

S. K. STEFFY & H. H. NAYLOR.
 DUPLEX AIR COMPRESSOR.
 APPLICATION FILED APR. 8, 1911.

1,041,693.

Patented Oct. 15, 1912.

2 SHEETS—SHEET 1.

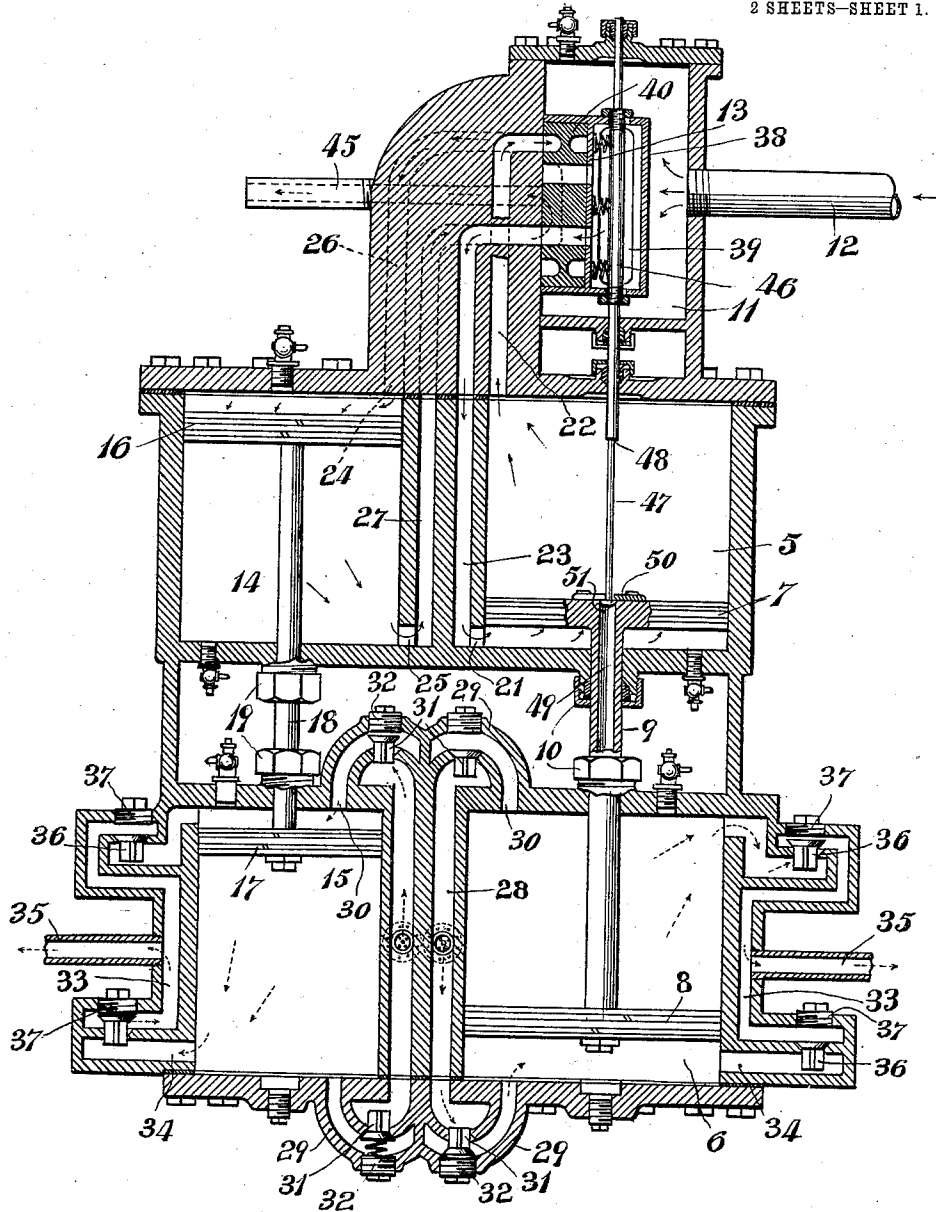


Fig. 1.

Witnesses

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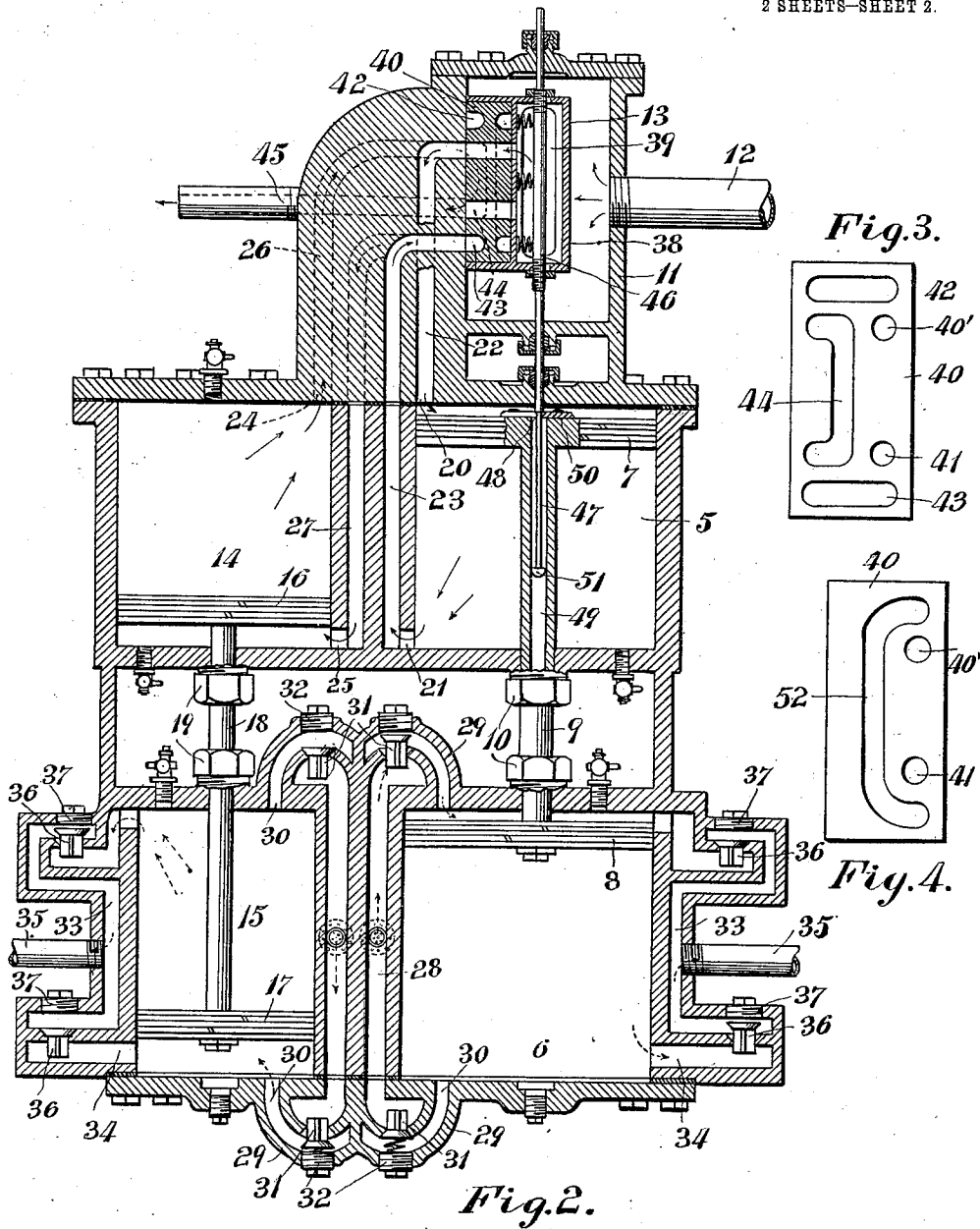
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UNITED STATES PATENT OFFICE.

SIMON K. STEFFY, OF HARRISBURG, AND HOWARD H. NAYLOR, OF MARIETTA,
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DUPLEX AIR-COMPRESSOR.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, SIMON K. STEFFY and HOWARD H. NAYLOR, citizens of the United States, residing at Harrisburg and Marietta, in the counties of Dauphin and Lancaster, State of Pennsylvania, have invented new and useful Improvements in Duplex Air-Compressors, of which the following is a specification.

The invention relates to fluid compressors, and more especially to the class of compound air compressors, designed for use particularly on locomotives.

The primary object of the invention is the provision of an air compressor, in which steam from a locomotive may be utilized for operating the compressor, whereby the latter will supply pressure to the reservoirs for controlling the air brakes of a train.

Another object of the invention is the provision of a compressor in which there are arranged adjacent air cylinders, which supply air to the reservoirs for controlling the air brakes, the motors operating the pistons in the air cylinders being controlled by means of a slidable valve block, which is capable of reversal, so that should one motor, or air cylinder, become disabled, the other motor and cylinder may be sustained active, by which the reservoirs supplying the air brakes, may be maintained charged.

A further object of the invention is the provision of a compound air compressor of this character in which the capacity thereof is increased by which the reservoirs supplying the air brakes are charged.

The present invention consists essentially in the combination with high pressure motor and air cylinders arranged in line, pistons reciprocable therein and movable in unison, of supplemental or low pressure motor and air cylinders, pistons movable in unison in said cylinders, connections between the high pressure and low pressure motor cylinders, whereby the exhaust from the first is utilized as a motive power to drive the piston in the second, a steam chest communicating with the motor cylinders, a slide valve controlling the steam admission to the cylinders and exhaust thereof therefrom, the slide valve being constructed so that should one motor cylinder become disabled, the other one can be maintained active, inlet ports in each of said air cylinders, and connections between said air cylinders, whereby the ex-

haust from the low pressure air cylinders is delivered into the high pressure cylinders, whereby the exhaust from the low and high pressure air cylinders is delivered on the compression by the pistons in the said cylinders to the reservoirs on each reciprocation of said pistons for the charging of the reservoirs, whereby the air brakes may be controlled, the slide valve being controlled by the pistons working within the high pressure motor and air cylinders.

A still further object of the invention is the provision of a compound compressor which is simple in construction, thoroughly reliable and efficient in operation, and inexpensive in manufacture.

In the drawings forming a part of this specification, is illustrated the preferred form of the embodiment of the invention, which, to enable those skilled in the art to carry the invention into practice, will be set forth at length in the following description, while the novelty thereof will be pointed out in the claims hereunto appended.

In the drawings: Figure 1 is a vertical longitudinal sectional view through a compressor constructed in accordance with the invention, the pistons in the high pressure motor and air cylinders being lowered, while the pistons in the low pressure motor and air cylinders are raised. Fig. 2 is a similar view of the pistons reversed and the slide valve shifted. Fig. 3 is a plan view, looking toward one face of the slide valve. Fig. 4 is a view, looking toward the opposite face thereof.

Similar reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to the drawings by numerals, the compressor comprises a motor cylinder arranged in alinement with an air compressor cylinder 6 and operating in the manner usual in such apparatus.

Disposed within and reciprocable in motor and air cylinders, respectively, are pistons 7 and 8, the latter being connected by means of a piston rod 9, so as to be movable in unison. The piston rod 9 passes through suitable stuffing boxes 10 mounted centrally in the inner adjacent heads of the said cylinders.

Superimposed upon the upper head of the motor cylinder 5 and suitably secured thereto is a steam chest 11 provided with a steam

inlet pipe 12 adapted for communication with the steam boiler of a locomotive, in any ordinary well-known manner, the live steam being admitted to the chest through the said pipe. Working within the steam chest 11 is a piston slide valve 13, the same being adapted to control the feed and exhaust to and from the high pressure motor cylinder, as will be presently described.

Contiguous to the high pressure motor and air compressor cylinders are low pressure motor and air compressor cylinders 14 and 15, respectively, the supplemental motor cylinder being designed to utilize the exhaust of the high pressure motor cylinder for its motive power. Arranged within the supplemental low pressure motor and air compressor cylinders are pistons 16 and 17, respectively, the same being connected together by means of a piston rod 18, so as to be movable in unison. This piston rod 18 passes through suitable stuffing boxes 19 mounted centrally in the adjacent inner heads of the said supplemental cylinders.

Formed in the motor cylinder 5 are ports 20 and 21, respectively, the port 20 being located in the outer head of the said cylinder, while the port 21 is located in the side wall of the cylinder, near the inner head thereof, and these ports communicate with passages 22 and 23, respectively, which lead to the steam chest 11, so that live steam is taken in and exhausted to and from the motor cylinder 5 through the ports 20 and 21 on alternate reciprocation of the piston 7.

Formed in the low pressure motor cylinder 14 are ports 24 and 25, respectively, the port 24 being provided in the outer head of the said cylinder, while the port 25 is provided in the side wall near the inner head thereof, and these ports are in communication with steam passages 26 and 27, respectively, which lead to the steam chest 11, so that live steam is taken in and exhausted to and from the motor cylinder 14 through the said ports 26 and 27 on the reciprocation of the piston 16 therein.

Formed on the adjacent inner sides of the high and low air compressing cylinders 6 and 15, respectively, are inlet air passages 28, the same extending parallel with the said cylinders and provided with elbow-like ends 29 connected with the inner and outer heads of the said cylinders, respectively, the elbow-like ends 29 forming inlet ports 30, in which are arranged check valves 31 which serve to admit air from the outer atmosphere from the passages 28 on suction, and to close on compression when the pistons 8 and 17 are reciprocated within the high and low air compressor cylinders. In the elbow-like ends 29, in alinement with the check valves 31, are threaded removable plugs 32 which, when taken out of the said ends 31, will permit access to be had to the check valves 31

for the removal thereof or the cleaning of the same, as will be obvious.

Formed at the outer side of the high and low air compressor cylinders 6 and 15 are air outlet passages 33, the same being adapted for communication with air outlet vents 34 opening through the sides of the said cylinders into the same, and with outlet pipes 35 leading to the air reservoirs (not shown) for controlling the air brakes, the exhaust of air from the high and low air compressor cylinders to the outlet passages 33 being controlled by means of check valves 36, which are adapted to open and allow the compressed fluid to flow through the passages 33 to the air reservoirs on the compression strokes of the pistons 8 and 17 in the said cylinders. On the suction strokes of the pistons 8 and 17, the valves 18 are closed.

Fitted in the walls of the vents 34 in alinement with the check valves 36 are movable plugs 37 which permit access to be had to the said check valves 36 for the cleaning thereof or the removal of the same from the said vents when desired.

The slide valve 13 comprises a socketed shell or hollow casing 38 provided with steam inlet slots 39 at opposite sides thereof, and disposed longitudinally of the same. Within the shell or casing 38 is detachably fitted a valve block 40, which is provided with spaced openings 40' and 41, respectively, which are adapted to alternately communicate with passages 22 and 23 leading from the steam chest 11 to the motor cylinder 5 for admitting live steam thereinto at opposite sides of the piston 7 on the reciprocation of the slide valve shell or casing. Formed in one face of the valve block 40 are elongated cavities 42 and 43, respectively, the same being disposed transversely of the said block, and the cavity 42 is adapted to establish communication between the passages 22 and 26 leading to the ports 20 and 24 in the motor cylinders 5 and 14, respectively, on movement of the valve shell or casing 38 in one direction, while the cavity 43 is adapted to establish communication between the passages 23 and 27 leading from the steam chest 11 to the ports 21 and 25, respectively, in the motor cylinder, on the reverse movement of the slide valve shell or casing 38. Thus it will be seen that steam from the motor cylinder 6 will be let into the motor cylinder 14 on the reciprocation of the piston 7 in said motor cylinder 5 for reciprocating the piston 16 in the motor cylinder 14, thereby operating said pistons. Formed in the valve block 40, between the cavities 42 and 43, is an arcuate shaped elongated cavity 44, which is adapted to establish communication between the passage 27, leading from the motor cylinder 14 to the steam chest 11, and an exhaust passage 45 leading from said steam chest to the

atmosphere, thereby permitting the exhaust of spent steam from the said motor cylinder 14 to the atmosphere, as will be obvious, when the valve shell or casing is moved in one direction in said steam chest.

Passed through the valve shell or casing 38 is a valve rod 46, the inner end of which is formed with a reduced stem 47 forming an abutment shoulder 48, the reduced stem 47 being adapted to telescope within a suitable bore 49 formed in the piston rod 9, when the pistons 7 and 8 are reciprocated within the motor and air compressor cylinders 5 and 6, respectively.

Arranged concentrically about the valve stem or rod 46, and fixed to the piston 7, is a striking disk 50, which is adapted to engage the shoulder 48 on the suction stroke of the piston 7 within the motor cylinder 5 for shifting the valve shell or casing 38 in the steam chest 11. The stem 47, at its free end, is formed with a head 51 which is adapted to be engaged by the striking head 50 on the compression stroke of the piston 7 within the motor cylinder 5, thereby reversing the movement of the valve shell or casing 38 within the said steam chest. Thus, in this manner the course of the live steam to and from the motor cylinders and the steam chest will be controlled, as will be clearly obvious.

The opposite face of the valve block 40 is formed with a substantially arcuate-shaped elongated groove or channel 52 which is adapted to establish communication alternately between the passages 23 and 45, and

22 and 45, when the said valve block 40 has been reversed within the valve cylinder or shell 38, on discovery of the disabled condition existing in the motor cylinder 14 and the low pressure air compressor cylinder 15, and in this manner, the piston within the motor cylinder 5 may be maintained active for operating the piston in the high pressure air compressor cylinder for the charging of the air reservoirs, without the operation of the pistons within the low pressure air compressor cylinder, and the motor cylinder coöperative therewith.

From the foregoing, taken in connection with the accompanying drawings, it is thought that the construction and operation of the invention will be readily understood, without requiring a more extended explanation, and therefore the same has been omitted.

What is claimed is:

A slide valve comprising a shell having oppositely disposed longitudinal steam inlet openings therein, a reversible valve block having a pair of faces mounted in said valve shell, said valve block being provided on one face with transverse openings and a longitudinal arcuate opening, and on its opposite face with a longitudinal arcuate opening.

In testimony whereof we affix our signatures in presence of two witnesses.

SIMON K. STEFFY.

HOWARD H. NAYLOR.

Witnesses:

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C. F. HIPPLE.