W. P. BARCLAY.

Hydraulic and Wire-Rope Pumping System.

No. 197,239. Patented Nov. 20, 1877.

Fig: 1.

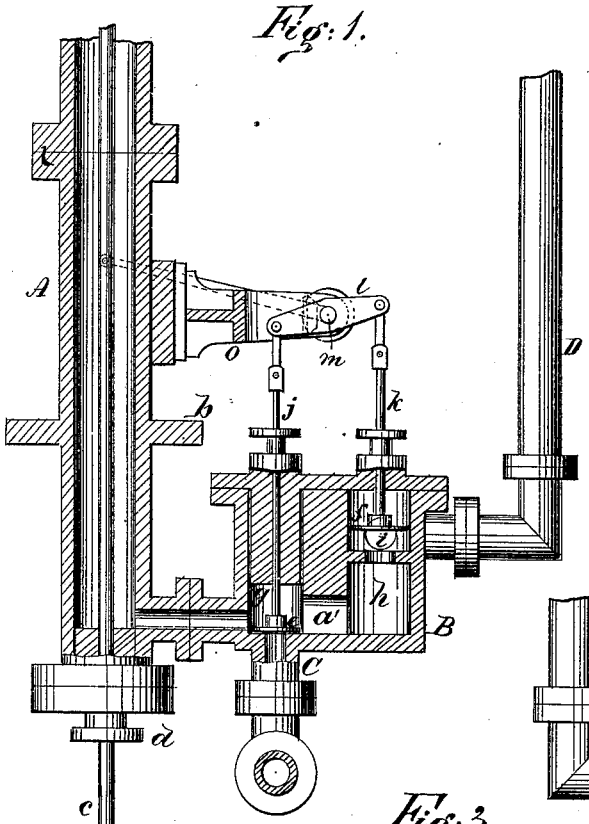


Fig: 2.

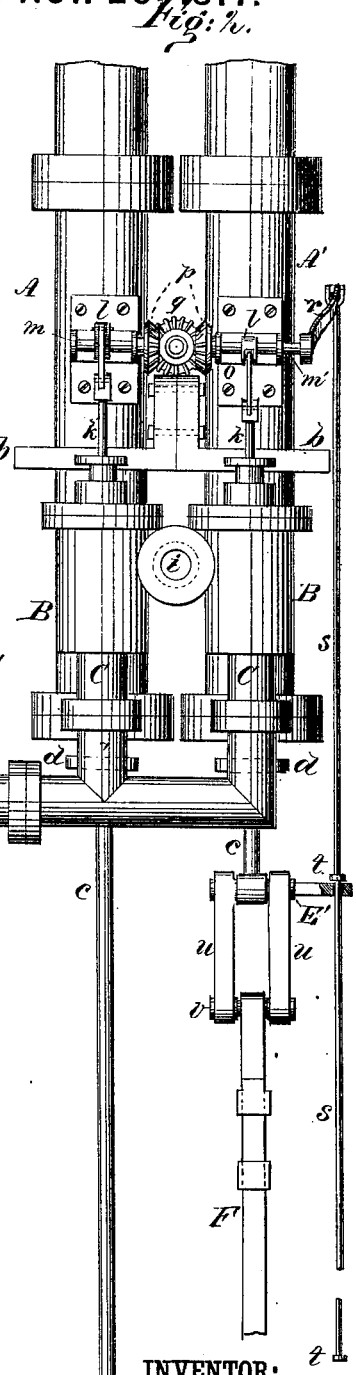
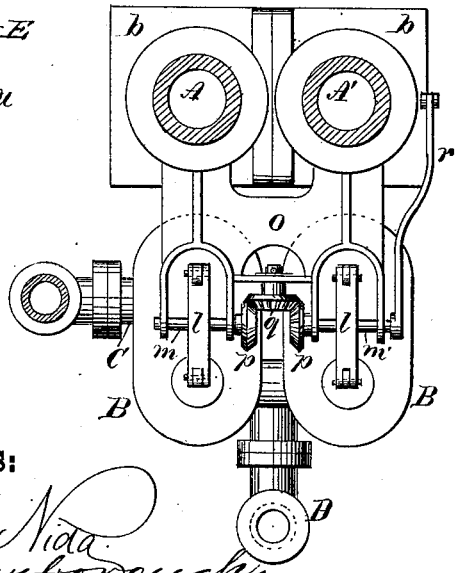


Fig: 3.



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WILLIAM P. BARCLAY, OF VIRGINIA CITY, NEVADA.

IMPROVEMENT IN HYDRAULIC AND WIRE-ROPE PUMPING SYSTEMS.

Specification forming part of Letters Patent No. **197,239**, dated November 20, 1877; application filed October 6, 1877.

To all whom it may concern:

Be it known that I, WILLIAM P. BARCLAY, of Virginia City, in the county of Storey and State of Nevada, have invented a new and Improved Hydraulic and Wire-Rope Pumping System, of which the following is a specification:

Figure 1 is a vertical section of a portion of my improved apparatus. Fig. 2 is a front elevation of the same; and Fig. 3, a plan view of the same, partly in section.

Similar letters of reference indicate corresponding parts.

The object of my invention is to provide apparatus for economically raising water from mines and deep shafts; and it consists in a combination of hydraulic lifting-cylinders, a system of pumps, and wire-rope connections, as hereinafter more fully described.

In pumping machinery, such as is commonly employed in freeing mines from water, rigid pump-rods, of wood, and pump-cylinders the pistons or plungers of which have a comparatively short stroke and a slow speed, are used, necessitating the employment of pumps of large diameter for the raising of a very moderate quantity of water in a given time. As water is inelastic, and as the pump-rods are rigid and unyielding, a greater speed in the pumps is found not to be practicable from the frequent breakages which would occur with the pump-rods.

By my improvements these difficulties are obviated, and the pumping is accomplished effectively and economically.

I use as many pumping-cylinders in the mine or shaft as may be required to lift the water, the cylinders being placed one above the other, and connected, so as to divide the pressure between them. I employ two series of pumps, and connect together the piston-rods of each series by wire ropes, and at or near the mouth of the shaft I place a hydraulic engine, to be presently described.

The discharge-pipe of the lower pump delivers the water to a receiver, from which the suction-pipe of the next pump above takes it, and it is delivered to another receiver, and so on until it reaches the top of the shaft.

Referring to the drawings, A A′ are cylinders, having flanges *b*, by which they are secured together and supported. Each cylinder contains a piston, the rod *c* of which passes out through a stuffing-box, *d*, in the lower end of the cylinder.

A valve-chest, B, is connected with each cylinder, which contains two circular valves, *e f*, which are placed in cylindrical chambers *g h*, formed in the valve-chest. The valve *e* closes the discharge-pipe C. The valve *f* has a seat formed in the middle of the chamber *h*, below the supply-passage *i*, which connects the chambers *h* of the two valve-chests, and communicates with the supply-pipe D. A passage, *a′*, connects the chambers *g h*.

The valves *e f* are attached to rods *j k*, which pass out of the top of the valve-chests, through stuffing-boxes, and are connected with levers *l*, having equal arms. These levers are secured to the shafts *m m′*, which are journaled in a bracket, *o*, attached to the pump-cylinders. These shafts are placed in the same axial line, and have on their inner or adjacent ends miter-wheels *p*, which mesh into an intermediate miter-wheel, *q*, that turns on a stud projecting from the bracket *o*. When one of the shafts *m m′* is moved, the other, by virtue of the connection just described, moves also, but in the opposite direction.

To the shaft *m′* an arm, *r*, is attached, which extends backward to the center line of the pump-cylinders, and is connected with the rod *s*, that extends downward through a cross-head, E′, on the end of the piston-rod *c* of the cylinder A′, and is provided with collars *t*, which are engaged by the cross-head at each end of its stroke.

A cross-head, E, is also attached to the lower end of the piston-rod of the cylinder A. Both cross-heads E and E′ are turned to receive links *u*—one pair to each cross-head. A round cross-bar, *r*, connects the lower ends of the links, and to it the end of the wire-rope F is secured. These ropes are connected with the two series of pumps before mentioned. Water under pressure is admitted through the pipe D to the chambers *h* of the valve-chests B, the valve *f* being open and the valve *e* closed; water enters the cylinder A and forces up the piston, carrying with it all of the pump-pistons connected with it by the wire-rope F. During this time the piston in the cylinder A′

descends, the valve *f*, connected with it, being closed, and the valve *e* open.

The water discharged from the cylinder passes into the vertical portion of the discharge-pipe C, which is of sufficient length to contain a column of water capable of wholly or partly counterbalancing the weight of the wire-rope and pistons connected with the piston-rod of the cylinder A. When the cross-head E′ reaches the lower end of its stroke it strikes the lower collar *t* on the rod *s*, and moves the said rod and the arm *r*, connected therewith, so as to shift the valves *e f* of both cylinders, and admit water to the empty cylinder, and permit the water to escape from the full one. When the cross-head E′ reaches the upper end of its stroke, it strikes the upper collar *t* on the rod *s*, and shifts the valves, so as to again reverse the action of the cylinders.

To avoid the too frequent shifting of the valves, the hydraulic cylinders, as well as the pump-barrels, are made as long as practicable. The use of long cylinders and the employment of wire ropes, whereby ample time is given for the elasticity of any cushions that may be employed to give out and take up their elasticity at the end of their strokes, allow of a more sudden starting at the commencement of strokes and a corresponding increase of speed in pumps over the heavy wood-rod system.

When a steam-engine is used as the motor-power to the hydraulic cylinders, the vertical stand-pipe is dispensed with, and one hydraulic cylinder-piston and its series of pumps is made to balance the other series, for when the piston of one hydraulic cylinder is declining with its series of pumps, there is communicated to the ascending piston the full weight or pressure of the descending ones, constituting an equal balancing of one series of pumps by the other, and the velocity of the descending series is regulated solely by the ascending ones; also, by the employment of the hydraulic cylinders in connection with a steam-engine, a higher degree of economy is attained, as a small engine run at high velocity, cutting off steam at the most advantageous point, can be used, thus utilizing the steam to much better advantage than is possible in steam-pumping apparatus, when steam must of necessity be used at full pressure nearly or quite to the end of the stroke.

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

1. The hydraulic cylinders A A′ and the wire ropes F, in combination with two series of pumps, substantially as and for the purpose herein shown and described.

2. The combination of two sets of valves, *e f*, the levers *l*, and the miter-gears *p q*, substantially as herein shown and described.

3. The combination of the cross-head E′ and rod *s* with valve-operating mechanism, for moving two or more sets of valves in opposite directions, substantially as shown and described.

4. A vertical stand-pipe connected with the discharge-opening of hydraulic cylinders, for containing a column of water for partly counterbalancing the piston and its load, substantially as shown and described.

WILLIAM PARIS BARCLAY.

Witnesses:
SAMUEL GARRISON PALMER,
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