

UNITED STATES PATENT OFFICE.

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AUTOMATIC COUNTER-BALANCE TO SPEAR-RODS OF MINING-PUMPS.

SPECIFICATION forming part of Letters Patent No. 243,852, dated July 5, 1881.

Application filed January 20, 1881. (Model.)

To all whom it may concern:

Be it known that we, SAMUEL B. CONNOR, HENRY DODS, and WILLIAM S. FERGUSON, of Virginia City, in the county of Storey and State of Nevada, have invented a new and Improved Automatic Counter-Balance to Spear-Rods of Mining-Pumps, of which the following is a specification.

In the construction of heavy mining-pumps it has been found necessary to apply an immense counter-balance to the spear-rods, in order to make them lift under an equal application of power as when they are lowered. The contrivance now commonly in use for this purpose is what is called a "balance-bob," and is constructed upon the plan of a direct lever, one end being connected to the spear-rod, while the other end is loaded heavily enough to balance said spear-rod, or nearly so. While the spear-rod travels in a straight line up and down, the balance-bob travels in a semicircle; hence the power exerted by it is not in a direct line. Assuming a pump of ten feet stroke to be making seven double strokes per minute, the spear-rod travels at the rate of one hundred and forty feet per minute, making fourteen stops in that time, one at each end of stroke. Assuming the weight of the bob to be seven tons and the weight on the spear-rod end to be thirty tons, then the weight or counter-balance on the opposite end of the bob would be thirty tons, making the whole weight sixty-seven tons, to be started and stopped fourteen times in a minute, at a velocity of one hundred and forty feet per minute; hence an immense strain is brought on the bob and its connections, causing great expenditure of power and frequent breakages, and consequent delays and interruptions in the work. These bobs of ordinary construction require an excavation of over seven thousand cubic feet, which is costly to make and very expensive to keep in repair.

Another objection to the balance-bob in common use is that at each change of stroke of the pump the thrust and strain upon the spear-rod is instantaneous.

The object of our invention is to remove these objections and to substitute a device that occupies less space, is more durable, less ex-

pensive to keep in repair, less liable to get out of order, and offers an elastic resistance at each stroke of the pump.

The invention consists in connecting the counter-balance with the spear-rod by means of air or water pipes and cylinders provided with suitable plungers, whereby said counter-balance is made to co-operate with the spear-rod.

Figure 1 is a side elevation of the device. Fig. 2 is a vertical sectional elevation of the same on line $x x$, Fig. 1. Fig. 3 is a vertical sectional elevation of the same on line $y y$, Fig. 1. Fig. 4 is a plan of the device. Fig. 5 is a transverse section on line $z z$, Fig. 1.

Similar letters of reference indicate corresponding parts.

In the drawings, A A represent the plungers, rigidly secured to the spear-rod B by two brackets, C C. Said plungers A A work in the two air or water cylinders D D, that are provided with suitable stuffing-boxes, a , at their upper ends, and said air-cylinders D D are connected at their lower ends to a hollow fixed plunger, E, by means of the pipes F F F', the pipes F F having one end connected with the cylinders D D and the other end with the pipe F', that is directly connected with the said plunger E. This plunger E is open at the top, and on it is a vertically-moving cylinder, G, which is closed at the top, and is provided with suitable stuffing-boxes, b , about its open mouth in contact with the plunger E.

H is the weight-box, preferably of boiler-plate iron, and of cylindrical shape, open at the top to receive the counterbalancing-weights that may be put in it, and having its bottom strengthened by internal ribs, $c c$. Said weight-box H is set centrally over the cylinder G, resting on the lower annular flange, f , thereof, so that cylinders G and weight-box H move together. Said weight-box H is guided in its vertical movements by the claspings of its lugs $d d$ around the vertical guide-standards K K. Air or water is introduced into the pipe F' through the supply-pipe L, that is provided with a check-valve, M, to prevent any sudden loss of air or water in the event of the fracture of said supply-pipe L.

With this device, when the spear-rod B is

moving down, the plunger A displaces the air or water in the cylinders D and compresses it through the pipes F F' and fixed plunger E into the moving cylinder G, thereby causing the said cylinder G and weight-box H, containing suitable counterbalancing-weight, to rise, and when the spear-rod B moves up the compressed air or water is moved in the reverse direction by the downward movement of the box H and cylinder G, and the said spear-rod B thereby aided in its upward movement. This weight-box H and its contents is designed to perform the same duties as the ordinary balance-bob device, and it performs them with far greater ease and with much less liability of derangement of parts.

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

1. An improved automatic counter-balance to spear-rods of mining-pumps, constructed substantially as herein shown and described,

consisting of plungers A A, air or water cylinders D D, hollow fixed plunger E, pipes F F', vertically-moving cylinder G, supporting weight-box H, and air or water supply pipe L, operated as set forth.

2. The combination, with the plungers A A, air or water cylinders D D, hollow plunger E, pipes F F', moving cylinder G, and weight-box H, of the spear-rod B and brackets C C, substantially as herein shown, and for the purpose described.

3. In an automatic counter-balance to spear-rods of mining-pumps, the combination, with the vertically-moving cylinder G, of the weight-box H, substantially as and for the purpose described.

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Witnesses:

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