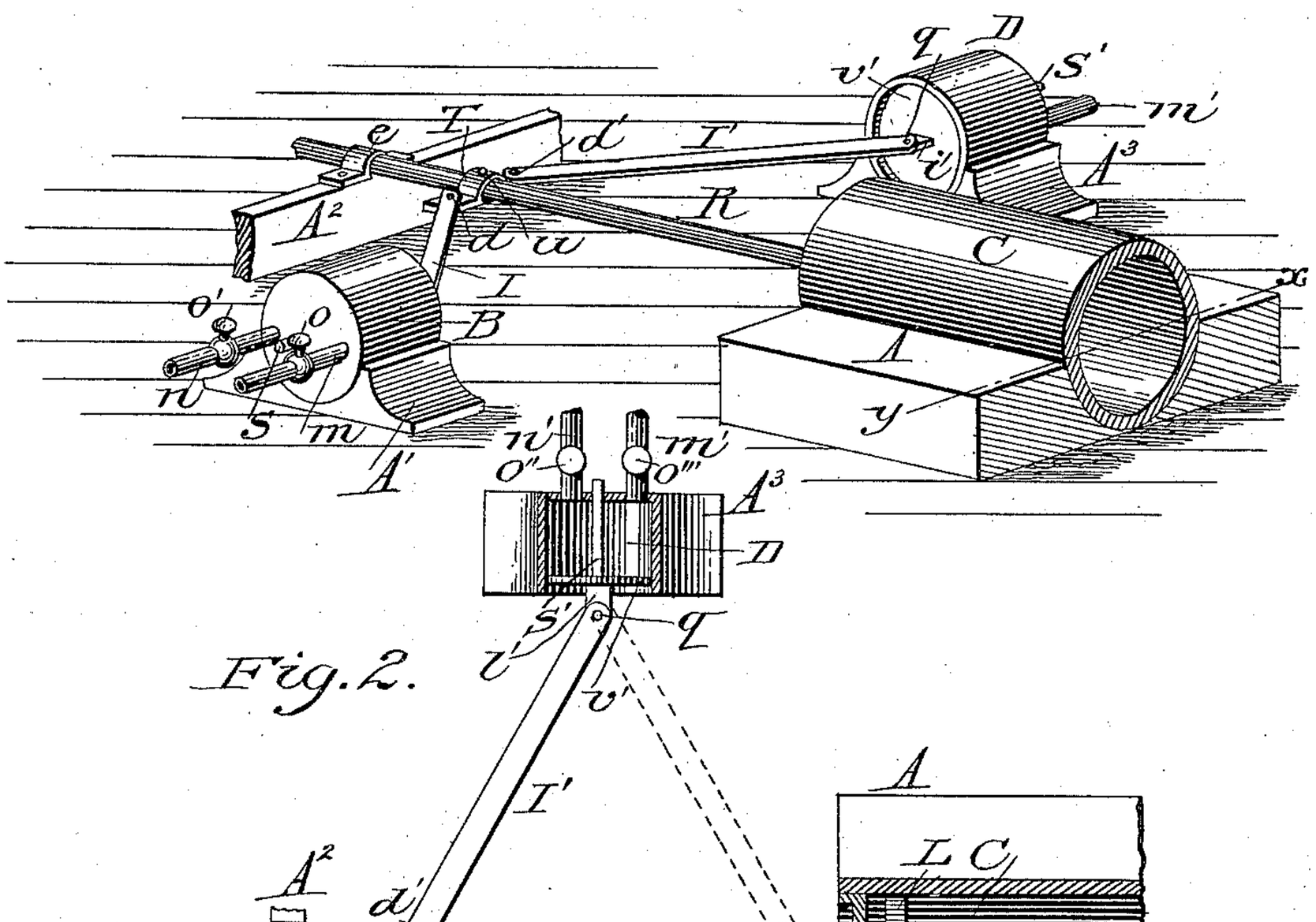
(No Model.)

W. H. MORRISON.

STEAM ENGINE.

No. 344,003. Patented June 22, 1886.

Fig. 1.



Witnesses.

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WILLIAM HENRY MORRISON, OF INDIANAPOLIS, INDIANA.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 344,003, dated June 22, 1886.

Application filed November 13, 1885. Serial No. 182,751. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HENRY MORRISON, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented new and useful Improvements in Steam-Engines, of which the following is a specification.

My invention relates to the partial equalization of the action of steam in the cylinder of a steam-engine when the steam is cut off before the end of the stroke of the piston for the purpose of increasing the efficiency of the steam and of economizing steam. I attain these objects by the mechanism illustrated in the accompanying drawings, two sheets, marked Figures 1 and 2.

Fig. 1 is a perspective view of the improvements referred to. Fig. 2 is a cross-section of them, the plane of the cross-section being shown by the dotted line *y x* in Fig. 1.

Similar letters refer to similar parts throughout the several views.

C is the ordinary cylinder of a steam-engine fastened to a part of the fixed frame A.

L is the piston of cylinder C, and R is its piston-rod.

B and D are auxiliary steam or water cylinders, fastened, respectively, to two parts, A′ and A³, of the fixed frame of the engine. Their object will be hereinafter explained.

The cylinders B and D have similar parts—namely, their pistons *v* and *v′*, the short bars *i* and *i′*, attached to these pistons, their piston-rods *s* and *s′*, which pass through the outer heads of B and D, as shown, the pipes *n* and *n′* *m* and *m′*, with their respective stop-cocks *o″* *o‴* *o* *o′*. The pipes *n* and *n′* are to connect with the steam in the steam-dome of a steam-boiler. The pipes *m* and *m′* are to connect with the water in a steam-boiler below the low-water line. By this means the cylinders B and D may by the opening or closing of the stop-cocks *o* *o′* *o″* *o‴* have either water or steam in them. It may be preferable in some cases to use water, as described, in the auxiliary cylinders B and D, and in other cases, where the piston has a rapid motion, to use steam in the said auxiliary cylinders. If the stop-cocks *o′* and *o″* are open and the stop-cocks *o* and *o‴* are closed, the cylinders B and D will have steam in them; but if the stop-cocks *o* and *o‴* are open and the stop-cocks *o′* and *o″* are closed, the cylinders B and D will have water in them. The piston-rod R passes through the guide *e*, which is fastened to a part of the fixed frame A².

The appearance and connections of the various parts are shown in the drawings, Figs. 1 and 2. A sleeve, T, surrounding the piston-rod R, is firmly fastened by a set-screw, *u*, or other suitable means, to the piston-rod R, as shown. The lever I is pivoted to the sleeve T by the pivot *d*, and it is pivoted also at its other end to the short bar *i*, attached to the piston *v* by the pivot *q*. The lever I′ is pivoted at one end to sleeve T by the pivot *d′*, and at the other end to the short bar *i′*, attached to the piston *v′* by the pivot *q′*, as shown, so that at one end of the stroke of the piston L the levers I and I′ assume the positions shown in the drawings, and at the other end of the stroke of piston L they assume the positions shown by the dotted lines marked I² and I³. Supposing the steam for cylinder C to be cut off at one-third stroke, then in the first half of the stroke of piston L the pistons *v* and *v′* are pressed outward against the pressure of the steam or water (as the case may be) which is in the auxiliary cylinders B and D, these cylinders being by their pipes, as described, in connection with the steam or water in a steam-boiler. This diminishes the power of the engine during the first half of the stroke of the piston L, but the same amount of power is returned from the cylinders B and D during the latter half of the stroke of the piston L, (when otherwise the power of the steam in cylinder C would not drive the piston L with sufficient force,) thus approximately equalizing the power of the engine at the different parts of the stroke of piston L. Another object is to economize steam. One of the cylinders, B or D, might be used alone; but two are here used to obviate the side strain. If steam is used in the auxiliary cylinders B and D, they might be placed above the high-water line in the steam-boiler, so as to allow any condensed steam to run back into the steam-boiler. There is a modification of this plan which I will mention—namely, the auxiliary cylinders B and D may be made oscillating cylinders, as in the case of the ordinary os-

cillating steam-engines, and their interior piston-rods, extending to the sleeve T and fixed immovably to the pistons *v* and *v'*, may be connected with the sleeve T by the pivot-joints *d* and *d'*. Again, the levers I and I' might be connected directly with the rod R.

I am aware that levers connected by a toggle-joint worked by a connecting-rod and operating-pistons in air-cylinders have been employed to partially equalize in an imperfect manner the action of steam used expansively in a steam-engine; therefore I do not claim such an arrangement here. I obtained a patent on the imperfect plan just referred to December 21, 1852, Patent No. 9,486; but the plan herein described is more perfect than the former one.

I am aware also that the piston-rods of the auxiliary cylinders B and D have been connected with the main piston-rod without intervening connecting-rods, and that both steam (as in Alfred Gregory's Patent, No. 8,345, issued September 9, 1851) and water have been employed in the auxiliary equalizing-cylinders B and D; but the water in these cylinders has not heretofore been connected with the water in the boiler of the steam-engine.

What I claim as of my invention, and desire to secure by Letters Patent of the United States, is--

The combination of the auxiliary equalizing-cylinders B and D, their pistons *v v'*, and their pipes *m m'*, when these pipes *m m'* are connected with the water in the boiler of the steam-engine, substantially as and for the purpose described.

WILLIAM HENRY MORRISON.

Witnesses:

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