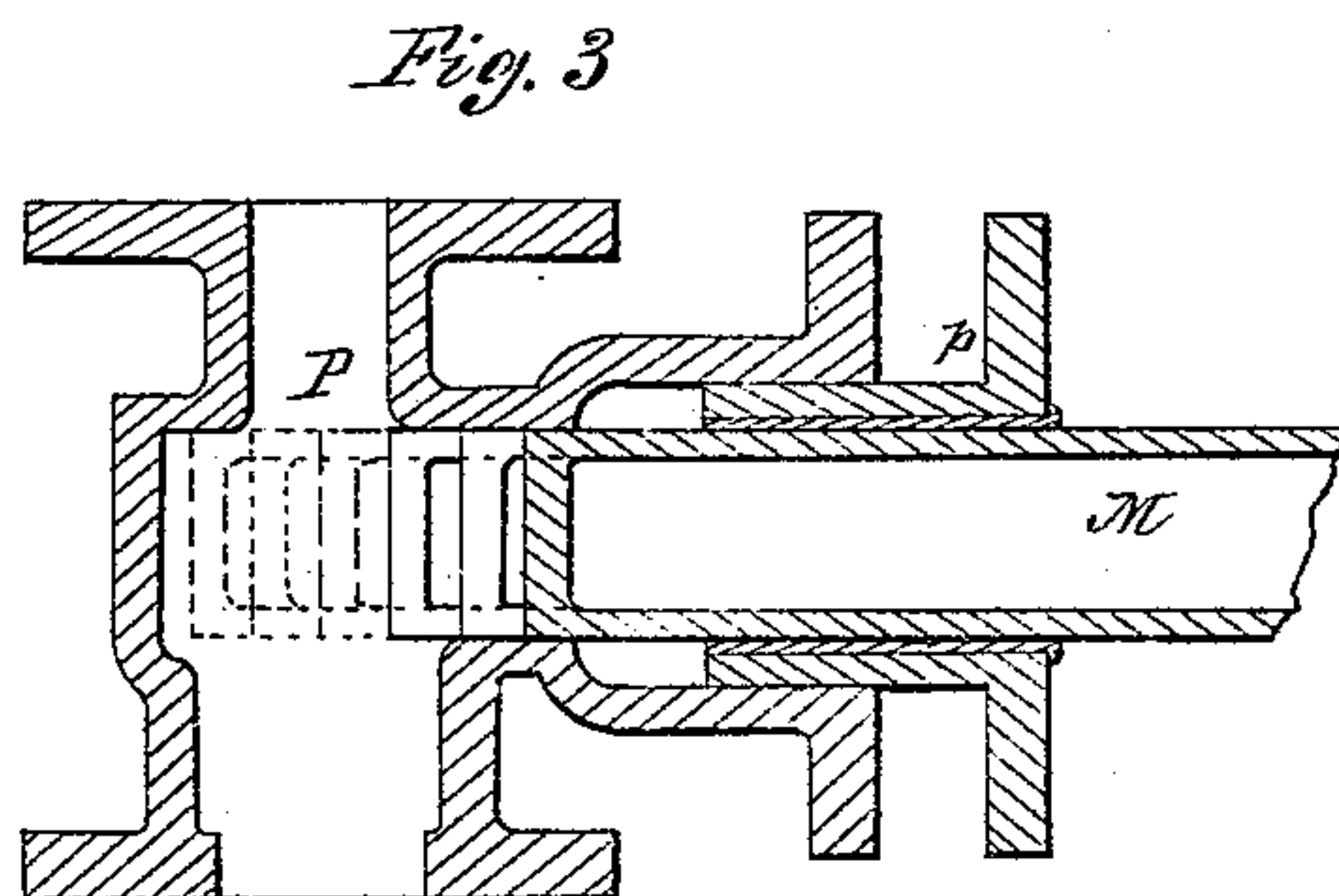
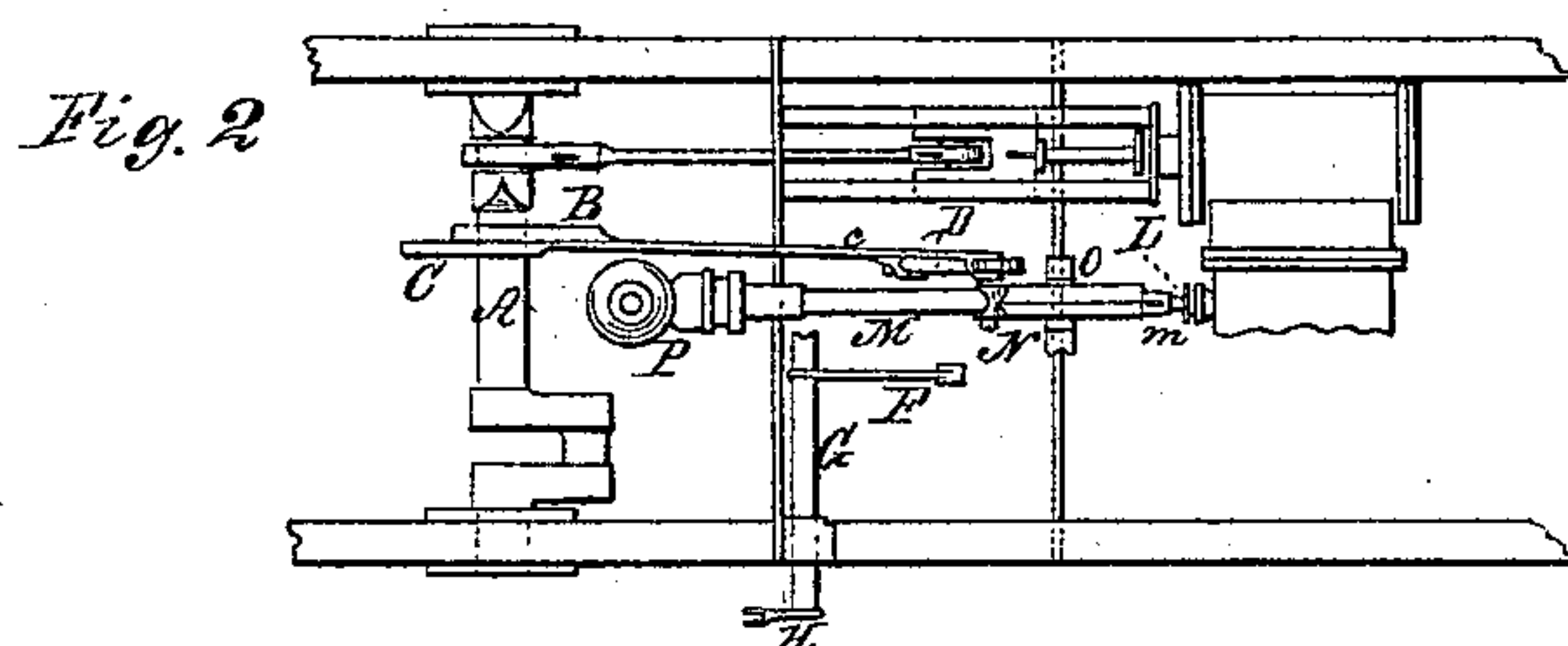
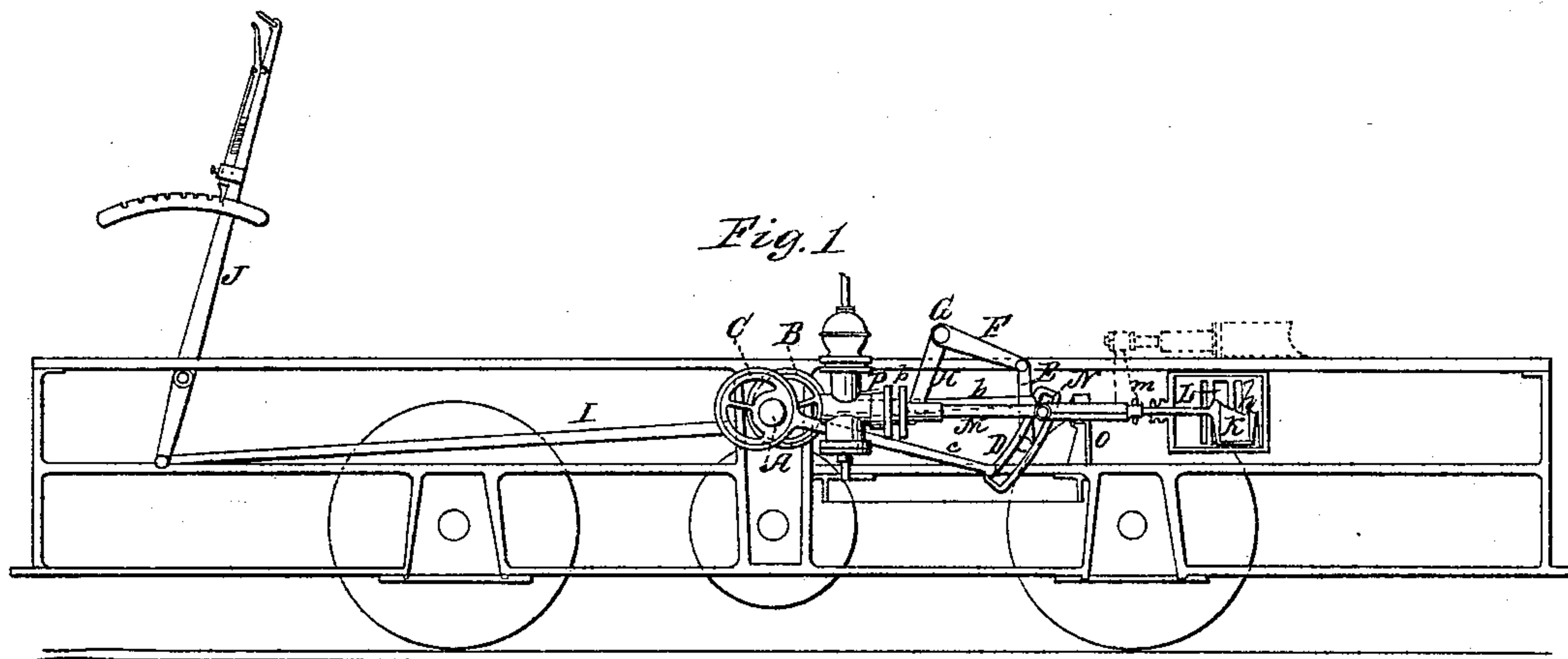


Cooke & Smith,
Steam Cut-Off.
N^o 40,307. Patented Oct. 13, 1863.



Witnesses;
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Inventors;
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UNITED STATES PATENT OFFICE.

JOHN COOKE, OF PATERSON, NEW JERSEY, AND ALBA F. SMITH, OF NORWICH, CONNECTICUT, ASSIGNORS TO JOHN COOKE.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. 40,307, dated October 13, 1863.

To all whom it may concern:

Be it known that we, JOHN COOKE, of Paterson, in the county of Passaic, in the State of New Jersey, and ALBA F. SMITH, of Norwich, in the county of New London, in the State of Connecticut, have invented a certain new and useful Improvement in Steam-Engines; and we do hereby declare that the following is a full and exact description thereof.

Our invention relates to the working of the pump or pumps which supply the boiler with water, and to the relation thereof to the other portions of the mechanism. It is intended exclusively for engines in which the motion or throw of the valve or valves of the engine is variable, so as to consume or use in the engine a larger quantity of steam when the throw of the valve is increased and less steam when the throw or motion of the valve is diminished. The device known as the "link-motion" or the Stevenson link motion fulfills these conditions very perfectly, and is used with success in the engines to which we have applied our invention. In all engines which consume the steam in greater quantities with each revolution when in one condition than another, the feed-pumps should by some means be made correspondingly more or less efficient. Our engine belongs to such class, and our invention lies in the means whereby we vary the efficiency of our pump so as to correspond very nearly or exactly with the consumption of the steam.

To enable others skilled in the art to make and use our invention, we will proceed to describe its construction and operation by the aid of the accompanying drawings, which form a portion of this specification.

Figure 1 is a side elevation, and Fig. 2 is a plan view showing the essential parts of our invention, as applied to what is known as a dummy-locomotive. Three dummy-locomotives having our invention thus applied have been constructed, and have now been several months successfully used in the service of the Hudson River Railroad Company, moving cars along the streets of New York.

Similar letters of reference indicate like parts in both the figures, and so much of the frame-work and other parts of the engine appears in these drawings as is necessary to explain the relation of our invention thereto.

A is the main shaft, to which rotation is communicated by the action of the engine through the medium of cranks in the ordinary manner.

B and C are eccentrics.

b c are eccentric rods.

D is a Stevenson link.

E is a slight hanger connecting the latter to the arm F of the lifting-shaft G, which latter is turned through the agency of the arm H, connection I, and hand-lever J, so as to raise and lower the link D to a limited extent at pleasure.

K is a slide-valve closely fitted to the cylinder-face *k*, and operated within the steam-chest by a stem, L, which extends out through a suitable stuffing-box. The stem L is prolonged by means of a stout rod, M, to which it is coupled by a socket and key, as represented at *m*. A suitable pin, N, fixed in the side of the rod M, stands in the slot in the link D, and is adapted to receive motion from the vibration of the link D, either directly or through a die-block, and to compel the valve K to reciprocate to a variable extent, according as the link D is raised or lowered. All these parts, as also the fixed guide or steadiment O, are constructed and arranged in the ordinary and well-known manner, excepting that some of the parts should be made a little stronger, and adapted to endure more strain than usual, the necessity for which will presently appear.

P is an ordinary pump, connected in any ordinary manner to the water-tank and the boiler. (Not represented.) The rod M is continued through the stuffing-box *p*, and forms the plunger of the pump P. It is enlarged and properly finished to form a plunger of the right area, and may be made hollow to diminish the weight.

It will be seen that the throw or motion of the plunger of the pump will correspond exactly with the throw of the valve K, the two being directly connected, and both operated through the agency of identical mechanism.

Consequently every movement of the hand-lever J, which lowers the link D, and increases the throw of the valve K, so as to postpone the period of "cutting off," and consequently to admit more steam into the cylinder at each stroke, will necessarily and without further

attention correspondingly increase the extent of the motion of the plunger M, and consequently increase the quantity of water thrown into the boiler. An elevation of the link D, however slight, will for the same reasons simultaneously diminish the quantity of steam consumed and the quantity of water pumped at each revolution of the engine.

Fig. 3 shows in different colors the extreme positions of the plunger M when the engine is working with different degrees of expansion. The dark section and the dark dotted outline show, respectively, the extreme positions of the plunger M when the engine is working full stroke and consuming the maximum quantity of steam and water. The blue section and the blue dotted outline show the extreme positions of the same plunger when the engine is working with a higher degree of expansion, or in common language "cutting off shorter." The section done in red and the corresponding red dotted outline indicate the extreme positions, and consequently indicate by the distance between them the throw of the pump while working with the link D in an intermediate position.

The red outline appended to Fig. 1 above the rod M represents an arm and pump attached rigidly, but in a different position relatively to the rods L M. Such an arrangement would realize the benefits of our invention in part. So also would various conceivable connections through levers, oblique rods, &c., connected to M or through separate links all connected to the same handle J, one link being in such case used for the valve-motion, and a different one for the pump-motion, and both operated from the same or from different main shafts.

Some of the advantages due to certain features of our invention may be separately enumerated, as follows:

First. By reason of the fact that the pump-plunger M is made to operate with a variable throw by a movement of the same hand-lever J, or its equivalent, which correspondingly varies the throw of the valve K, we insure a variable action of the pump, corresponding nearly or exactly with the variable consumption of steam. This may be availed of either alone or in conjunction with other means of closing off or varying the supply to the boiler,

and so far as it is availed of reduces the labor of the engineer in attending to the apparatus. It induces or contributes to induce a constant level of the water in the boiler, whether the steam be taken therefrom rapidly or in almost imperceptible quantities.

Second. By reason of the direct connection of the pump-plunger M and the valve-stem L, and the operating of both the pump and the valve directly from the link D, or its equivalent, having a variable throw, as described, we simplify and cheapen the construction and reduce the weight of our machinery, and also diminish the space occupied thereby. We also render the pump and the steam chest stuffing-boxes each a guide to the rigid bar or rod L M, in consequence of the direct connection of the several parts arranged as described, and enable this single bar thus steadied and supported at each end to better resist the vertical strain due to the inclined position assumed by the link D. When, as usual, the pump is operated by other means, and the valve-stem L is alone operated by link D, arranged otherwise as represented, the vertical strains on the stem L are so inadequately resisted by the guide O that there is always liable to be after a short period of wear so great a yielding to these strains as to cause both the guide O and the stuffing-box to wear out of shape.

Having now fully described our invention, what we claim as new, and desire to secure by Letters Patent, is as follows:

1. Simultaneously varying the throw of the pump-plunger M and of the valve K by the single hand-lever J, or its equivalent, substantially in the manner and for the purpose herein set forth.

2. Giving a variable throw to the pump-plunger M, and valve-stem L, which are rigidly connected, and arranged substantially in the manner and for the purposes herein set forth.

JOHN COOK.

ALBA F. SMITH.

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