(No Model.)

# S. E. ST. O. CHAPLEAU.

## STEAM LOCOMOTIVE.

No. 437,376. Patented Sept. 30, 1890.

*Fig. 1.*

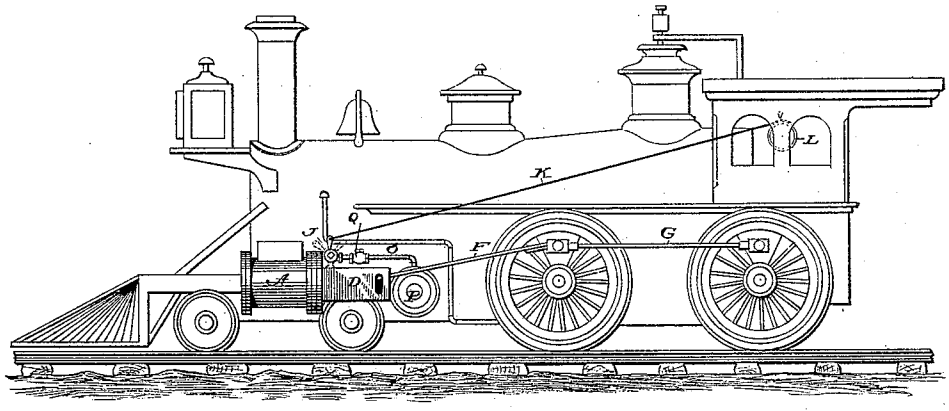



*Fig. 2.*

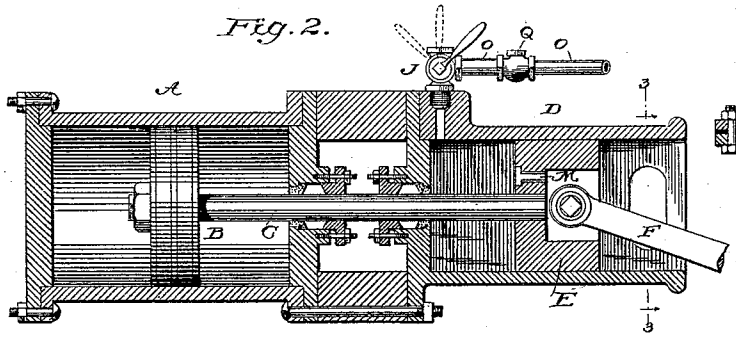



*Fig. 3.*
*on line 3-3*

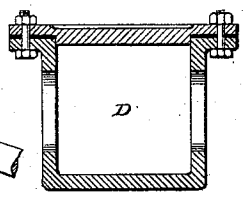



*Fig. 5.*

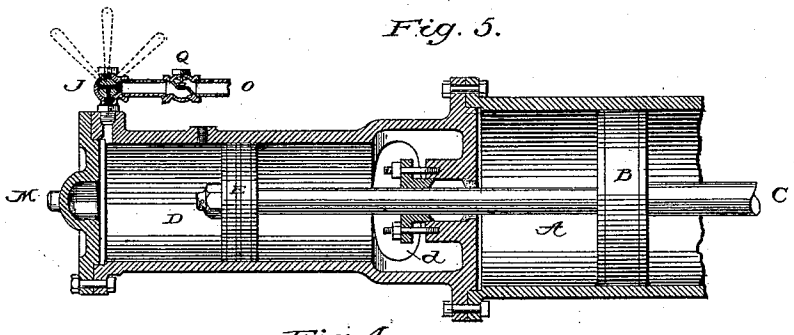
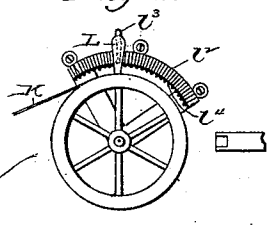



*Fig. 4.*




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By his Atty
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# UNITED STATES PATENT OFFICE.

SAMUEL E. ST. O. CHAPLEAU, OF OTTAWA, CANADA.

## STEAM-LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 437,376, dated September 30, 1890.

Application filed December 14, 1889. Serial No. 333,820. (No model.)

*To all whom it may concern:*

Be it known that I, SAMUEL E. ST. O. CHAPLEAU, of Ottawa, in the Province of Ontario and Dominion of Canada, have invented certain Improvements in Steam-Locomotives, of which the following is a specification.

My invention relates to improved means for controlling the speed and arresting the motion of steam-propelled locomotive-engines, and for utilizing the momentum of the train as it is brought to a state of rest, for the compression of air to be used in operating the brake, or for other purposes.

To this end the invention consists, primarily, in combining directly with the rod of each steam-actuated driving-piston a second piston and an air-confining cylinder provided with a valve under the control of the engineer to regulate the air-delivery, whereby the atmospheric resistance to the movement of the supplemental piston is applied to check the movement of the main piston and driving-wheels.

It further consists in a novel arrangement of valves and pipes for delivering and confining the air compressed in the supplemental cylinder that it may be applied for operating the brakes, promoting the draft in the boiler, to aid in ventilating and heating the cars, or for such other purposes as may be desired.

In the accompanying drawings, Figure 1 is a side elevation of a locomotive provided with my improvement. Fig. 2 is a vertical axial section through the main and supplemental cylinders on one side of the engine. Fig. 3 is a cross-section on the line 3 3 of Fig. 2. Fig. 4 is a side view of the devices for adjusting and locking the air-controlling valve. Fig. 5 is a vertical section through my supplemental cylinder and connections in modified form.

The locomotive represented in the drawings is in all respects of ordinary construction, except as to the supplemental air-compressing devices hereinafter described.

Referring to Figs. 1 to 4, A represents one of the ordinary steam-cylinders, containing a reciprocating piston B, connected by piston-rod C, pitman F, and connecting-rod G to the driving-wheels H for the purpose of imparting rotary motion thereto in the ordinary manner.

In applying my improvement I attach to or otherwise secure in line with the steam-cylinder A a secondary cylinder D on the rear side thereof. This supplemental cylinder is closed at its forward end, but open at the rear, and contains a piston E, fixed to the rear end of the main piston-rod C, so that the pistons are compelled to move in unison.

For the purpose of admitting air into the supplemental cylinder, I provide an inwardly-opening valve M, which is preferably located in the piston E, as illustrated in Fig. 2, although it may be located in the forward end of the cylinder D, if preferred.

At the forward end the supplemental cylinder is provided with a three-way cock or valve J, leading from the interior of the cylder to the external atmosphere and also communicating through a lateral pipe O with a receiver P, adapted to retain compressed air. This receiver P may be connected through suitable pipes and valves with the brake mechanism, or with the stack of the chimney, or with any other portion of the engine or part of the train where compressed air may be utilized. The pipe O is provided with a check-valve Q, opening toward the receiver P. The valve J is connected by a rod K to a hand-lever L, mounted in the cab in position to be conveniently operated by the engineer. The lever is arranged to move over a graduated plate $l^2$, which indicates, when read in connection with the lever, the position of the valve J. A locking-dog $l^3$ on the lever engages a fixed notched plate $l^4$ to hold the lever and thereby the valve in the position desired.

The operation of the apparatus is as follows: During the ordinary action of the engine the valve J is turned so as to afford a free communication between the supplemental cylinder and the external atmosphere, so that as the piston E is carried backward and forward the air passes freely into and out of the supplemental cylinder. When, however, the momentum of the train is to be checked or air to be compressed, the valve J is turned to establish communication between the supplemental cylinder and the pipe O, shutting off communication with the atmosphere, the result of which is that during the backward movement of the supplemental piston E the cylinder D is filled with air entering through the valve M, and that during the forward movement of the piston E the confined air is compressed and driven through the valve J, pipe O, and check-valve Q into the receiver,

in which it is confined by means of the check-valve. The resistance offered by the air in advance of the piston E varies according to the pressure of the air confined in the receiver P and to the extent to which the valve J is closed. By turning this valve so as to greatly restrict the air-delivery opening or completely close the same the piston E is subjected to a great resistance, which resistance is transmitted to the driving-wheels to arrest their rotation. Thus it will be seen that the supplemental cylinder and piston are caused to act in a very efficient manner as a brake to arrest the motion of the train and also as a means of utilizing the momentum of the entire train, and what would otherwise be wasted energy to effect the compression of the air.

I prefer to locate the supplemental cylinders, as shown and described, in rear of the main cylinders, for the reason that in this position the supplemental piston E serves to guide the connected ends of the piston-rod and pitman, thus taking the place of the ordinary cross-head and cross-head guides. When the parts are thus arranged, I prefer to make the supplemental cylinder of a square or other polygonal form in cross-section, and to make its upper side adjustable vertically, as shown in Fig. 3, in order to compensate for the wear thereon incident to the upward pull and thrust of the pitman.

In Fig. 5 I have illustrated my supplemental cylinder as located in front instead of in rear of the main cylinder. In this case the inlet-valve M is located in the cylinder-head. The valve J and its connections are the same as in the preceding figures. Air is admitted freely to the rear end of the supplemental cylinder through an opening *d* formed therein, as shown.

It will of course be understood by the skilled mechanic that the valves herein shown may be of any ordinary or approved form, and that the connections for operating the valve J from the cab or other part of the engine may be modified at will.

In the apparatus above described the supplemental piston acts to compress the air during its movement in one direction only.

I do not claim, broadly, an air-compressing piston attached to the rod of a steam-actuated piston, as I am aware that this combination has been used in air-compressing pumps.

Having thus described my invention, what I claim is—

1. In combination with a locomotive-engine having the usual steam cylinders and pistons, the supplemental air-cylinder, its piston connected to the main piston-rod, a self-opening valve admitting air to the supplemental cylinder, an adjustable valve J, controlling the flow of air from the cylinder, and a valve-operating device extending thence within reach of the engineer, whereby the engineer is enabled to throw the supplemental devices into and out of operation at will.

2. In combination with a locomotive-engine having the usual steam cylinders and pistons as a means of arresting the motion of the engine and train at will, a supplemental air-cylinder, its piston attached to the main piston-rod, an adjustable stop-valve J to positively control the delivery of air from the supplemental cylinder, and an operating device extending from said valve to the cab within reach of the engineer, whereby the engineer is enabled to subject the pistons at will to more or less resistance and thus check or arrest the momentum of the train.

3. In a locomotive-engine, the main cylinder and piston, in combination with the supplemental air-cylinder and its piston connected with the main piston, an air-inlet valve to said supplemental cylinder, the outlet-valve J, its operating-rod, the lever connected to said rod, the indicator adjacent thereto, and a locking device for the lever.

4. In a locomotive-engine, the steam cylinder and piston, as usual, in combination with a supplemental cylinder, its piston connected with the main piston, a self-opening valve M, admitting air to the supplemental cylinder, an air-receiver, a pipe leading from the supplemental cylinder to said receiver, a check-valve located between said cylinder and receiver and opening toward the latter, and a valve in said pipe under the control of the engineer for regulating the delivery of air from the supplemental cylinder, whereby the engineer is enabled to subject the piston to a controllable resistance in order to arrest the motion of the train and the momentum of the train rendered available for compressing air into the receiver.

5. In a locomotive-engine, the steam-cylinder, its piston, and piston-rod, in combination with the supplemental cylinder located in rear of the main cylinder and connected to the main piston-rod, the driving-wheel, the pitman connecting the driving-wheel and the supplemental piston, and suitable valve mechanism directing air into and out of the supplemental cylinder, whereby said supplemental piston is adapted to serve the double purpose of compressing air and of guiding the pitman in place of the ordinary cross-head.

6. In combination with the main cylinder and piston, the supplemental piston, the driving-wheel, the pitman connecting the driving-wheel and supplemental piston, and the supplemental cylinder having its upper side adjustable vertically in relation to the remaining portion, substantially as described and shown.

In testimony whereof I hereunto set my hand, this 26th day of October, 1889, in the presence of two attesting witnesses.

SAMUEL E. ST. O. CHAPLEAU.

Witnesses:
W. R. KENNEDY,
W. W. MORTIMER.