B. HEDGE & F. A. CUSHMAN.

Vacuum Dredging-Machine

No. 226,661. Patented April 20, 1880.

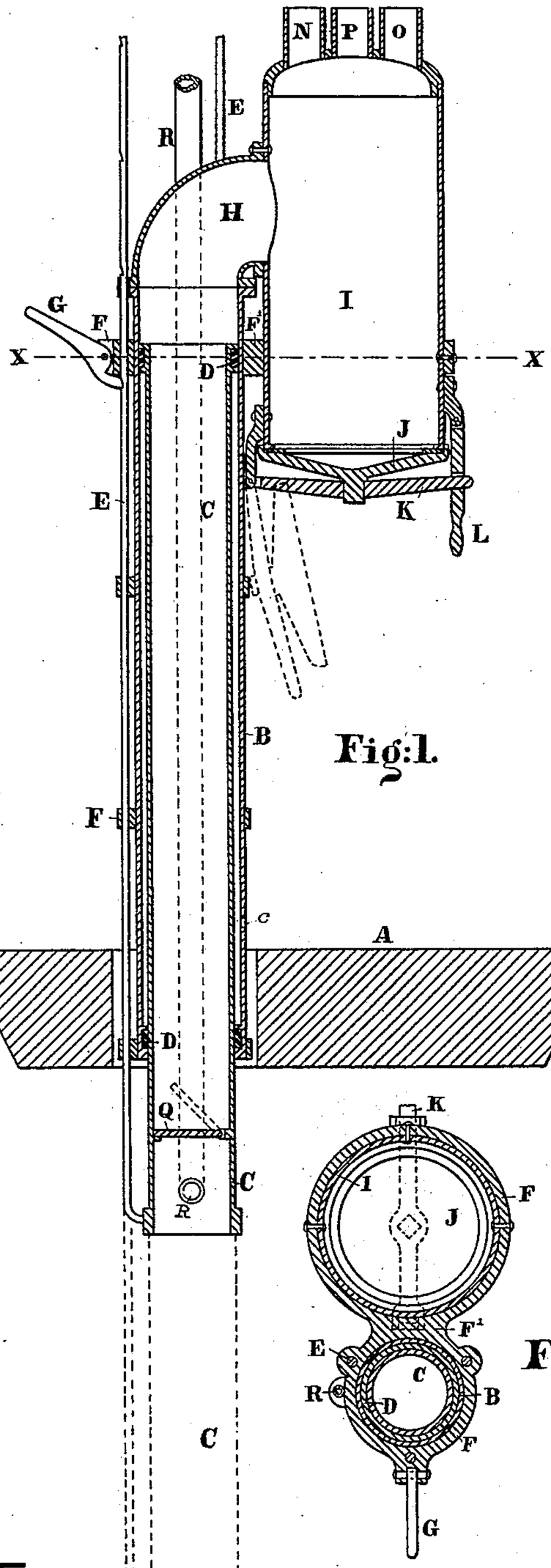

Fig:1.

Fig:2.

Witnesses.

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VACUUM DREDGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 226,661, dated April 20, 1880.

Application filed June 27, 1879.

To all whom it may concern:

Be it known that we, BARNABAS HEDGE, of Augusta, Maine, and FRANCIS A. CUSHMAN, of Lebanon, New Hampshire, have jointly invented certain Improvements in Vacuum Dredging-Machines; and we do hereby declare that the same are fully described in the following specification and illustrated in the accompanying drawings.

The object of our improvement is to increase the efficiency of vacuum-dredges by providing them with a telescopic extension-tube and with suitable means of stiffening or bracing the main tube and its telescopic extension to prevent their collapse longitudinally by atmospheric pressure, whereby said machines are adapted to operate in the removal of deposits at varying depths without the necessity of raising and lowering the entire apparatus to accommodate it to such variations. We also improve this class of machines by the employment therewith of an air-tube adapted to supply air under pressure within the mouth of the extension-tube at the moment the vacuum is formed, to facilitate elevation of the material in the tube.

The several features of our invention are hereinafter described, and are specifically set forth in the appended claims.

Our inventions are in the nature of improvements upon the apparatus described in the Letters Patent of the United States No. 203,892, granted May 21, 1878, to Augustine Crosby, of Benton, Maine, for improvement in vacuum-dredgers.

In the accompanying drawings, Figure 1 is a vertical central section of a machine embodying our various improvements, and Fig. 2 a transverse section of the same, taken through the line *x x*, Fig. 1.

A represents the scow or platform upon which the apparatus is placed for use, being suitably supported thereon in any convenient manner.

B is the receiver, consisting of a strong metallic tube, open at the bottom and extending downward through a well or opening in the scow or platform A into the water or soil beneath.

C is a tube adapted to slide telescopically up and down upon or within the tube B, so as to reach and to some extent penetrate the mud or gravel to be removed by the dredging operation. When the depth is very great there may be two or more of these telescopic sections, adapted to extend downward to reach the bottom, and to close one within the other for removal from place to place.

D represents a packing interposed between the tube B and extension-tube C, for the purpose of making an air-tight joint between them. This packing is preferably applied in the form of flat rings of elastic compound surrounding the inner tube, and properly secured in position, so as not to be displaced by atmospheric pressure or otherwise. An air-vent, *c*, may be provided for the space between the inner and outer tubes.

The tube C is raised or lowered and supported by means of rods, chains, or similar connecting devices on the scow or platform and suitable operative mechanism. Stiffening-bars E, running through eyes or collars F, and provided with set-screws, ratchet and pawl G, or other locking apparatus, will be required to prevent the tubes B C from closing upon each other when a vacuum is formed, and in order that the operation may tend to drive the tube C downward, as well as to elevate the material within it, the intent being that, for these purposes, the tubes B and C shall be practically as one. Suitable provision should also be made for raising and lowering either tube with relation to the other, or both together, in order to make the machine available under all circumstances.

The upper end of the receiver B is connected by an elbow, H, with a vertical or inclined discharging-tube, I, forming part of the vacuum-chamber, and serving as a temporary receptacle for the mud, silt, or gravel which is forced up through the tubes B C and elbow H when a vacuum is formed in said tubes.

The bottom of the discharging-chamber is provided with a gate, J, hinged or otherwise secured thereto, so as to be readily opened for the discharge of the material raised through the tubes B C and deposited in the chamber I.

The gate J is formed with suitable locking devices, by which it may be securely closed when desired, and packing is interposed, if necessary, to make the joint air-tight.

In the drawings there is shown a hinged

lever, K, carrying the cap or gate J, and held in proper closed position by a link, L. Any other convenient means of securing the gate may be resorted to.

We unite the receiver and discharger rigidly to each other by the collar or band F surrounding both tubes, with a solid block, F′ between them for greater stability.

The principle relied on in the operation of this machine, whereby mud, gravel, &c., may be raised from the bed of a stream or similar location, is the familiar one set forth in the Letters Patent hereinbefore referred to, viz: the formation of a vacuum in the chamber by the admission of steam under pressure to expel the air, and the subsequent condensation of the steam by jets of cold water. The result of this formation of a vacuum is that atmospheric pressure will tend to drive the tubes downward, and will force the material in the lower part of the receiver B and its extension C upward into the parts B H I, from which the air has been expelled and the steam condensed. Such portion of this material as is thus forced into the discharging-chamber I may then be removed by gravitation through the gate J, as stated.

In order to facilitate these operations and keep the several valves free from obstruction by mud or gravel, we group the valves at the upper end of the discharging-chamber I, as shown in the drawings.

N is the air-valve, open when the machine is ready for operation, with the gate J closed and the extremity of the tube C sunk in the deposit to be removed. The steam-valve O is then opened, admitting an amount of steam sufficient to expel the air and completely fill the otherwise vacant space in the tubes. Both these valves are then closed, and through the cock P a spray of cold water is thrown in, condensing the inclosed steam and forming a vacuum more or less perfect, but sufficient to induce such atmospheric pressure as will force up a column of mud, &c., through the tubes B C and elbow H, to fill the greater part of the discharger I. A suitable valve, Q, opening upward in the tube B or C, serves to retain at the height to which it has been raised all the material that has passed such valve, and to prevent its return to its original level through the tubes B C when the gate J and valve N are opened for the discharge of the contents of the tube I.

The various valves should be operated automatically or otherwise, in unison, during the operation above detailed, which may be repeated indefinitely.

The material removed by the action of the machine may be disposed of by discharge into sluices, delivery to barges, or otherwise, according to circumstances.

In the event the water is too deep or the weight of material in the tube B and extension C is too great for the ordinary atmospheric pressure alone to raise, we employ an air-tube, R, extending down and opening into the bottom of the telescopic tube, and closed by a spring-valve to prevent mud from entering. At the moment the vacuum is formed in the receiver and discharger air is admitted or compressed air is forced through this tube R beneath the section of mud, sand, &c., in the tube C; and such portion of material to be removed as is above this air-inlet will be permitted and forced to rise by the pressure of this air-column rushing in beneath it and co-operating with the vacuum at the upper end of the tubes B C. It will, of course, be understood that the steam, water, and compressed-air inlets are properly connected with suitable reservoirs of those fluids by flexible tubes or otherwise; but we have not thought it necessary to illustrate such parts of the mechanism, nor the engine by which the machine may be operated, nor the details of the valves, nor the hoisting and supporting apparatus required.

Ordinary mechanical skill will suggest the proper construction and connection of the several parts not already fully described or shown.

We claim as our improvements in vacuum-dredging machines—

1. The combination of the receiver B and telescopic extension C, braced to prevent collapse when a vacuum is formed, and provided with suitable packing, substantially as and for the purposes set forth.

2. The combination of the receiver B, telescopic extension C, stiffening-braces E, and discharger I J, substantially as and for the purposes set forth.

3. The combination of the receiver B and discharger I, united by the elbow H and the collar or band F, and constituting the vacuum-chamber, with the extension-tube C and air-vent *c*, substantially as and for the purposes set forth.

4. The combination of the receiver B, discharger I J, and air-supplying tube R, substantially as and for the purposes set forth.

5. The combination of the receiver B, telescopic extension C, discharger I J, and air-tube R, substantially as and for the purposes set forth.

6. The combination, with the receiver B, of the discharger I, having gate J at one end and air, steam, and water valves at the other end, substantially as and for the purposes set forth.

7. The combination, with the vacuum-chamber or discharger I, of the receiver B, telescopic extension C, and connecting or stiffening bars E, substantially as and for the purposes set forth.

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