J. R. WILCOX.

Automatic Mine-Draining Apparatus.

No. 219,050. Patented Aug. 26, 1879.

FIG. 1.

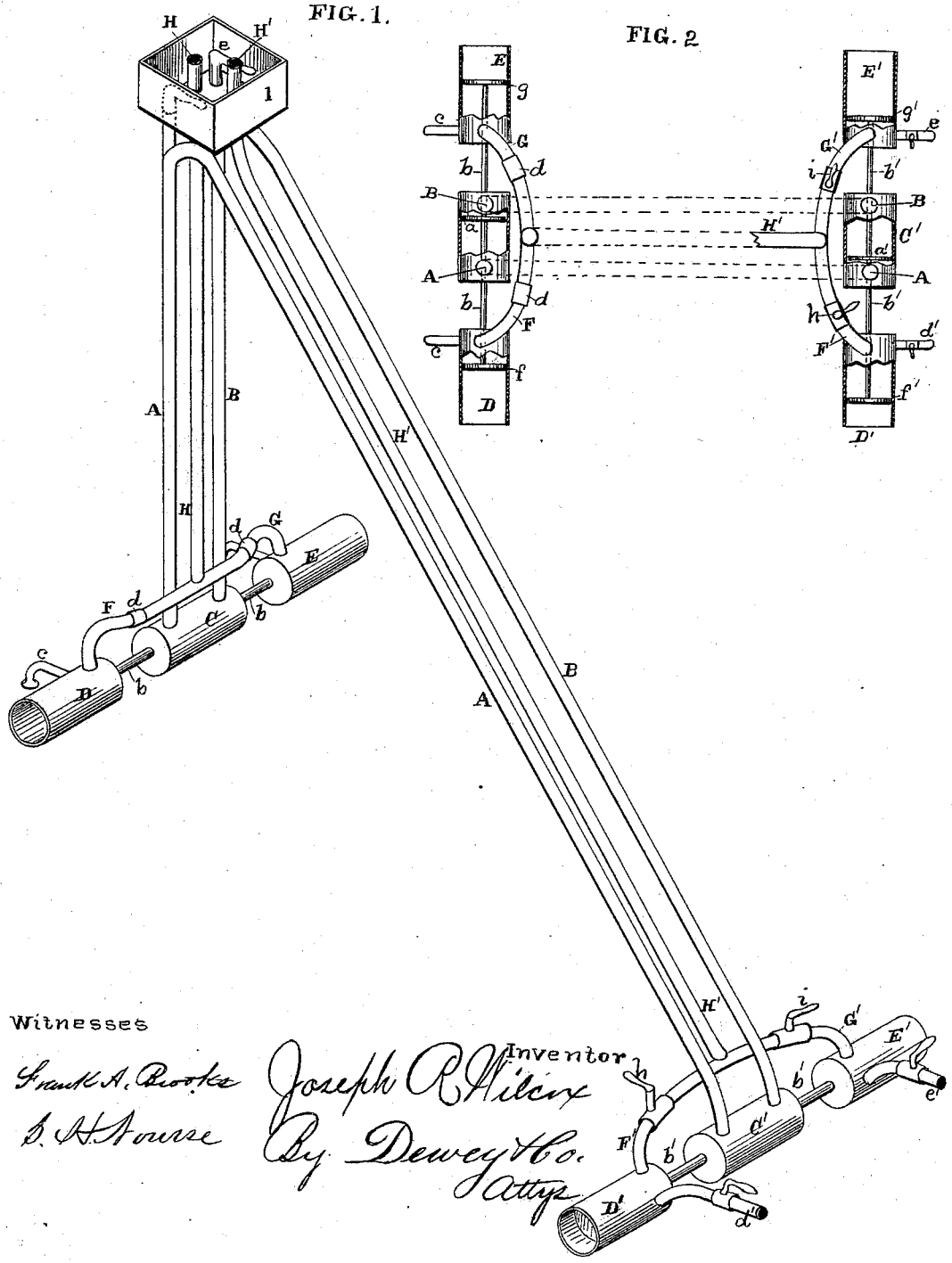

FIG. 2.

Witnesses

Frank A. Brooks

D. A. Towne

Inventor

Joseph R. Wilcox

By Dewey & Co.

Attys

UNITED STATES PATENT OFFICE

JOSEPH R. WILCOX, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN AUTOMATIC MINE-DRAINING APPARATUS.

Specification forming part of Letters Patent No. **219,050**, dated August 26, 1879; application filed June 9, 1879.

To all whom it may concern:

Be it known that I, JOSEPH R. WILCOX, of the city and county of San Francisco, and State of California, have invented an Automatic Mine-Draining Apparatus; and I hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to an improved apparatus for raising water from mines, wells, &c.; and my improvements consist in providing two sets of three cylinders each, one set inside the mine and the other outside, the latter being placed at a lower point than the inside set. Each set of cylinders is placed in line, so that one piston-rod may carry three pistons, one for each cylinder. Two pipes connect with opposite ends of each of the central cylinders, so that a continuous pipe leads from one end of the inside central cylinder up and out of the mine, down to one end of the outer central cylinder, and thence from the opposite end of said outside central cylinder up and down into the mine, connecting with the other end of said inside cylinder, thus forming a continuous double water-column when said pipes are filled and sealed.

The two outer inside cylinders, which are provided with suction-pipes, are connected by separate pipes with a centrally-placed pipe, which discharges into an open tank at the surface, said pipe being continued down the outside from said box, where it is connected with the two outer outside cylinders by separate pipes provided with valves or cocks, said outside cylinders being provided with discharge-pipes controlled by cocks.

By allowing the water which flows down the central outside pipe from the box to discharge first into one of the outer outside cylinders, and then into the other, alternately, the pistons of said cylinders are operated by the weight of water in said pipe, and the piston-rod moves the piston of the central cylinder so as to shift the continuous column in the two connecting-pipes, which column thus operates, first one way and then the other, the piston in the central inside cylinder. As this piston is moved back and forth it moves the alternate pistons of the outer inside cylinders, so as to force the water up the central inside short pipe, which empties into the box, said water thus being forced to the surface by the weight of the heavier column outside. The heavier body of water in the longer pipe outside is thus utilized in raising up the water in the inside shorter pipe, said shorter pipe at the same time giving the water-supply to the outside one.

In this way the water may be raised from mines in such localities as offer facilities for a proper fall by a very simple application of the heavier part of a column of water to a series of pistons moved by said water.

In the accompanying drawings, Figure 1 is a perspective view of my invention. Fig. 2 is a plan view, showing the arrangement of valves.

Two pipes, A B, extend down the shaft in the mine, or down a well, and, on reaching the surface, are led down in any direction, so that their outer ends are at a lower point than the ends in the shaft. The ends of the pipes in the mine open into opposite ends of a common cylinder, C, in which is a piston, *a*, on a rod, *b*. This rod extends through both ends of the cylinder, and each end of the rod is fitted with a piston, *f g*, which play in independent cylinders D E. Each of these cylinders D E is provided with an inlet pipe or valve, *c*, which leads to the sump in the mine or the water in the well, and through them the water is admitted to the cylinders, as hereinafter described.

At the end of the pipes A B outside the shaft, and lower down than the inner ends, is a similar arrangement of cylinders and pipes. The pipes A B open at the opposite ends of a cylinder, C′, having a piston, *a′*, on a rod, *b′*, said rod *b′* extending through both ends of the cylinder, and having pistons *f′ g′*, which play in independent cylinders D′ E′, as shown. Each of these cylinders D′ E′ is provided with a discharge-pipe, *d′ e′*, each pipe being provided with a cock, as shown.

From the cylinders D E in the mine or well lead two pipes, F G, one from each cylinder, and opening into a common pipe, H, which leads upward and opens into an open box, I, on the surface at the top of the mine. From there a pipe, H′, which is really only a continuation of the pipe H, runs down outside to the outer lower cylinders, D′ E′, with which it

is connected by pipes F′ G′, one of which leads from each of said cylinders to the pipe H′. These pipes F′ G′ are provided with cocks *h i*, as shown, by means of which communication may be cut off from either cylinder, as desired, for the purpose hereinafter described.

The pipes F G, leading from the cylinder D E to the pipe H, are provided with check-valves *d*, as shown.

Priming-valves *e* are placed at the upper bends of the pipes A B, by which said pipes may be supplied with water to replenish them in case any waste occurs.

In order to operate my pumping apparatus, I first fill the pipes A B with water by means of the priming-valves *e*, or in any desired or convenient manner. The outer cylinders, C′ D′ E′, must be, at a point outside the mine or well, lower than the point at which the cylinders C D E are situated, the two sets of cylinders being connected by the pipes, as herein described. This is necessary in order that the column of water in the pipe H′ outside the mine shall be enough heavier than the column in the pipe H to overcome the weight of water in said pipe H, and the friction of moving the water in the pipes, moving the pistons and valves, &c., as hereinafter described.

When the pipes A B H′ are completely filled with water the device may be set at work.

It may be supposed that the piston *f′* in the cylinder D′ on the outside of the mine has completed its outward stroke and is at the outer end of the cylinder. In that case the piston *a′* of the central outer cylinder C′ is at that end of said cylinder nearest the cylinder D′, and the piston *g′* of the cylinder E′ is at that end of the cylinder E′ nearest the central cylinder, by reason of all three pistons being on the same rod. I then close the cock *h* in the pipe F′ and open the cock in the discharge-pipe *d′* of the cylinder D′, so that the water may flow out of said cylinder through said discharge-pipe. At the same time I open the cock *i* in the pipe G′, leading from the central pipe H to the cylinder E′ and close the cock in the discharge-pipe *e′* of said cylinder.

The water in the long central pipe H′ then flows into the cylinder E′ through the pipe G′ and forces its piston *g′* over, thus drawing over, by means of the rod *b′*, the piston *a′* of the central cylinder C′ and the piston *f′* of the cylinder D′, forcing the water through the discharge-pipe *d′*.

As the piston of the central cylinder C′ is thus drawn over it pushes the water up the pipe B, which column is balanced by that in the pipe A. As the column of water is pushed up the pipe B and down its short leg to the bottom of the mine, this water enters one side of the central inside cylinder C, and pushes its piston *a* over toward the cylinder D, at the same time moving the column up the short inside leg of the pipe A and down its long outside leg, the two short and long columns of the pipes A B forming counter-balances for each other, so that there is nothing for the piston *a′* to overcome except the friction of the water in the pipes A B, as far as the contents of those pipes are concerned.

In moving this continuous column of water contained in the pipes A B, however, the piston *a* in the cylinder C is moved from one side to the other, as before described. In being thus moved the piston-rod *b*, common to the three cylinders C D E, is moved over in the direction of the cylinder D, taking with it the two pistons *f g* of the cylinders D E. As these pistons are thus drawn over, that one in the cylinder D draws water into said cylinder from the sump or well through the inlet-pipe *c*, thus filling said cylinder, the check-valve *d* in the pipe F preventing any water flowing back into the cylinder from the pipe H. The moving over of the piston *g* in the cylinder E forces the water previously drawn into said cylinder through the pipe G into the center pipe H, and thence up into the box I on the surface, whence it will flow down through the pipe H′, and be utilized in operating the outside pistons for the reverse stroke.

As soon as the three pistons *a f g* in the cylinders C D E are all over nearest the outer end of the cylinder D, and the three pistons *a′ f′ g′* in the cylinders C′ D′ E′ are all over nearest the outer end of the cylinder E, the reverse action takes place. The water from the pipe H′ is allowed to flow into the cylinder D′ behind its piston, and move said piston out, thus drawing over the pistons *a′ g′*, discharging the water from the piston E′, and reversing the motion of the water in the central piston and pipes A B. In so doing the central piston of the inside cylinder C is moved back again, drawing the water into the cylinder E and forcing it out of the cylinder D into the pipe H, and so to the surface.

In this way the weight of the long column of water is utilized in forcing up the short column, the water in the pipes A B acting as a belt or rope in moving the piston in the central cylinder.

By suitable connections and mechanism the action of the cocks in the pipes F′ G′ *d′ e′* may be made automatic, and the water from the central pipe H′ be shifted first into the cylinder D′ and then into E′, operating the pistons alternately.

Priming-cocks *e* may be placed at the highest point of the pipes A B, by which they may be filled. I prefer to seal these pipes up and put clear water in them, so that the central cylinders will not become worn by gritty water from mines. As any leakage occurs the waste may be supplied through the priming cocks or valves *e*.

The use of the central pipe H H′ is not essential to the operation of the device other than for the purpose of allowing the gritty water to flow through. By connecting the pipe F′ from the cylinder D with the pipe B′, and connecting the pipe G′ from the cylinder E with the other pipe, A, the operation will

be the same, the water being then drawn up alternately through the short leg of one pipe, A, and then the short leg of the other one, B. I prefer, however, to operate the pistons in the manner described.

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

1. The cylinders C C′, with their pistons *a a′* moving in said cylinders, in combination with the water-containing pipes A B, connecting the corresponding ends of said cylinders, whereby the motion of the piston in one cylinder is communicated directly to that of the other by the alternate action of the column of water contained in the pipes, substantially as herein described.

2. The cylinders C C′, with their pistons *a a′* and connecting-pipes A B, in combination with the cylinders D′ E′, with their pistons *f′ g′*, rod *b′*, and pipes F′ G′, with their cocks *h i*, whereby the operating-column of water may be alternately transferred from one outside piston to the other, so as to give alternate motion to the column in the pipes A B, for the purpose of moving the pistons *a a′*, substantially as and for the purpose herein described.

3. The cylinders C C′, with their pistons *a a′* and connecting-pipes A B, in combination with the cylinders D′ E′, with their pistons *f′ g′*, rod *b′*, and pipes F′ G′, with their cocks *h i*, said pipes being either connected with the pipes A B or with an independent column, H′, whereby the pistons D′ E′ may be driven by either of said columns, so as to operate the pistons *a a′*, substantially as herein described.

4. The cylinders C′ D′ E′, with their connecting-rod *b′* and pistons *a′ f′ g′*, pipes F′ G′, with their valves, and the operating-column A B or H H′, in combination with the continuous rod *b*, pistons *a f g*, pipes F G, and suction-pipes *e e*, whereby the operation of the piston *a′* in the cylinder C′ actuates the pistons in the cylinders D E to raise the column of water through the pipe H, substantially as herein described.

5. The cylinders C D E C′ D′ E′, with their rods *b b′*, pistons *a f g a′ f′ g′*, in combination with the pipes A B, with their priming-cocks *e*, by which the column of water in the pipe A B is kept unbroken and leakage remedied, substantially as herein described.

6. The cylinders D′ E′, with their pistons *f′ g′* and discharge-valves *d′ e′*, pipes F′ G′, and valves *h i*, whereby the exterior pistons are actuated by a column of water in the pipes A B or H′, in combination with the cylinders C, its piston *a*, and the pumping-cylinders D E, pipes F G, and check-valves, whereby the column of water is raised through the pipe H to the surface or discharge-box I, and thence discharged outside the mine through the cylinders D′ E′, alternately, substantially as herein described.

7. In combination with the pipes A B H H′, with their cylinders C D E C′ D′ E′, piston-rods, and pistons, and the pipes F G F′ G′, with their valves, suction and discharge pipes, the accumulation-box or reservoir I, placed at the highest point of said pipes, for collecting water from a stream and directing it into the operating pipe H′, whereby the pistons, cylinders, and operating-column may be moved and water raised from the mine by a balance of power being given in favor of the outer cylinder from a source outside of the mine, substantially as herein described.

In witness whereof I have hereunto set my hand.

JOSEPH R. WILCOX.

Witnesses:

CHAS. G. YALE,

FRANK A. BROOKS.