

(No Model.)

D. F. NISBET.

STEAM ACTUATED VALVE.

No. 295,669.

Patented Mar. 25, 1884.

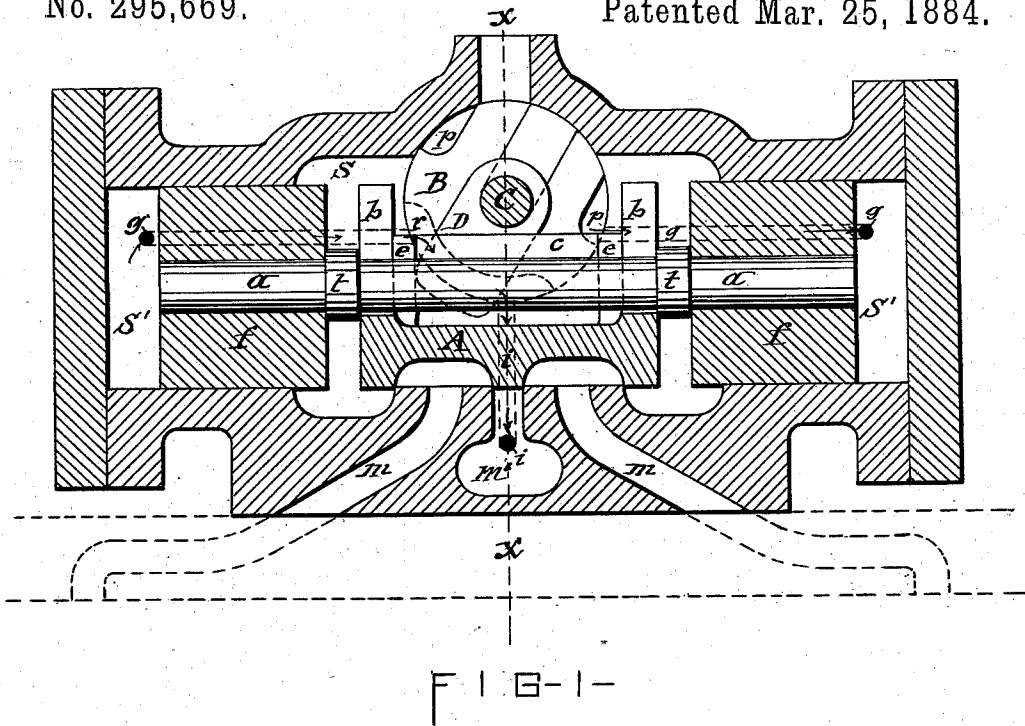


FIG-1-

FIG-2-

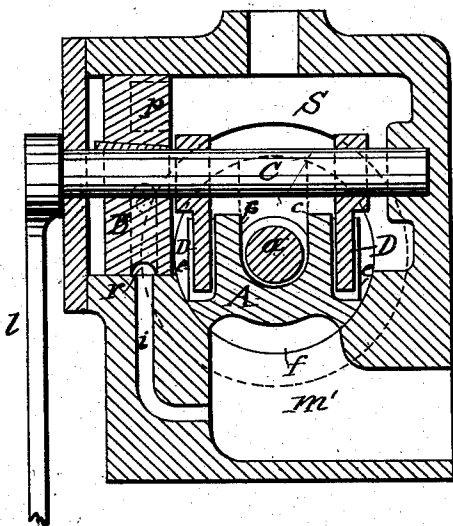
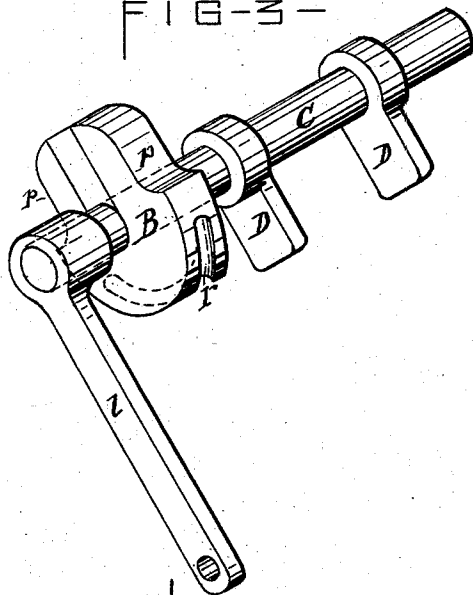


FIG-3-



ATTEST—

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# UNITED STATES PATENT OFFICE.

DAVID F. NISBET, OF SYRACUSE, NEW YORK.

## STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 295,669, dated March 25, 1884.

Application filed November 28, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, DAVID F. NISBET, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Steam-Actuated Valves, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention consists in a novel construction and combination of the valve of a steam-cylinder and means for actuating said valve, whereby the operation of the valve is rendered positive without the employment of a balance-wheel, and with a comparatively slight motion of the valve-gear, and consequently with a materially reduced friction and wear of the latter; and, furthermore, the said valve-gear is rendered safe from liability of disarrangement, and easy of access for repairs or adjustment, all as hereinafter more fully described, and specifically set forth in the claims.

In the annexed drawings, Figure 1 is a longitudinal section of my invention. Fig. 2 is a transverse section on line *x x*, Fig. 1; and Fig. 3 is a detached isometric view of the main actuating mechanism of the valve.

S represents the steam-chest, mounted on the steam-cylinder of an engine or pump, and provided with the usual steam and exhaust ports, *m* and *m'*.

A is an ordinary slide-valve, which I designate the "main" valve, for the reason hereinafter explained, said valve being arranged to reciprocate over the ports *m m m'*, to admit the steam to the cylinder and pass the exhaust-steam from the same in the usual manner. The steam-chest S has its interior formed with end extensions, S', preferably of cylindrical form, and in each of said extensions is fitted a steam-tight piston, *f*. Said pistons are fixed to opposite ends of a rod, *a*, which is extended through yokes *b* on the main valve A, and holds said valve securely between the pistons *f f* by collars *t*, fixed to or formed on the rod *a* between the piston and valve.

B denotes a supplemental valve in the form of an annular disk, fitted steam-tight in an opening, E, in the side of the steam-chest. Said supplemental valve is rigidly attached to a rock-shaft, C, which is extended across the main valve A, midway between the yokes there-

of, and is journaled in the opposite side of the steam-chest, as shown in Fig. 2 of the drawings. To the rock-shaft C are also firmly attached two cams, D D, which project radially at corresponding angles from said shaft. By means of longitudinal parallel ribs *e e*, projecting from the top of the valve A at the sides of the cams D D, the rock-shaft is prevented from moving longitudinally, and is thus confined to its bearings in the steam-chest.

On the inner side of each of the yokes are two shoulders or projections, *e e*, which are in range with the cams D D, so as to encounter with the same during the oscillation of the rock-shaft, the alternate encounter with the projections at opposite sides of the rock-shaft imparting a rectilinear reciprocating motion to the main valve A. The cams D and projections *e* are so proportioned as to allow the valve to be carried only part way its requisite stroke, the stroke being completed by the following instrumentalities:

The annular supplemental valve B, seated in a circular opening in the side of the steam-chest, as before described, is provided in the lower portion of its peripheral face with a groove or channel, *r*, which is extended about one-third the circumference of the valve B, and the upper portion of the supplemental valve is provided with two recesses or passages, *p p*, which extend to the periphery of the supplemental valve.

Through the side wall of the steam-chest are extended channels or ducts *i*, *g*, and *g*, one of which reaches from the supplemental valve B to the exhaust-port *m'* of the cylinder, and the other two ducts are extended from the supplemental valve to the ends of the steam-chest extensions S'. The channel *r* and passages *p p* in the supplemental valve B and the ends of the ducts *i*, *g*, and *g*, adjacent to the supplemental valve, are arranged in such positions in relation to each other that when the rock-shaft C is at one of the extremes of its movement the channel *r* in the supplemental valve communicates with the duct *i* and with one of the ducts *g*, while one of the passages *p* of the supplemental valve is in coincidence with the other duct, *g*. This allows the steam to escape from the rear of one of the pistons *f* to the exhaust-port, while steam passes from the

steam-chest to the back of the other piston *f*, as indicated by arrows in Fig. 1 of the drawings. This relief of the piston at one end of the main valve and the application of steam-  
 5 pressure to the piston on the opposite end of said valve causes the latter to be moved to the end of its requisite stroke. The oscillation of the supplemental valve B brings the passages thereof alternately in communication with  
 10 the ducts leading to opposite ends of the steam-chest. The ducts *g* intersect the steam-chest extensions *S'* a sufficient distance from the end thereof to cause the end of the duct to be closed by the piston *f* before it has reached  
 15 the end of its stroke, thereby confining a portion of the steam in the end of the steam-chest extensions, to form a cushion for receiving the thrust of the approaching piston. The rock-shaft C receives its motion by means  
 20 of an arm, *l*, attached to the said shaft, and connected with the main piston-rod in any suitable manner to partake the requisite motion therefrom.

It will be observed that the described means  
 25 for operating the main valve dispense with the fly-wheel, and are simple in construction, positive in their action, and while secure in their arrangement they are, nevertheless, easy of access for repairs, renewal, or adjustment. In  
 30 the reverse motion of the rock-shaft the cams D move the main valve sufficiently to carry the piston *f* clear of the end of the ducts *g*, and simultaneously bring the passage *p* of the supplemental valve in coincidence with  
 35 the aforesaid duct to admit steam through the same to the back of the receding piston, and this application of steam propels the piston to the end of its stroke.

It will be observed that by the described arrangement a single duct serves to convey steam  
 40 to and from the end of the steam-chest extension.

Having described my invention, what I claim as new, and desire to secure by Letters  
 45 Patent, is—

1. In combination with a slide-valve of a steam-engine, a steam-chest having its inte-

rior formed with end-extension pistons on the ends of the valve, a rock-shaft having cams  
 50 adapted to move the valve part way its stroke, a supplemental valve connected with the rock-shaft and provided with steam and exhaust passages, and auxiliary steam and exhaust channels extended from the supplemental valve,  
 55 respectively, to the ends of the steam-chest extensions and to the exhaust-port of the steam-cylinder, said parts being constructed and arranged in such relation to each other that the main valve will move part way its stroke synchronous with the first movement of the  
 60 supplemental valve and complete the stroke by the pressure of steam admitted to the steam-chest extensions by the supplemental valve, substantially as specified.

2. In combination with a slide-valve of a  
 65 steam-cylinder, a steam-chest provided in the center of one of the sides with an annular opening, the exhaust-port of the cylinder, a rock-shaft extended through the center of said cavity, a disk mounted on the rock-shaft and  
 70 fitted to the aforesaid cavity, and having in its periphery recesses adapted to communicate with the aforesaid ducts, and cams attached to the rock-shaft and adapted to carry the valve part way its stroke, substantially as described  
 75 and shown.

3. In combination with the main valve provided with pistons at opposite ends, the rock-shaft provided with cams D D, the supplemental valve provided with passages *r* and *p*  
 80 *p*, and single ducts extended from the supplemental valve, respectively, to opposite ends of the steam-chest and to the exhaust-port, substantially as described and shown.

In testimony whereof I have hereunto signed  
 85 my name and affixed my seal, in the presence of two attesting witnesses, at Syracuse, in the county of Onondaga, in the State of New York, this 17th day of November, 1883.

DAVID F. NISBET. [L. s.]

Witnesses:

FREDERICK H. GIBBS,  
 CHARLES H. DUELL.