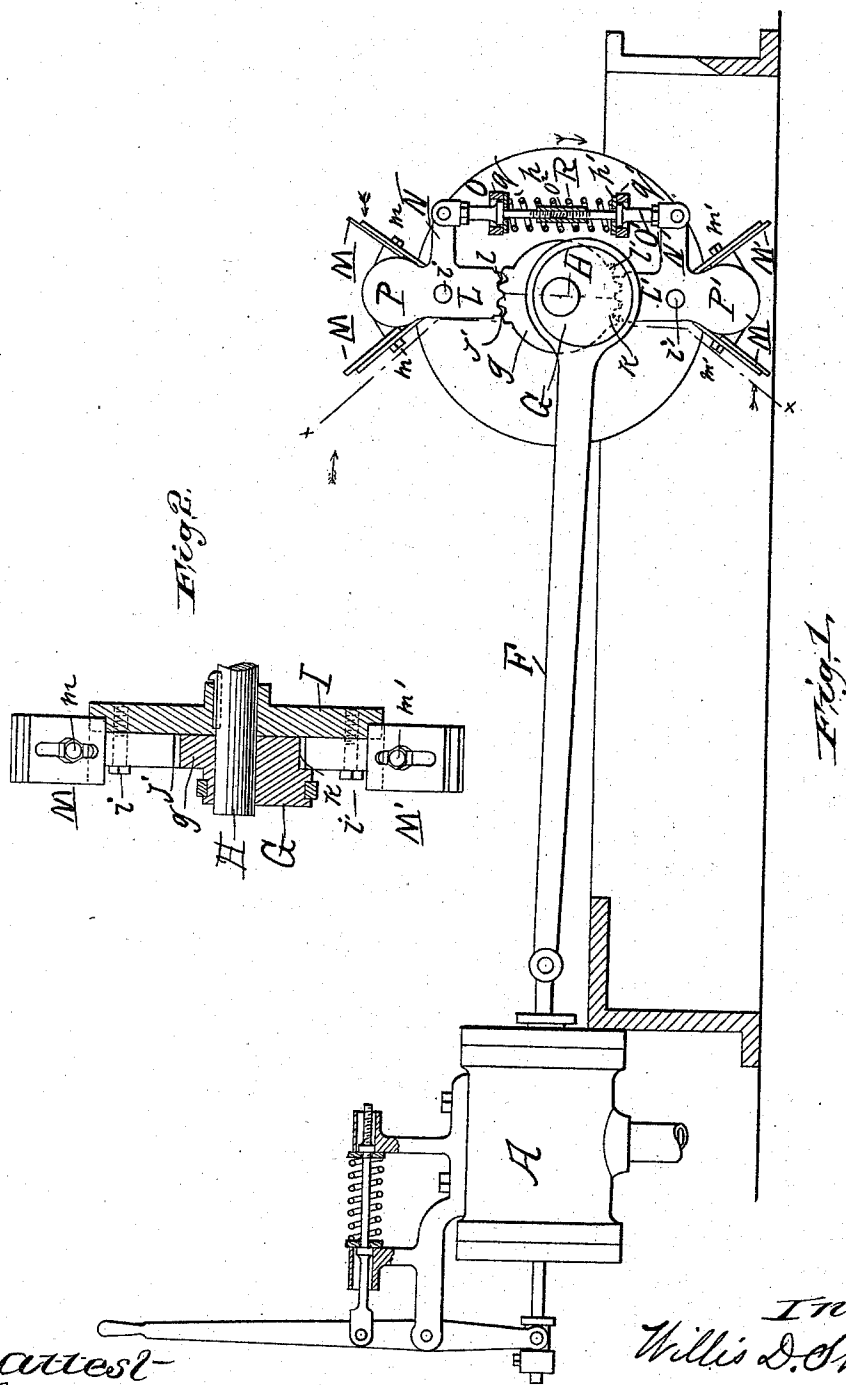


(No Model.)

W. D. SHERMAN.
STEAM ENGINE.

No. 530,555.

Patented Dec. 11, 1894.



attest
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UNITED STATES PATENT OFFICE.

WILLIS D. SHERMAN, OF BROOKLYN, NEW YORK.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 530,555, dated December 11, 1894.

Application filed March 23, 1894. Serial No. 504,815. (No model.)

To all whom it may concern:

Be it known that I, WILLIS D. SHERMAN, a citizen of the United States, and a resident of Brooklyn, in the county of Kings, State of New York, have invented a certain new and useful Improvement in Steam-Engines, of which the following is a specification.

My invention relates to improvements in steam engines, and is especially concerned with automatic steam counter-balances for the same, of the kind described and claimed in my application for Letters Patent filed in the United States Patent Office the 20th day of March, 1894, Serial No. 504,474.

In particular, this invention relates to improvements in the devices for automatically varying the lead of the main valve of steam engines (whereby the steam counter-balance is produced) by the resistance of the air on revolving blades. The resistance of the air causes the blades to fall behind the main shaft, and the blades are connected with the eccentric in such a manner that this backward tendency of the blades shifts the eccentrics in the direction of increasing the lead of the valve. The greater the speed of the engine the greater the resistance of the air on the blades, and the greater the lead of the valve, and the greater the proportion of the stroke during which an air cushion is produced in front of the piston, to counter-balance the inertia of the same and its connected parts.

The said device is adapted to be used with all steam engines which have eccentrics, and is particularly adapted to be combined with port-reversing engines.

Referring to the drawings which accompany the specification, Figure 1 is an elevation of the device applied to a port-reversing engine. Fig. 2 is a face view on a larger scale of the blades, and showing certain other parts in section.

A being the cylinders, F the connecting rod of the valve, and G the eccentric on the main shaft H, the improved automatic steam counter-balance is applied in the following manner: The eccentric G is connected or formed integral with the collar *g*, which has a working fit on the main shaft H, and is provided with teeth *j*, *k*, preferably arranged on opposite extremities of a diameter of the main

shaft H, as shown. I is a disk keyed on the said main shaft H adjacent to the collar *g*. In said disk I is pivoted at *i*, *i'*, the levers L, L', to which levers are secured in any suitable manner the blades M, M'.

In the drawings I show the levers L, L', each provided with weights P, P', and the aforesaid blades M, M', secured to the said weights by means of bolts and slots *m*, *m'*, respectively, but I can dispense with the said weights P, P' and connect the said blades directly with the levers L, L' and while I show in the drawings the said blades arranged in pairs on each side of the eccentric, it would suffice to use the single blade on each side thereof, but I prefer the arrangement shown in the drawings. I also prefer to form each blade in two pieces which may slide over each other, so as to increase the effective surface when desired. The inner ends of said levers L, L', are provided with teeth *l*, *l'*, which mesh respectively with the teeth *j*, *k*, of the collar *g*. Said levers L, L' are also provided with arms N, N' which are pivotally connected with rods O, O', which work through eyes in lugs *q*, *q'*, fixed on the disk I. The inner ends of said rods O, O' thread in a sleeve *o*². Said rods O, O' are shouldered at *o*, *o'* to bear against washers *p*, *p'*, between which is a spring R, coiled loosely around the rods O, O' and sleeve *o*². The tension of said spring is regulated by turning the sleeve *o*², and said spring is so set as to normally hold the eccentric in such position that there is no lead to the valve of the port-reversing engine.

The device operates in the following manner: Assuming that the main shaft be running in the direction of the arrow (Fig. 1) the resistance of the air will manifestly cause the said blades M, M', to tend to lag behind the main shaft, as indicated by the small arrows adjacent to the blades, but this tendency will oscillate the aforesaid levers L, L', about their respective pivots *i*, *i'*, in the direction of the air pressure, and the said levers will rotate the collar *g*, and, consequently, the eccentric G on the main shaft correspondingly, and thereby increase the lead of the main valve E, admitting steam in front of the piston and thereby producing a steam cushion in front of said piston, which automatically counterbalances the inertia of the piston and

its connected parts, and prevents the vibration which is caused by said inertia when the engine is running at high speed. If the engine be revolved in the opposite direction, manifestly the same effect will be produced, the air pressure on the blades M, M', now oscillating the said levers L, L', in a direction reverse to the motion of the said shaft as before, and giving the eccentric a lead in the opposite direction, and thereby again forming a steam cushion in advance of the piston. Thus it is apparent that in the case of engines which are required to run at variable speeds, as in hoisting apparatus, the inertia of the piston will be equalized by the steam cushion which is created by the automatic varying lead of the valve and the vibration of the engine reduced to a minimum.

The effect of the weights P, P', is to energize the motion of the blades M, M', for the inertia of the said weights P, P', will manifestly cause them to lag behind the main shaft, and this tendency will be added to the resistance of the air on the blades M, M'.

Now, having described my improvements, I claim as my invention—

1. In steam engines air resistance blades operatively connected with the main shaft and with the eccentric for the purpose of automatically varying the lead of the main valve

according to the speed of the piston, substantially as described.

2. The combination with port-reversing engines of air resistance blades operatively connected with the main shaft and with the eccentric for the purpose of automatically varying the lead of the main valve according to the speed of the piston, substantially as described.

3. The combination in steam engines of the cylinder, piston, main shaft, eccentric, main valve and air resistance blades operatively connected with the main shaft and the eccentric for the purpose of varying the lead of the main valve according to the speed of the piston, substantially as described.

4. In operative combination with the main shaft eccentric and valve, slotted blades M adapted to expose greater or less effective surface to the air for the purpose of varying the eccentric according to the speed of the engine, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 13th day of March, 1894.

WILLIS D. SHERMAN.

Witnesses:

WILLIAM H. S. CARLILE,
FRANK B. JOHNSON.