(No Model.)

J. WHEELOCK.

MECHANISM FOR CONTROLLING CUT-OFF VALVES.

No. 413,696. Patented Oct. 29, 1889.

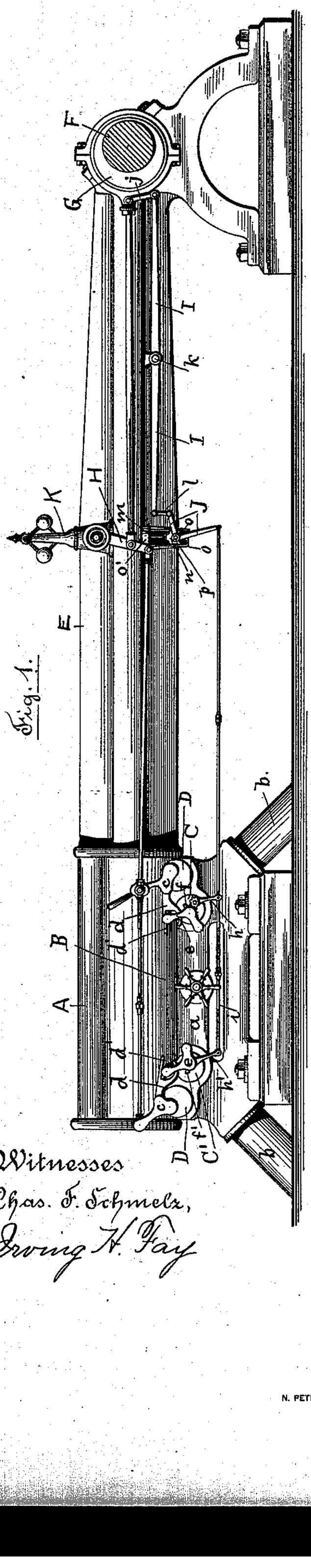

Fig. 1.

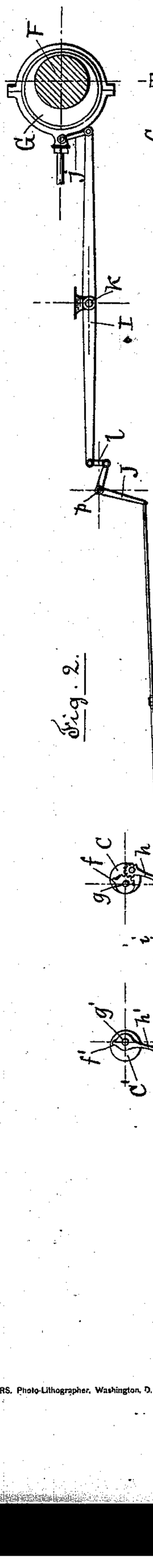

Fig. 2.

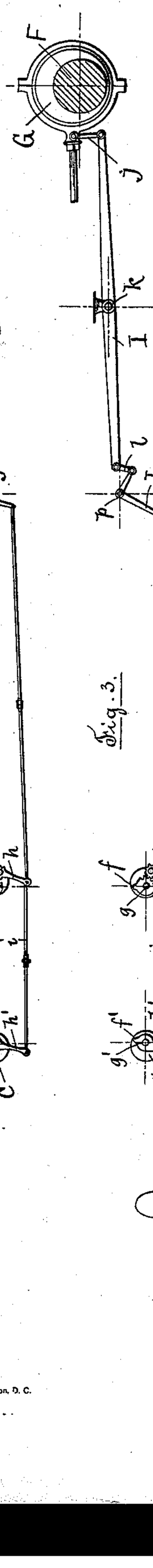

Fig. 3.

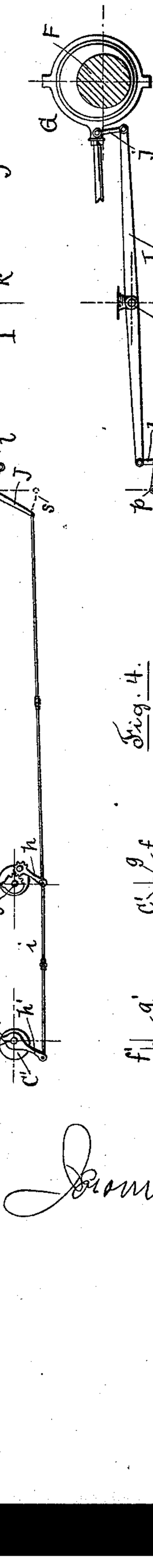

Fig. 4.

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MECHANISM FOR CONTROLLING CUT-OFF VALVES.

SPECIFICATION forming part of Letters Patent No. 413,696, dated October 29, 1889.

Application filed March 23, 1889. Serial No. 304,463. (No model.)

To all whom it may concern:

Be it known that I, JEROME WHEELOCK, a citizen of the United States, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Mechanism for Controlling Cut-Off Valves in Engines, of which the following, in connection with the accompanying drawings, is a specification sufficiently clear and descriptive to enable those skilled in the art to which my invention belongs to make and use the same.

My invention relates to automatic cut-off engines in which the cut-off valve is operated by means of the latch block and link connected to the arm of the exhaust-valve and adapted to be disengaged from said latch-block by a trip-cam operated by the governor, all of which are well-known and have been fully described in Letters Patent No. 144,174, granted to me on October 28, 1873; and my invention consists in the improved system of levers and connections by which the trip-cams are operated, as will be fully described, and particularly pointed out in the claims.

Heretofore it has been a serious objection that the link could not be disengaged from the latch-block attached to the arm of the cut-off valve, except at certain individual points of its forward travel, on account of the stationary condition on part of the trip-cam during the full stroke of the piston, when the engine is running at comparatively uniform speed—for instance, when the engine is running so slow that the governor does not cause the trip-cams to liberate the cut-off valve, even at the farthest point of travel in the valves. Steam is then admitted into the cylinder for almost the full stroke of the piston, and if any "load" on the engine should be suddenly removed the cut-off valve cannot be tripped during the return travel of the exhaust-valve crank, and the acceleration in speed would necessarily be so as to disturb the even movement of the fly-wheel, which in some cases is very detrimental to the machines which are driven by the engine—for example, to dynamos for electric lighting, which require a uniform and unvarying speed. This objection I overcome by the improved system of operating the trip-cams forming the subject of this application, and which is fully shown in the drawings, in which—

Figure 1 represents a side view of an automatic cut-off engine generally known as the "Wheelock engine" and embodying my improvements. Figs. 2 to 4, inclusive, are diagrams showing the positions which the trip-cams assume under different conditions in eccentric and governor.

Similar letters refer to similar parts.

In the drawings, A is the cylinder, into the steam-chest *a* of which steam is admitted by the throttle B and then passes through the cut-off valves C C′ into the cylinder.

D are the exhaust-valves, allowing the used steam to pass out of the cylinder and through the exhaust-pipes *b*.

As the construction is well known, as well as the operation of the cut-off valve by the arm of the exhaust-valve, I do not deem it necessary to describe the same fully, as the parts pertaining to the valve-operating mechanism are substantially the same in all cases.

E is the engine-bed, supporting at its forward end the crank-shaft F, carrying the eccentric G, which, through the rocker H, imparts an oscillating motion to the arms *c* of the main valves.

To the arm *c* is pivoted the link *d*, having a bolt *d′*, on which slides a latch-block, which is secured to the arm *e* of the cut-off valve. The links *d* are raised out of engagement with the latch-blocks on the arms *e* by the trip-cams *f f′*, the former of which is pivoted on the valve-stem *g*, and is provided with gear-teeth to be engaged by similar teeth provided on the hub of the lever *h*, which is pivoted on the shell of the cut-off valve C, while the latter cam *f′* is formed directly on the hub of the lever *h′*, pivoted on the valve-stem *g′*, both levers *h h′* being connected by means of the rod *i* and operated as follows: To the eccentric-strap G is attached the link *j*, the other end of which is secured to the lever I, which is pivoted at *k* to the engine-bed E, and the rear end of which is connected through the link *l* with the bell-crank lever J. K is the engine-governor, the balls of which cause the rise or fall of the rod *m*, which adjustably supports the cross-head *n*, sliding in ways *o*, which are secured to or made integral with

the bottom plate o' of the oil-reservoir of the governor. The bell-crank lever J is pivoted at p to the cross-head n, and its lower end is in direct connection with the lever h above mentioned. In Fig. 1 the governor is represented in its lowest position, and the piston may thus obtain full steam from the commencement of the stroke until the cut-off valve is tripped, which heretofore could only be accomplished during the forward movement of the arm attached to the exhaust-valve. This would allow full steam for the piston for fully three-quarters of the stroke, and if the engine should not require that amount of steam a sudden start on part of the piston would be the result, and the steam could not be shut off on account of the arm of the cut-off valve being connected to the slow-moving arm of the exhaust-valve.

By my improved system, as above described, I positively disengage the arm of the cut-off valve at any point not exceeding three-fourths of the stroke, allowing the steam to expand and carry the piston to the end of its stroke.

The operation is as follows: The rotation of the shaft F imparts a vibrating motion to the lever I, which in turn operates the bell-crank lever J, thereby causing a rocking motion on the part of the trip-cam levers $h\,h'$, the amount of which is the same always, but the location of which is regulated or controlled by the governor K, as may readily be seen by referring to Figs. 3 and 4 of the drawings, in which the eccentric is in the same position in both instances, while the cross-head carrying the bell-crank lever J is in its highest position in Fig. 3 and in its lowest position in Fig. 4. The amount of travel on part of said bell-crank lever J, as indicated by the dotted lines $s\,s$, is the same; but the location of such movement is forward in Fig. 4, so that the trip-cams $f\,f'$, upon the slightest action on part of the governor, may release the cut-off valve, even during the return travel of the exhaust-valve crank. In Fig. 3 the conditions are reversed, inasmuch as the travel of the trip-cams $f\,f'$ is such as to prevent any engagement of link and the arm of the cut-off valve, so that the engine is at all times under full control of the governor, and the cut-off valve may be tripped at any point of the piston travel up to three-quarters of the stroke. It will thus be seen that during each revolution of the crank-shaft the trip-cams travel once back and forth, and will consequently disengage the link from the arm of the cut-off valve during either forward or return movement of the exhaust-valve crank and at any point where the cams will encounter said link, the latter condition depending solely upon the position of the governor-balls.

Having fully described and explained my invention and its operation, what I claim as new, and desire to secure by Letters Patent, is—

1. In a valve-gear for controlling the cut-off valves of steam-engines, one or more trip-cams which complete one forward and backward movement during one revolution of the crank-shaft, means for operating the cams, and a governor for controlling the path of travel of said cams, substantially as and for the purpose set forth.

2. In a valve-gear for controlling the cut-off valves of engines, the combination of one or more trip-cams making a complete forward and backward movement during one revolution of the crank-shaft, with a governor whereby the path of such movement is controlled, substantially as and for the purpose set forth.

3. In a valve-gear for controlling the cut-off valves of engines, the combination of one or more trip-cams with means, substantially as described, for imparting to the trip-cams a complete forward and backward movement during one revolution of the crank-shaft, and a movable fulcrum controlled by the governor for controlling the path of travel of said cams, as and for the purpose set forth.

4. In a valve-gear for controlling the cut-off valves of engines, the combination of one or more trip-cams, an eccentric for imparting to the same a complete forward and backward movement during one revolution of the crank-shaft, and a governor whereby the path of such movement is controlled, substantially as and for the purpose specified.

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