J. DAVIDSON.

PUMPING DEVICE.

APPLICATION FILED MAR. 23, 1912.

1,075,406.

Patented Oct. 14, 1913.

2 SHEETS—SHEET 1.

FIG. 1.

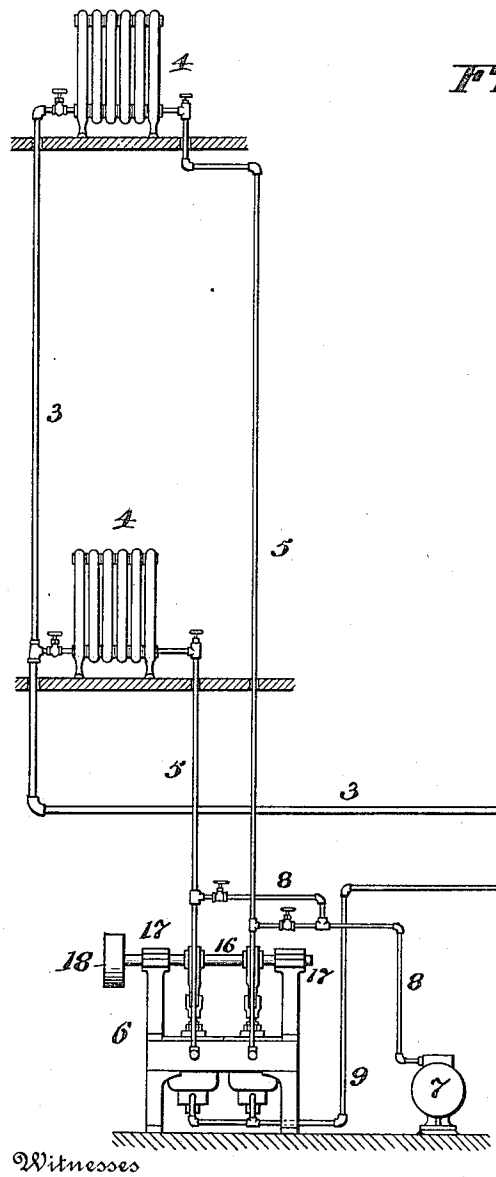
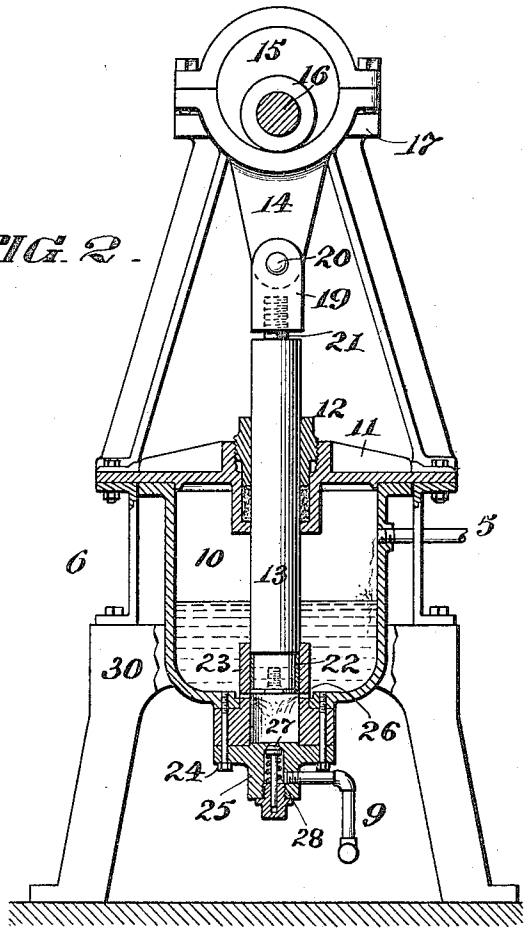


FIG. 2.



Witnesses

Daniel Webster Jr.

A. M. Kelly

Inventor

Joseph Davidson

By

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COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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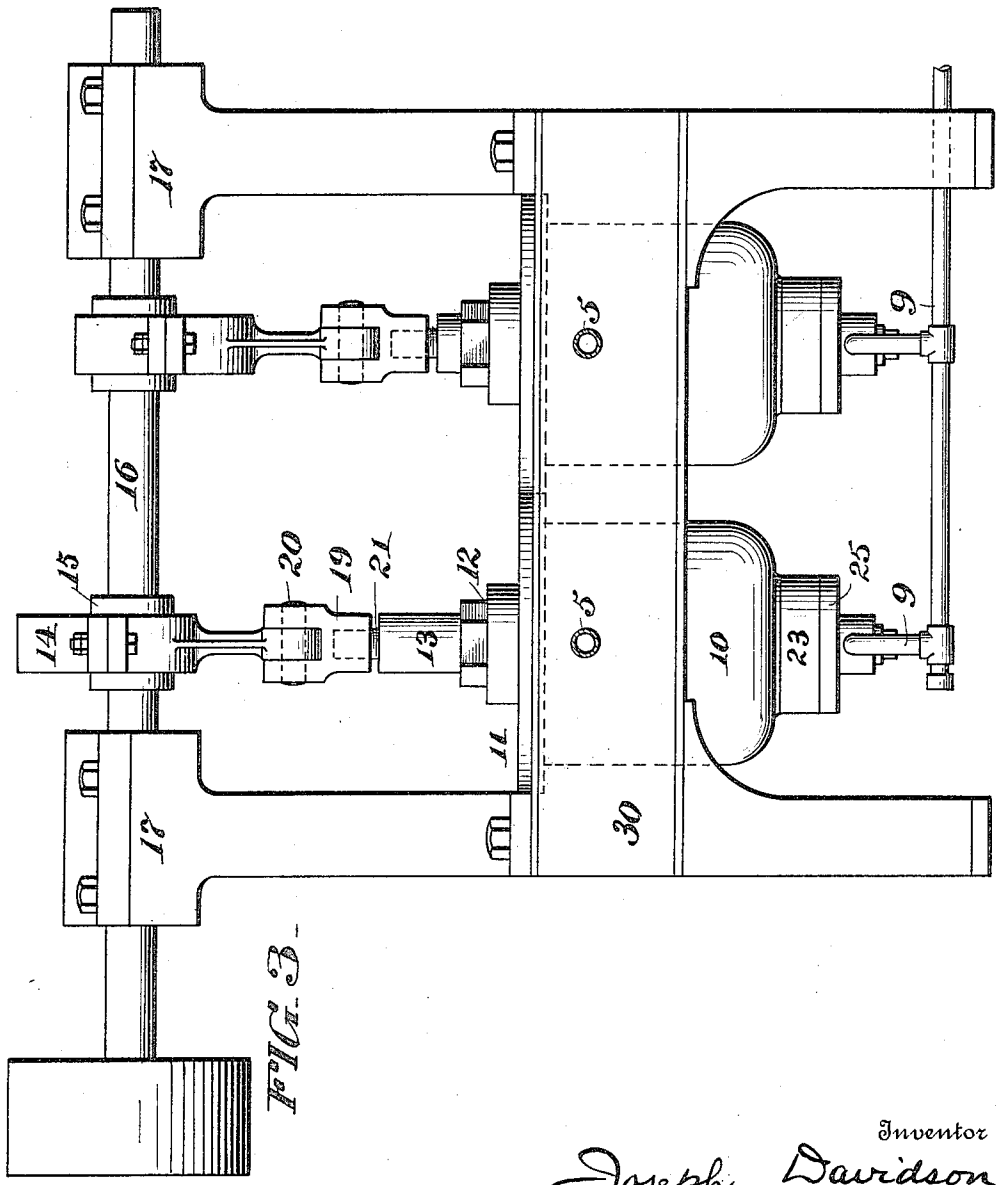


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UNITED STATES PATENT OFFICE.

JOSEPH DAVIDSON, OF EAST POINT, GEORGIA, ASSIGNOR OF ONE-HALF TO AMERICAN MACHINE & MANUFACTURING COMPANY, A CORPORATION OF NORTH CAROLINA.

PUMPING DEVICE.

1,075,406. Specification of Letters Patent. Patented Oct. 14, 1913.

Application filed March 23, 1912. Serial No. 685,710.

To all whom it may concern:

Be it known that I, JOSEPH DAVIDSON, a citizen of the United States, and resident of East Point, county of Fulton, and State of Georgia, have invented an Improvement in Pumping Devices, of which the following is a specification.

My invention has reference to pumping devices, and consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings which form a part thereof.

The object of my invention is to provide a suitable construction of pump for returning water of condensation from heating systems, or other sources of water of condensation, to the steam boiler or other place of reception against a higher pressure than that at which the water of condensation exists at the time it is delivered to the pump.

More particularly, my object is to provide a simple form of pump which is positive in action and durable in use, and is capable of delivering water and vapor against a high boiler pressure without becoming air bound.

My invention consists of a closed receiving chamber into which the water of condensation and vapor are received, said chamber being provided at its lower part with a cylinder having communication with the interior of the chamber, and having its bottom fitted with an eduction valve through which the water is forced for delivery to the boiler or other place, combined with a plunger working in the cylinder and with a lower part shaped to fit the lower portion of the cylinder adjacent to the eduction valve, whereby practically all clearance is eliminated when the plunger is at the bottom of its stroke, and whereby the water of condensation may freely pass into the cylinder when the plunger is at the upper part of its stroke, the said plunger extending upwardly through a stuffing-box in the receiving chamber above the water level therein, and power means for reciprocating the plunger; also the said mechanism, when provided with means for adjusting the downward throw of the plunger for regulating the minimum clearance desired between the end of the plunger and the cylinder.

My invention also comprehends details of construction which, together with the features above specified, will be better understood by reference to the drawings, in which:—

Figure 1 is a diagrammatic view illustrating a steam heating system with my improvements applied thereto; Fig. 2 is a sectional elevation of my improved pumping device; and Fig. 3 is a side elevation of the same.

While I have shown my invention as applied to a steam heating system, by way of illustration of its adaptability to meet the requirements of such a system, I do not restrict myself to any particular use of my pump, but refer to this special example of its use for illustrating the advantages and utility of the pump which is fully illustrated in Figs. 2 and 3.

Referring to Fig. 1, 2 is a steam boiler from which steam may be supplied through the usual reducing valve to the supply pipe 3 leading to the radiators 4. The water of condensation from the radiators may return by return pipes 5 and be delivered into the receiving chambers of the pump mechanism 6, from which it is pumped through the discharge pipe 9 and delivered again to the boiler 2. The heating system may be of any of the usual constructions and supplied with live steam or exhaust steam, or the latter supplemented with live steam, as is customary, but the water of condensation, in any event, is returned to the boiler by my improved pumping devices. In connection with the particular steam heating apparatus shown by way of example, a partial vacuum is maintained in the return pipes by means of a vacuum pump 7 and pipes 8 connecting the vacuum pump with the respective return pipes 5. While this presence of a partial vacuum is immaterial to my invention, I have shown means for providing such partial vacuum in the return side of a heating system to more fully demonstrate the utility of my invention, because in this case, the receiver 10 of the pumping device 6 may contain a pressure less than that of the atmosphere, while the delivery side of the pumping mechanism contains the boiler pressure which may be one hundred pounds, for example.

I will now refer to the details of con-

struction of my improved pumping mechanism which are more fully shown in Figs. 2 and 3. 10 is a receiver, which is closed at the top by a cover 11 having a stuffing-box 12 provided therein. This receiver is supported upon a suitable frame or stand 30. Secured to the lower part of the receiver is a cylinder 23, and attached to the bottom of the cylinder is a head 25 containing the eduction valve 27 which is spring pressed upward by means of a spring 28. The valve chamber of this head communicates with the discharge pipe 9, leading to the boiler. Bolts 24 clamp the head 25 and cylinder 23 tightly to the bottom of the receiver 10. If desired, the receiver, the cylinder and its head may be made integral, but it is more satisfactory to make them in separate parts and bolt them together, both for economy of construction and facility of repair. 13 is a plunger which extends through the stuffing-box 12 and guided thereby, and has its lower end working in the cylinder 23. The lower end of the plunger 13 is provided with packing rings 22, which form a substantially tight sliding fit with the interior surface of the cylinder 23. The bottom of the plunger 13 is made flat to form a close fit to the flat surface of the cylinder head adjacent to the eduction valve. As the plunger is shown in Fig. 2, it is at the top of its stroke, and the cylinder 23 is provided with lateral ports 26 through its wall immediately below the bottom of the plunger when in this position, the said ports opening from the lower part of the receiving chamber 10. The water of condensation, from the steam heating or other source, is delivered into the receiving chamber 10 by the pipes 5, which communicate therewith above the normal water level therein.

Arranged above the supporting frame 30 are bearings 17, in which a shaft 16 is journaled and adapted to be rotated by a belt wheel 18 or other means. The shaft 16 is provided with eccentrics 15 upon which are arranged the eccentric straps 14. Pivoted to the eccentric straps at 20 are heads 19 in which are screwed, at 21, the upper ends of the plungers 13. It will be understood that as the eccentrics are rotated, the plungers are reciprocated, and during such reciprocation are guided both in the cylinders and in the stuffing-boxes. The throw of the eccentrics may be in opposite directions, as indicated in Fig. 3, so as to more satisfactorily distribute the load on the revolving shaft 16, but I do not restrict myself in this respect; and furthermore, this particular feature would depend upon there being a plurality of the pumping devices. For operating against a high pressure, such as a boiler pressure, it is important that there shall be very little clearance between the bottom of the plunger and the cylinder head and up to the eduction valve, and I therefore provide the adjusting screw connection 21 between the plunger 13 and the head 19 which will enable me to reduce this clearance to a minimum and to compensate for any wear which takes place in the pivot 20 or between the eccentric and eccentric strap. The play in the upward direction is of less importance, and hence the adjustment to be compensated for may be confined to the clearance of the plunger at the bottom of its stroke.

In the operation of my improved pumping device, it will be understood that the water of condensation delivered to the receiver 10 will rapidly rush through the ports 26 into the cylinder 23 when the plunger 13 rises sufficiently to open the ports, as indicated in Fig. 2. The passage of the water into the cylinder will be made positive by reason of the fact that the rise of the plunger creates a partial vacuum within the cylinder and thereby induces a rapid flow of the water from the receiver into the cylinder below the plunger. As the plunger 13 closes the ports at the initial movement in its downward stroke, it is evident that the water which is confined below the plunger and within the cylinder can only escape by way of the eduction valve 27, and against the pressure existing in the pipe 9. As the clearance is reduced to a minimum, it is evident that whatever vapor or steam supplements or is entrapped by the water of condensation, said vapor is condensed by the pressure under which it is compressed and is driven out through the eduction valve together with the water of condensation supplied to the cylinder as such. By reason of this operation and the provision of a minimum clearance at the time that the plunger is forced fully down, the liability of the pump becoming steam or air bound, when pumping against a high pressure, is eliminated and hence the pump operates with regularity in the performance of its duty in removing the water of condensation from the system and delivering it against the boiler pressure. The receiver 10 performs the function of a hotwell for receiving the condensation water so that the pump will be provided with a continuous supply of fluid irrespective of the irregularity of the delivery of condensation water into the receiver. For this reason, the capacity of the pump may be reduced to a minimum and hence smaller power will be required to keep it in operation. Furthermore, it will be seen that as the receiver may be made air tight, the pressure therein may be below atmospheric pressure, as would occur in the employment of my invention in vacuum systems of steam heating. By employing a plurality of these pumps operated from a common shaft, it is evident that the condensations from different parts

of the heating or other system, or from different systems may be separately handled so as not to interfere with or affect the operative conditions of each and yet all the pumps be delivering to the same boiler and operated by the same common power. Furthermore, by operating several pumps from the same shaft the resistances may be so distributed that only one pump is at any moment putting the full load upon the operating means.

Referring more specifically to the advantages of the construction of my improved pumping mechanism, I would point out the following advantages: The clearance between the plunger and the cylinder, when the plunger has completed its discharge stroke, is entirely cut out, thus insuring a positive discharge of all water or steam which may have filled the cylinder, said discharge having capacity to overcome the resistance of the boiler pressure; this prevents the pumps becoming steam or air bound and insures regularity in its action in removing all condensation from the systems to be drained. The location of the intake port near the top of the cylinder and immediately under the bottom of the plunger at the completion of its upward stroke, gives ample provision for filling the cylinder from the receiver, and as these ports are at the bottom of the receiver, the latter may be fully drained under positive discharge by the pump; this provision for supplying the cylinder with the water of condensation permits the pump to have only one movable valve, namely, that constituting the discharge valve 27. By eliminating intake valves, there are no obstructions by way of valves or checks or irregular passages provided, thereby to restrict the free flow of fluid into the cylinder, and consequently my improved construction enables the filling of the cylinder with condensation water upon the rising of the plunger to be more positive than where such valves would be employed, and also reduces the amount of wear which comes upon the structure; the rising of the plunger produces a vacuum within the cylinder and which, when the ports 26 are uncovered, acts to cause a rapid inrush of water of condensation to quickly fill the cylinder below the plunger. The provision of the plunger cylinder at the bottom of the receiver and with the upper end of said cylinder opening into the interior of the receiver, allows any water which may pass upward between the plunger rings and the cylinder to return directly into the receiver, making it unnecessary to provide a very tight packing at this point, and thereby cheapening the construction without impairing the efficiency of the device for the purpose for which it is intended. The packing around the upper end of the plunger, where it passes through the top of the receiver, being placed entirely above the pump cylinder and away from the water of condensation, it is not affected by the high pressure which would come upon it were it placed at the top of the plunger cylinder 23, and hence the usual trouble of keeping the packing tight and free from leaks is overcome; furthermore, the placing of the stuffing-box at a considerable distance above the pump cylinder provides guiding portions for the plunger at considerable distances apart and thereby insures accurate reciprocation of the plunger without undue wear upon said guiding portions. Provision being made to enable the coöperation of the plunger with the bottom of the cylinder to be such as to maintain the minimum clearance at the bottom of the discharge stroke irrespective of the wear which may come upon the eccentrics or operating portions, insures the positive action of the pump in its function as a pump discharging against an outside pressure without air binding. The arrangement of this pump mechanism with a plurality of receivers and a cylinder and plunger in each receiver, and all plungers operated by one power shaft, enables the draining of as many systems or portions of a system, respectively carrying different pressures, as there are plungers, the said plungers and cylinders insuring discharge through one common pipe to the boiler which may carry any pressure above that of the systems being drained.

While I have shown eccentrics and eccentric straps for operating the plungers from the common shaft, it is to be understood that these constitute in effect the equivalent of cranks having large crank bearings, and that it is also to be understood that any other means of operating these plungers from a common shaft may be employed in lieu of the particular means shown by way of example. It is also to be understood that while I have illustrated the use of my invention in connection with a vacuum steam heating system, for disclosing a general application of the invention, my improved pumping devices may be employed in connection with the draining of the cooking systems in oil mills, and returning the condensation without material loss of heat to the boilers, or may be used for any other system or purpose wherein condensation water is to be removed from a system, whether returned to the boiler or elsewhere.

While I prefer the constructions of the pumping mechanism shown, as being well adapted for the requirements of my invention, I nevertheless do not restrict myself to the details, as these may be modified without departing from the spirit of the invention.

Having now described my invention, what

I claim as new and desire to secure by Letters Patent, is:—

1. In a machine of the character described, the combination of an inclosed receiver provided at the top with a stuffing-box having a gland acting as a guide and at the bottom with a cylinder extending above and below the lowest part of the interior of the receiver said cylinder having constantly open ports through its side walls adjacent to the bottom of the receiver and an eduction port opening from the bottom of the cylinder, a check valve in said eduction port to permit the discharge from the cylinder but prevent back flow thereto, a vertical plunger forming a close sliding joint through the stuffing-box and gland and having its lower part guided in the cylinder, said plunger shaped to be capable of being withdrawn from the cylinder through the stuffing-box and its gland without opening the receiver, and power devices arranged above the receiver and its stuffing-box and jointed to the upper end of the plunger for reciprocating the plunger, the gland of the stuffing-box taking the lateral and oblique thrust of the plunger due to the operation of the power devices.

2. In a machine of the character described, the combination of an inclosed receiver provided at the top with a stuffing-box having a gland acting as a guide and at the bottom with a cylinder extending above and below the lowest part of the interior of the receiver said cylinder having constantly open ports through its side walls adjacent to the bottom of the receiver and an eduction port opening from the bottom of the cylinder, a check valve in said eduction port to permit the discharge from the cylinder but prevent back flow thereto, a vertical plunger forming a close sliding joint through the stuffing-box and gland and having its lower part guided in the cylinder, said plunger shaped to be capable of being withdrawn from the cylinder through the stuffing-box and its gland without opening the receiver, a head adjustably screwed upon the upper end of the plunger, a transverse shaft, an eccentric secured to the shaft, an eccentric strap operated by the eccentric and hinged to the head and by which the plunger is reciprocated, the adjustment between the head and the plunger arranged to adjust the distance from the bottom of the plunger to the axis of the shaft whereby the lower end of the plunger may be adjusted in respect to the closeness of its approach to the bottom of the cylinder.

3. In a machine of the character described, a receiver for fluid having a guiding stuffing-box at its upper part combined with a cylinder fitting through the bottom part of the receiver and extending up into the same and having transverse openings through its side walls adjacent to the bottom of the receiver, a cylinder head bolted to the bottom of the cylinder and to the receiver and having a valve controlled eduction port, a cylindrical plunger guided through the stuffing-box at the top of the receiver and having a packing ring around its lower end and guided in the cylinder, and power devices above the receiver and stuffing-box for reciprocating the plunger.

In testimony of which invention, I hereunto set my hand.

JOSEPH DAVIDSON.

Witnesses:
R. W. Hicks, Jr.,
A. D. Kennedy.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."