No. 836,141. PATENTED NOV. 20, 1906.

J. D. REEKIE.

COMPOUND ENGINE AND PUMP.

APPLICATION FILED NOV. 27, 1905.

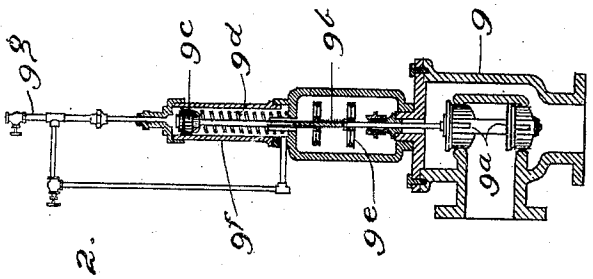

Fig. 2.

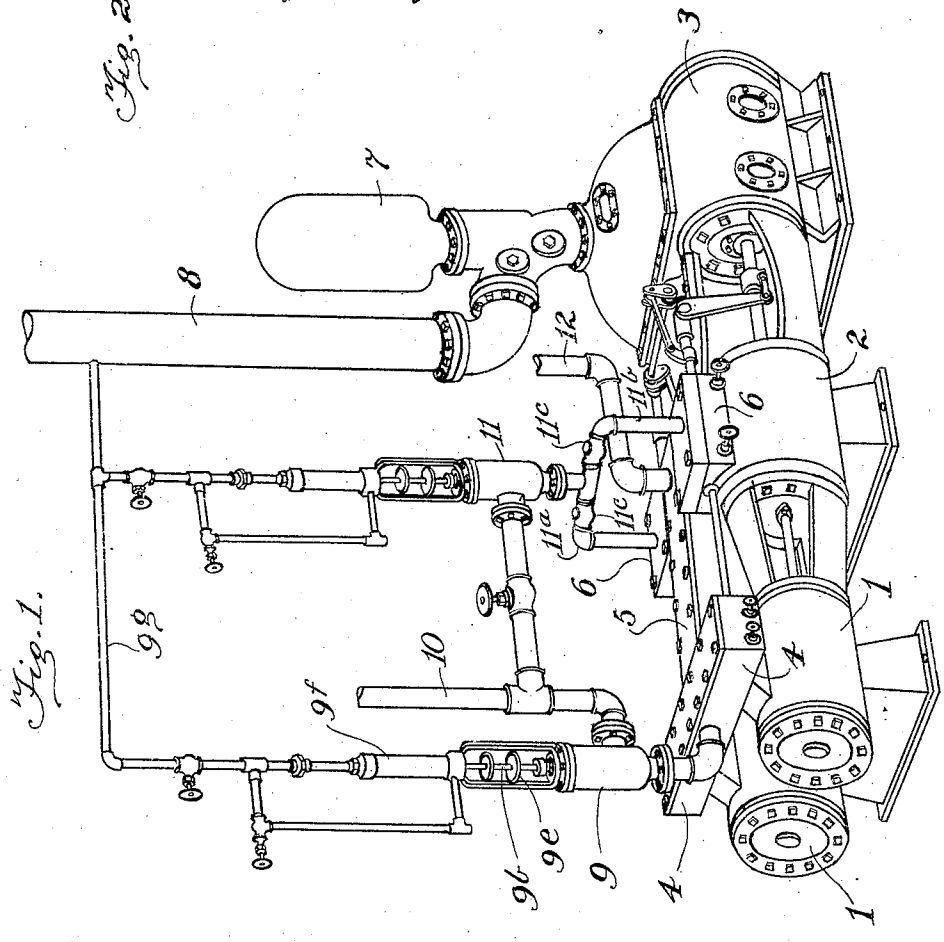

Fig. 1.

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COMPOUND ENGINE AND PUMP.

No. 836,141. Specification of Letters Patent. Patented Nov. 20, 1906.

Application filed November 27, 1905. Serial No. 289,163.

To all whom it may concern:

Be it known that I, JAMES D. REEKIE, a citizen of the United States, residing at Duluth, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Compound Engines and Pumps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to compound engines and pumps, and has for its object the construction, arrangement, and adjustment of means for automatically admitting steam direct from the boiler to the low-pressure cylinders when there is not sufficient pressure of steam to operate the high-pressure cylinders and when the column or pressure of water from the pump is of less than a predetermined weight.

With this and such other objects in view as may be hereinafter disclosed it consists of the constructions, combinations, and arrangements of parts hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a perspective view of such parts of a compound duplex pump as are necessary to describe my invention, showing my invention in connection therewith. Fig. 2 is a vertical central section, partly in side elevation, of one of the governors forming part of my said invention.

Said pump, including the governor 9, but exclusive of the governor 11, is, or is intended to be, substantially identical with the pump well known to the trade as the "Fairbanks-Morse Compound Duplex Pump," and said governor 9 and the governor proper, 11, are substantially identical with the governor well known to the trade as the "Fisher" governor for steam-pumps. I do not, therefore, claim invention in the main portion of the pump separately or separately in said governors or in the pump and the governor 9 alone, but in my arrangement and additional connections of the governor and in the resultant combination. Neither do I desire to be limited to the use of the identical structure illustrated, as it is obvious that said invention may be applied or extended to or embody modifications or other styles of compound pumps, whether they be for pumping liquids or air or gases.

In the accompanying drawings, 1 is the high-pressure steam-cylinder, and 2 is the low-pressure steam-cylinder, and 3 is the pump-cylinder. 4 is a steam-chest for the high-pressure cylinder or cylinders, and 5 is an exhaust-conduit leading from the high-pressure cylinder to the steam-chest 6 of the low-pressure cylinder. Since the pump illustrated is a duplex, these parts are in duplicate, the conduit 5 being longitudinally divided by an interior partition-wall (not shown) to form two compartments, one of which connects the steam-cylinders on one side of the pump and the other of which connects the steam-cylinders on the other side of the pump.

7 is the air-pressure dome, and 8 is the water-discharge or reservoir pipe.

The steam-chests 4 are connected with the boiler through the valve 9^a of the governor 9 by any suitable means, as by the pipe 10. Said valve 9^a is provided with an adjustable valve-stem 9^b, terminating in a piston 9^c, supported by a spring 9^d, adapted to open said valve. Suitable tension is effected in said spring by lengthening or shortening said valve-stem by means of the wheel 9^e, whereby the lower end of the valve-stem is screwed into the upper end of said stem. Said piston 9^c is inclosed in a cylinder 9^f, forming part of said governor, and said cylinder above said piston is connected by any suitable means with the pipe or reservoir 8, as by the pipe 9^g. Thus when the pressure of water in said pipe 8 is sufficient to counteract the tension of said spring 9^d the piston 9^c is driven down and said valve 9^a is closed. When said pressure is relieved, said valve is automatically opened by said spring. If, however, the steam-pressure should fall below that required to operate the pistons in the high-pressure cylinders, the opening of the valve in the governor 9 would be without avail. This might occur in the temporary absence of the engineer or from various other temporary causes. In such case it is desirable to operate the pistons in the low-pressure cylinders by direct pressure from the boiler, such latter pistons being capable of operation under a much lighter pressure. After the

steam-pressure has become heavy enough to again operate the high-pressure pistons it is desirable to cut off direct pressure from the low-pressure cylinders, so that the pistons therein can be more economically worked by exhaust from the high-pressure cylinders. To accomplish these desires, I connect with the steam-chests of the low-pressure cylinders the governor 11, similar in all respects to the first said governor, except that in case of a duplex pump said governor is provided with a branched connection, the opposite branches 11^a and 11^b, of which lead to the correspondingly-opposite steam-chests of the low-pressure cylinders and each of which branches is provided with a return check-valve 11^c to prevent the flow of steam from one of the chests 6 to the other. It is obviously immaterial whether said branches connect directly with said steam-chests or with the corresponding compartments of the conduit 5. Said governor 11 is also connected to said pipe 8 in manner substantially similar to that in which the governor 9 is connected to said pipe; but the valve of the governor 11 is adjusted to close under a lighter water-pressure than that under which the governor 9 is adjusted to close. Thus if the governor 9 be adjusted to close at one hundred and thirty pounds water-pressure and the governor 11 be adjusted to close at one hundred and fifteen pounds water-pressure it will be evident that so long as the steam-pressure is maintained at normal weight to operate the higher-pressure pistons it will operate the machine to keep the water-pressure near the normal weight of one hundred and thirty pounds; but when the steam-pressure falls, so that the high-pressure pistons do not promptly operate when the valve of the governor 9 opens, the water-pressure might continue to fall to zero were it not that when it has fallen to one hundred and fifteen pounds the valve of the governor 11 will open, admitting steam direct from the boiler through the pipe 10 to the low-pressure cylinders, the pistons in which then operate the pump to keep the water-pressure at or near one hundred and fifteen pounds, thus greatly prolonging the action of the engine under a subnormal steam-pressure.

12 is the exhaust-pipe from the low-pressure cylinders to the atmosphere or to a suitable condenser. (Not shown.)

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination with a compound engine and pump having high and low pressure steam-cylinders connected to a steam-boiler, and a reservoir for receiving the discharge of said pump, and a governor adapted to control the admission of steam to said high-pressure cylinder and to be operated by the pressure of the contents of said reservoir, of a second governor adapted to control the admission of steam directly from the boiler to the low-pressure cylinder and adapted to be operated by a lighter pressure of the contents of said reservoir than the pressure required to operate the first said governor.

2. The combination with a compound engine and pump, having a high and a low pressure steam-cylinder connected to a source of steam-supply, and a reservoir for receiving the discharge of said pump, and a valve adapted to govern the admission of steam direct from said source to said high-pressure cylinders, and means adapted to be operated by the pressure of the contents of said reservoir to close said valve when said pressure is of a predetermined weight, of a second valve adapted to govern the admission of steam direct from said source to said low-pressure cylinder and means adapted to close said valve and to be operated by the pressure of the contents of said reservoir at a predetermined lesser weight than that required for closing the first said valve, and means for automatically reopening said valves respectively when the closing-pressures are relieved.

3. The combination of a compound or multiple expansion duplex engine and pump, having high and lower pressure steam-cylinders connected to a source of steam-supply, and a reservoir for receiving the discharge from said pump, and a valve adapted to govern the admission of steam direct from said source to said high-pressure cylinders, and means adapted to be operated by the pressure of the contents of said reservoir to close said valve when said pressure is of a predetermined weight, of a second valve adapted to govern the admission of steam direct from said source to said lower-pressure cylinders, and means adapted to close said second valve and to be operated by the pressure of the contents of said reservoir at a predetermined lesser weight than that required for closing the first said valve, and a branched steam-conducting connection interposed between said second valve and said lower-pressure cylinders and a return check-valve positioned in each branch of such connection and adapted to prevent the flow of steam from one of the lower-pressure cylinders to the corresponding cylinder on the opposite side of the engine.

4. The combination with a compound or multiple expansion engine and pump, of a source of steam-supply, a steam-conduit extending from said source direct to the steam chest or chests of the low-pressure steam cylinder or cylinders, a valve adapted to be closed by pressure of a predetermined weight of the discharge from said pump, and adapted

to control the supply of steam through said conduit, and means for opening said valve when said pressure is relieved.

5. The combination with a two-set compound or multiple expansion engine and pump, of a source of steam-supply, a steam-conduit extending from said supply to the steam-chests of the low-pressure cylinders, and check-valves adapted to prevent the flow of steam from one low-pressure cylinder to the corresponding low-pressure cylinder on the opposite side of the engine.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

JAMES D. REEKIE.

Witnesses:
JAMES T. WATSON,
W. J. JOHNSON.