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P. A. HUMBERT.

PUMP.

No. 301,993. Patented July 15, 1884.

Fig: 1.

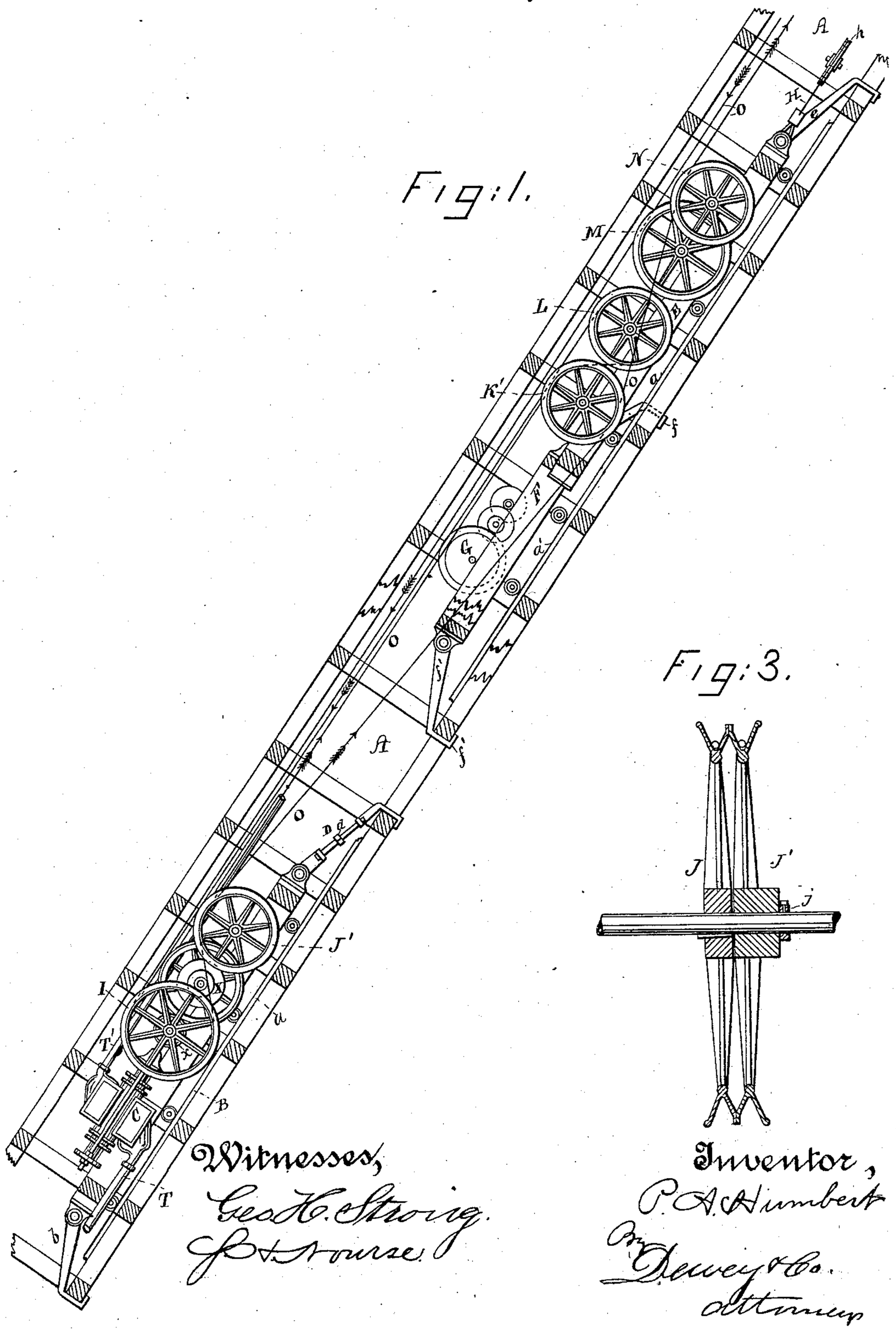

Fig: 3.

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Fig: 2.

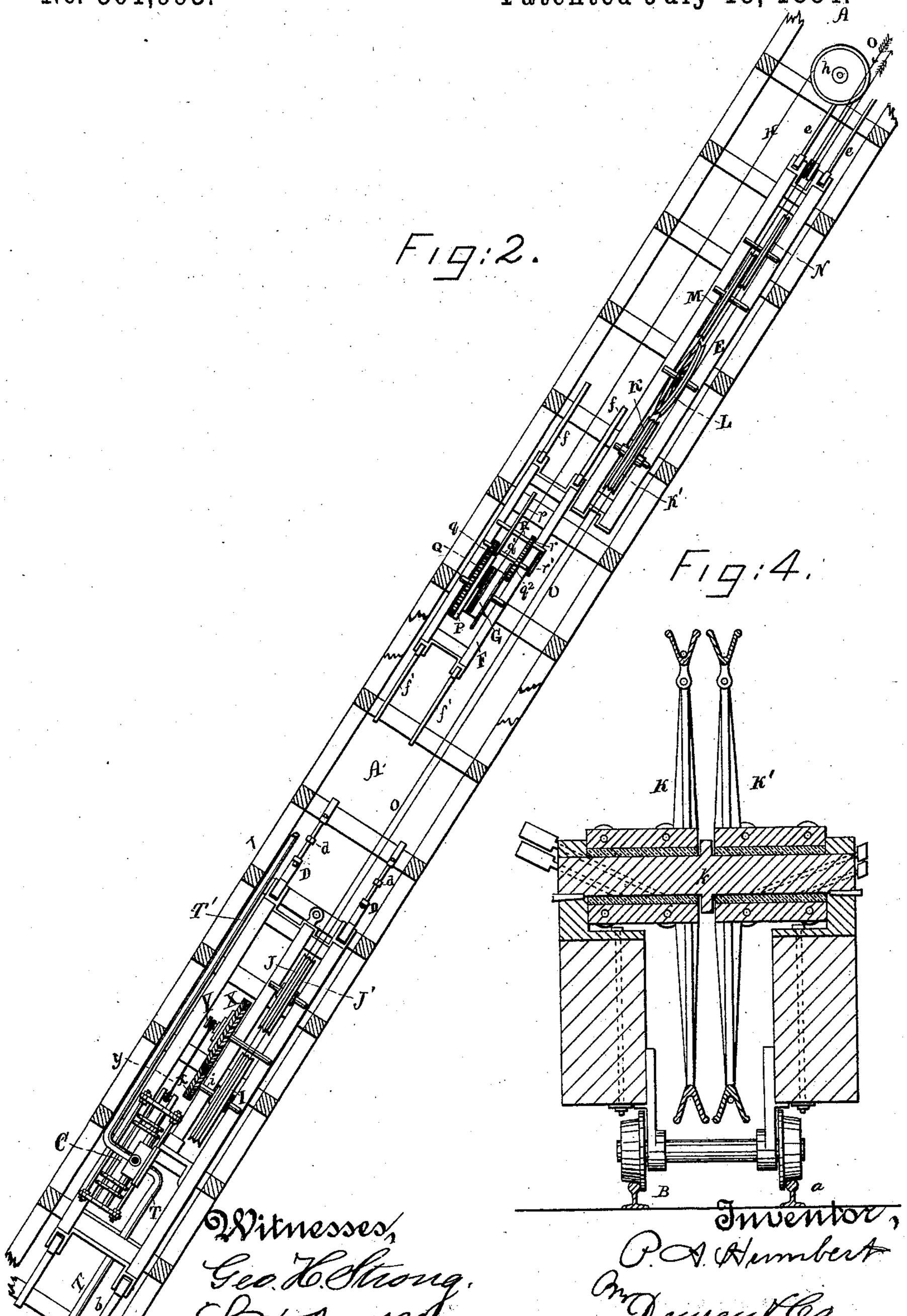

Fig: 4.

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Fig: 7.

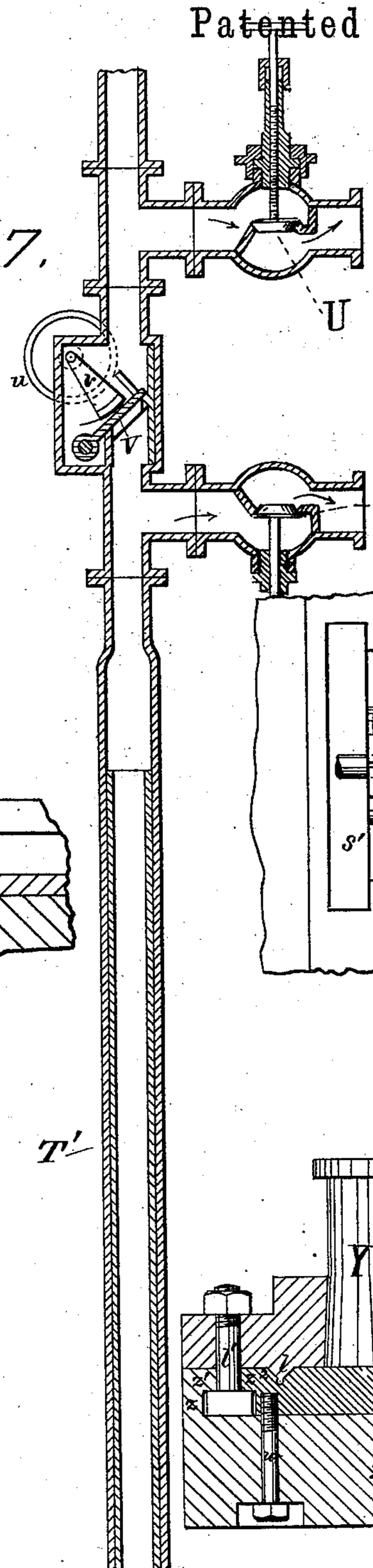


Fig: 5.

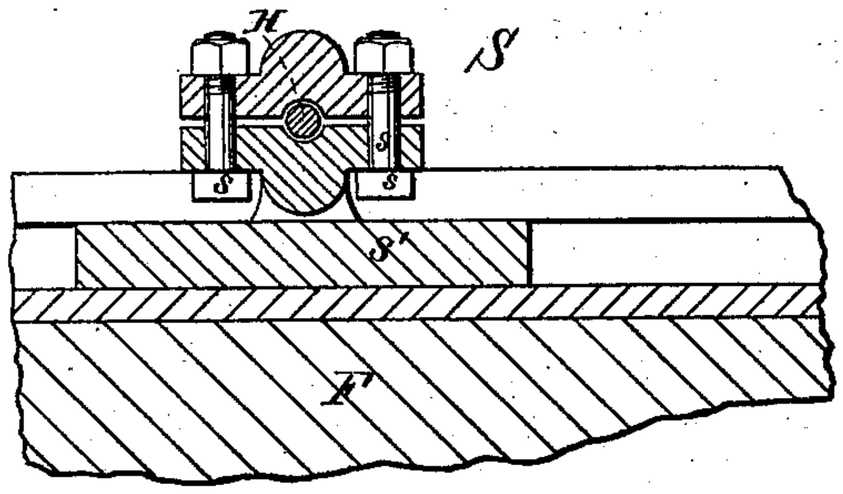


Fig: 6.

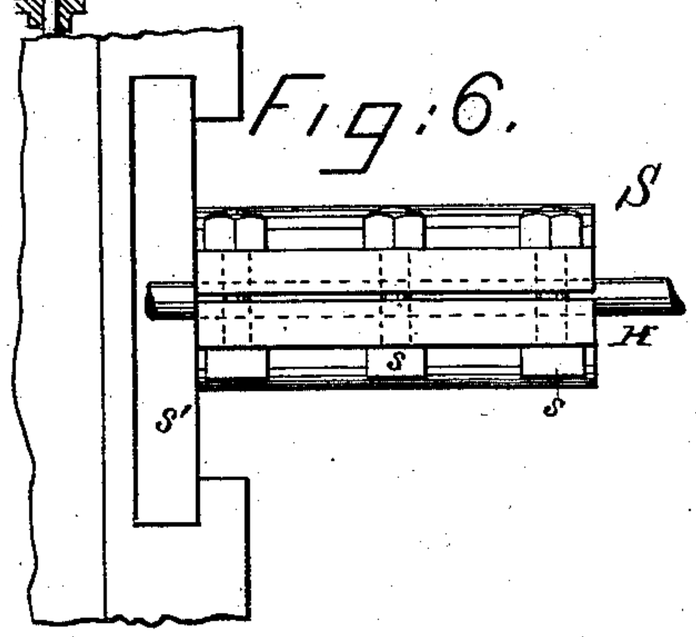
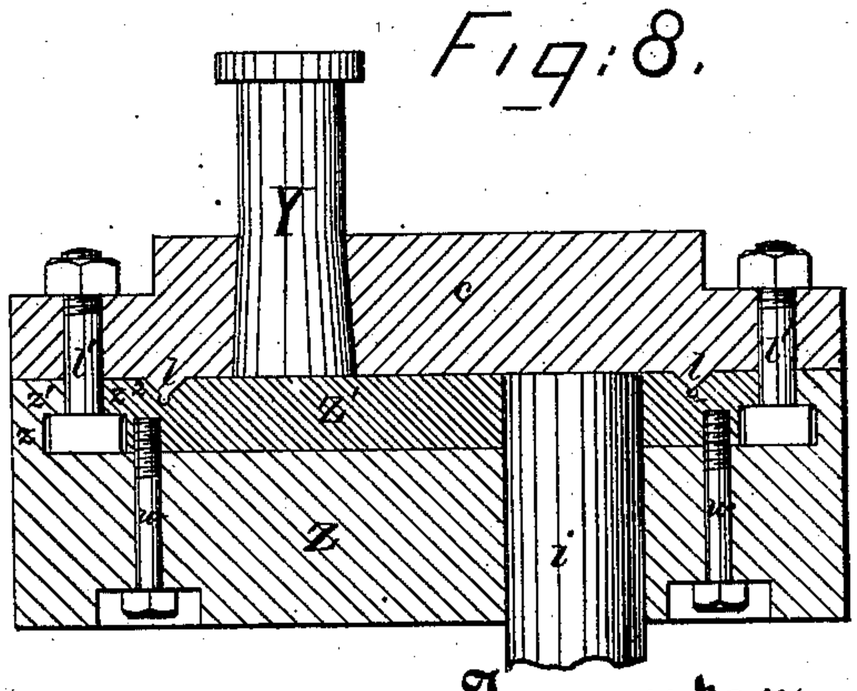


Fig: 8.



Witnesses,
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UNITED STATES PATENT OFFICE.

PIERRE A. HUMBERT, OF SAN FRANCISCO, CALIFORNIA.

PUMP.

SPECIFICATION forming part of Letters Patent No. 301,993, dated July 15, 1884.

Application filed January 26, 1884. (No model.)

To all whom it may concern:

Be it known that I, PIERRE A. HUMBERT, of the city and county of San Francisco, and State of California, have invented an Improvement in Sinking-Pumps; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to that class of pumps used in mines, and adapted to be lowered as the shaft is sunk to keep it free of water; and it consists in a pump suspended in the shaft and driven by an endless traveling wire rope or cable passing down the shaft and forming a loop around a suitable sheave or sheaves located at a point above, and adapted to be lowered to shorten the loop and allow the pump to sink without having to splice the driving rope or cable.

It consists, further, in the novel construction of parts, the arrangement of sheaves, the means for suspending and lowering the upper sheaves, for securing the pump, and extensible suction and discharge pipes, the latter provided with peculiar valves, in means for altering the stroke of the pump, and in other details of construction, all of which I shall hereinafter fully explain, reference being had to the accompanying drawings, in which—

Figure 1 is a side view of my sinking-pump apparatus, showing it in a shaft of a mine. Fig. 2 is a top view of same. Fig. 3 is a detail view of sheaves J J′. Fig. 4 is a similar view of sheaves K K′. Fig. 5 is an end view of clamp S. Fig. 6 is a side view of same. Fig. 7 is a vertical section of the discharge-pipe. Fig. 8 is a vertical section of eccentric crank and pin.

The object of my invention is to provide a sinking-pump which is adapted to be driven by an endless traveling wire rope or cable, and which, in its adjustments as the shaft is sunk, will not require the stoppage of the rope nor its splicing to lengthen it, and can therefore be lowered without loss of time and without inconvenience.

A is the shaft of the mine, on the under or lower wall of which are laid tracks *a a′*, for the various wheeled trucks hereinafter described. B is one of these trucks, which carries the pump C. The lower end of this truck is provided with dogs *b*, adapted to engage with the cross-timbers of the shaft. Its upper end is also provided with dogs D, which are furnished with a tightening-nut, *d*, or turn-buckle, and are likewise adapted to engage with the cross-timbers. When the dogs at both ends are thrown in, the nuts *d* are turned up to tighten and hold the truck B firmly to its place wherever adjusted.

E is another truck on the same track, but higher up in the shaft. The upper end of this truck is provided with safety-dogs *e*, which come into action only in case of a break, when they prevent the truck from falling.

On the track *a′* is a third truck, F, having at its upper end safety-dogs *f* and at its lower end dogs *f′*, which suspend and hold the truck when adjusting the others, as I shall explain, or which save it from falling in case of a break. This last truck carries a windlass, G, from which a wire rope or cable, H, extends up the shaft to a guide-sheave, *h*, over which it passes down the shaft again to the top of truck E, to which it is secured. This rope is for the purpose of suspending truck E and drawing upon it, so that the driving-rope which connects the trucks E and B shall remain tight, thus taking up the slack. This will be better seen after the description of the driving-rope and its course, which I now proceed to explain.

Upon truck B is mounted a double-faced sheave, I, Fig. 2, in front of which are two sheaves of equal diameter, though both are of smaller diameter than sheave I. One of these sheaves, J, Fig. 3, is keyed fast to the shaft, while the other, J′, is loose on the shaft, and is held to its place by a collar, *j*.

Upon the lower end of truck E is a shaft, *k*, upon which are loosely mounted the sheaves K K′, Fig. 4, the bearing of which is in the hubs of the sheaves as they turn on and not with the shaft. These sheaves are of equal diameter—about equal to the diameter of the sheave L, mounted just above them, and which is set on an angle, as shown in Fig. 2. Above this is a sheave, M, of a diameter sufficiently great to carry the rope over the sheaves just described. Above this, and overlapping at one side, is a sheave, N.

O is an endless wire rope or cable, which is supposed to be driven by suitable mechanism

at the surface, (unnecessary to show here,) and through which the power is transmitted to operate the pump. The wire rope passes down the shaft, as shown by the descending arrow, taking the top of sheave M, which carries it over sheaves L K and sheave J below to the inner face of sheave I. It thence passes around said face of sheave I, up between it and sheave J, over the top of sheave J, by which it is directed up the shaft to sheave K. It passes over the top of this sheave and down between it and inclined sheave L, the bottom of which it strikes. It is thence carried around and to the top of said sheave, and, directed by its inclination, passes down to the outer or near face of sheave I on the lower truck. By this it is carried around, under, and up again beside itself between the sheaves I and J′, over sheave J′, upward and inclining downwardly to the bottom of sheave K′; thence, missing the lower portion of inclined sheave L, it passes up to the top of sheave N, and thence up the shaft, as indicated by the ascending arrow. The rope in its course is kept clear of itself, by which all chafing is avoided, and throughout its length it is held up from the lower wall of the shaft, so that it cannot be interfered with in any manner. This holding up of the rope is very necessary in an inclined shaft such as I have here shown; but in a vertical shaft it would not be important, and I could therefore dispense with such sheaves of the arrangement as are used only to direct and keep the rope near the top.

The reason for the fast sheave J and loose sheave J′ is as follows: The endless rope passes over the tops of each in the same direction, and if both were made in a single sheave, or both keyed to the shaft, the least variation or difference in the circumference of their faces would cause a drag on the rope; but by having one of them loose this variation is of no importance, as the loose one can regulate itself to the speed of the other.

The reason for the loosely-mounted and independent sheaves K K′ is that the course of the endless rope over one is in a direction opposite to its course under the other. By the course of the driving wire rope, as described, it will be seen that by reason of going back to the sheaves on the truck or frame E a loop is formed in the rope. This loop provides for the necessary extra length of rope in sinking the pump. If the pump were driven directly by an endless wire rope or cable extending from the surface to the pump, it is evident that whenever the pump would have to be lowered as the sinking of the shaft progressed the driving-rope would have to be cut and a new length inserted and spliced. This operation would take time and occasion the stoppage of pumping operations so frequently that the device would be impractical; but I have provided for running a length of driving-rope sufficient for any desired depth by means of taking up the surplus in a loop, by the shortening of which the pump may be lowered during a continuance of the operation until the loop is lessened to its limit. In order to explain this more fully, I will illustrate it in connection with the drawings. Suppose the pump has been operating from the position shown during a time sufficient to sink the shaft to a depth which carries the water below the suction of the pump, then it has to be lowered until its suction can again reach the water. The ordinary course would be to cut the driving-rope and splice it, to allow the pump to be lowered; but instead of having to do this, and thereby lose time, I simply lower the frame or truck E, thus slacking up the loop of the rope, which allows the pump to be lowered to the desired point, and this adjustment or lowering of the pump can continue until the loop is shortened to its limit, which takes place when the truck E reaches the truck B. This operation of lowering can be done rapidly with the least possible loss of time. In a small shaft, and with a light pump and short driving rope or cable, I could allow the pump frame or truck to remain suspended in the shaft with no other support than that which the driving-rope itself would afford, the upper frame or truck being temporarily secured, in which case the weight of the pump and frame would tighten the driving-rope to take up the slack, and I could thus dispense with independent means for taking up the slack; but with heavier machinery and a deeper shaft this would not be practicable, as the pump would be too heavy for the rope and would be liable to have too much vibration. Therefore I have the tightener frame or truck F, as I have heretofore mentioned. I shall now describe it more fully.

Upon the windlass G on the truck F is a strap-brake, P, having handle *p*. The windlass has also a large gear, Q, which meshes with a pinion, *q*, on a shaft, *q′*, which also carries a gear, q^2, meshing with a pinion, *r*, on a shaft, R, adapted to be operated by a crank, *r′*.

Under a beam of the truck F, Fig. 5, is a rope clamp or grip, S, consisting of two halves provided with suitable seats, through which the suspending wire-rope H passes. This clamp is tightened by bolts *s*, Fig. 6, and is secured to a slide, *s′*, mortised in the beam, Fig. 5, in order to allow the rope to adjust itself to the proper plane from the sheave *h* to the windlass. When the rope is thus gripped, the winding drum is relieved. The tightener-truck F is to be made heavy enough to draw up on and suspend the truck E, and is itself suspended, when its dogs are released, by the weight of the latter truck and its connection with the pump-truck B, which is firmly placed below by means of its dogs. This upward tension on the truck E therefore takes up the slack in the driving-rope.

When the pump has to be lowered, I first seize the lever P of the windlass, unclamp the rope H from grip S, and lower the truck F down until it rests on its upper dogs, and its

lower dogs *f'* drop into place. Then I loosen nuts *d* to slacken up the lower dogs *b* of truck B, which I knock out, after which I wind up on the windlass G until I can free the upper dogs, D, of truck B, when both trucks B and E are suspended in the shaft. Then I let the windlass revolve to pay out on the suspending-rope, thus lowering the trucks B E, the latter moving down faster than the former, shortening the loop of the driving-rope, until the truck B has reached a point where the suction of the pump will again act. Then I stop the windlass G, let the dogs *b* D of truck B fall in, and tighten up the upper dogs to secure said truck. I then loosen the dogs *f'* of the truck F and wind up on the windlass, raising the said truck F until its dogs *f* are free, and then I clamp the rope again, when the truck is suspended, and its weight will draw up on truck E, suspending it, and take up the slack of driving-rope again. This operation is repeated until the loop of the driving-rope is shortened to its limit.

In order to make the adjustments of the pump as few as possible, and to render it unnecessary at every adjustment to fit on a length to the discharge-pipe, I make both the suction-pipe T and the discharge-pipe T' telescopic by means of the slip-joint shown in Fig. 7. When the shaft has been so deepened as to lower the water beyond the suction, instead of immediately lowering the pump, I simply lengthen out the slip-joint of the suction until it reaches its extent; and when the pump has been lowered, instead of having immediately to add a new length to the discharge-pipe, I lengthen out its slip-joint; but when it does become necessary to add to the discharge I have provided for the continuous operation of the pump during the work of fitting the new piece. In this connection I provide also for relieving the pump of the weight of the water-column, so that in the operation of lowering a considerable weight is removed, making the handling of the tightener that much easier.

In Fig. 7, which may now represent the discharge-pipe U, is the usual forking-valve, by means of which the surplus water which the pump may be taking over and above the necessity of the case is carried back into the sump. Below this valve, in the discharge-pipe, is an upwardly-swinging clack-valve, V. Below this is an outlet-valve, W, which I call the "lowering-valve." When the pump is being lowered, the valve W is opened, and all the water passes out through it, and is conducted into the sump again. The clack-valve, being relieved, falls down and supports the column of water above, thus relieving the pump of its weight; but when a new piece of pipe has to be added above, then, to protect the workmen from occasional splashes through the valve, I have the lever *v*, operated by a crank-wheel, *u*, and adapted to press upon and hold the valve down tight.

The mechanism by which I transfer the power of the endless driving-rope to the pump is as follows: Upon the end of the shaft *i* upon which the sheave I, Fig. 2, is mounted is a pinion, *x*, which meshes with a gear, X, to which the crank-pin Y is attached. The pitman *y* of the pump is connected with the crank-pin. In order to regulate the throw of the crank and pin and operate the pump to whatever extent is required, I have the device shown in Fig. 8.

Z is a disk keyed eccentrically onto the shaft *i* beside the face of the gear X. This disk has a rim, *z*, with a lip, *z'*, extending inwardly and forming a groove.

Z' is a disk, having a lip, z^2, on its rim. This is laid upon the disk Z, and is bolted to it by the bolts *w*. Upon the disks Z *Z'* is fitted a plate, *c*, which is adapted to turn thereon, being guided by a small tongue and groove at *l*, and secured in any position by means of bolts *l'*, the heads of which have been previously seated in the groove formed by the lips of the disks Z *Z'*, and whose bodies extend up between the lips and through the plate *c*. The crank-pin Y is secured in this plate, as shown. By loosening the bolts *l'* the plate *c* may be turned on its bearing to give the pin Y more or less throw, according to its position with relation to the shaft *i*. By tightening up the bolts again the pin may be fixed in the desired position.

The necessity for altering the stroke of the pump herein is as follows: The endless wire-rope by which it is operated is itself driven by the same power and at the same rate of speed as the endless rope which drives the stationary pumps, not herein mentioned. Now, when the water in the bottom of the shaft gets low, it is not advisable to run the sinking-pump to its fullest capacity, and its work must be lessened in some manner. To do this by slowing down the driving-rope would affect similarly all the stationary pumps, which may not be desirable. Instead of this, the mechanism I have described enables me to accomplish the result of making the sinking-pump do more or less work without changing the speed of the driving-rope; but the advantage of such a device is not confined to a sinking-pump, but applies to the station-pumps, or any pumps driven by an endless cable, for it is never advisable to reduce the speed of the cable too much, as the friction on the sheaves would be lessened and much power wasted.

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

1. A sinking-pump apparatus for a mine, consisting of a pump suspended in the shaft, and driven by an endless traveling wire rope or cable passing down the shaft and forming a loop, in combination with suitable sheaves located at a point above and adapted to be lowered, substantially as and for the purpose described.

2. A sinking-pump apparatus for a mine, consisting of a pump suspended in the shaft, suitable sheaves connected with the pump-frame, and movable sheaves at a point above the pump, in combination with an endless traveling wire rope or cable passing from the source of power to the pump-sheaves, and forming a loop around the movable sheaves, and a mechanism, substantially as described, for transferring the power of the endless wire rope or cable to the pump, substantially as described.

3. A sinking-pump apparatus for a mine, consisting of a pump suspended in the shaft, and suitable sheaves connected with the pump-frame, sheaves suspended in the shaft above the pump, an endless traveling wire rope or cable passing down the shaft to the pump-sheaves, and forming a loop around the upper sheaves, in combination with means, as described, for lowering the latter sheaves to sink the pump, and a mechanism for transferring the power of the rope or cable to the pump, substantially as described.

4. In a sinking-pump apparatus for a mine, a pump having a frame adapted to be secured in the shaft of the mine and temporarily released and suspended therein, said frame carrying suitable sheaves connected with mechanism for transferring their power to the pump, sheaves suspended in the shaft above the pump, an endless traveling wire rope or cable passing down the shaft to the pump-sheaves, and forming a loop around the upper ones, in combination with a mechanism, as described, for lowering said upper ones when the pump-frame is released from the shaft, and raising them again, when it is secured, to take up the slack of the rope or cable, substantially as herein described.

5. In a sinking-pump apparatus for a mine, a pump having a frame adapted to be secured in the shaft of the mine and temporarily released and suspended therein, said frame carrying suitable sheaves, a sheave in the shaft at a point above the pump, a truck which acts as a counter-weight in the shaft, and a connection between said counter-weight and the upper sheaves, whereby the latter are suspended in the shaft, a means for lengthening said connection to lower said sheaves, and endless traveling wire rope or cable passing down the shaft to the pump-sheaves, and forming a loop around the upper ones, and a mechanism for transferring the power of the rope or cable to the pump, substantially as herein described.

6. In a sinking-pump apparatus for a mine, a pump in the shaft having a frame, and a double-faced sheave on the frame, connected with operating mechanism to transfer power to the pump, a frame suspended in the shaft above, having a sheave upon it adapted to lead a wire rope or cable to and from the faces of the pump-sheave, and an endless traveling wire rope or cable passing down the shaft to the pump-sheave, and forming a loop over the upper sheave, substantially as herein described.

7. In a sinking-pump apparatus, the frame or truck B, carrying pump C, the double-faced sheave I, and the sheaves J J′, mounted on said frame, in combination with the frame or truck E, suspended in the shaft above, the sheaves K K′, the inclined sheave L, and the directing-sheave N on said frame, the endless traveling wire rope or cable O, passing down and up the shaft and over the sheaves, as described, and a mechanism for transferring the power of the rope or cable to the pump, substantially as herein described.

8. In a sinking-pump apparatus for a mine, the pump frame or truck B, having sheaves I J J′, as shown, in combination with the suspended frame or truck E above, having sheaves K, K′, L, M, and N, as described, and the endless traveling wire rope or cable O, directed over and under said sheaves, substantially as herein described.

9. In a sinking-pump apparatus for a mine, the truck B, having pump C, the holding-dogs *b* D, and suitable sheaves on the truck, connected with mechanism for transferring their power to the pump, the truck E in the shaft above, having suitable sheaves mounted upon it, and the endless traveling wire rope or cable O, directed over and under said sheaves, as described, in combination with the counter-weight truck F in the shaft, having a windlass, G, with brake and crank mechanism and dogs *f f′*, and the wire rope H, passing from the windlass up over a sheave above and down to the truck E, substantially as herein described.

10. In a sinking-pump apparatus, the pump-truck B, with its sheaves and dogs, the upper truck, E, with its sheaves, and the endless traveling wire rope or cable O, all arranged as herein described, in combination with the counterweight-truck F, having windlass G, with brake and crank mechanism, the suspending-rope H from the windlass to sheave *h*, and truck E, and the clamp S on the truck F, for binding the rope, substantially as herein described.

11. In a sinking-pump apparatus for a mine, in which the pump is adapted to be lowered from time to time, and is driven by an endless traveling wire rope or cable, as herein described, the discharge-pipe T′ from the pump, having the forking-valve U and the clack-valve V below it in the pipe, substantially as herein described.

12. In a sinking-pump apparatus for a mine, in which the pump is adapted to be lowered from time to time, and is driven by an endless traveling wire rope or cable, as herein described, the discharge-pipe T′ from the pump, having the lowering-valve W and the clack-valve V in the discharge-pipe above it, substantially as herein described.

13. In a sinking-pump apparatus for a mine, in which the pump is adapted to be lowered

from time to time, and is driven by an endless traveling wire rope or cable, as herein described, the discharge-pipe T′, having the forking-valve U, the lowering-valve W, and the clack-valve V in the pipe between them, substantially as herein described.

14. In a sinking-pump apparatus for a mine, in which the pump is driven by an endless traveling wire rope or cable, the means for altering the stroke of the pump to vary its work without reducing the speed of the rope or cable, consisting of the shaft *i*, to which the power of the rope is transferred, the disks Z Z′, secured eccentrically on said shaft, and having lips z' z^2, forming an annular groove, the bolts *l*′, guided by said groove, the plate *c*, secured to said bolts, and the crank-pin Y in the plate, connected with the pitman of the pump, substantially as herein described.

15. A device for changing the stroke of a pump, consisting of the disks Z Z′, secured eccentrically on the power-shaft, and forming an annular groove between them, as shown, the bolts *l*′, guided in said groove, the plate *c*, secured by the bolts, and the crank-pin Y on the plate and connected with the pump-pitman, substantially as herein described.

In witness whereof I have hereunto set my hand.

PIERRE A. HUMBERT.

Witnesses:
C. D. COLE,
J. H. BLOOD.