

(No Model.)

3 Sheets—Sheet 1.

J. STONE.
CHECK VALVE.

No. 580,294.

Patented Apr. 6, 1897.

Fig. 1.

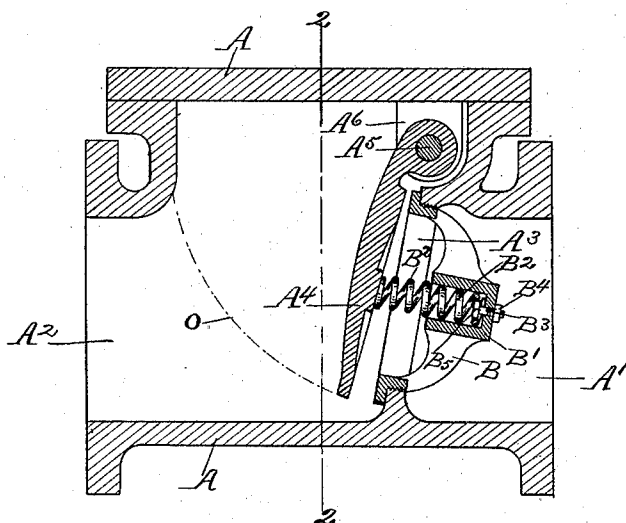
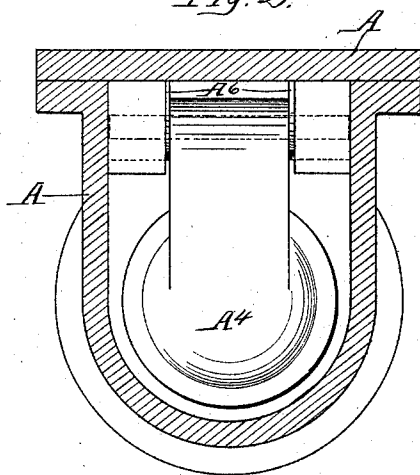


Fig. 2.



Witnesses:
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Inventor:
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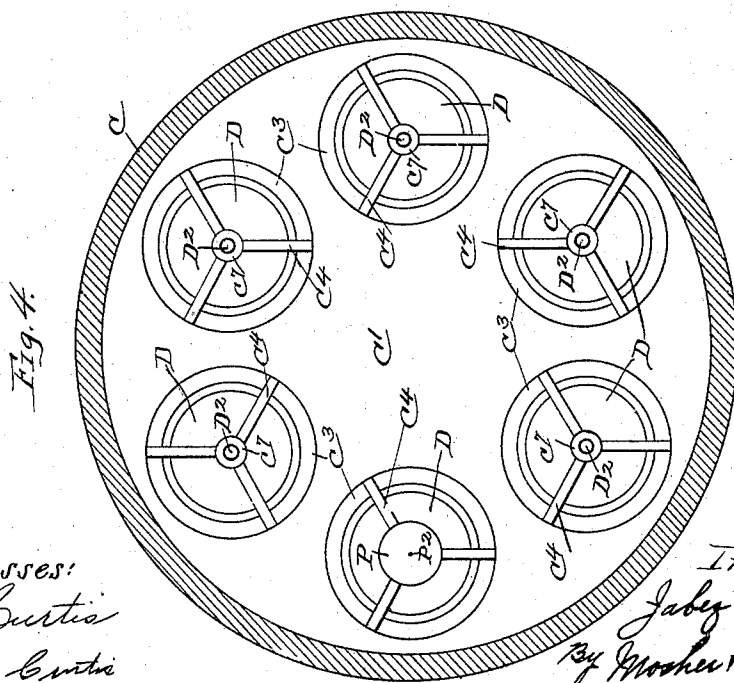
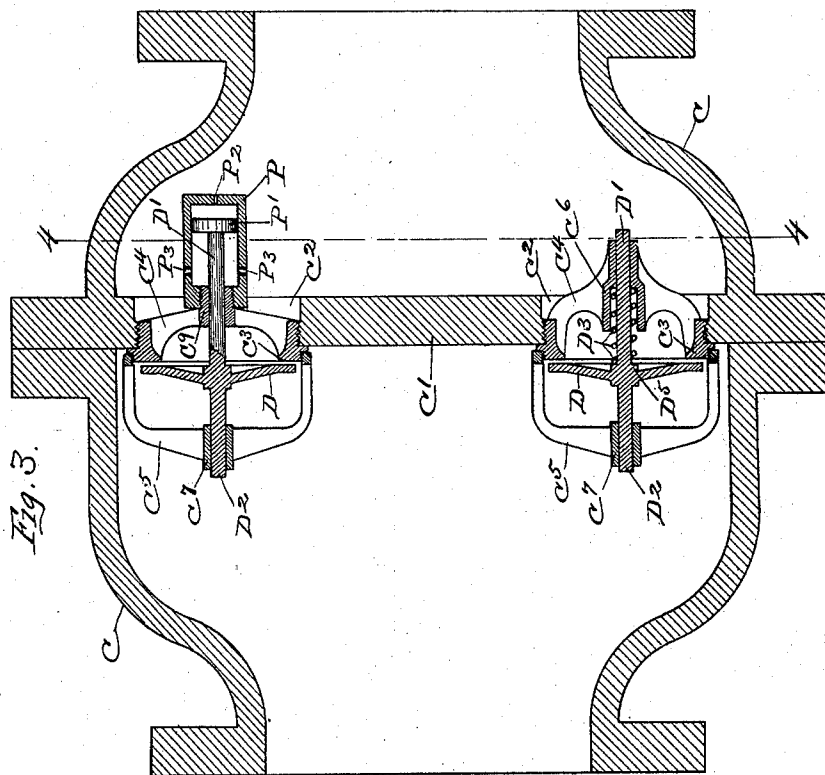
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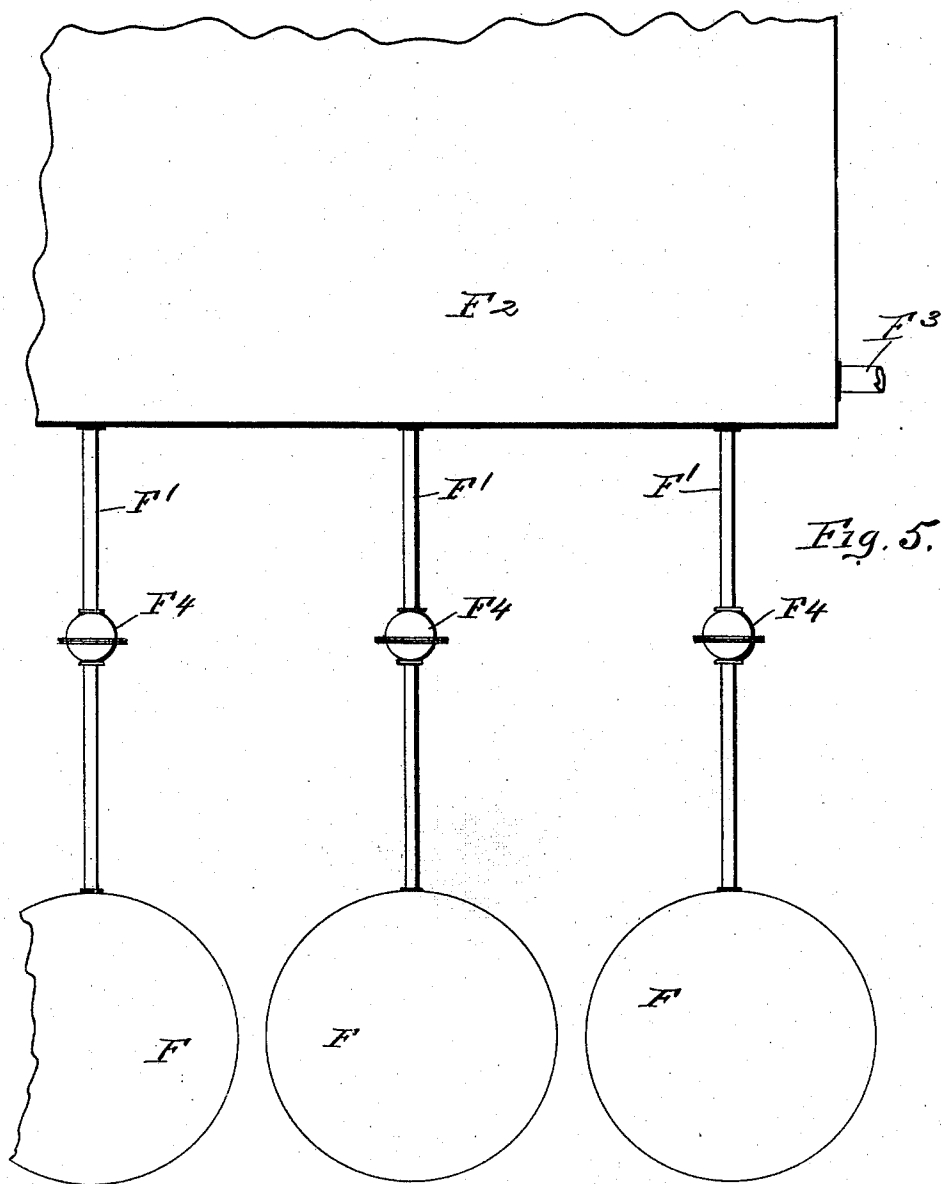
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3 Sheets—Sheet 3.

J. STONE.
CHECK VALVE.

No. 580,294.

Patented Apr. 6, 1897.



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UNITED STATES PATENT OFFICE.

JABEZ STONE, OF WATERFORD, NEW YORK, ASSIGNOR TO THE LUDLOW VALVE MANUFACTURING COMPANY, OF TROY, NEW YORK.

CHECK-VALVE.

SPECIFICATION forming part of Letters Patent No. 580,294, dated April 6, 1897.

Application filed March 14, 1896. Serial No. 583,150. (No model.)

To all whom it may concern:

Be it known that I, JABEZ STONE, a citizen of the United States, residing at Waterford, county of Saratoga, and State of New York, have invented certain new and useful improvements in Check-Valves, of which the following is a specification.

The invention relates to such improvements; and it consists of the novel construction and combination of parts hereinafter described and subsequently claimed.

Reference may be had to the accompanying drawings, and the letters of reference marked thereon, which form a part of this specification.

Similar letters refer to similar parts in the several figures.

Figure 1 of the drawings is a cross-sectional view of a steam-pipe, showing one form of my improved check-valve in front elevation. Fig. 2 is a central vertical longitudinal section of the same, taken on the broken line 2 2 in Fig. 1. Fig. 3 is a central longitudinal section of a steam-pipe, showing another form of my improved check-valve and two forms of yielding buffer. Fig. 4 is a cross-section of the same, taken on the broken line 4 4 in Fig. 3. Fig. 5 is a front elevation showing a portion of a steam-supply chamber connected with a plurality of steam-boilers by feed-pipes severally provided with my improved check-valve.

In modern power-stations erected for the purpose of generating power in the operation of street-railway systems, both electrical and cable, one or more large steam-engines are employed which take their steam from a steam-chamber common to a plurality of high-pressure steam-boilers. Should one of the boilers or its pipe leading to the steam-chamber prove defective or develop a considerable leak, the steam generated by the other boilers would escape by way of the steam-chamber through such defective part and endanger life by reason of its comparatively large volume. It has been the practice, therefore, to provide each pipe leading from a boiler to the common steam-chamber with a check-valve which would at once and automatically close when the pressure in the steam-chamber exceeded the pressure in that steam-pipe.

It is peculiarly characteristic of street-railway systems that by reason of the large number of independently-operated cars and the frequency of stopping and starting the work performed by the engines varies in amount to an extraordinary degree and at very frequent intervals. The rush of steam into and through the steam-chamber to supply the large cylinder of the engine produces a back pressure when the steam is cut off from the cylinder and the check-valves close, to be opened again when the steam is again let into the engine-cylinder, thereby producing a vibratory movement of the check-valves corresponding with the strokes of the steam-piston in the engine. Now when it happens that the engine is suddenly drawn upon to do work nearly double its normal capacity the rush of steam from the boilers opens the check-valves comparatively wide, and the back pressure being far in excess of the normal the valve-disks are driven to their seats with terrific and destructive force.

The object of my invention is to provide against such destructive pounding of the valve-disk upon the seat, and this I accomplish by providing an auxiliary spring-seat or yielding buffer for the valve-disk.

Referring to Figs. 1 and 2 of the drawings, A is a section of the steam-pipe, having the inlet-opening A', leading from a steam-boiler, (not shown,) and the outlet-opening A'', leading to the steam-chamber. (Not shown.)

A³ is the stationary valve-seat supported by the pipe, and A⁴ a disk valve pivoted at one side by the pivot A⁵ to the ears A⁶, projecting interiorly from the pipe-wall.

The spider B is supported by the pipe within the inlet-opening and is provided with a hollow hub B', adapted to receive one end of the coil-spring B². The spring is held within the hub by means of a screw-threaded bolt B³ and nut B⁴. The head B⁵ of the bolt bears upon the inner end coil of the spring, and the bolt-shank passes through an aperture in the hub, as shown in Fig. 2. The other or outer end of the spring projects from the hub on one side of the plane of the stationary valve-seat to the opposite side and into the path traversed by the disk during its initial opening movement and at and near

the end of its closing movement. The outer end of the spring forms a yielding seat to be engaged by the disk.

In use the pipe-section occupies a horizontal position, as shown in Fig. 2, so that the force of gravity will tend to close the valve. The steam passing from the boiler to the steam-chamber will open the valve, forcing the disk up along the curved dotted line O, and any back pressure of the steam will assist gravity in closing the valve.

As above explained, the rapid changes of pressure in the steam-chamber, in conjunction with the relatively constant pressure of steam coming from the boiler, tend to set up a vibratory movement of the disk.

As heretofore constructed the size and weight of the disk in large pipes caused the disk to strike its seat with great force, sufficient to soon destroy the efficiency of the parts.

By interposing in the path of the disk a spring-buffer the force of the blow is taken by the buffer and the seating-surfaces of the disk and seat are preserved from injury.

The buffer-spring may be of sufficient strength to prevent the disk from engaging the seat while in ordinary use without in the least interfering with the function of the apparatus as a check-valve in case of accident to its appropriate boiler or its pipes leading to that boiler, for the reason that when the pressure of that boiler is abnormally reduced the pressure from the other boilers, transmitted through the steam-chamber, immediately overcomes the force of the buffer-spring and closes the check-valve and maintains it in a tightly-closed position.

When desired, a plurality of valve-disks may be placed in the same pipe and made to slide to and from their seats in suitable bearings, as shown in Figs. 3 and 4, in which the pipe C is provided with a diaphragm C', having a plurality of openings C², the combined area of which preferably slightly exceeds the cross-sectional area of the boiler-pipe. Each opening is provided with a surrounding valve-seat C³ and oppositely-projecting spiders C⁴ and C⁵.

The valve-disk D is provided with front and rear stems D' and D² in line with each other and adapted to move endwise in bearings in the hubs C⁶ and C⁷ of the respective spiders.

The hub C⁶ has a chamber adapted to receive the coil-spring D³, one end of the spring having a bearing upon the bottom of the chamber and the other end upon the disk or a boss D⁵, as shown. The tendency of the spring is to hold the valve open or to force it farther open if the spring is not fully distended.

When preferred, a dash-pot buffer may be substituted for the spring-buffer, as shown in Figs. 3 and 4.

The pot P is screw-threaded interiorly at its open end and screwed onto a similarly-threaded end of one of the spider-hubs C⁹.

A piston P' is adapted to fit the interior of the dash-pot and is secured to one end of the disk-supporting stem, which is made of suitable length to cause the piston to reciprocate within the pot as the valve-disk moves in opening or closing.

The closed end of the shell of the dash-pot is provided with a small vent-opening P² and the other end with one or more escape-openings P³.

The operation of this form of buffer is as follows: When the back pressure of steam acts upon the disk to close the check-valve or urge the disk toward its seat, the piston is forced into the dash-pot, but the cross-sectional area of the vent-opening being very small compared with that of the piston the escape of steam or air from the dash-pot is comparatively slow and will not permit of a movement of the piston-stem and valve-disk sufficiently quick to fully seat the disk while its boiler is supplying steam to the steam-chamber; but in case of accident the escape would be sufficiently quick to cause the valve-disk to be seated in time to avoid damage.

In Fig. 5 I have shown three steam-boilers F, in which the steam is generated, connected by feed-pipes F' with a steam-supply chamber F² common to all the generators. The supply-pipe F³ leads from the chamber to a steam-engine. (Not shown.) Each feed-pipe is provided with a check-valve F⁴, cushioned, as I have described, against back pressure.

In check-valves of great size a valve-disk of the required dimensions would have an area of many square inches exposed to the back pressure of steam, and in the largest check-valves it would be difficult or impracticable to provide a yielding buffer or spring of sufficient size and strength to successfully resist the back pressure and cushion the disk, as I have described.

By providing a plurality of valved apertures in a diaphragm extending across the feed-pipe, as shown in Figs. 3 and 4, I am able to distribute the aggregate back-pressure force among the plurality of valve-disks, so that the pressure exerted on no one disk is excessive, and springs or buffers of a size and strength easily secured can be employed.

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

1. The combination with a feed-pipe, a solid valve-disk within the pipe, and a pipe-supported valve-seat located between the disk and the pipe-inlet and engageable by the disk, of a yielding buffer interposed in the path of the disk on the inlet side, whereby the valve-seat is protected from injurious pounding by the closing movements of the valve induced by back pressure, substantially as and for the purpose set forth.

2. The combination with a steam-supply chamber, a plurality of steam-generators, and feed-pipes respectively leading from the generators to the supply-chamber, of a plurality

of cushioned back-pressure-resisting check-valves severally located in the respective feed-pipes, substantially as and for the purpose set forth.

- 5 3. In a check-valve, the combination with a feed-pipe, a diaphragm extending transversely of the pipe and provided with a plurality of apertures, and a plurality of valve-seats on the outer side of the diaphragm respectively surrounding said apertures, of a
10 plurality of solid valve-disks movable toward

and from the respective valve-seats, and a yielding buffer for the several valve-disks interposed to resist movement of the disk toward the diaphragm, substantially as described. 15

In testimony whereof I have hereunto set my hand this 12th day of March, 1896.

JABEZ STONE.

Witnesses:

GEO. A. MOSHER,
FRANK C. CURTIS.