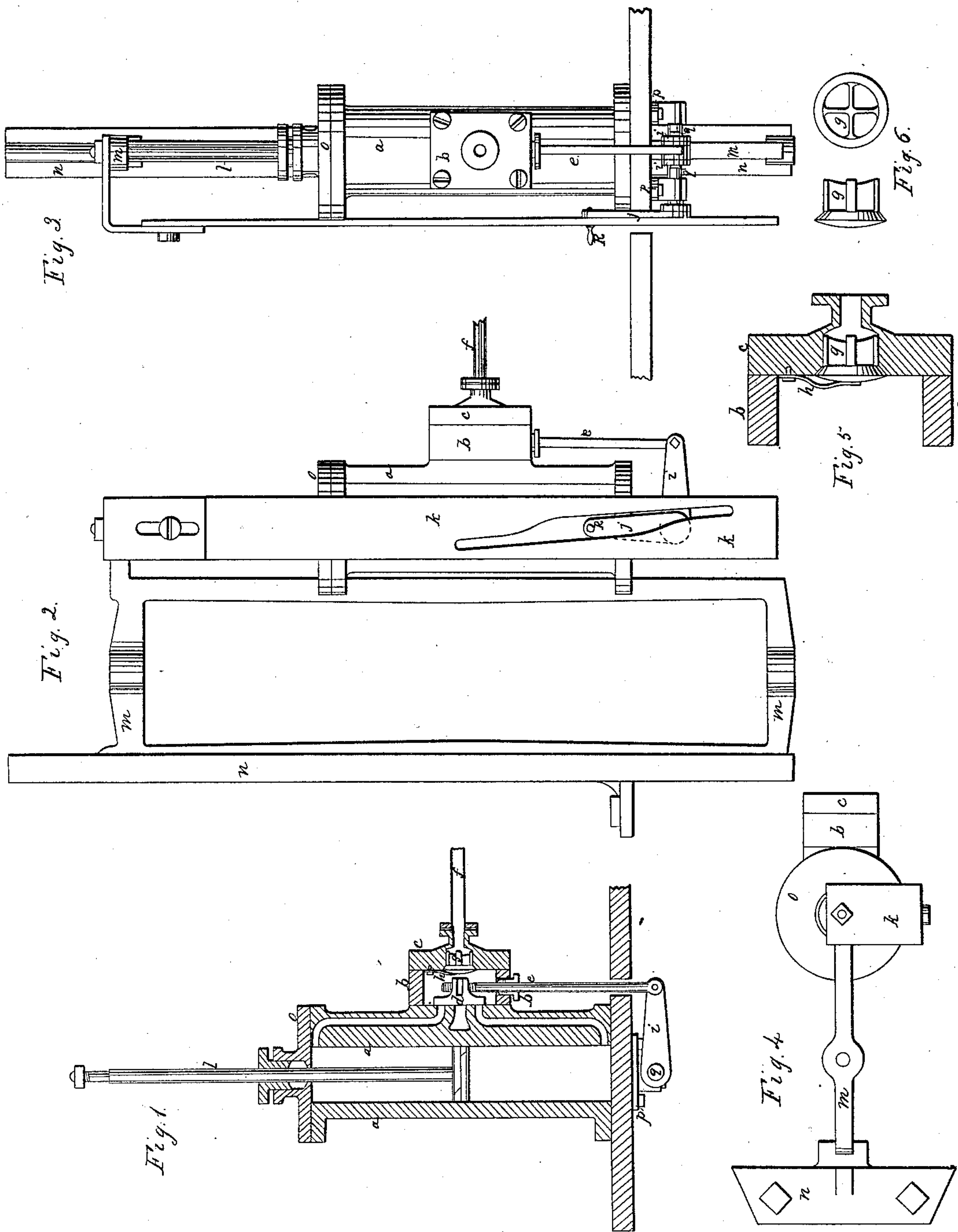


C. A. Spring,
Reciprocating Steam Engine,
No. 9,602, *Patented Mar. 1, 1853.*



UNITED STATES PATENT OFFICE.

CHARLES A. SPRING, OF KENSINGTON, PENNSYLVANIA.

IMPROVED SUPPLEMENTAL VALVE FOR RECIPROCATING STEAM-ENGINES.

Specification forming part of Letters Patent No. 9,602, dated March 1, 1853.

To all whom it may concern:

Be it known that I, CHARLES A. SPRING, of Kensington, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Reciprocating Steam-Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form part of this specification, and in which—

Figure 1 represents a longitudinal section through the cylinder and steam-chest of a steam-engine, showing also a portion of the frame and the valve-gear. Fig. 2 represents a side elevation of a steam-engine attached directly to a saw-frame. Fig. 3 represents another side elevation of the same, viewed at an angle of ninety degrees from the position whence it is seen in Fig. 2. Fig. 4 represents a top view of the engine and saw-frame shown in Figs. 2 and 3. Fig. 5 represents a section of the steam-chest, on an enlarged scale, with the reaction-valve in position, the arrangement of which constitutes the subject of my invention; and Fig. 6 represents a side and end view of said valve, which in this example is of the winged, puppet, or conical variety.

It is well known that when lead is given to the steam-valve of a reciprocating steam-engine, as is generally done, to admit steam in front of the piston near the extremity of its stroke, for the purpose of arresting its momentum and that of the other moving parts preparatory to reversing their motion without straining the machinery, there is a reflux of the steam from the cylinder almost immediately after it has entered, which is caused by the compression of it by the continued approach of the piston to the head of the cylinder. The compression of the steam is diffused through the pipes and boiler, and is thus lost, or nearly so. For the purpose of more effectually utilizing the power employed in compressing the lead steam, and at the same time to prevent more effectually the knocking out of the heads of the cylinder by the piston, I have arranged a valve which opens toward the cylinder in such position in the steam-chest lid that it will open by the pressure of the steam in the boiler to permit the steam to pass from the latter into the cylinder; but whenever the pressure on the side next the cylinder be-

comes greatest and the steam begins to return to the boiler, then this valve will close and arrest the reflux, so that whatever force is exerted in compressing the steam in the cylinder before the piston as it approaches the end of its stroke will be given out again on the return of the piston to aid in accelerating its motion, so that the force required to arrest the momentum of the moving parts at one stroke is borrowed from that stroke and added to the next. Again, if the weight and momentum of the moving parts are very great, the piston large, and the steam in the boiler at a very low pressure, any practicable lead in an engine in such a case might without my improvement be wholly inadequate to arrest the momentum but with my improvement it would be abundant. To illustrate this point, suppose the steam to be admitted before the piston at a pressure of one atmosphere, when it is an inch from the head. By the time the piston has approached within half an inch of the head the tension of the steam will have been increased to two atmospheres; when within a quarter of an inch to four atmospheres; an eighth of an inch, eight atmospheres, and when the piston has approached within one-sixteenth of an inch of the head the pressure of the steam before it will be sixteen atmospheres, while the steam in the boiler and behind the piston is but one, and of course the force available for overcoming the momentum of the piston, &c., is five times as great as it would have been if a free reflux of the steam into the boiler had taken place, as it would have done in the absence of my stop or reflux valve. The pressure in front of the piston may upon this principle be increased to the highest point ever required in practice, and when the piston commences its return-stroke, at which time the inertia of the moving parts has to be overcome before their motion can be got up, there is a great force—much above the average pressure of the steam—ready to apply itself at this point, where it is so necessary to the equable motion of the machine. When by the return movement of the piston the pressure in the cylinder is reduced slightly below that of the boiler, the reflux-valve instantly opens and permits the steam to flow again from the boiler into the cylinder, as if no such valve were used. This arrangement of the valve to prevent the

reflux of the steam from the cylinder protects the engine against strains in overcoming the momentum of the moving parts when the motion is reversed and against the danger of having the heads of the cylinder knocked out by the piston in case the connecting rod or crank breaks. It also insures a more equable motion, and prevents the pulsations in the boiler which would otherwise be caused by the reflux of the steam.

The engine represented in the accompanying drawings is of the usual reciprocating direct-action variety, except that the lid *c* of the steam-chest is fitted with a valve, *g*, opening inward and closing, when shut, the mouth of the pipe *f*, which conducts the steam from the boiler to the engine. The valve *g* is in this case of the puppet variety, and is pressed toward its seat by a spring, *h*, which is of barely sufficient strength to shut and keep the valve from jarring. The size and range of motion

of the valve are such that when open it will allow the steam to flow freely from the boiler to the cylinder. Any suitable valve may be substituted for this.

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

The arrangement of a valve in the lid of the steam-chest, or the equivalent thereof, between the cylinder of a steam-engine and the boiler, in such manner that it will prevent the reflux of the lead steam by closing whenever the pressure of the steam in the engine exceeds that in the boiler and opening again whenever the pressure in the boiler is greater, substantially as herein set forth.

In testimony whereof I have hereunto subscribed my name.

CHARLES A. SPRING.

Witnesses:

J. L. SMITH,
JOHN DAVIS.