(No Model.)

J. BARRETT.

ARTESIAN WELL APPARATUS.

No. 511,924. Patented Jan. 2, 1894.

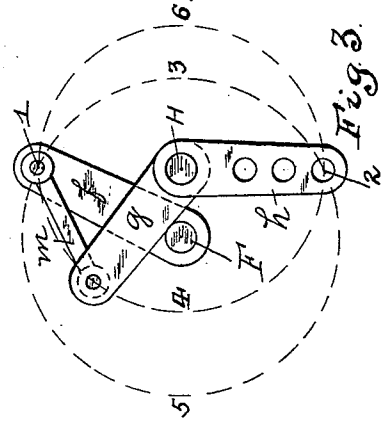

Fig. 3.

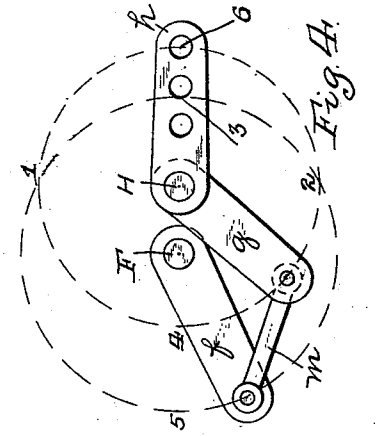

Fig. 4.

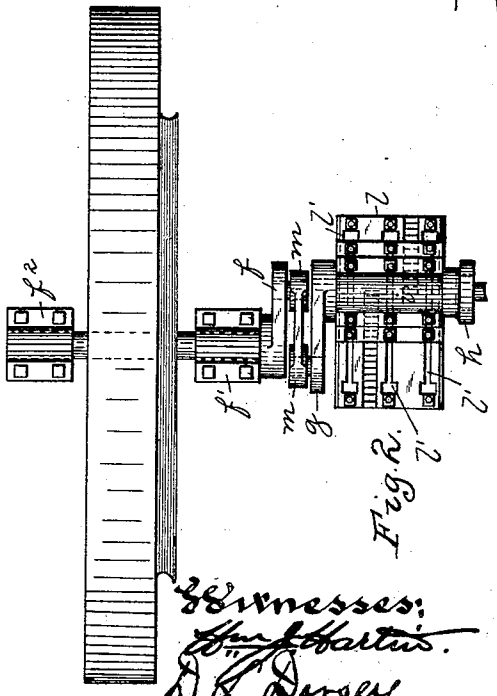

Fig. 2.

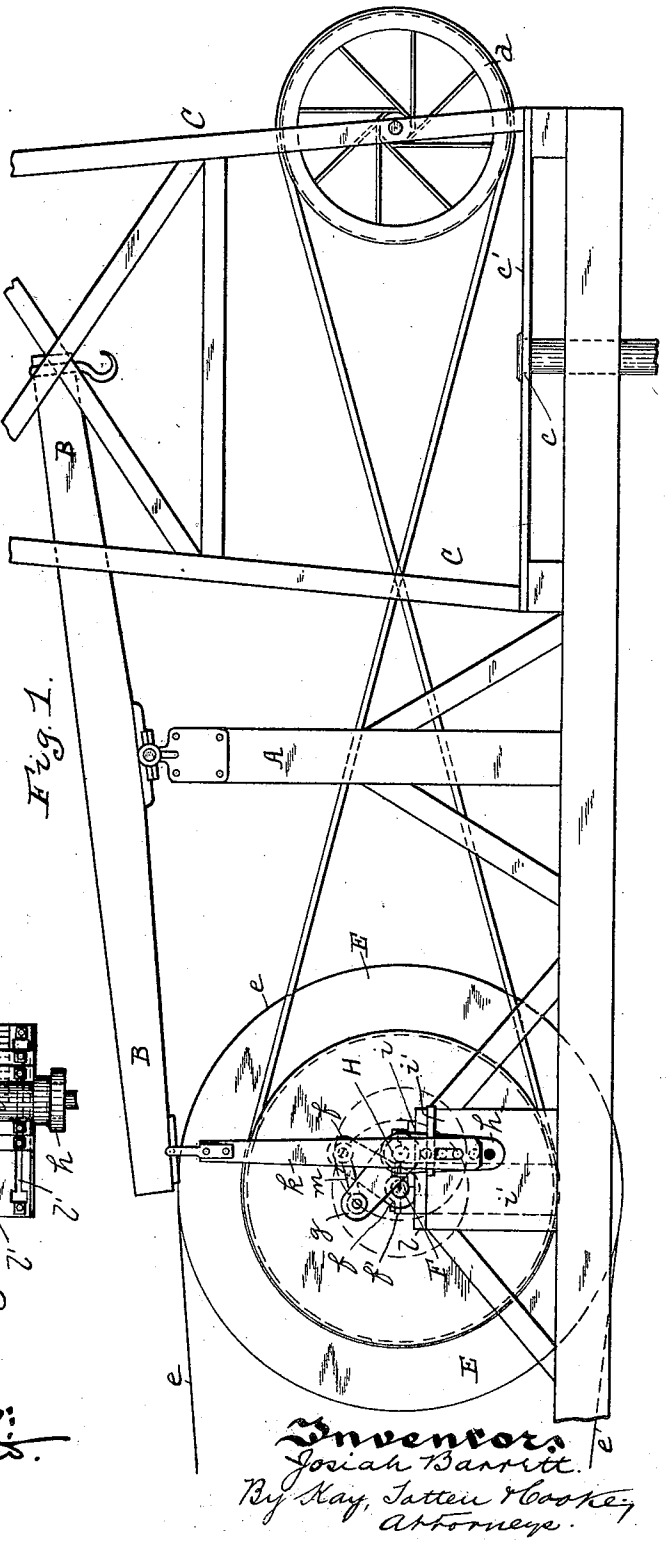

Fig. 1.

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JOSIAH BARRETT, OF ALLEGHENY, PENNSYLVANIA.

ARTESIAN-WELL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 511,924, dated January 2, 1894.

Application filed March 24, 1893. Serial No. 467,435. (No model.)

To all whom it may concern:

Be it known that I, JOSIAH BARRETT, of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Artesian-Well Apparatus; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to mechanical motions suitable for operating oil well apparatus, or for like purposes, where it is desired to drive a shaft at different speeds, such as in lifting and dropping of oil well tools. Its purposes are practically the same as those set forth in Letters Patent No. 495,689, granted to me April 18, 1893.

The oil well apparatus, either for drilling or pumping, generally consists of a walking beam which is pivoted upon a samson post, one end of it extending over above the hole to be drilled or the hole or well already drilled and which is being pumped, while the other end of this walking beam is connected by means of a pitman to a crank shaft, the usual construction being that this crank shaft shall be driven directly by belting from the engine.

The operation of drilling is to lift the rope by the movement of the walking beam and then to permit the tools to drop as the walking beam descends, so giving the necessary stroke for the cutting or drilling of the rock. The speed of movement of said apparatus has always been limited by one factor, namely, the stretching of the rope, it being necessary to operate at such speed as would draw on the rope sufficiently slowly to enable it to free the tools and lift them, it being found that if the apparatus were run too rapidly, the result would be a churning of the tools within the well, the quick application of power stretching the rope so rapidly and to such an extent that it would not act to lift the tools. This difficulty in the stretching of the rope is, of course, experienced more particularly in deep well drilling which is found necessary in many of the gas and oil regions, and for this reason it has been necessary to operate at a much slower speed in proportion to the depth of the well. It is, of course, desirable that the tools shall be free to drop as quickly as possible and yet be under control, and the necessity of slow movement in raising has necessarily prevented as quick a drop as desirable. To obtain the necessary hard blow for drilling in deep wells, the weight of the tools has also been increased, and this has necessitated the corresponding increase in engine power and reduction in speed; and the movement of the engine was also necessarily irregular under the strain of lifting and dropping. By the improvement described in my said application filed June 10, 1892, this difficulty was overcome by means of a sliding connection between the crank shaft connected by the pitman to the walking beam and an auxiliary driving shaft operated by the engine, by which device a greater proportion of the stroke of the driving shaft was utilized in lifting than in dropping, and the necessary slow lift and quick drop obtained.

My present invention has for its object the production of the slow lifting stroke and the quick drop, or like irregular stroke of the shaft operating the walking beam with an increase of power, as will hereinafter be described. Though it is especially applicable to this particular purpose, it may be employed with advantage with other mechanical devices, and therefore is not limited to the oil well apparatus.

It consists, generally stated, in the combination of a driving shaft having a crank arm, a shaft parallel with the driving shaft but on a different plane therefrom, and having a crank arm and a link or rod connecting the two crank arms so that the power from the driving shaft to the driven shaft is always applied at the ends of the cranks and the full power thereof applied; and to move the driven shaft for one-half of its revolution the driving shaft will travel for over one-half of its revolution, while to move the driven shaft for the other one-half of its revolution the driving shaft will move for less than one-half of its revolution, the quick and slow movement above indicated being thus obtained, and, when employed in oil well apparatus, the greater part of the movement of the driving shaft being utilized for the raising of the tools, while the quick drop of the tools is obtained because of the driving shaft traveling only through a comparatively small part of its stroke.

It also consists in certain other improve-

ments which will be hereinafter more particularly set forth and claimed.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a side view, partly broken away, illustrating my invention. Fig. 2 is a top or plan view thereof; and Figs. 3 and 4 are diagram views showing the position of the parts in the course of movement thereof.

Like letters of reference indicate like parts in each.

In the accompanying drawings A is the samson post, B the walking beam, C the derrick, and *c* the well opening in the derrick floor *c'*, the bull wheel *d* being mounted in the derrick.

Power is applied to the band wheel E which is secured to the driving shaft F mounted in suitable bearings *f' f²*, the band wheel driving the shaft F by means of a belt *e* extending from the engine, which is not shown. The driving shaft F is rotated by means of the engine at a regular speed and carries the crank arm *f*.

Located below the rear end of the walking beam is the crank shaft H which has the two crank arms *g h*, the crank arm *h* being connected by the pitman *k* to the rear end of the walking beam. This crank shaft H is mounted in a suitable bearing *i* which is parallel to but, as shown, is on a different vertical plane from the driving shaft F, the two shafts being preferably placed upon the same horizontal plane, as shown, though for some purposes in the employment of the apparatus the two shafts may be placed on the same diagonal plane or the same vertical plane, according to the way in which the power is to be utilized and the points in the movement of the shaft H at which the slower and faster movement, respectively, are required.

For use in connection with oil well drilling apparatus, the shafts F and H are placed upon the same horizontal plane, as shown. The crank arm *f* and the crank arm *g* are connected by the link or connecting rod *m*, so that the power is applied from the driving shaft F to the crank shaft H at the ends of the crank arms, and the full power of the driving shaft thus transmitted to the crank shaft H during the entire revolution of the respective shafts. It will be noticed that the crank arms *g h* are not in line with each other, the crank *g* extending in a diagonal position when the crank *h* is in a vertical position. The reason for this is that it is desirable, in obtaining the peculiar stroke required for well drilling or pumping, that the end of the crank arm *f* of the driving shaft shall be in the same vertical plane as the crank arm *h* when said crank arm *h* stands vertically, so that the driving shaft F shall be required to travel in the longer part of its stroke for the movement of the crank arm *h* from its upper vertical position to its lower vertical position, and a shorter part of its stroke for the movement of the crank arm *h* for the other one-half of its movement, as will be seen from the diagram views, and the link *m* must be of sufficient length to properly transmit the power from the crank arm *g* to the crank arm *f* when the parts are in their respective positions.

The bearing *i* for the crank shaft H is made adjustable on its stand or block *i'* by means of suitable grooves *l'* in the bed plate *l* of the bearing block, so as to vary the respective strokes of the shafts, as by drawing the crank shaft H more into line with the driving shaft F the movement of the crank shaft will be caused to correspond more to the movement of the driving shaft, and by moving the crank shaft H farther from the driving shaft a greater difference of movements between the two shafts will be obtained.

Broadly considered, the above constitutes the entire apparatus. When in use the driving shaft will be rotated at a regular speed by the engine, and when the crank arm *h* of the crank shaft H stands perpendicular, such as when it is in position shown in Figs. 1 and 2, where the end of the walking beam carrying the tools is raised and it is desired to obtain the quick drop, the crank arm *f* of the driving shaft extends at an upward incline so as to bring its outer end practically in the same vertical plane as the crank arm *h* of the crank shaft H. The power is transmitted from the driving shaft through the link to the crank arm *g* of the shaft H, and as the crank arm *f* of the driving shaft turns to the right and travels from the point *l* for about one-third of its stroke to the point 2 in the course 2—3—1 the crank arm *h* will travel from the point 2 in the course 2—4—1 to the point *l*, so lowering the tools; and as the tools are raised, the crank arm *f* travels in the course 2—5—1 for about two-thirds of its stroke in causing the crank arm *h* to travel in the other one-half of its stroke from the point *l* in the course 1—6—2 in raising the tools. It will thus be seen that while the driving shaft is moving at a regular speed, in traveling about one-third of its stroke it carries the crank shaft connected through the pitman to the walking beam for one-half of its stroke, thus giving the quick drop, and in raising the tools it is necessary for the driving shaft to travel for about two-thirds of its stroke in order to move the crank shaft one-half of its stroke, two-thirds of the power of the engine and of the time necessary for one revolution being therefore employed directly for raising the tools, and during the raising of the tools, the crank shaft and its pitman traveling much slower than in the dropping of the tools, the two desired movements of a quick drop and a slow and strong raising of the walking beam being thus obtained. During all of this stroke the power is applied from the end of the crank arm of the driving shaft to the end of the crank arm of the crank shaft, the full power

of the engine being thus utilized during the entire lifting stroke and the link *m* swinging on the crank pins by which it is connected to these shafts, so as to accommodate itself to the respective movements of the crank arms. The apparatus therefore provides a simple means for obtaining such differentiation of stroke, and enables me to employ a greater part of the stroke of the driving shaft for lifting, while the power is applied with the greatest leverage practicable during the entire movement, and, consequently, I am enabled to operate the tools at a great saving of power, probably twenty per cent., with the consequent saving of fuel.

A further advantage obtained is the saving of time in drilling when the apparatus is employed for that purpose, as the engine may be run at a higher speed without fear of the churning of the tools within the well, which is accommodated for by the quick drop of the tools made possible by the apparatus, which also increases the force of the blow struck by the tools in drilling, so that even in deep well drilling the apparatus may be run at a higher speed.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In Artesian well apparatus, the combination of a driving shaft having a crank arm, a shaft parallel therewith but on a different plane from the driving shaft, and having a crank arm and a link or rod connecting the two crank arms, substantially as set forth.

2. In Artesian well apparatus, the combination of a driving shaft having a crank arm, a shaft parallel with but on a different plane from the driving shaft, having two crank arms which extend out in a diagonal direction from each other, and a link or rod connecting the crank arm of the driving shaft to one of the crank arms of the other shaft, substantially as set forth.

3. In Artesian well apparatus, the combination of a driving shaft having a crank arm, a shaft parallel with and on the same horizontal plane but on a different vertical plane from the driving shaft, said shaft having two crank arms, one connected to a walking beam and the other extending diagonally therefrom and connected by a link or bar to the crank arm of the driving shaft, substantially as set forth.

In testimony whereof I, the said JOSIAH BARRETT, have hereunto set my hand.

JOSIAH BARRETT.

Witnesses:
J. N. COOKE,
WM. J. HARTIN.