipe 18. The valves 16 may be of brass and closable upon brass or equivalent seats 19, and they have guide-stems 20, extending into tubular guides 21, which guides have heads, as at 22, and are screw-threaded into the upper part of the chamber 17 and in line with the cylinders 10. By this construction the whole structure of the cylinders and the water-chamber may be formed in a single casting. The holes for the guides 21 are in line with the cylinders to admit of a boring-bar and tools by which the cylinders can be bored out, this being all the finishing which is necessary, after which the openings at the top of 17 being screw-threaded the guides 21 can be screwed to their seats and the pumps are ready for use.

As many stations 23 may be employed as the depth of the mine from which the water is to be raised and convenience in handling the water would make necessary. Usually these stations may be at each level, and at each of these stations is a receiving-tank 24, which serves to collect all the water from the level above and to receive the water raised by the pump from the level below. At each of these tanks 24 is located a pair of pumps 10, the inlet of the pumps being submerged in the tank, as previously described. A bracket or arm 25 of any suitable form is fixed to each of the pump-rods A and projects sufficiently to connect with the transverse bar 8 of that pump, and through the side rods 9 and the bar 11 at the bottom the plunger is actuated as previously described. These intermediate or relay pumps are set just sufficiently to one side of the pump-rods to give a proper clearance and so disposed with relation thereto as to make the least strain upon the rods.

The greatest amount of water is usually found in the upper levels of mines, and this is collected as thoroughly as possible into the tanks of those levels, so that the pump at the bottom will have the smallest quantity of water to raise.

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

1. A deep-level pumping apparatus comprising parallel open-bottomed cylinders with inlet-openings, plungers, valves and discharge-pipe; a second series of similar pumps located at intermediate levels between the bottom and the top; tanks from which the

pumps are supplied and into which the water from the levels below is successively delivered; pump-rods extending to the bottom said rods having connection at the lower ends with plungers of the lowest pump, and having rack-bars at their upper ends; mechanism including a horizontal shaft and toothed segments thereon engaging said rack-bars whereby the rods are alternately reciprocated so that one pump is always lifting before the other commences to descend; and connections between the rods and the plungers of each of the intermediate pumps whereby all are operated in unison.

2. In a deep-level pumping apparatus, pumps consisting of cylinders disposed in pairs, pump-rods connecting with the plungers of said cylinders, and means for reciprocating said pump-rods consisting of vertically-slidable guided toothed rack-bars, a segmental gear engaging each of said bars and a shaft upon which the gears are mounted said gears so disposed with relation to the bars that one segment engages its rack and commences to lift it and the attached pump-rod an instant before the other rod and its load have ceased to rise by the disengagement of its actuating-segment with its rack.

3. In a pumping system, reciprocable pump-rods, slidably-guided toothed rack-bars with which the pump-rods are connected, a horizontally-revoluble power-shaft having toothed segments fixed thereto adapted to alternately engage the teeth of the rack-bars, cams mounted and revoluble upon the same shaft, rollers carried by the rack-bars in line above the cams, said rollers being received upon the upper ends of the cams at the instant when the rack-bars are released from the toothed segments.

4. The combination in a pumping apparatus of pump-rods, toothed rack-bars with which said rods are connected, a horizontally-revoluble shaft having oppositely-disposed toothed segments adapted to engage each of the rack-bars whereby each revolution of the shaft produces two reciprocations of each pump-rod, arms or brackets projecting from the upper ends of the rack-bars, antifriction-rollers journaled therein, and double-armed cams fixed to the shaft and so disposed as to receive the antifriction-rollers at the instant when the toothed segments pass out of engagement with the rack-bars whereby the weight of the pump-rod connections is supported upon the cams and the pump-rod allowed to descend in unison with the revolution of the cams.

5. The combination in a pumping apparatus of pump-rods, toothed rack-bars with which they are connected, a horizontally-revoluble shaft having oppositely-disposed toothed segments adapted to engage each of the rack-bars, said segments being so disposed that each rod commences its upward movement before the other rod commences its downward movement, arms or brackets

projecting from the rack-bars and antifric-  
tional rollers journaled therein, double-armed  
cams fixed to the shaft and adapted to re-  
ceive the rollers upon their upper ends at the  
5 instant when the rack-bars are released from  
the toothed segments whereby the weight of  
the pump-rod and its connections is received  
upon the cam, said cam having such a curva-  
ture that the weight thus transmitted acts

through the cam to assist in the revolution of  
of the shaft and is the counterbalance to the  
opposite rod and its connections.

In witness whereof I have hereunto set my  
hand.

JOHN K. HOGAN.

Witnesses:

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