P. Van Dyk.

Water Elevator.

No. 93,373. Patented Aug. 3. 1869.

Fig. 1.

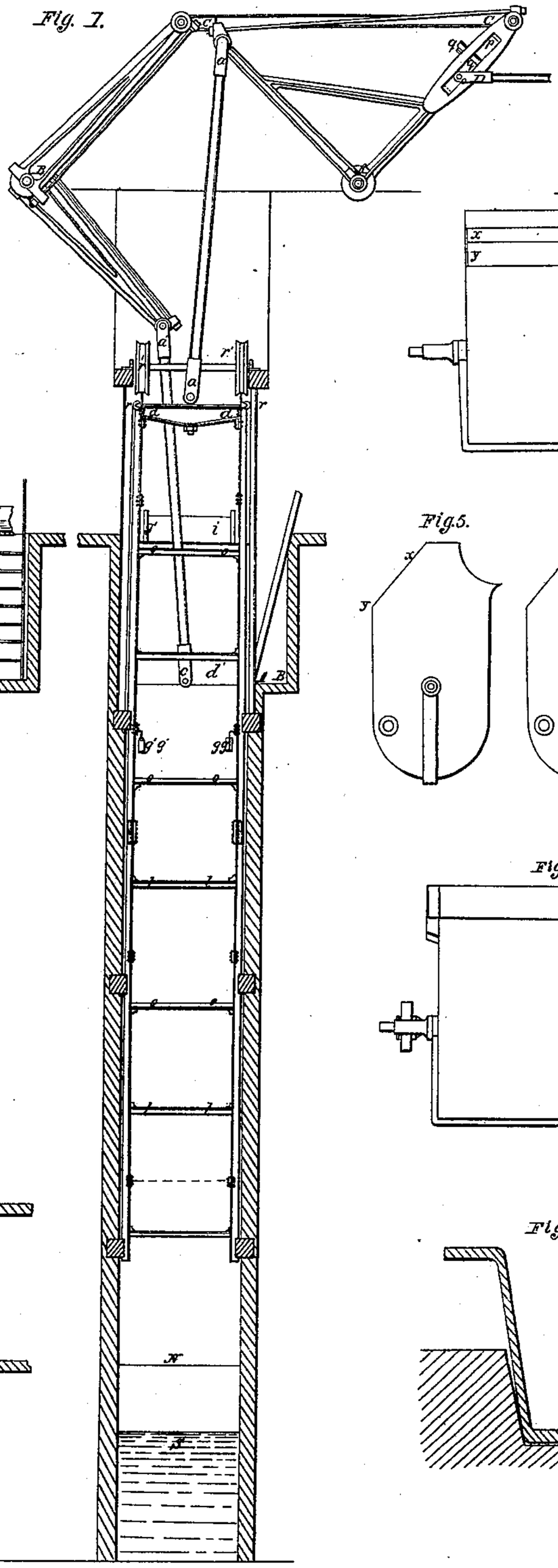

Fig. 2.

Fig. 4.

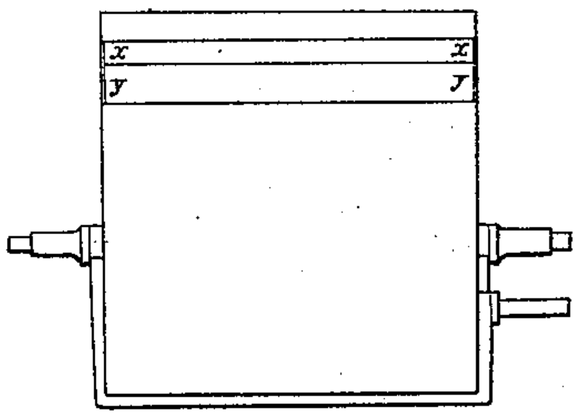

Fig. 5.

Fig. 6.

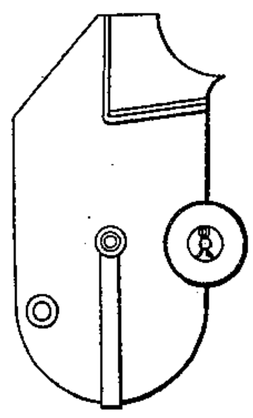

Fig. 7.

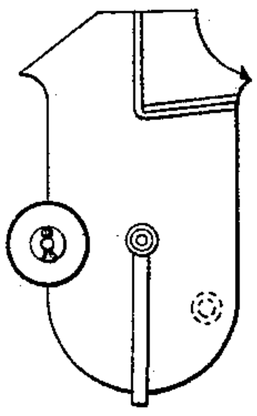

Fig. 8.

Fig. 3.

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PIETER VAN DŸK, OF THE HAGUE, HOLLAND.

Letters Patent No. 93,373, *dated August* 3, 1869.

IMPROVEMENT IN WATER-ELEVATORS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, PIETER VAN DŸK, mining engineer, of The Hague, in the Kingdom of Holland, have invented certain "Improvements in Man-Engines for Raising Water and Lowering and Raising Men;" and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification, is a description of my invention, sufficient to enable those skilled in the art to practise it.

The nature of my invention consists in a modification of the apparatus known in mines as man-engines, whereby it is adapted to elevating water.

The specialties of this new apparatus, are—

First, that it forms a complete system of man-engine, which it resembles by the form of its two shafts, furnished with landing-stages and their alternate rising and falling movement.

Secondly, that the water is lifted and carried by buckets of convenient form, but variable, which, by appropriate mechanism, tip their contents, one into the other, at the end of the up-stroke, so that the water to be lifted is always in the shaft of the lift which is ascending,

The advantages of this apparatus over lifting-pumps are as follows:

A. The new apparatus for lifting water, has neither valve, piston, nor stuffing-box. The parts subject to wear are axles moving slowly in their journals and lightly loaded. The repairs are, therefore, less frequent than in force-pumps for great elevation, and there is nothing hidden of the mechanism, so that it may be easily inspected every day.

B. This man-engine having a very great stroke, (about thirteen feet,) can be changed into a water-lifter, and allows of one shaft being used for the men and for raising water.

C. One motive-power suffices for raising water and for lifting the men, an important consideration for the mines where the engine working the man-engine is only employed a few hours a day.

D. The new apparatus is preferable to pumps for irrigating lands, by reason of the working not being liable to interruption by the earthy and solid matters which river-waters carry in suspension in great quantities, especially in tropical and mountainous countries.

Two pitmen, *a a'*, Figure 1 of the drawings annexed, are moved in opposite directions by the beams A and B, describing about a quarter of a circle, and united together by the rod C. These beams receive their movement from the connecting-rod D, which is itself put in motion by a rotating shaft.

At the lower extremity of each of these pitmen *a a'*, is suspended a system of rods or lifts *d d'*, nearly similar to those ordinarily employed in man-engines.

These two lifts are represented in the Figure 2. One only is fully shown in fig. 1, in order to avoid confusion in the drawing.

These lifts are made of a peculiar-shaped iron called in France "zores," of which the Figure 3 shows the section full size.

The lifts are guided in a vertical plane by the rollers *r r*, fig. 1, working on the rails for one length of the stroke, and for the rest of their length by simple notches cut in the wooden or other traverses of the shaft of the mine. (See also fig. 3.)

The lifts are united by means of two flat ropes or bands passing over pulleys *r'*, figs. 1 and 2. This suspension serves also as a means of safety. By repeating these pulleys at certain equal distances in deep mines, the great weight of the lifts is supported and balanced.

The lifts serve to support the buckets $e\ e^1\ e^2\ e^3$, &c., fig. 2, placed at equal distances from one another, and able to turn upon a horizontal axis or trunnions.

The buckets represented in fig. 2 are not shown in fig. 1, where, in one of the lifts, the position of the axis of the bucket is shown by dotted lines. For a complete apparatus, three forms of buckets are required:

First, a pair of buckets e^7 and e^8, fig. 2, represented separately by the two views, figs. 4 and 5. The buckets fill by immersion, the water entering by the opening determined by the brim *x y*.

Second, a pair of tipping-buckets, e^1 and e^2, fig. 2, specially intended to empty the water at the surface of the earth, represented upon a larger scale by the Figures 7 and 8.

Third, pairs of intermediate buckets $e^3\ e^4$ of fig. 2, and more especially indicated by the figs. 6 and 8.

The number of these buckets of course depends upon the height the water has to be lifted.

Each bucket, in emptying, makes a little more than a quarter of a revolution—about ninety-four degrees.

The number of buckets to be placed upon each lift, depends upon the depth of the shaft and the output of the water on the capacity of the buckets and the number of strokes the lifts make in a given time.

In our example, the distance of the buckets is 3^m 20, and the stroke of the piston is 0^m 80 more, or four metres.

All the buckets of the same lift, counting from the first or highest one, are united, one to the other, by the rods *f f*, so that the movement given to one bucket is imparted to all the others.

The quarter of a revolution that the buckets should have to empty their contents, one into the other, is given to them by the tappets *g g*, *g' g'*, *g* and *g'*.

The tappets *g* and *g'*, fig. 2, are placed and fixed by the side of the receptacle for the water at the surface *i* and *i*. They act upon the buckets $e^1\ e^2$, placing them, one after the other, in the position indicated in the drawing at e^1.

The two other tappets, *g g* and *g' g'*, fig. 1, of which

one of the two only is visible, though partly hidden by the bucket e^3 in the elevation, fig. 2, are fixed to the wooden traverses of the shaft. Their form is simply an inclined plane, the first two tappets forming an angle of about fifty-eight degrees, the two others of twenty-eight degrees.

From the preceding indication, the working of the apparatus will be easily understood by referring to the drawings annexed.

The right lift, attached to the rod *a*, is at the end of its up-stroke whilst the left lift is at its lowest point.

The bucket e^6 is filled by immersion, the water filling it, as indicated by the arrows near *y*, where the side of the back part of the bucket is opened for a sufficient depth. The bucket never fills higher than the stop *y*, which exactly determines the quantity of water lifted at each stroke.

All the other buckets are made of such a capacity, that after receiving the contents of the buckets e^7 e^8, the level of the water shall be low enough to avoid any spilling.

The level of water of a full bucket ought to be about ten centimetres below the spout, so that it shall not begin to tip its contents till it is inclined eighteen degrees. By these means, and with a well-chosen form of spout, all loss is avoided in tipping one bucket of water into the other.

Whilst the bucket e^6 is filling by immersion in the reservoir of the shaft, the buckets e, e^4, and e^2, have been filled in the same time by the buckets e^7, e^5, and e^3, whilst the highest one of all, e^1, has poured out its contents on the surface.

At each simple stroke of the piston, all the buckets of the lift which is descending, are empty, whilst those upon the ascending lift are full. Each stroke of the piston, therefore, carries to the surface-outlet the contents of one bucket. The normal position of the buckets is vertical, as the drawing shows for the full buckets on the left lift.

In order that the buckets shall right themselves after they are discharged, and retain that position when they are charged up to the time they strike the tappets, each bucket is fitted at its base with a brace to the trunnion, or a prolongation that passes under the buckets in the form of a bent axle, to give them the necessary weight to keep them constantly vertical, figs. 4, 5, 6, 7, and 8.

The union-rods *f f* act in the same way by their weight to right the buckets when the rollers quit the tappets.

The righted buckets ought to rest against a pin fixed in the lifts, so that all the swinging may be avoided.

The traverse or bar S, serves also to right the buckets in case the counterweight has not acted.

On calculating the work spent to lift the water and to tip it at the end of each stroke into the opposite buckets, and including the force absorbed by the friction of the axles and the displacement of the counterpoise, also taking into account the actual weight of water put out, and comparing the force expended with the useful effect obtained, it will be found to give a useful effect of about eighty-two per cent.

The drawings annexed show that the motion is imparted by beams or pitmen attached to some motor with rotating axle. The alternate movement of the lifts can also be more simply produced by uniting each of the lifts direct to the two cylinders of a steam-engine, the cylinders being placed vertically and axially with each of the corresponding lifts.

It is in this way that the man-engines of the Coal Company of l'Espérance de la Ste. John Cockerell de Seraing are worked. In all cases it will be indispensable to adopt an arrangement that will admit of the speed of the stroke being slackened at the end of each stroke.

Considering that such an arrangement does not belong absolutely to a general plan of my invention, which consists, in the present case, in lifting water in a novel manner, I shall not say more upon this point.

When the apparatus is to be used as a man-engine, the buckets must be emptied by tipping, to do which, the union-rods c^4 and c^3 must be unhooked; after which the apparatus will empty itself in $n-1$ strokes, when n indicates the number of buckets on a lift. The stroke is then shortened from 4^m to 3^m 20^c.

In the mechanism indicated in our design, this reduction is obtained by taking out the wedges *q q* of the beam A, fig. 1, and moving the parts slowly, which displaces the sliding catch *p* of the connecting-rod, carrying it into the second position, after which the wedges *q q* are again inserted, and the connecting-rod is refixed so as to give the lifts a stroke of 3^m 20^c.

With a stroke of 3^m 20, the traverses *l l*, *o o*, &c., of the two lifts, will be opposite each other, or at a level at the end of each stroke.

In using these traverses *l l* as landing-stages for the feet, and the parallel traverses *o o*, shoulder height, for the grasp of the hand of the miner, when he steps out the lift going up or down, as he desires, the apparatus will be identical with the man-engines, that is to say, there is no essential difference with the ordinary kind.

The landing-stages l^m and l^n, correspond, or nearly so, to the level of the galleries M and N, as the landing-stages l^p and *l* B, with the galleries or floors for leaving A and B. It is possible to establish, upon the traverse *l*, a landing-stage in wood more commodious, which will hold at least two men at once.

The capacity of the buckets, according to the dimensions indicated, is three hundred and fifty litres, or about three hundred and fifty quarts. The apparatus not containing any water when being used as a man-engine, can then be used in all safety with a load up to three hundred and fifty kilos, or about eight hundred and seventy pounds per landing-stage.

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

The arrangement of the tipping-buckets for lifting water, in combination with the man-engine, substantially as specified.

In testimony whereof, I have hereunto set my name, in presence of two subscribing witnesses.

P. VAN DŸK.

Witnesses:

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