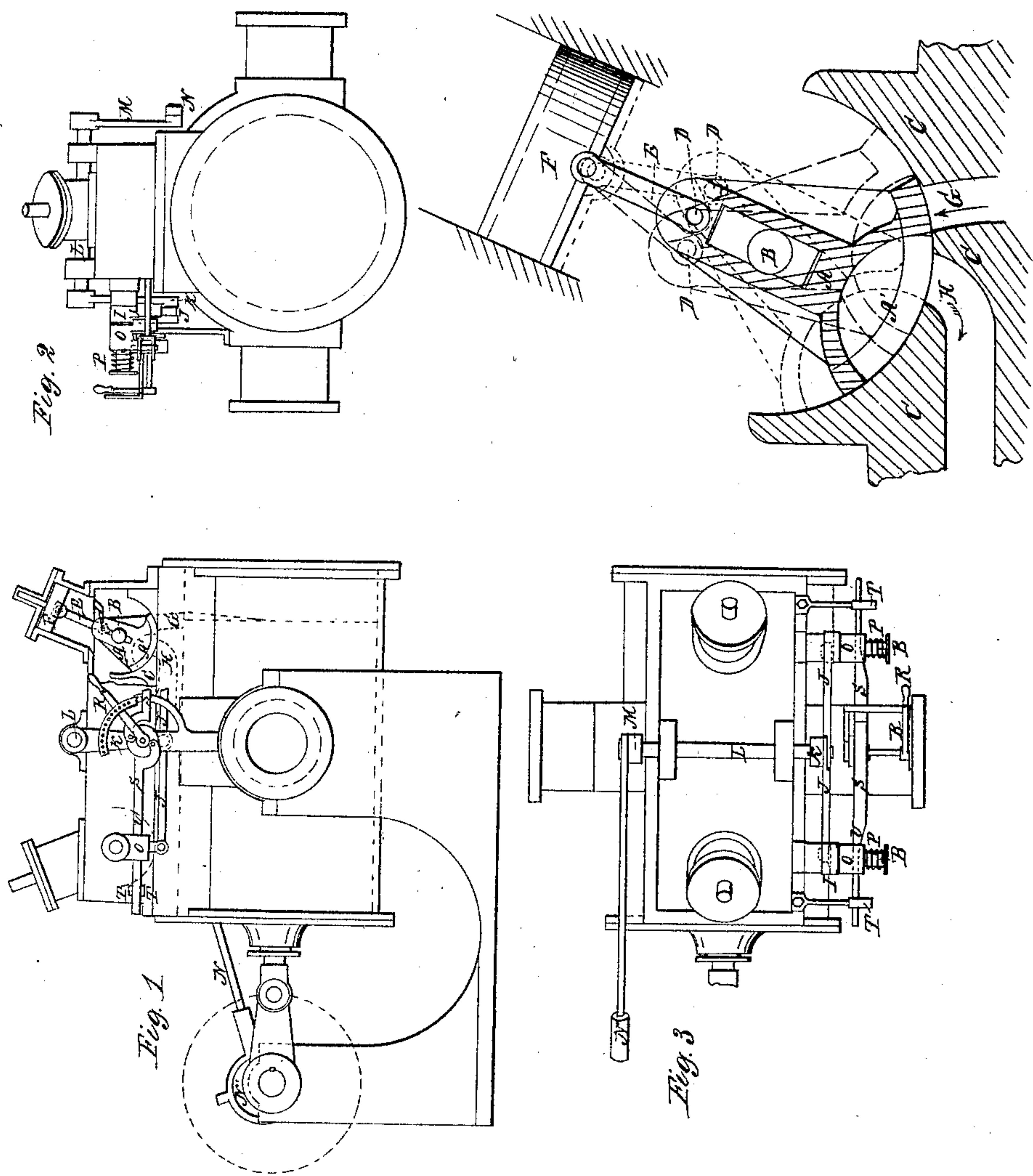


H. O. Perry,
Steam-Engine Valve-Gear.
No 18,925. Patented Dec. 22, 1857.



UNITED STATES PATENT OFFICE.

HORATIO O. PERRY, OF BUFFALO, NEW YORK.

GIVING MOTION TO VALVES OF STEAM-ENGINES.

Specification of Letters Patent No. 18,925, dated December 22, 1857.

To all whom it may concern:

Be it known that I, HORATIO O. PERRY, of Buffalo, in the county of Erie and State of New York, have invented a certain Improvement in Giving Motion to Valves of Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings and to the letters marked thereon.

Figure 1 is a side view, Fig. 2 an end elevation, and Fig. 3 a plan of an oscillating engine, with my improvements.

Similar letters of reference indicate like parts in both drawings.

Ever since the action of steam has been closely investigated, and experiments on the economy of engines have been rigorously conducted, it has been well understood that there is economy in closing the steam valves before the termination of the stroke of the piston to allow the steam to act expansively; also that there is economy in varying the point of "cut off," as it is termed, at will, so as to avoid the necessity for throttling the steam to control the motion of the engine; also that there is economy under such circumstances in shutting the steam valves very rapidly, so as to avoid "wiredrawing" the fluid;—and ever since the properties of matter have been investigated it has been well established that shocks and concussions are objectionable in all kinds of mechanism. It has however been difficult to construct steam engines in such manner as to fulfil all the first named conditions without involving difficulties in regard to the last named point.

My improvement applies to such engines and such only as employ semi-rotating or rolling valves which are released and allowed to shut automatically. It relates to the means of shutting such valves when they are detached from the positive mechanism, and of stopping the motion without shock at the right point. Its effect is to shut such valves rapidly and quietly without necessitating any dash-pots or air cushions to stop the motion.

It consists first in acting on the valve by a force independent of the engine in the manner fully represented and described below, so that while the force has great effect in turning the valve when the latter is first

released and consequently moves it very rapidly at that instant, its effect decreases to nothing as the valve assumes the position at which it is desirable that it shall stop, and becomes a negative and retarding force when it chances to revolve by momentum past that position. I accomplish this by subjecting to a tensile strain a link so connected that it shall be in a line radial to the axis (or at its "dead point") when the valve is in the position to stop.

It also consists, in connection with the first, in the employment in the manner fully represented and described below, of a piston acted on by the steam to give the necessary tensile strain to the link, in order that said tensile strain may be proportional to the resistance. The resistance to the motion of the valve is due mainly to the pressure of the steam, and it increases or diminishes as said pressure increases or diminishes, and it is consequently important not only to make the force greatest at the commencement of the motion and nothing at the termination thereof, but also, to make the whole sum of the force or the units of work expended in the operation vary with the pressure of the steam, so that the motion will be destroyed at or near the same point whether the pressure be greater or less.

My invention therefore in its simplest form consists in simply shutting the valve by a force peculiarly applied; in its more approved form the force is also made to vary with the necessities of the case, and in its most perfected form it is also applied in such a direction that the valve is partially balanced thereby. The automatic closing of the valves being performed by the balance pistons, the force impelling them is always proportional to the pressure of the steam; and therefore just sufficient for the purpose, without necessitating any considerable surplus power and consequently without producing any considerable amount of momentum to be annihilated after the movement is completed.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation. I apply it alike to direct acting or beam engines, or to oscillating engines, which latter is the style represented in the drawings. It is only necessary, when the engine is not an

oscillating engine, to give the eccentric a greater throw so that the proper motion will always be imparted to the valve.

A represents one of the forms of valve to which my invention is applicable. It is mounted loosely on the shaft B, and fits nicely in the hollow cylindrical surface C. To the point D, on this valve, is attached by means of the link E, a small piston F, fitting nicely in a corresponding cylinder, as represented. This pressure of the steam in the steam chest tends to urge this piston up, and thus by the tension on the link E constantly impels the valve to assume and maintain the position indicated by the dark lines in the drawings. It also relieves the valve A from a part of the force which would otherwise press it with great violence against C.

G is a short port leading, as directly as possible to the end of the cylinder.

H is a port leading from the vicinity of G to allow the escape of the exhaust steam. The valve A has a hollow throat A' through which, when the valve is in a suitable position, the steam from G may freely escape into H. Small springs, not represented, are introduced between the shaft B, and the valve A which serve to keep the valve A in steam-tight contact with C when there exists no pressure of steam in the steam chest. The shafts B project through stuffing boxes in the side of the steam chest, and carry on their extremities parts which alternately move and release the valve by the aid of said valve-stems, so that the valve is opened at the proper time by a positive mechanism through the aid of such parts, and is released at the period when it is desired for the valve to shut. Whenever the valve is thus released it is immediately revolved into the position represented, by the pull on the link E and by changing the releasing devices or the positions of some parts thereof the valve may be released at any desired point less than a half stroke, so that my device is a variable cut-off, possessing very obvious advantages, and closing the valves independently of the opening mechanism, and also independently of any weights or springs.

The resistance to the closing of a valve arises mainly from the pressure of the steam thereon; and as this is necessarily variable in all engines, it is difficult to provide just sufficient force for the purpose by other devices; but mine allows a very perfect equalizing of the power and the resistance. The piston F must be made of such size as nearly to equal in area the whole effective area of the valve A and thus to relieve it of most of its load, and must be connected, as represented, to a convenient point on the opposite side of the shaft, so that its pull will always

tend to close the valve when released, and the connecting link must be attached to the valve at such a distance from the center of the shaft that it can act to advantage in so doing. So long as the pressure of the steam is constant the pull on the link E is so, but this disposition of the parts makes the leverage of F, or, in other words, the effect of this force in giving motion to A diminish as the valve approaches its proper position, and be reduced to nothing when it is fully attained. As a consequence, no dash-pot or air-cushion is required by my invention, but the valve is always stopped by friction at on near its most desirable position. The face of the valve A which serves to cover the port G is purposely made considerably wider than the port G, so that if excessive friction exists in consequence of dry steam or tight packing, the valve may move automatically to a less distance than ordinary; or if unusual lubrication be afforded it may move farther than ordinary, and no bad effects will ensue in either case. It will be noted that the pull on the link E becomes opposed to the motion of the valve so soon as the latter has revolved beyond its most desirable position.

An opening of some kind must be left in the cover of the cylinder F' or a pipe F'' must be provided to communicate from thence to the exhaust passages at some convenient point so as to allow the escape of whatever steam may chance to leak past the balance piston F and thus to insure the existence of only the same amount of pressure per square inch as obtains within the cavity A.

I do not confine myself to the precise form of valve represented in the accompanying drawings. I do not require that the positive mechanism shall move the valve in both directions from its most desirable shut position as my invention is equally applicable, and production of equally good results when applied to a valve without a hollow throat and which simply covers a single port and uncovers the same by turning to a limited extent in one direction only; but I do confine the use of my invention to its connection with rotating or partially rotating valves which are opened by a positive mechanism and then detached at or before the completion of the stroke and allowed to shut automatically.

What I claim as my invention and desire to secure by Letters Patent is as follows:

1. I claim the above described method of shutting a rolling or partially rotating valve by pulling on a link so attached that its effect in rotating the valve decreases as the valve assumes its most desirable shut position and tends to revolve it in the reverse direction when the valve revolves by mo-

mentum past such position when operated substantially as and for the purpose herein set forth.

2. I also claim the above described method
5 of operating said link by the pressure of the steam so that the whole amount of power available in shutting shall be always proportional or very nearly proportional to the

resistance, for the purpose of enabling the valve to stop in the proper position under all 10 pressures of steam as above set forth.

HORATIO O. PERRY.

Witnesses:

JOHN D. SHEPARD,

WILLIAM HENRY EASTMAN.