

No. 870,981.

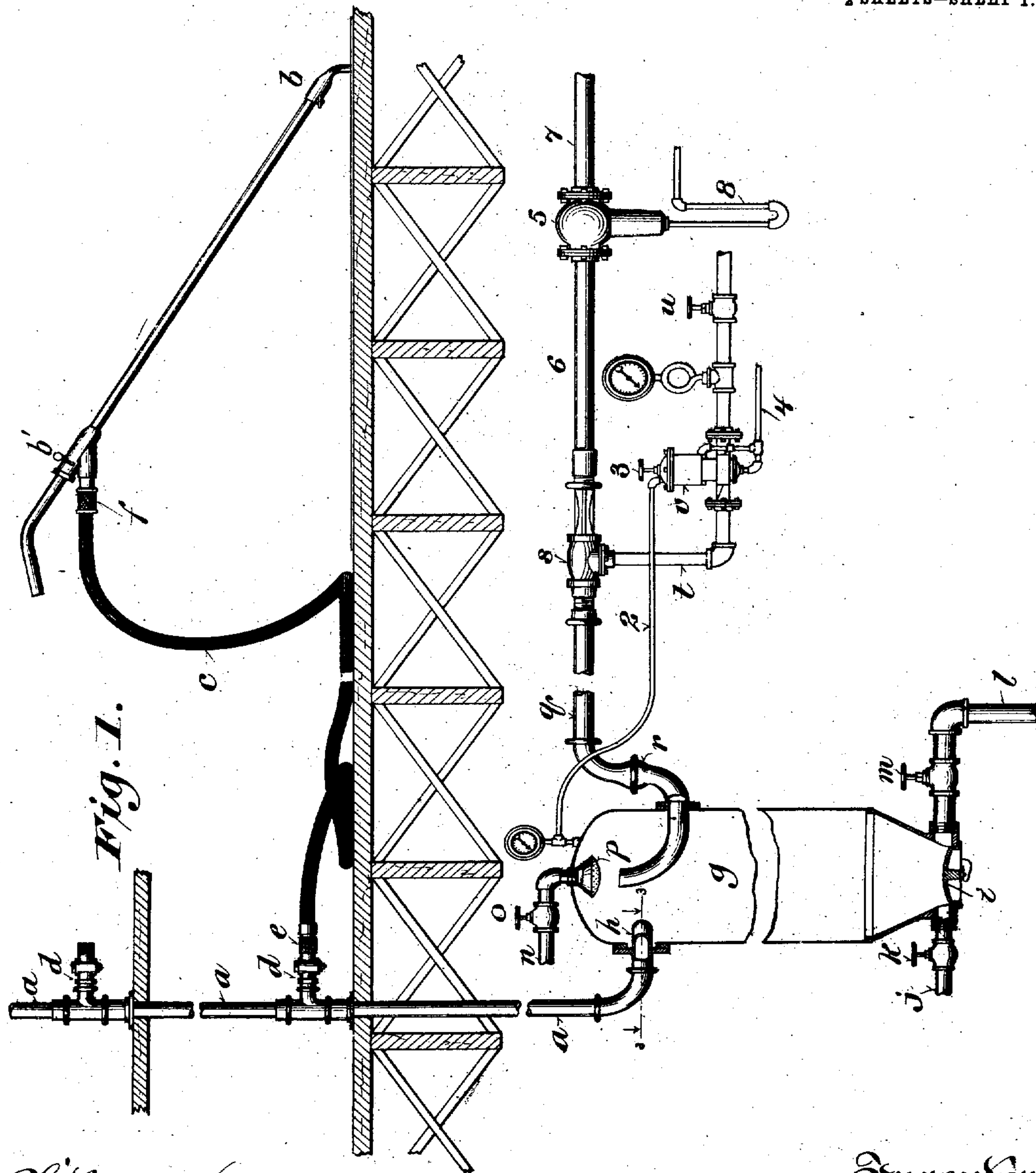
PATENTED NOV. 12, 1907.

F. J. MATCHETTE & R. RADDATZ.

VACUUM CLEANING SYSTEM.

APPLICATION FILED JAN. 15, 1906.

2 SHEETS—SHEET 1.



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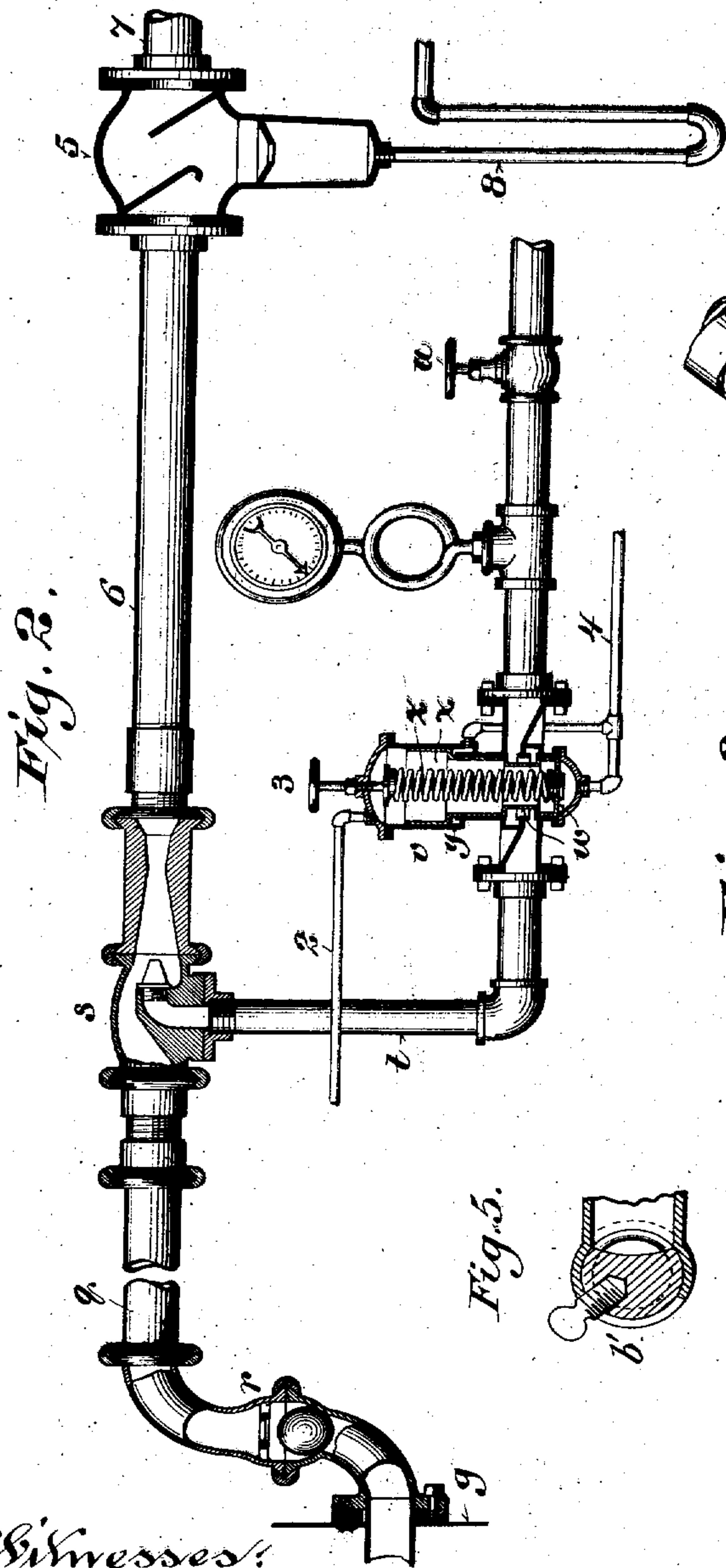


Fig. 2.

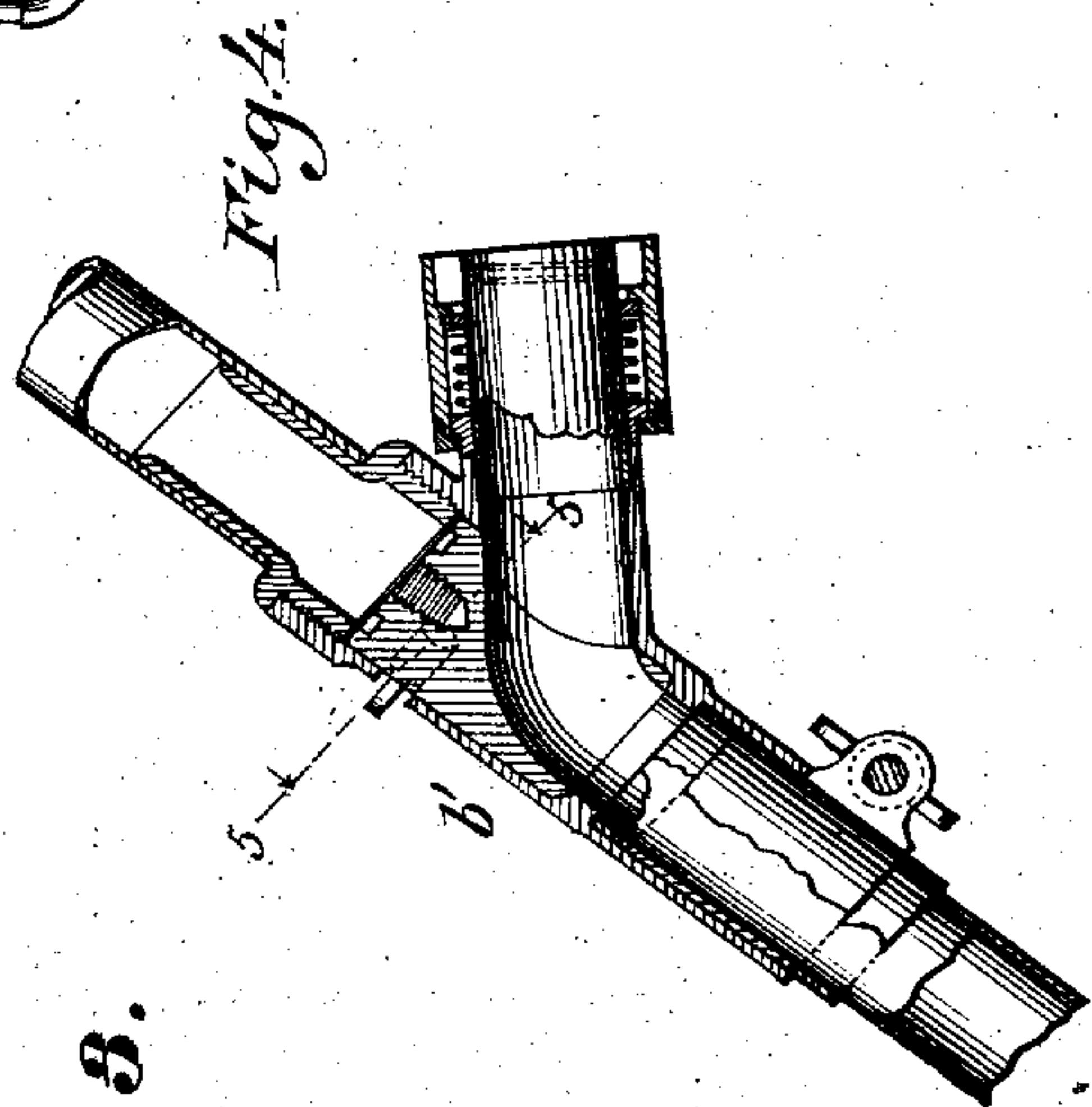


Fig. 4.

Fig. 3.

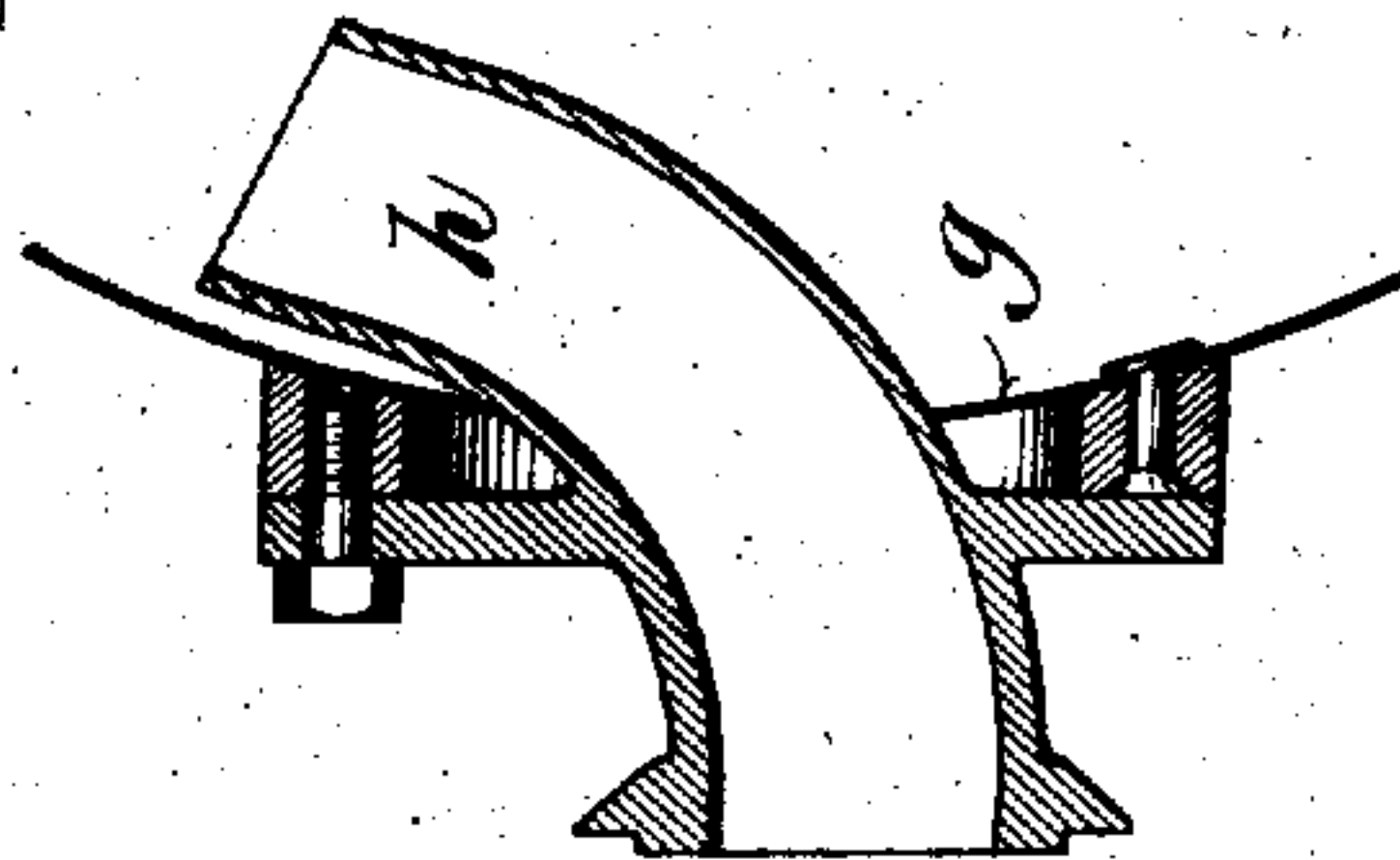
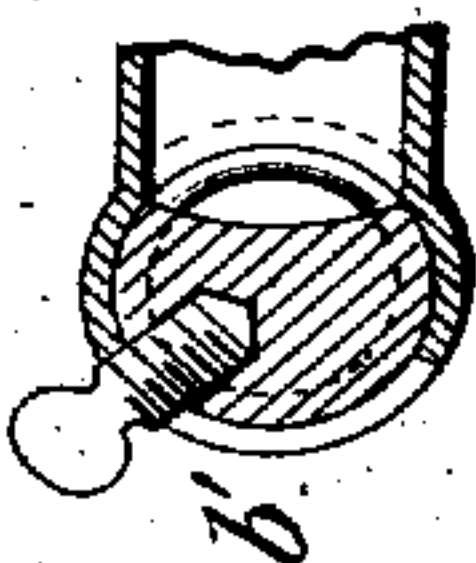


Fig. 5.



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UNITED STATES PATENT OFFICE.

FRANK J. MATCHETTE AND RICHARD RADDATZ, OF MILWAUKEE, WISCONSIN; SAID RADDATZ
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VACUUM CLEANING SYSTEM.

No. 870,981.

Specification of Letters Patent.

Patented Nov. 12, 1907.

Application filed January 15, 1906. Serial No. 296,089.

To all whom it may concern:

Be it known that we, FRANK J. MATCHETTE and RICHARD RADDATZ, citizens of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Vacuum Cleaning Apparatus, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

10 This invention relates to apparatus for removing dust and dirt from various articles such as carpets, furniture, floors, walls or the like. Its main objects are to simplify and improve the construction and operation of the vacuum-producing and controlling means; to
15 reduce the cost of apparatus of this class; to economize space and power in its installation and operation; to save time, labor, care and attention in the operation of the system and in keeping it in working order; to sterilize or render innocuous the air and any dust which
20 may be discharged therewith from the system into the outside air; and generally to simplify and improve the construction and operation of apparatus of this class.

The invention consists in certain novel features of construction and in the peculiar arrangement and combinations of parts hereinafter particularly described and pointed out in the claims.

25 In the accompanying drawing which illustrates only one of the various forms or embodiments of the invention like characters designate the same parts in the several figures.

30 Figure 1 is a general view partly in elevation and partly in vertical section of apparatus embodying the invention; Fig. 2 is a view on an enlarged scale partly in elevation and partly in vertical section of a part of the apparatus shown in Fig. 1; Fig. 3 is an enlarged
35 horizontal section on the line 3-3, Fig. 1; Fig. 4 is a longitudinal section on an enlarged scale of one of the controlling valves which are associated with the cleaning tools, and Fig. 5 is a cross section of the same on the
40 line 5-5, Fig. 4.

45 *a* designates a suction pipe or main with which the tools, implements or apparatus to be operated by the vacuum are connected. For example, as shown in Fig. 1, a sweeper, nozzle or suction head *b* is detachably
connected by a hose *c* with said pipe, which is provided at convenient points with stubs or branches, each
50 having a valve *d*. The various tools or implements used with the system, the branches of the suction main and the hose sections, are provided with couplings *e* and *f* for readily connecting and disconnecting them, and the several sweepers and other portable cleaning
implements are provided in or near their handles, as shown in Figs. 1, 4 and 5 with valve *b'* for more readily cutting them off from the suction main and thus pre-

venting waste of power whenever work is discontinued or one tool is changed for another.

The pipe *a* leads into the upper part of a primary dust separator *g*, in which it is provided with a tangential nozzle *h* or is bent as shown in Fig. 3, so as to give a vertical movement to the air and thereby facilitate the separation of the dust and dirt therefrom. The lower part of the separator is preferably conical or funnel shaped, terminating at the bottom in an opening which is provided with a door or closure *i* for affording access to the interior of the separator, and if desired, for removing from time to time the dust and dirt which collect therein.

For removing the dust and dirt without opening the door *i*, the separator is provided on one side near the bottom with a water supply pipe *j* having a valve *k*, and on the opposite side with a discharge pipe *l* having a valve *m*. Another water supply pipe *n* provided with a valve *o* is connected with the top of the separator and terminates therein with a rose or sprinkler head *p*, for loosening and washing down into the discharge pipe *l* the dirt and dust which are apt to cake and stick to the walls of the separator.

From the separator *g* a pipe *q*, having a check valve *r* which closes towards the separator, leads to an aspirator or ejector *s*. This check valve may however, be otherwise located, provided it is arranged to prevent back flow of air into the suction main when the aspirator is not in operation.

As shown in Fig. 1, the pipe *q* preferably opens upward into the central and upper part of the separator where the air is the least agitated and is freest from dust. The blast or jet nozzle of the aspirator is connected by a pipe *t* with a steam boiler or other source of fluid pressure, (not shown,) and this pipe is preferably provided with a valve *u* for manually shutting off the fluid pressure supply from the apparatus.

The supply of steam or other pressure medium to the aspirator is controlled by an automatic governor *v*, the operation of which is mainly controlled by the valves *b'* associated with the cleaning implements. As shown in Fig. 2, a form of governor suitable for the purpose consists of a valve *w*, formed or connected with an enlarged piston head *x*, and fitted therewith in a correspondingly shaped case *y*.

The valve and piston head are preferably made hollow and open at the larger end, to receive a long spiral spring *z*, which normally holds the valve open as shown in Fig. 2, so as to admit steam or other pressure medium to the aspirator. The piston chamber is connected at the end opposite the valve by a pipe *2* with the primary dust separator *g*, or with any other convenient part of the system in which a vacuum is to be maintained. A screw *3*, threaded in the case *y* at the end opposite the

valve *w*, serves to adjust the tension of the spring *z* so that the valve will be closed by any desired degree of vacuum.

A waste pipe 4, leading from the lower ends of the piston and valve chambers, carries off any water of condensation that may form therein and would otherwise interfere with the proper operation of the governor.

The use of a long spring *z* which is permitted by allowing it to extend through the piston head and valve without increasing the length of the governor, avoids any considerable variation in the tension of the spring within the limits of the movement of the valve and piston.

A secondary dust separator 5 for removing any fine dust that may be drawn with the air from the primary separator *g* and for separating water of condensation and dirt from the steam and air is preferably provided, and connected with the discharge of the aspirator *s* by a tube or pipe 6, which serves as a sterilizing and mixing chamber, as hereinafter explained.

From the upper part of the separator 5 an air and steam outlet pipe 7 leads into a chimney, stack or flue, or the air which has been sterilized and freed from dust and dirt may be discharged directly into the atmosphere.

A discharge pipe 8, preferably formed or provided with a trap, leads from the lower part of the separator 5 into a sewer or other convenient waste conduit.

The system operates as follows: The valve *u* being opened and steam or other fluid under pressure being admitted through the pipe *t* to the aspirator *s*, a vacuum or low pressure is produced in the apparatus and air with dust and dirt taken up or collected by one or more cleaning tools or implements *b*, is drawn through the suction pipe *a* into the separator *g* by the action of the steam or other pressure fluid in said aspirator. From the separator *g* the air, from which the coarse dirt and the greater part of the fine dust have been separated, is drawn through the pipe *q* and check valve *r* into the aspirator, from which it is discharged with the steam or other fluid employed to operate the aspirator. In case of a rise in the vacuum to the limit at which the governor *v* is adjusted to cut off the supply of steam or other fluid under pressure to the aspirator, by reason of a complete or partial stoppage of the admission of air into the pipe *a*, as for example, when work with a cleaning implement is discontinued or its connection with said pipe is cut off, or when an implement using more air is exchanged for one using less, the increased vacuum which results, acting on the valve *w* and piston head *x*, closes said valve, cuts off the supply of steam or other pressure fluid to the aspirator and thereby effects a saving in power according to the extent of the suspension or reduction of work. When the operation of the aspirator is stopped, the check valve *r* closes, thereby preventing reduction and waste of vacuum on account of the back flow of air through the aspirator into the primary separator *g* and suction main *a*, and while the aspirator remains inactive and the check valve closed, the dust and dirt entrained with the air flowing into said main from a cleaning implement which continues in operation will be deposited in or drawn towards said separator, which thus serves as a low pressure reservoir as well as a dust separator and dust receptacle. Whenever as the result of the normal opera-

tion of the apparatus or as the result of leakage, the pressure falls to the limit at which the governor is adjusted to admit steam or other pressure medium to the aspirator, the spring *z* opens the valve *w*. The aspirator is thus started and continues to operate until the pressure rises to the limit at which the governor is adjusted to close said valve. The aspirator will thus be automatically stopped and started at varying intervals while one or more cleaning implements are in use, and will continue in operation, consuming steam or fluid under pressure, for longer or shorter periods according to the varying demands upon the system. For example, in a plant having an aspirator designed by continuous operation to keep a certain number of sweepers at work simultaneously, if half that number are cut out by closing the controlling valves *b'*, the aspirator will be in service approximately only half the time. In like manner in a five sweeper plant the aspirator will have to operate but one-fifth of the time to maintain the required vacuum for the continuous operation of a single sweeper. It will be seen, therefore, that the action of the governor which controls the consumption of power for the operation of the vacuum producing means is itself controlled by the valves *b'* which are associated with the cleaning implements and are constantly at hand.

The limits at which the governor acts to stop and start the aspirator are varied for maintaining a higher or lower pressure by the adjustment of the screw 3 which controls the tension of the spring *z*.

The dust and dirt collected in the lower part of the separator *g* may be removed from time to time by opening the door *i* or preferably without opening the door by opening the valve *m* and either or both of the valves *k* and *o*. In the latter case the water admitted into the separator through either or both of the pipes *j* and *n* loosens and washes the dirt and dust into the discharge pipe *l*, which conducts them off into a sewer or other convenient conduit or receptacle.

Any dust which may be drawn from the primary separator *g* into the aspirator is carried with the steam or other sterilizing medium which is preferably employed to operate the aspirator, into the mixing tube or chamber 6, where it is mixed and agglomerated or stuck together with the condensing steam. The air with whatever fine dust may be entrained therewith into the aspirator, coming into contact and mingling with the steam issuing from the nozzle of the aspirator, is thoroughly sterilized and rendered innocuous in its passage through the tube or chamber 6, from which it is discharged into the secondary separator 5. The fine dust thus stuck together with condensed steam, entering this separator, settles therein and is discharged through the pipe 8 into a sewer or other waste conduit or receptacle while the air and dry steam are discharged through the pipe 7 into a chimney or other flue, or may be discharged without harm or objection directly into the atmosphere.

The operation of the aspirator and of the dust separators requires little or no attention and care, except to open the valve *u* in case it is closed, and to remove the dirt and dust from the primary separator *g* from time to time.

In place of steam, other agents, such as air or gas, may be employed under pressure to operate the aspi-

rator, and for sterilizing the dust and air discharged from the system, the air, gas or other agent which operates the aspirator may be heated.

The apparatus as herein shown and described may be used without change for other purposes than cleaning by simply connecting the machine, apparatus or tool to be operated with the suction main *x*. It may be utilized for doing different kinds of work at the same time, as for example, it may be used when required for cleaning purposes and for operating elevator doors, heat regulating apparatus and the like.

When used for other purposes than, as well as for, removing dust and dirt, the primary separator *g* serves as a reservoir to prevent sudden or extreme fluctuations of pressure or vacuum in the system and the secondary separator serves to separate water from steam when used to operate the aspirator.

As will be readily understood by those skilled in the art, the embodiment of the invention herein disclosed is for illustrative purpose and to explain the salient features of the invention, the characteristics of which are pointed out in the claims.

We claim:

1. In a vacuum cleaning system, the combination of a suction pipe, vacuum producing means in connection with said pipe, and an automatic governor actuated by variations of vacuum in the apparatus to automatically control the action of the vacuum producing means.

2. In a vacuum cleaning system, a dust separator, a portable suction head in operative connection therewith, vacuum producing means connected with said separator and normally acting to produce a vacuum therein, and an automatic governor actuated by variations of vacuum in said separator for automatically controlling the operation of the vacuum producing means.

3. In a vacuum cleaning system, a dust separator, a portable suction head in operative connection therewith, a valve to control the operative condition of said suction head, vacuum producing means connected with said separator, and an automatic governor actuated by variations of vacuum in the separator for automatically starting and stopping the operation of the vacuum producing means to cause the latter to maintain a predetermined vacuum in the separator.

4. In a vacuum cleaning system, the combination of a suction pipe, vacuum producing means in connection with said pipe, an automatic governor actuated by variations in degree of vacuum in the apparatus and controlling the operation of the vacuum producing means to maintain a predetermined vacuum, and a check valve for preventing back flow of air into the apparatus when the vacuum producing means is inoperative.

5. In a vacuum cleaning system, the combination of a suction pipe, a valve controlling the admission of air to said pipe, vacuum producing means in connection with said pipe, and means operated by variations in degree of vacuum in the apparatus to cause the vacuum producing means to be operative when the vacuum falls to a predetermined pressure and to automatically stop the operation of the vacuum producing means when the predetermined vacuum has been attained.

6. In a vacuum cleaning system, the combination of a suction pipe, a portable suction head flexibly connected to said pipe, a valve for controlling the operative condition of said suction head, vacuum producing means in connection with said pipe, and an automatic governor operated by variations in degree of vacuum within the apparatus and controlling the operation of the said vacuum producing means.

7. In a vacuum cleaning apparatus, the combination with a suction pipe and valve controlled air inlets connected with said pipe for controlling the points of admission of air to the pipe, or means for exhausting air from said pipe, and a governor connected with said suction pipe and with

the air exhausting means, said governor being responsive to the actuation of the valve controlled inlet and in turn controlling the operation of said air exhausting means, substantially as described.

8. In a vacuum cleaning apparatus, the combination with a suction pipe and a valve for controlling the admission of air to said pipe, of means for exhausting air from said pipe, a low pressure or vacuum reservoir with which said suction pipe and air exhausting means have communication, and a governor connected with said reservoir and said air exhausting means, said governor being actuated by variations of pressure exerted thereon through said reservoir, and in turn automatically controlling the operation of said exhausting means, substantially as described.

9. In a vacuum cleaning apparatus, the combination of a suction main having a valve controlled inlet connection, an aspirator communicating with and adapted to exhaust air from said main and having a fluid pressure supply connection, and an automatic governor adapted to open and close said pressure supply connection according to variations of vacuum in the system, substantially as described.

10. In a vacuum cleaning apparatus, the combination of a suction main provided with valve controlled inlet connections, vacuum producing means communicating with and adapted to exhaust air from said main, and an automatic governor constructed and arranged to stop and start the vacuum producing means according to variations of vacuum in the system, substantially as described.

11. In a vacuum cleaning apparatus, the combination of a suction main having valve controlled inlet connections, an aspirator communicating with and adapted to exhaust air from said main, a fluid pressure supply connected with said aspirator, an automatic governor constructed and arranged to close and open the fluid pressure supply to the aspirator according to variations of vacuum in the system, and a check valve arranged to prevent back flow of air into said main, substantially as described.

12. In a vacuum cleaning apparatus, the combination of a suction main, an aspirator communicating therewith and having a fluid pressure supply connection, and an auxiliary separator connected with the discharge of the aspirator and having a liquid trapped discharge connection and a separate gaseous fluid discharge, substantially as described.

13. In a vacuum cleaning apparatus, the combination of a suction main, an aspirator communicating with said main and having a fluid pressure supply connection, an automatic governor connected with the vacuum side of the system and controlling the supply of the fluid pressure medium to the aspirator, and means for adjusting the governor to open and close said pressure supply connection under different degrees of vacuum, substantially as described.

14. In a vacuum cleaning apparatus, the combination of a suction main, a low pressure reservoir into which said main discharges, an aspirator connected with said reservoir and having a pressure supply connection, and a separator connected with the discharge of said aspirator, substantially as described.

15. In a vacuum cleaning apparatus, the combination of a suction main, a low pressure reservoir connected with said main, an aspirator connected with said reservoir and having a pressure supply connection, a check valve arranged to prevent back flow of air into said reservoir, and an automatic governor connected with the suction side of the system and controlling the pressure supply to the aspirator, substantially as described.

16. In a vacuum cleaning apparatus, the combination of a suction main, a low pressure reservoir connected with said main, an aspirator connected with said reservoir and having a pressure supply connection, a check valve arranged to prevent back flow of air into said reservoir, an automatic governor for controlling the pressure supply to the aspirator, and a separator connected with the discharge of the aspirator, substantially as described.

17. In a vacuum cleaning apparatus, the combination of a suction main provided with a valve controlled inlet con-

nection, vacuum producing means communicating with said main and adapted to exhaust air therefrom, an automatic governor adapted to stop and start the vacuum producing means according to variations of vacuum in the system, and a check valve arranged to prevent back flow of air into said main, substantially as described.

18. In a vacuum cleaning apparatus, the combination of a suction main having a valve controlled inlet connection, a low pressure reservoir connected with said main, vacuum producing means connected with said reservoir and adapted to exhaust air therefrom, an automatic governor adapted to stop and start the vacuum producing means according to variations of vacuum in the system, and a check valve arranged to prevent back flow of air into said reservoir, substantially as described.

19. In a vacuum cleaning apparatus, the combination of a suction main, a portable cut-off valve having a flexible connection with said main, vacuum producing means adapted to exhaust air from said main, and an automatic governor operated by variations of vacuum in the apparatus and controlling the operation of said vacuum producing means, substantially as described.

20. In a vacuum cleaning apparatus, the combination of a suction main, a portable cut-off valve having a flexible connection with said main, vacuum producing means communicating with said main and adapted to exhaust air therefrom, an automatic governor adapted to stop and start the vacuum producing means according to variations of vacuum in the system, and a check valve arranged to

prevent back flow of air into said main, substantially as described.

21. In a vacuum cleaning apparatus, the combination of a suction main having a valve controlled inlet connection, a low pressure reservoir connected with said main, an aspirator communicating with and adapted to exhaust air from said reservoir and having a fluid pressure supply connection, an automatic governor for controlling the pressure supply to the aspirator, and a separator connected with the discharge of the aspirator, substantially as described.

22. In a vacuum cleaning apparatus, the combination of a suction main, a low pressure reservoir in communication therewith, means for exhausting air from said main and reservoir, automatic means operated by variations of pressure in the apparatus and controlling the operation of said air exhausting means, means for preventing back flow of air into the apparatus when said air exhausting means is inoperative, and portable means for controlling the operation of said automatic controlling means at a distance therefrom, substantially as described.

In witness whereof we hereto affix our signature in presence of two witnesses.

FRANK J. MATCHETTE.
RICHARD RADDATZ.

Witnesses:

CHAS. L. GOSS,
BERNARD C. ROLOFF.

Correction in Letters Patent No. 870,981.

It is hereby certified that in Letters Patent No. 870,981, granted November 12, 1907, upon the application of Frank J. Matchette and Richard Raddatz, of Milwaukee, Wisconsin, for an improvement in "Vacuum Cleaning Systems," an error appears in the the printed specification requiring correction, as follows: In line 60, page 1, the word "vertical" should read *vortical*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 18th day of March, A. D., 1909.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.

nection, vacuum producing means communicating with said main and adapted to exhaust air therefrom, an automatic governor adapted to stop and start the vacuum producing means according to variations of vacuum in the system, and a check valve arranged to prevent back flow of air into said main, substantially as described.

18. In a vacuum cleaning apparatus, the combination of a suction main having a valve controlled inlet connection, a low pressure reservoir connected with said main, vacuum producing means connected with said reservoir and adapted to exhaust air therefrom, an automatic governor adapted to stop and start the vacuum producing means according to variations of vacuum in the system, and a check valve arranged to prevent back flow of air into said reservoir, substantially as described.

19. In a vacuum cleaning apparatus, the combination of a suction main, a portable cut-off valve having a flexible connection with said main, vacuum producing means adapted to exhaust air from said main, and an automatic governor operated by variations of vacuum in the apparatus and controlling the operation of said vacuum producing means, substantially as described.

20. In a vacuum cleaning apparatus, the combination of a suction main, a portable cut-off valve having a flexible connection with said main, vacuum producing means communicating with said main and adapted to exhaust air therefrom, an automatic governor adapted to stop and start the vacuum producing means according to variations of vacuum in the system, and a check valve arranged to

prevent back flow of air into said main, substantially as described.

21. In a vacuum cleaning apparatus, the combination of a suction main having a valve controlled inlet connection, a low pressure reservoir connected with said main, an aspirator communicating with and adapted to exhaust air from said reservoir and having a fluid pressure supply connection, an automatic governor for controlling the pressure supply to the aspirator, and a separator connected with the discharge of the aspirator, substantially as described.

22. In a vacuum cleaning apparatus, the combination of a suction main, a low pressure reservoir in communication therewith, means for exhausting air from said main and reservoir, automatic means operated by variations of pressure in the apparatus and controlling the operation of said air exhausting means, means for preventing back flow of air into the apparatus when said air exhausting means is inoperative, and portable means for controlling the operation of said automatic controlling means at a distance therefrom, substantially as described.

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