

E. D. & F. W. EAMES.
Pumping-Engine.

No. 127,322.

Patented May 28, 1872.

Fig. 1.

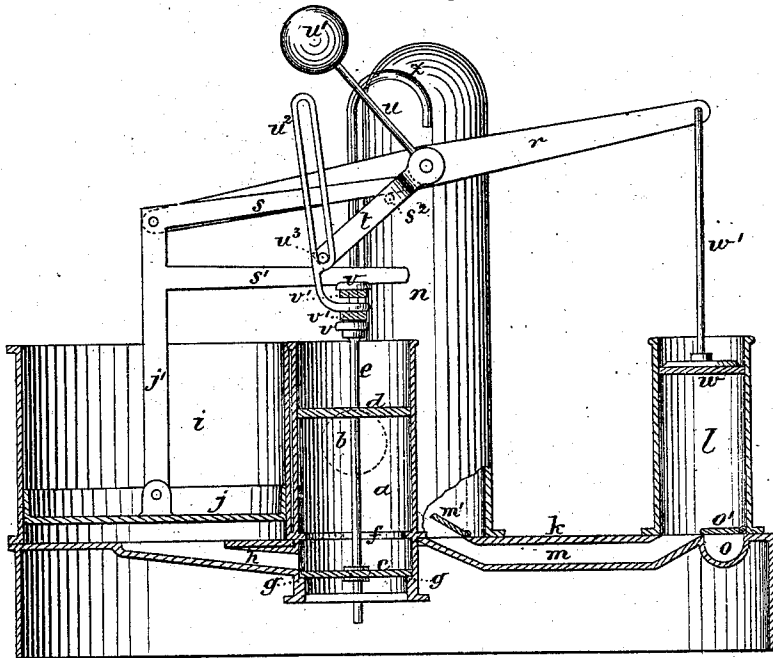
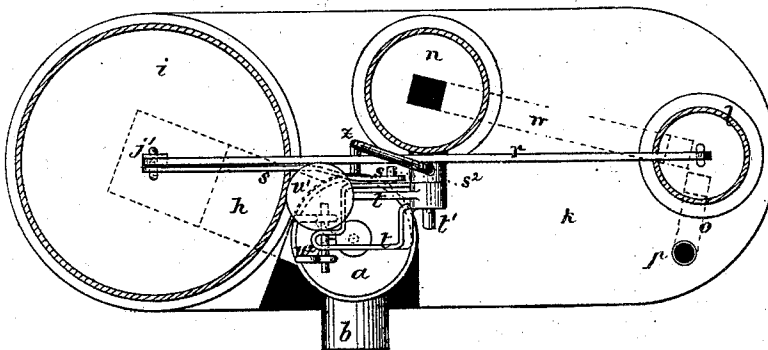


Fig. 2.



Witnesses:

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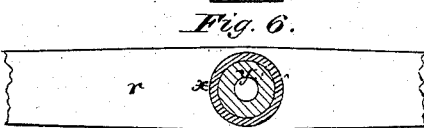
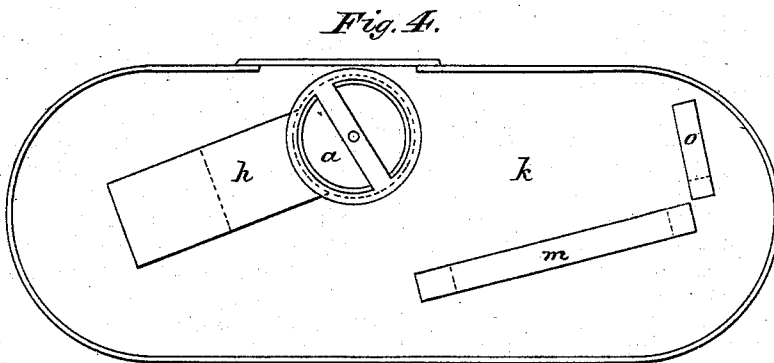
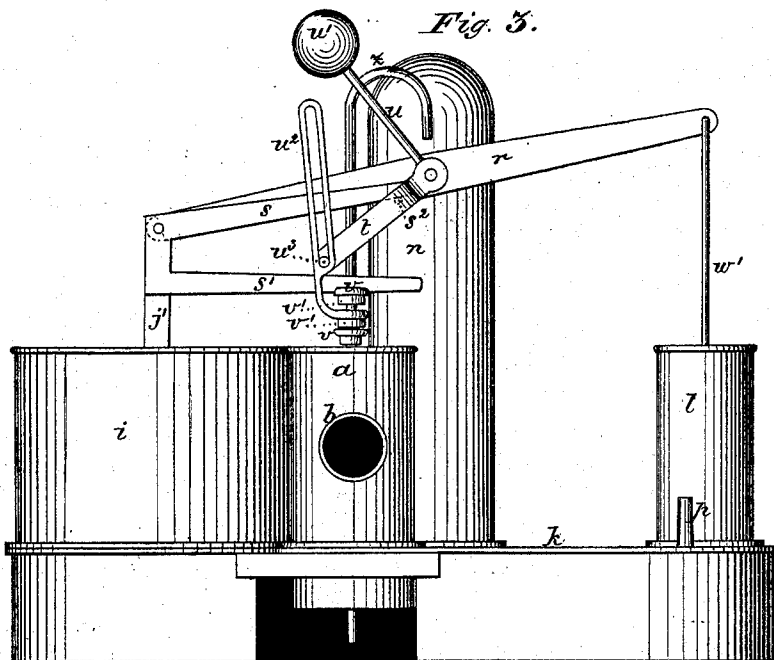
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by
Johnson Klauke & Co.
his attys.

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Witnesses:

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UNITED STATES PATENT OFFICE.

ELISHA D. EAMES AND FREDERICK W. EAMES, OF GRAND RAPIDS, MICH.

IMPROVEMENT IN PUMPING-ENGINES.

Specification forming part of Letters Patent No. 127,322, dated May 28, 1872; antedated May 20, 1872.

To whom it may concern:

Be it known that we, ELISHA D. and FREDERICK W. EAMES, of Grand Rapids, in the county of Kent and State of Michigan, have invented a new and useful Improvement in Automatic Pumping-Engines, of which the following is a specification:

Our invention relates to pumping-engines operated from a sufficient head of water; and the said invention consists, first, in obtaining the return stroke of the driving-piston through the elevation of the pump-piston by means of charging the pump-cylinder under direct pressure from the head of water; second, in the combination, with the pump-cylinder, of an automatic pumping-engine, having a smaller diameter than the driving-cylinder of a valve, so arranged as to relieve the pressure under the driving-piston at the moment when the direct pressure of the head of water is to operate the pump-piston in order to accomplish the return stroke of the driving-piston; third, in balancing the valve of an automatic engine, by means of a piston, suitably connected to the valve to allow the valve to be operated by a power exceeding but little its own gravity; fourth, in forming the upper seat of a balance-valve of a smaller diameter than that of the valve, in order to enable the pressure of the head of water on the larger area of the under side of the piston to keep the valve in an elevated position during the return stroke of the driving-piston; fifth, in operating the main valve from the driving-piston by means of a balance-weight heavier than the gravity of the valve, in order to automatically admit or shut off the head of water from the driving-cylinder; and, lastly, in the construction, combination, and arrangement of the parts in such a manner as to form a smooth working automatic pumping-engine, as will be hereinafter more fully described.

In the accompanying drawing, Figure 1, Sheet I, represents a longitudinal vertical section of our improved pumping-engine, some of the parts being shown in elevation. Fig. 2, Sheet I, is a plan or top view of the same. Fig. 3, Sheet II, is a front elevation; and Fig. 4, Sheet II, an under-side view of the same. Figs. 5 and 6, Sheet II, are a horizontal section and side elevation, respectively, of the

bearing of the walking-beam of our improved engine.

The head of water is admitted in any suitable manner to the valve-chamber *a*, open at both ends, through an opening, *b*, which is arranged with relation to the valve *c* and the piston *d* on the valve-rod *e*, as to be always between the valve and piston, whatever their position may be. On the inside of valve-chamber *a* are formed the upper and lower bearings *f g* for the valve *c*, the upper bearing *f* having a smaller diameter than the valve, in order to reduce the area of the latter when in position against said bearing. From between these bearings opens the passage *h*, connecting with the under side of the driving-cylinder *i*, through which passage the water flows from the valve-chamber *a* to elevate the driving-piston *j*. The cylinder *i* and valve-chamber *a*, are arranged on a bed-plate, *k*, the valve-chamber extending below said bed-plate, as shown in the drawing. At the opposite end of the bed-plate *k* is arranged a pump-cylinder, *l*, of a very much smaller diameter than the cylinder *i*, which pump-cylinder is connected, by means of a passage, *m*, under the bed-plate, with an air-chamber, *n*, located between the two cylinders, and, by means of a passage, *o*, with an opening, *p*, which in any suitable manner is connected to the same head of water which supplies the valve-chamber, or may be connected directly to the valve-chamber below the piston *d*, so as to take the pressure through said valve-chamber instead of from the head direct. A valve, *m'*, closes the passage *m* in air-chamber *n*, while a valve, *o'*, closes the passage *o* in the pump-cylinder *l*. Pivoted to the driving-piston *j* is the piston-rod *j'*, the upper end of which is pivoted to a walking-beam, *r*. The piston-rod carries two arms, *s s'*, extending parallel with the walking-beam, so as to come alternately into contact with a pin, *s''*, on the inner arm of a balance-link, *t*, during the up-and-down movement of the piston-rod. This balance-link *t* is mounted by a bearing upon the pin or arm *t'*, on which the walking-beam is also mounted. From the hub of the balance-link *t*, extends an arm or lever, *u*, carrying at its end a weight, *w*, sufficiently heavy to overcome the weight of the valve *c* and piston *d*. The free end of the link *t* extends

between two slotted arms, u^2 , in the slots of which a pin, u^3 , secured on and passing through the free end of link t , has a free movement. The arms u^2 unite at their lower ends and embrace the valve-rod e between two bearings v , formed on or secured to said valve-rod. Between the lower end of the arms u^2 and the bearings v , are located elastic cushions v' , which break the concussion when the pin u^3 operates against the upper or lower ends of the slots in arms u^2 . The piston w of the pump-cylinder l is connected to the walking-beam by means of a piston-rod, w' .

The operation of our improved automatic pumping-engine is as follows: The water having free communication from its head enters the valve-chamber a , and passes from the same through the passage h into the driving-cylinder i and elevates the piston j , and, through its rod j' and the walking beam r , depresses the piston w in the pump-cylinder l , thus forcing the water in the same through the passage m into the air-chamber n , from where it may be discharged through any suitable opening, and forced to the point or points desired, the valve o' closing the passage o during this operation, while the valve m' remains open. When the arm s^1 , by reason of the elevation of piston j and piston-rod j' , reaches the pin s^2 on the inner arm of the link t , it elevates the same by revolving the link on its bearing, and carrying the lever u with its weight u' , which is inclined to one side over its center on the bearing to the other side. During all this operation the valve c and piston d , have remained immovably in position, but at the moment the lever u is carried over the center its weight u' , falling with a sudden shock, elevates the piston d and valve c , which being perfectly balanced, are easily operated. This movement is arrested by the pin u^3 striking against the upper ends of the slot in the slotted arms u^2 . The valve c now bears against its upper bearing f , and presents a smaller area to the head of water than the piston d , and consequently the balance of pressure is on the piston, and thus aids in keeping the valve elevated until again pressed down by outside force. The elevation of the valve c having shut off the head of water from the passage h , the latter is thereby placed in communication with the open lower end of the valve-chamber a , and the water in the cylinder i under the piston j is free to flow off through the passage h and the open lower end of valve-chamber a into a waste flue, thus relieving all pressure on the under side of piston j , and allowing a small power to depress the piston. At the same time the downward pressure of the piston w , in the cylinder l being relieved, the valve m' closes and valve o' opens, thereby allowing the head of water pressing against the valve o' through passage o to enter the cylinder l , and, by elevating the piston w , not only fill the cylinder with water under pressure, but also to return the piston j to the bottom of its cylinder. As the piston j sinks in the cylinder i ,

the arms s s^1 are carried down with it, and the upper arm s coming into contact with the pin s^2 depresses the link, carries the lever u with its weight back over the center, and the pin u^3 striking against the lower of the slots in the slotted arms u^2 forces the piston d and valve c to their former position, thereby again allowing the head of water to flow into the passage h and cylinder i , and repeating the operation above described.

In order to soften the blow on the valve-rod e the elastic cushions v' are placed between the bearings v on the rod e and the lower end of the arms u^2 , thereby rendering the engine smooth working and almost noiseless. As there is always a great surplus of power beyond that required in elevating the piston w of the pump-cylinder l , we may weight that arm of the walking-beam r connected to the piston w , so as to have the additional weight assist in depressing said piston, and consequently in the elevation of water to the desired point. The engine may be made to run faster or slower by either regulating the influx of water, or by means of a stop-cock on the discharge-pipe near the air-chamber, so as to have the engine work against a greater or less pressure, as may be desired.

In Figs. 5 and 6 is shown the bearing for the walking-beam; it consists of a cast-iron rim, x , formed on or secured to the walking-beam r into which rim is fitted a circular-block of *lignum vitae*, y , having the proper opening for the bearing-pin t' formed in it. This *lignum vitae* bearing may be lubricated by a small pipe, z , arranged over it, and communicating either with the cylinder i , or any other source from which water may flow to it, from which pipe water may be allowed to drip into said bearing. This bearing is of especial value in our engine, as the same is generally placed at a short distance from railroad stations, &c., and requires no attendant to oil or lubricate it.

It will be readily seen from the foregoing description, that a very small head of water is sufficient to operate our engine, as no suction occurs in the same, the pressure of the head of water filling the pump-cylinder, thereby obviating suction. The engine can stop only when the weight does not operate the valve with all the force of its fall over the center, and should this occur, any common laborer or workman near the engine, seeing it stop, can, by simply pressing the weighted lever down on whichever side it may be inclined, set it going, while it can be stopped at any moment by easing the weighted lever over the center, without allowing it to operate the valve c .

Having described our invention, we claim—

1. An automatic pumping-engine in which the return stroke of the driving-piston is effected by changing the direct pressure from the head of water from the driving-piston to the pump-piston, so that the latter alone effects the return stroke of the former, essentially as described.

2. In combination with the pump and driv-

ing cylinders of an automatic pumping-engine which are charged alternately, and never both at the same time, by direct pressure to effect the return stroke of the driving-piston, we claim a valve so arranged as to relieve the pressure under the driving-piston at the moment when the direct pressure is exerted under the pump-piston, essentially as described, by shutting off the head of water entirely from the driving-piston.

3. In an automatic pumping-engine, we claim a valve, *c*, balanced by means of a piston suitably connected to the valve so as to admit or shut off the water from the cylinder *i*, essentially as described.

4. In combination with the piston *d* and valve *c* of an automatic pumping-engine, which are operated by the direct pressure of the head of water only, we claim the upper valve bearing *f*, of a smaller diameter than the valve to assist in sustaining the valve in an elevated position, essentially as described.

5. The combination of the passages *m o* and

valves *m' o'*, air-chamber *n*, pump-cylinder *l*, opening *p*, piston *w*, and suitable connecting mechanism with the valve *c*, essentially as and for the purposes described.

6. The arrangement of the passage *h*, from cylinder *i*, in relation to the valve *c*, to either open communication with the head of water, or allow the free efflux of water from the cylinder *i*, essentially as described.

7. In an automatic pumping-engine we claim the cylinders *i l*, with their pistons *j* and *w*, the valve-chamber *a*, with the automatically-operated valve *c* and piston *d*, air-chamber *n*, passages *h m o*, valves *m'* and *o'*, and balance beam *r*, with piston-rods *j'* and *w'*, combined and arranged to operate essentially as described.

ELISHA D. EAMES.

FREDERICK W. EAMES.

In presence of—

JOHN C. HEALY,
S. M. QUINN.