

April 29, 1930.

I. C. JENNINGS

1,756,595

DUPLEX WET VACUUM PUMPING APPARATUS

Filed Sept. 6, 1927

5 Sheets-Sheet 1

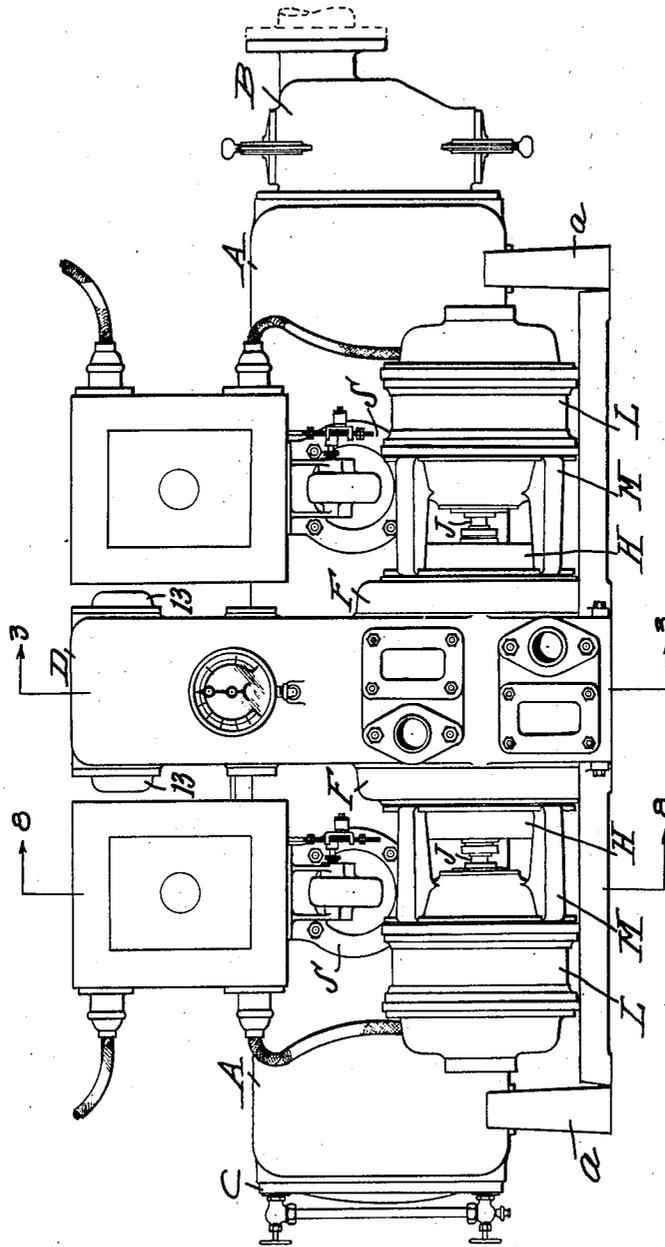


Fig. 1.

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5 Sheets-Sheet 2

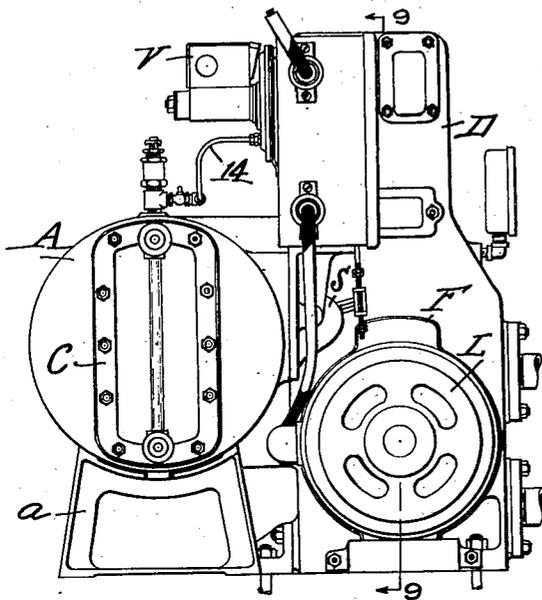


Fig. 2.

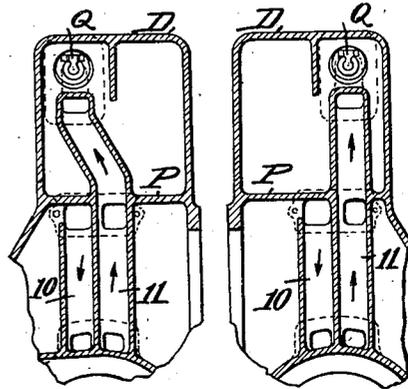


Fig. 4.

Fig. 5.

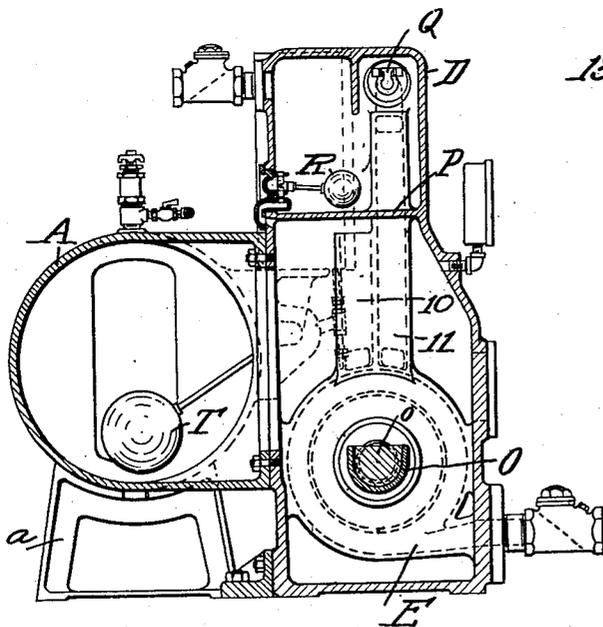


Fig. 3.

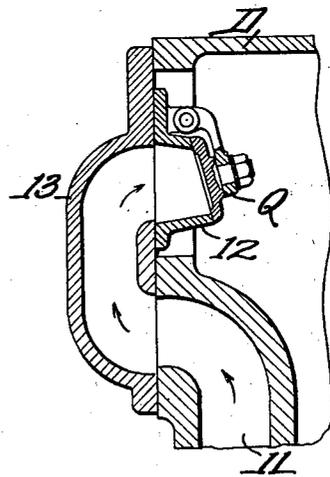


Fig. 6.

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5 Sheets-Sheet 3

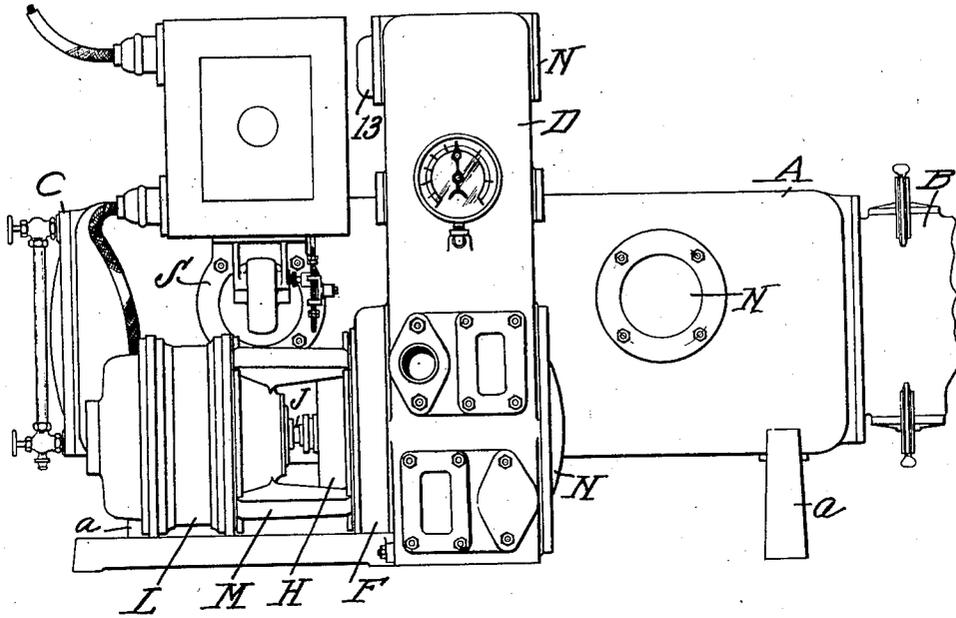


Fig. 7.

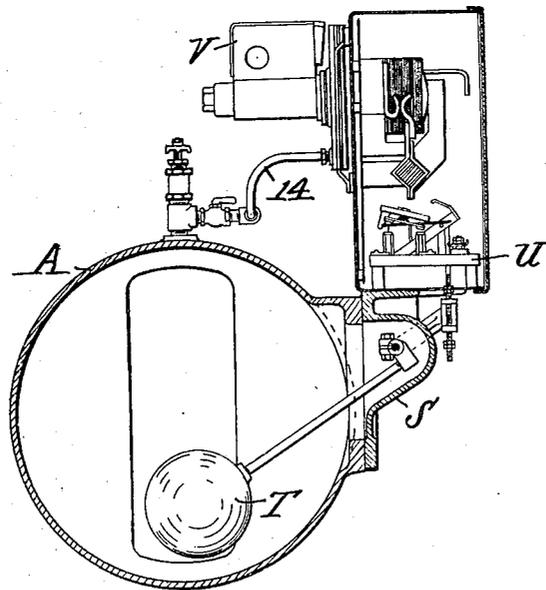


Fig. 8.

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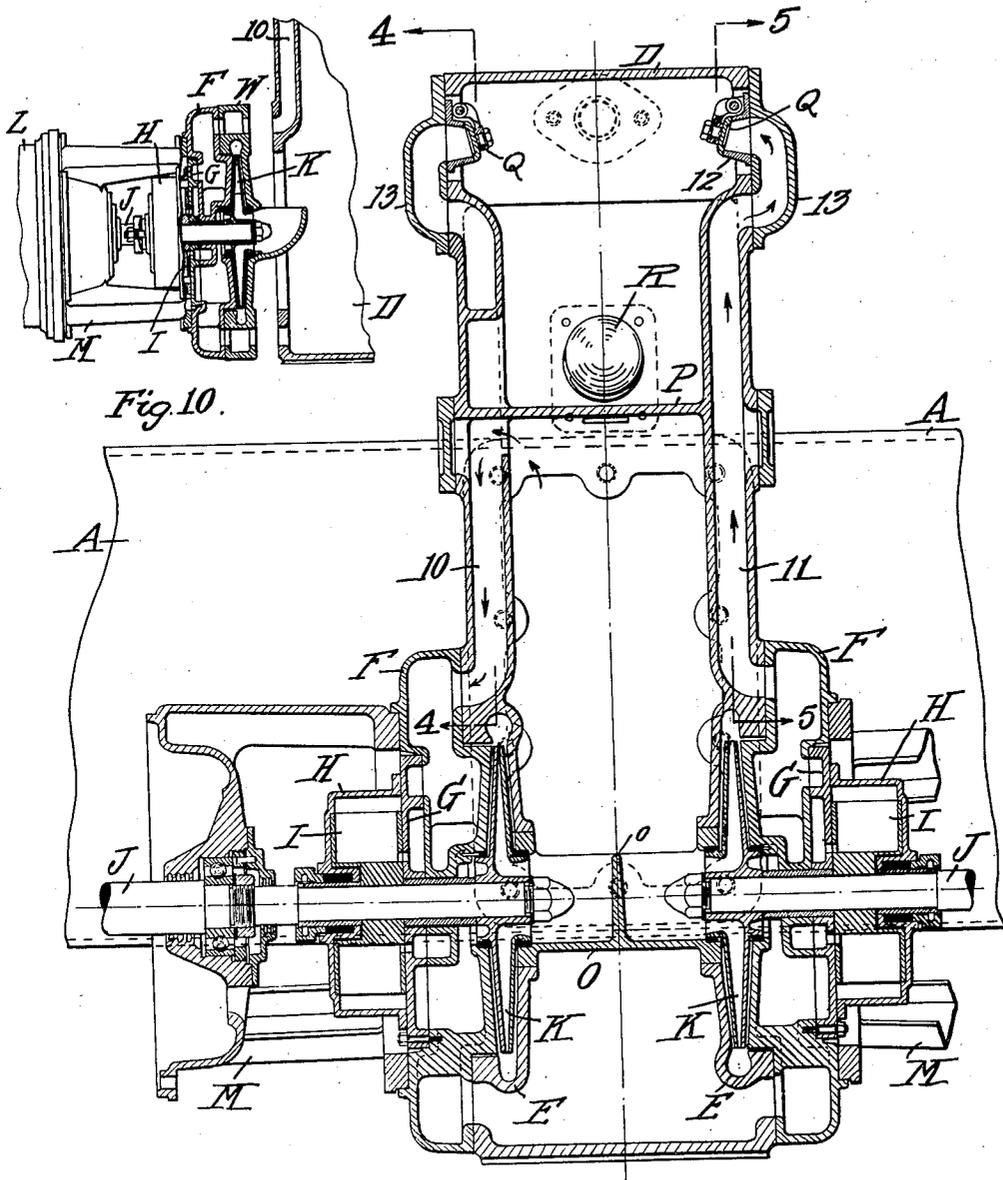


Fig. 10.

Fig. 9.

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5 Sheets-Sheet 5

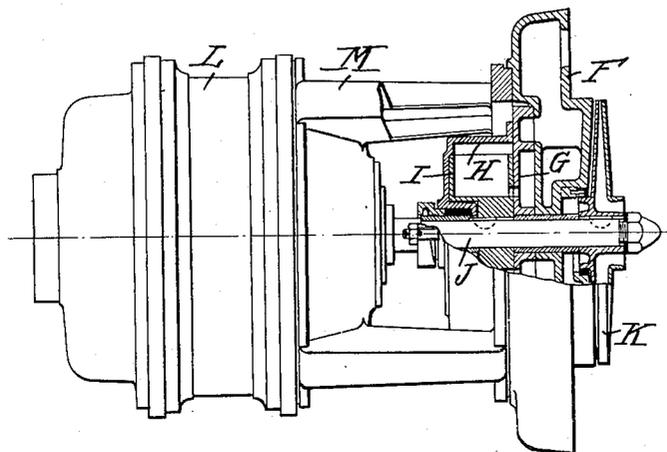


Fig. 11.

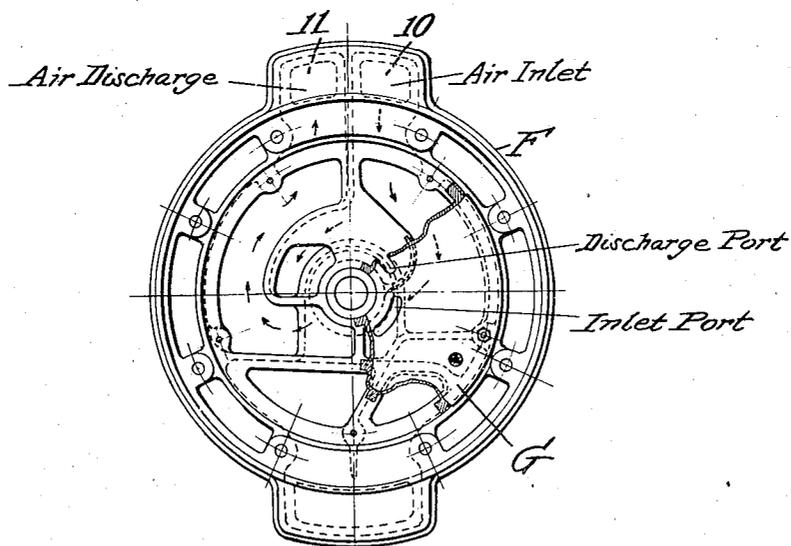


Fig. 12.

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# UNITED STATES PATENT OFFICE

IRVING C. JENNINGS, OF SOUTH NORWALK, CONNECTICUT

## DUPLEX WET VACUUM PUMPING APPARATUS

Application filed September 6, 1927. Serial No. 217,671.

The object of this invention is to improve the wet vacuum pumping apparatus shown and described in Letters Patent of the United States, No. 1,592,024, granted to me July 13, 1926. In said patent is shown a wet vacuum pumping apparatus, consisting of a rigid base; a tank secured thereto; and an air pump and water pump secured to the side of the tank; and a motor for driving the pumps mounted on the base.

In an application for patent filed by me November 9, 1926, Serial No. 147,343, I have shown an improvement on said structure, which consists in securing the motor directly to the pump casing, which is secured to the side of the tank.

In said patent and in said application, a structure is shown, in which only a single pumping unit is employed. In some installations, it is desirable to arrange the apparatus so that, if wanted, two pumping units can be used in connection with a single tank, along the lines of the apparatus shown in United States Patent No. 15,637, reissued to me, June 26, 1923.

The particular object of this invention is to devise an apparatus along the lines of said Patent No. 1,592,024 and of said application Serial No. 147,343, which will enable me to use the apparatus either with a single pumping unit, or, if desired, with two pumping units so that the apparatus is capable of use either as a single or duplex pump.

To this end the invention consists in providing a large receiving or storage tank and a smaller forwardly extending supplemental receiving tank connected therewith, to either or both sides of which supplemental storage tank a pumping unit can be secured. Each pumping unit consists of a casing carrying a motor, a rotary air pump, and the impeller of a centrifugal water pump, so assembled that these parts can be attached as one structure to the side of the supplemental tank.

The invention further consists of the details and arrangements hereafter described, which lead to economical manufacture and simplification in operation.

The invention is illustrated in the accompanying five sheets of drawings, in which

Fig. 1 is a front elevation of the complete duplex apparatus;

Fig. 2 is a left-hand end elevation relatively to Fig. 1;

Fig. 3 is a cross-sectional elevation on the line 3—3 of Fig. 1;

Figs. 4 and 5 are sectional views on lines 4—4 and 5—5 of Fig. 9, showing the passages inside of the supplemental tank;

Fig. 6 is a detail of one of the check valves, which prevents back-flow of the air and gas exhausted from the system;

Fig. 7 is a partial front elevation illustrating the construction when the apparatus is used with only one pumping unit;

Fig. 8 is a cross-sectional elevation on the line 8—8 of Fig. 1;

Fig. 9 is a cross-sectional elevation, on an enlarged scale, taken on the line 9—9 of Fig. 2;

Fig. 10 is a partial view similar to Fig. 9, illustrating a slight difference in volute construction;

Fig. 11 is a front elevation illustrating the unit motor and pump construction, and

Fig. 12 is a front elevation illustrating the air head and port plate taken on line 12—12 of Fig. 11 with the port plate partly cut away.

The invention will be best understood by a detailed description of the parts.

Referring to the drawings and in detail, "A" designates the receiving or separating tank in which the returns are received. If the apparatus is used in connection with a vacuum steam heating system, these returns comprise the water of condensation and air that may leak into the system and gas that may be formed therein. This tank "A" in preferred form consists of a horizontally arranged cylindrical body which can be made of any length desired. The ends of this tank are similar. To one end of this tank is attached a strainer or receiving pot "B", through which the returns are led. This construction provides a very low reception of the returns. A head "C" carrying a water gauge is secured to the other end of the tank. The parts "B" and "C" are interchangeable, that is, either part can be secured to either end of the tank for ease in piping.

The receiving tank "A" is preferably supported on two small feet or saddles "a-a". By this construction the receiving pot and return pipe can be set low.

A supplemental receiving tank "D" is secured to the front of the tank "A". The front of the receiving tank "A" is finished and the back of the supplemental tank "D" is also finished, and the two tanks are secured together by bolts or screws as shown in Fig. 3. This supplemental tank "D" rests on the floor or foundation.

By this construction of saddles and supplemental tank "D," substantially a three-point support of the entire apparatus is obtained, which prevents warping.

The sides of the supplemental tank "D" are milled or planed off, and the supplemental tank is provided with passages hereinafter described.

In the construction shown in Fig. 9, volutes "E" for the impellers of the water pumps are cast in the tank.

One of the pump units is illustrated in Fig. 11. The same consists of an air head "F," which fits on to the side of the supplemental tank "D". This air head carries a port plate "G," to which is secured the casing "H" of the air pump. This air pump consists of a rotor "I" having displacement chambers eccentrically arranged in said casing "H" to make up a pump of well known construction and similar to that illustrated in Figs. 3 and 11 of said Patent No. 1,592,024. The rotor "I" is secured on a shaft "J" passing through the air head "F." The impeller "K" of the water pump is secured on the end of this shaft "J." The shaft "J" passes through a stuffing box on the side of the casing "H." An electric motor "L" is carried by a frame or bracket "M," which is secured to the air head "F." By this arrangement a unit construction is provided which is illustrated in Figs. 10 and 11. This unit construction can be applied to either side of the supplemental tank "D".

If desired, only one of these motor and pump units can be applied to the supplemental tank "D" and plates "N" are secured to the other side of the supplemental tank "D," as illustrated in Fig. 7. This arrangement permits the installation of the apparatus with only a single pumping unit, and permits the installation of a duplex unit if the single unit does not carry the load or if the building in which the plant is employed is enlarged.

The unit pumping construction described provides a simple means by which replacements can be quickly made, because if any part needs repair or replacement, a new unit can be quickly installed and the parts of the removed unit, either motor or pumps, can be adjusted and gone over at leisure.

A dam "O" is placed in position between the two volutes. This dam consists of a cast-

ing "O" having a central rib "o" arranged so that a body of water will be trapped at the inner end of each pump unit and so that if only one pump is operating the water inlet to the other pump will be trapped, and so that the operating air rotor always will be provided with sealing water.

It is necessary in some structures, where the water pumps are to deliver against high head to machine the volutes, and when this is necessary, the volutes are preferably made in separate parts as shown in "W" in Fig. 10 and secured to the side of tank "D".

It is not necessary to describe all of the passages and detailed operation in view of the disclosures in my prior patent and application previously referred to.

The supplemental tank "D" is divided into an upper and lower section by cross partition "P". The lower section only of the supplemental tank is in communication with the receiving tank "A".

The device operates substantially as follows, reference being had in the first instance to the left-hand pumping unit shown in Fig. 9.

When the left-hand pumping unit is in operation the air or gas, which has accumulated in the top of the lower part of supplemental tank "D", and tank "A" is drawn down through a passage 10 into the air head "F" by the operation of the pump, and is forced or driven into the upper part of the supplemental tank "D" through a passage 11. The connection of the air outlet passage 11 to the upper part of the supplemental tank "D" is controlled by check valve "Q", arranged as illustrated in Fig. 6. This check valve "Q" is pivoted to a seating 12, which is secured to a head 13 having a passage therethrough, the passage 11 being carried to the outside of the tank "D." By removing head 13 and the attached seat 12 of check valve "Q," the check valve can be got at for cleaning, inspection or repair without disconnecting any other part. In some instances, the passages 10-11 and 13 are cast in a plate secured to the side of the tank, instead of being formed in the sides of the tank and a single small head.

The water in the supplemental tank "D" passes through the dam "O" to the impeller "K" and is forced outwardly through the outlet passage which has a check valve. The passages on the other side of the supplemental tank "D" are arranged at rights and lefts relatively to the passages on the left-hand side as shown in Figs. 4 and 5, so that the same unit pump construction can be applied to either side of the supplementary tank "D".

Each air head "F" is provided with a passage so that the rotary air pump is properly primed with water, substantially as described in my prior Patent No. 1,592,024, and with a branch passage so that the side of the im-

pellor towards the air pump is relieved from water pressure.

A float "R" and valve controls a passage or by pass between the upper and lower portions of the supplemental tank "D" to permit any water carried up with the discharge air and gas to separate and return to the lower portion of the supplemental tank "D," as shown and described in my prior patents.

If it is desired automatically to control the starting and stopping of the apparatus, the construction shown in Fig. 8 preferably is employed. A head "S" is secured to the front of the tank "A" over an opening extending into the same. A float "T" is secured on a shaft journaled in said head "S," said shaft extending outside of the said head and carrying an arm connected to control an electric switch "U," which controls a starter for a motor. The top of the tank "A" is connected by a pipe 14 to a vacuum regulator "V," which also controls the starter. The box containing the electric switch and starter is placed on top of the head "S." The starter is connected by suitable cable to the motor, and the power cable is brought to the box as shown in Fig. 1. These cables preferably are arranged so as to plug into the side of the box so that they can be connected and disconnected very readily.

A float and electrical cut-out is preferably arranged in connection with each motor when the apparatus is made in duplex form. When two floats and two electrical controls, are employed by setting one float a little higher than the other, the lower float can be used to control one pumping unit and motor, and the other unit can be kept out of operation except in cases where a heavy load is put upon the apparatus which one pumping unit cannot handle. In this instance, when the water rises in the tank faster than it can be taken care of by one pumping unit the other pumping unit will be cut into operation and take care of the abnormal load.

When the apparatus is made in duplex form the two water outlets can be carried back to the boiler, or the two outlets can be connected together and a single pipe led to the boiler.

The details and arrangements shown and described may be greatly varied by a skilled mechanic without departing from the scope of my invention as expressed in the claims.

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

1. A tank construction for a wet vacuum pumping apparatus adapted to have a pumping unit secured thereto comprising a horizontally extending receiving tank for the returns, and a forwardly extending smaller supplemental receiving tank connected therewith to either or both sides of which a pumping unit can be secured.

2. A tank construction for a wet vacuum pumping apparatus adapted to have a pumping unit secured thereto comprising a horizontally extending receiving tank for the returns, two saddles for supporting this tank, and a forwardly extending smaller supplemental receiving tank connected therewith to either or both sides of which a pumping unit can be secured, the supplemental tank resting on the floor or foundation, whereby substantially a three point support of the entire apparatus is obtained.

3. A tank construction for a wet vacuum pumping apparatus adapted to have a pumping unit secured thereto comprising a horizontally extending receiving tank for the returns, a strainer or receiving pot attached to one end of this tank and a forwardly extending smaller supplemental receiving tank connected therewith to either or both sides of which a pumping unit can be secured.

4. A tank construction for a wet vacuum pumping apparatus adapted to have a pumping unit secured thereto comprising a horizontally extending receiving tank for the returns, a strainer or receiving pot attached to one end of this tank, a head carrying a water gage secured to the other end of the tank, the receiving pot and said head being interchangeable so that either can be secured to either end of the tank and a forwardly extending smaller supplemental receiving tank connected therewith to either or both sides of which a pumping unit can be secured.

5. A tank construction for a wet vacuum pumping apparatus adapted to have a pumping unit secured thereto comprising a horizontally extending receiving tank for the returns, and a forwardly extending smaller supplemental receiving tank connected therewith to either or both sides of which a pumping unit can be secured, the sides of the supplemental tank having suitable air passages adapted to establish communication between said tank and the pumping unit.

In testimony whereof I have hereunto affixed my signature.

IRVING C. JENNINGS.