

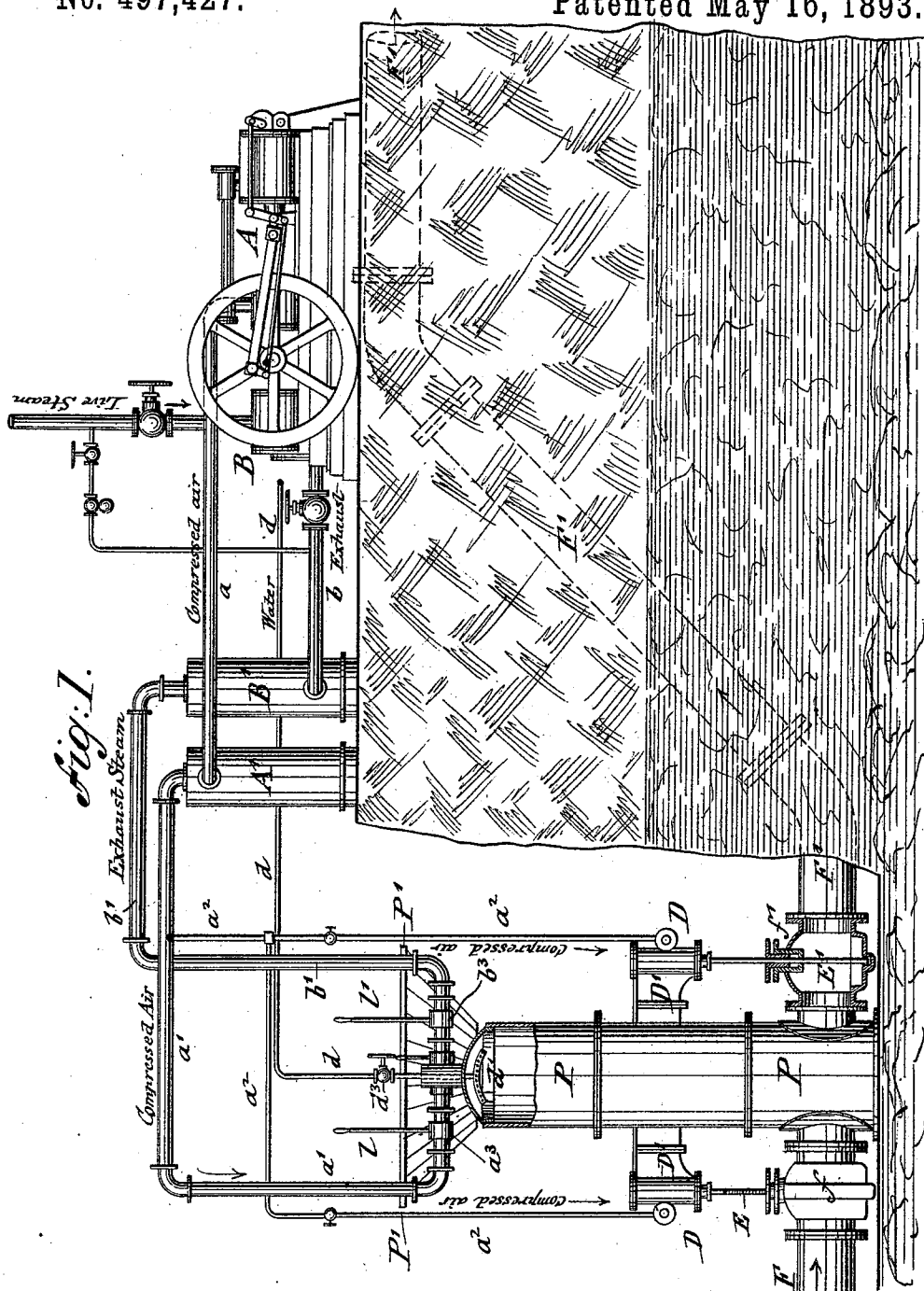
(No Model.)

3 Sheets—Sheet 1.

L. HUSSEY & E. D. HARSEN.
STEAM VACUUM DREDGER.

No. 497,427.

Patented May 16, 1893.



WITNESSES:

A. Schehl.
Martin Petry.

INVENTORS

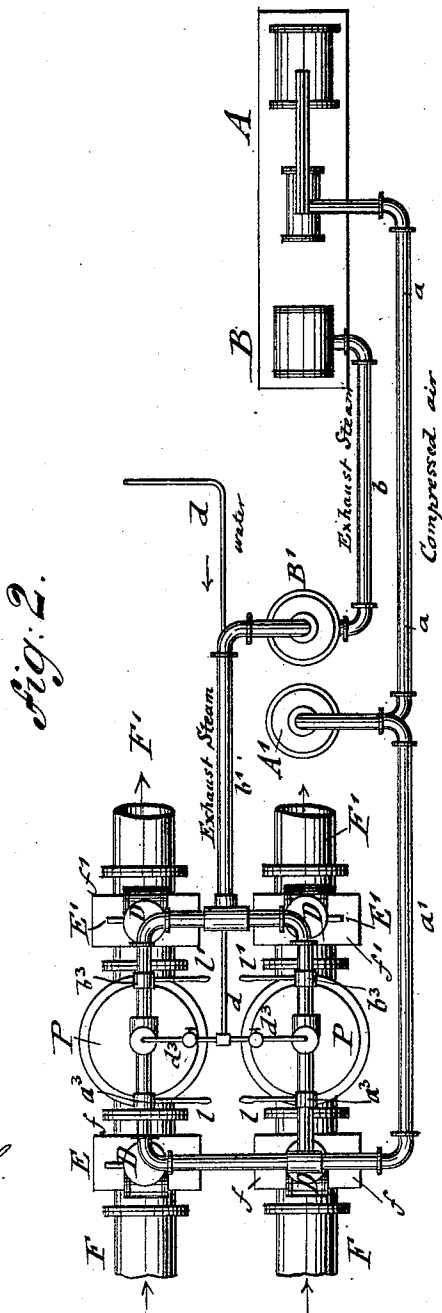
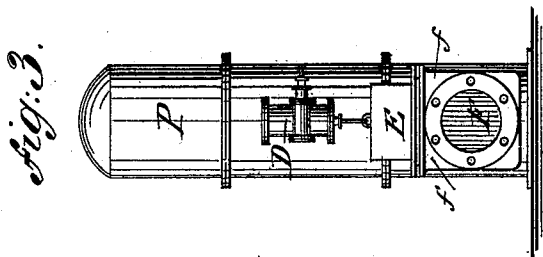
Levi Hussey and
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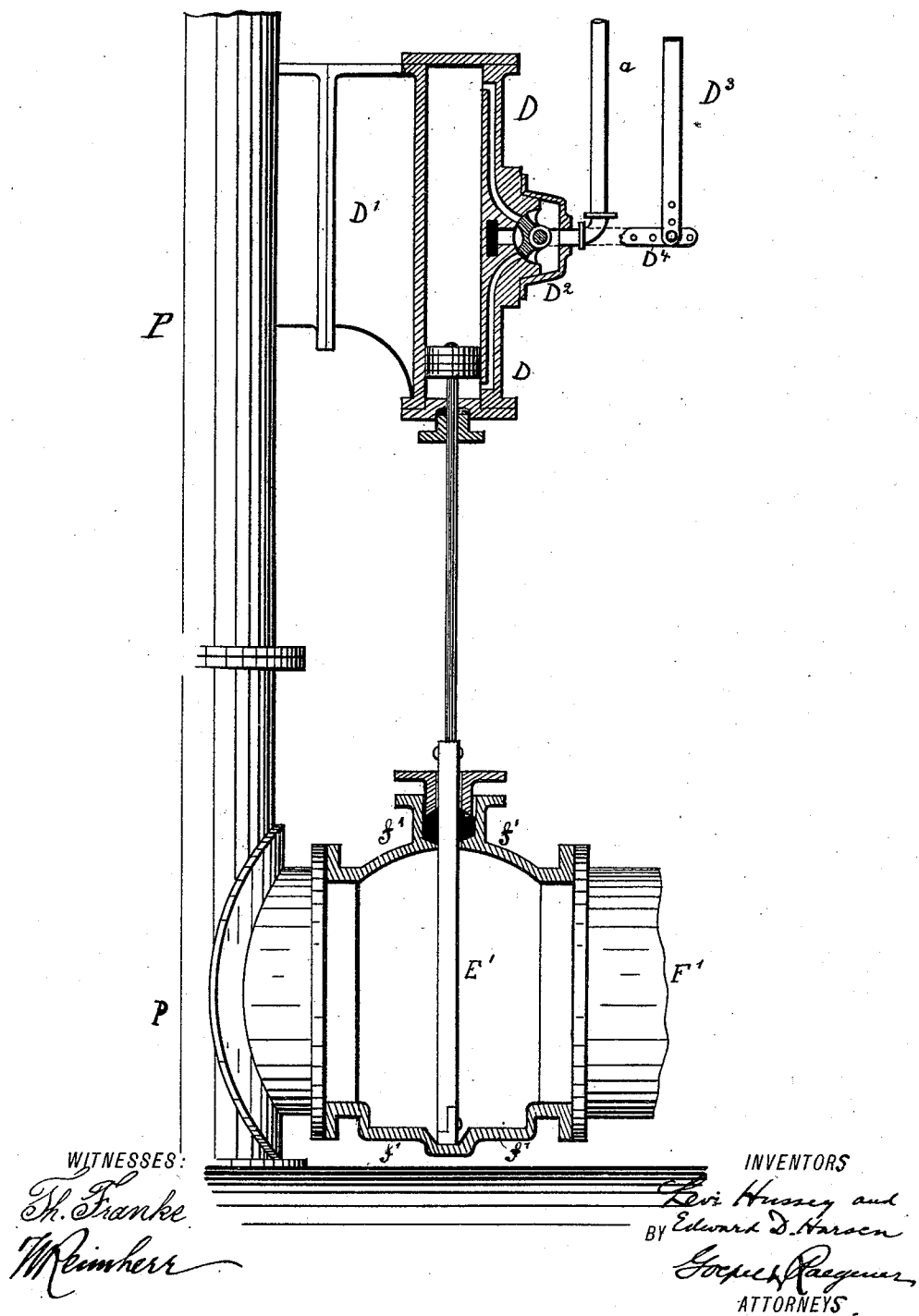
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3 Sheets—Sheet 3.

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Fig. 4.



UNITED STATES PATENT OFFICE.

LEVI HUSSEY, OF NEW YORK, AND EDWARD D. HARSEN, OF BROOKLYN,
NEW YORK, ASSIGNORS, BY DIRECT AND MESNE ASSIGNMENTS, TO THE
MINING AND DREDGING POWER COMPANY, OF WEST VIRGINIA.

STEAM VACUUM-DREDGER.

SPECIFICATION forming part of Letters Patent No. 497,427, dated May 16, 1893.

Application filed March 31, 1890. Renewed August 8, 1891. Again renewed February 18, 1892, and again renewed August 29, 1892. Serial No. 444,362. (No model.)

To all whom it may concern:

Be it known that we, LEVI HUSSEY, of the city, county, and State of New York, and EDWARD D. HARSEN, of Brooklyn, county of Kings, and State of New York, citizens of the United States, have invented certain new and useful Improvements in Steam Vacuum-Dredgers, of which the following is a specification.

This invention relates to that class of pumps in which the pressure of the atmosphere is utilized for elevating gravel and other solid material into a pump-chamber in which a vacuum is formed by the condensation of steam in the same and from which the material is afterward removed by means of compressed air that is admitted into said pump-chamber so as to force the material from the same through a pipe to a suitable elevation above the ground, and provide thereby an artificial dump for gravel or other débris, the pump being specially designed for dredging and mining purposes, in which large quantities of débris are to be removed.

The invention consists of a vacuum dredger, which comprises a pump-chamber the lower part of which is connected with a suction pipe at one side and a discharge pipe at the other side, gate-valves in said pipes, one at each side of the pump-chamber, cylinders worked by compressed air for operating said gate-valves, air and steam-pipes which connect the upper part of the pump-chamber with a compressor and with the exhaust-port of its steam-cylinder, so that the exhaust steam from said pump is utilized for producing the vacuum in the pump-chamber, while the compressed air is employed for working the gate-valves of the suction and discharge-pipes and forcing the material out of the pump-chambers and conducting it through the discharge-pipe to the place of deposit.

The invention consists further of certain details of construction and combination of parts which will be fully described hereinafter and finally pointed out in the claims.

In the accompanying drawings, Figure 1

represents a side-elevation of our improved steam vacuum-dredger, showing its connection with an air-compressor, parts being broken away and others in section. Fig. 2 is a plan of the same. Fig. 3 is an end-elevation of the pump-chamber, and Fig. 4 is a vertical section through one of the air-cylinders and its slide-valve.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A represents an air-compressor of any suitable construction and B the operating steam-cylinder of the same, the exhaust-port of which is connected by a pipe *b* with an intermediate reservoir B' for the exhaust-steam, while the air-compressing cylinder A is connected by an air-pipe *a* with a reservoir A' which is again connected by a pipe *a'* with the top-part of the pump-chamber P. The intermediate reservoir B' for the exhaust-steam is also connected by a pipe *b'* with the top-part of the pump-chamber P.

Above the pump-chamber P is arranged a platform P' on which the attendant who operates the vacuum dredger is stationed. Besides the pipes *b'* and *a'* for the exhaust-steam and compressed air, a water-supply pipe *d* is connected with the top-part of the pump-chamber P, said pipe being provided with a spray nozzle *d'* at the inside of the pump-chamber, so as to discharge the water in a spray which serves to condense the exhaust steam admitted into the pump-chamber and create thereby a vacuum in the same. The compressed air-pipe *a'* is further connected by branch-pipes *a²*, *a²*, with the cylinders D, D, which are supported by suitable brackets D' D', attached to opposite sides of the pump-chamber P. The compressed air is supplied by suitable slide-valves D³ to the interior of the cylinders D, D, so as to operate the pistons located in the same and alternately raise or lower a suction-gate valve E or a discharge gate-valve E', which valves are connected to the piston-rods of the air-operated pistons. The slide-valves D³ are oscillated at the proper time by the attendant, so as to produce the

supply of compressed air either above or below the cylinder, by a lever-rod D^3 , that is pivoted to an arm D^4 , which is keyed to the spindle of the slide-valve, outside of the valve-chest of the same, as shown clearly in Fig. 4. The suction gate-valve E is guided in a stuffing box of the casing f of the suction pipe F while the discharge gate-valve E' is guided in a stuffing box of the casing f' of the discharge-pipe F' . This latter pipe is connected with the level to which the gravel, mud, débris or other material is to be lifted, so as to convey it to a suitable elevation or artificial dumping ground.

The supply-pipes b' and a' for the exhaust steam and compressed air are provided with stop-cocks b^3 , a^3 , having levers l' , l , for opening and closing the same, the water-supply pipe being also provided with a stop-cock d^3 , so as to shut off the water supply to the pump chamber. The branch-pipes a^2 leading to the compressed air-cylinders D , D , have also stop-cocks which like the levers l , l' and stop-cock d^3 can be readily operated by the attendant stationed on the platform P' . It is preferable to arrange two pump-chambers P sidewise of each other, each pump-chamber being provided with valved suction and discharge-pipes F F' and gate-valves E E' for the same as well as with a pair of compressed air-cylinders, for alternately operating the gate-valves.

The operation of our improved steam vacuum dredger is as follows: When the valve of the steam supply-pipe of one pump-chamber is opened, the exhaust-steam is permitted to enter into the pump-chamber P . Water is then admitted in a spray into the pump-chamber, whereby the exhaust-steam is condensed and thereby a vacuum formed in the chamber. The end of the suction pipe F is submerged and terminates in a pit to which the material to be raised is continually supplied. The suction gate-valve E of the suction-pipe F is then opened by admitting compressed air into its cylinder, so that by the pressure of the atmosphere the material to be raised is then forced into the pump-chamber so as to fill the same. The suction gate-valve E is then closed and the discharge gate-valve E' opened by admitting compressed air into the cylinder of the discharge gate-valve. The valve of the supply-pipe a' by which compressed air is conducted into the pump-chamber P is then opened and the material forced by the pressure of the air from the pump-chamber through the discharge-pipe to the higher artificial level where it is to be delivered. The air supply-pipe is then closed and the exhaust steam-pipe opened, so that exhaust-steam is admitted to the pump-chamber until the air is driven off and the same filled with steam. The discharge gate-valve E' is next closed and a vacuum again established in the pump-chamber P by continuing the admission of

exhaust steam and admitting then a spray of water. The suction gate-valve E is then opened again and the material drawn into the pump-chamber, after which the suction gate-valve is closed and the discharge-gate valve opened and so on alternately. The pumps are worked alternately, so that while one pump-chamber is filling, the other is discharging and vice versa, whereby an almost continuous dredging operation can be kept up. By the arrangement of the reservoirs for the exhaust-steam and compressed air intermediately between the air-compressor and steam-cylinder and the pump-chambers, a regular supply of exhaust-steam and compressed air of uniform pressure is always at hand, so that the regular and reliable working of the pumps can be kept up.

The advantages of our improved construction of vacuum dredging apparatus are as follows: First, that by the use of exhaust-steam instead of live steam, the dredger can be operated at greatly reduced expense; secondly, that by the use of compressed air for the cylinders of the suction and discharge-gate valves as well as for forcing the material from the pump-chamber through the discharge pipe no condensation can take place which is the case with live steam, so that a more effective and direct action is obtained and a quicker and more economical discharge of the material produced; thirdly, that by the arrangement of two pump-chambers in close proximity to each other to which exhaust steam and compressed air are supplied alternately from the compressor and steam-cylinder greater quantities of material can be removed to a higher elevation within a given time and at considerable less expense than with the vacuum dredging apparatus operated by live steam.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. The combination, of a pump-chamber, supply and discharge pipes connected with the lower part of said pump-chamber, gate-valves in said pipes, cylinders for working said gate-valves, a reservoir for exhaust steam, a valved pipe connecting said reservoir with the pump-chamber, a reservoir for compressed air, valved pipes connecting said reservoir with the pump-chamber and with the cylinders and a valved water-supply pipe communicating with the pump-chamber, substantially as set forth.

2. The combination, of a steam-cylinder, an air-compressor operated by said steam-cylinder, a reservoir for the exhaust steam connected with the exhaust-port of the steam-cylinder, a second reservoir for compressed air connected with the air-compressors, a pump-chamber, valved pipes for connecting the pump-chamber with both reservoirs, a valved water supply pipe for the pump-cham-

ber, a suction pipe and a discharge-pipe communicating with the lower part of the pump-chamber, gate-valves in said suction and discharge-pipes, cylinders for operating said
5 gate-valves and valved pipes connecting the air-reservoir with the slide-valves of the cylinders, substantially as set forth.

In testimony that we claim the foregoing as

our invention we have signed our names in presence of two subscribing witnesses.

LEVI HUSSEY.
EDWARD D. HARSEN.

Witnesses:

PAUL GOEPEL,
JOHN A. STRALEY.