

(No Model.)

3 Sheets—Sheet 1.

D. A. DECROW.
VALVE MECHANISM.

No. 526,484.

Patented Sept. 25, 1894.

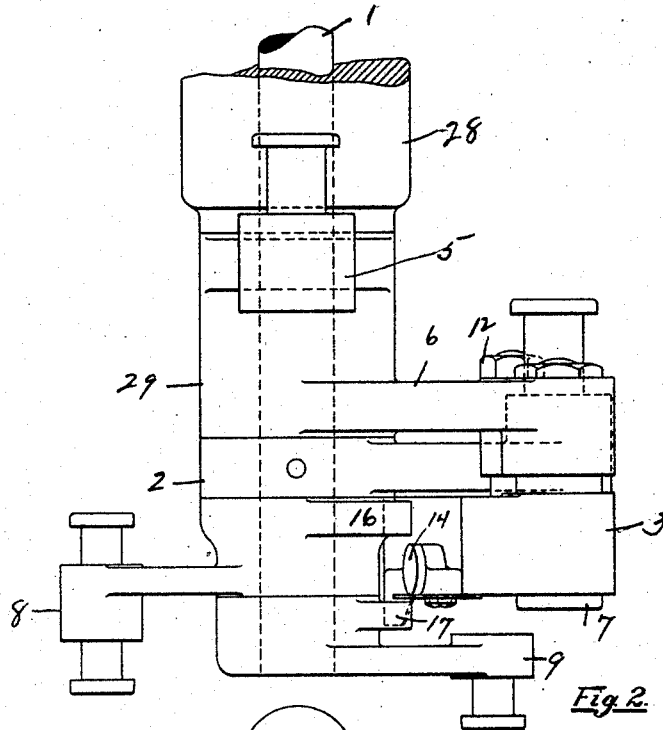


Fig. 2.

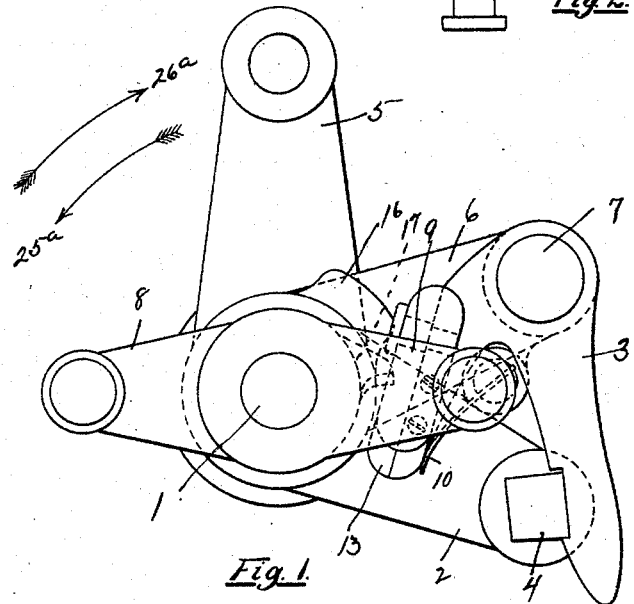


Fig. 1.

WITNESSES:-

A. E. Morris
M. J. Cavanaugh

INVENTOR:-

David A. Decrow
by Brown & Darby
Attys

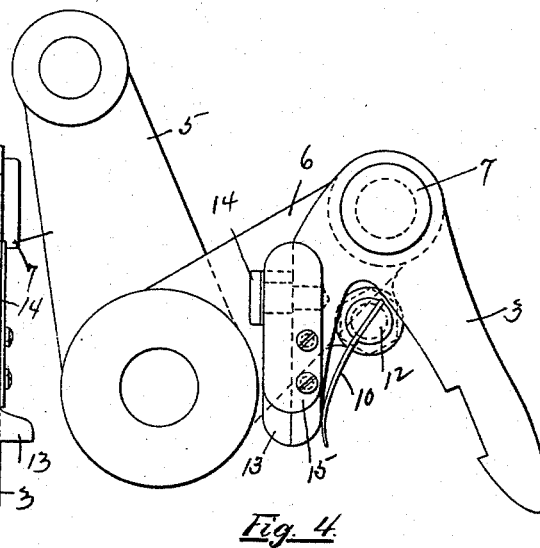
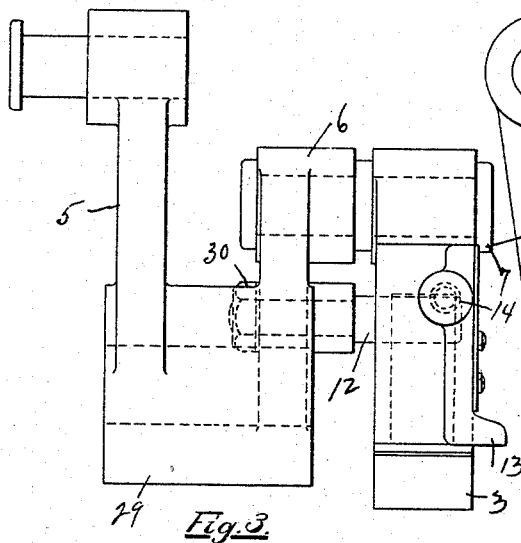
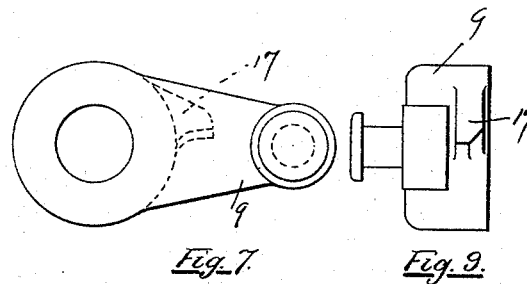
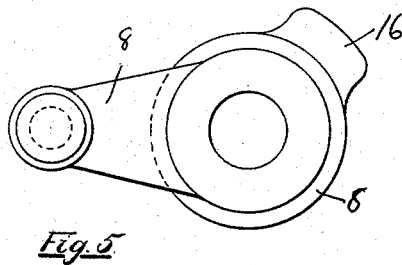
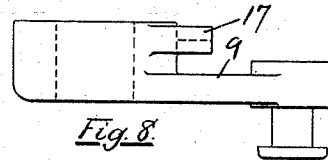
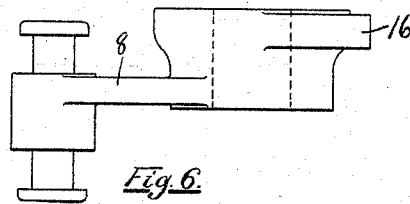
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A. L. Morris,
N. J. Cavanaugh.

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David A. Secrow
by Brown & Darby
Attys

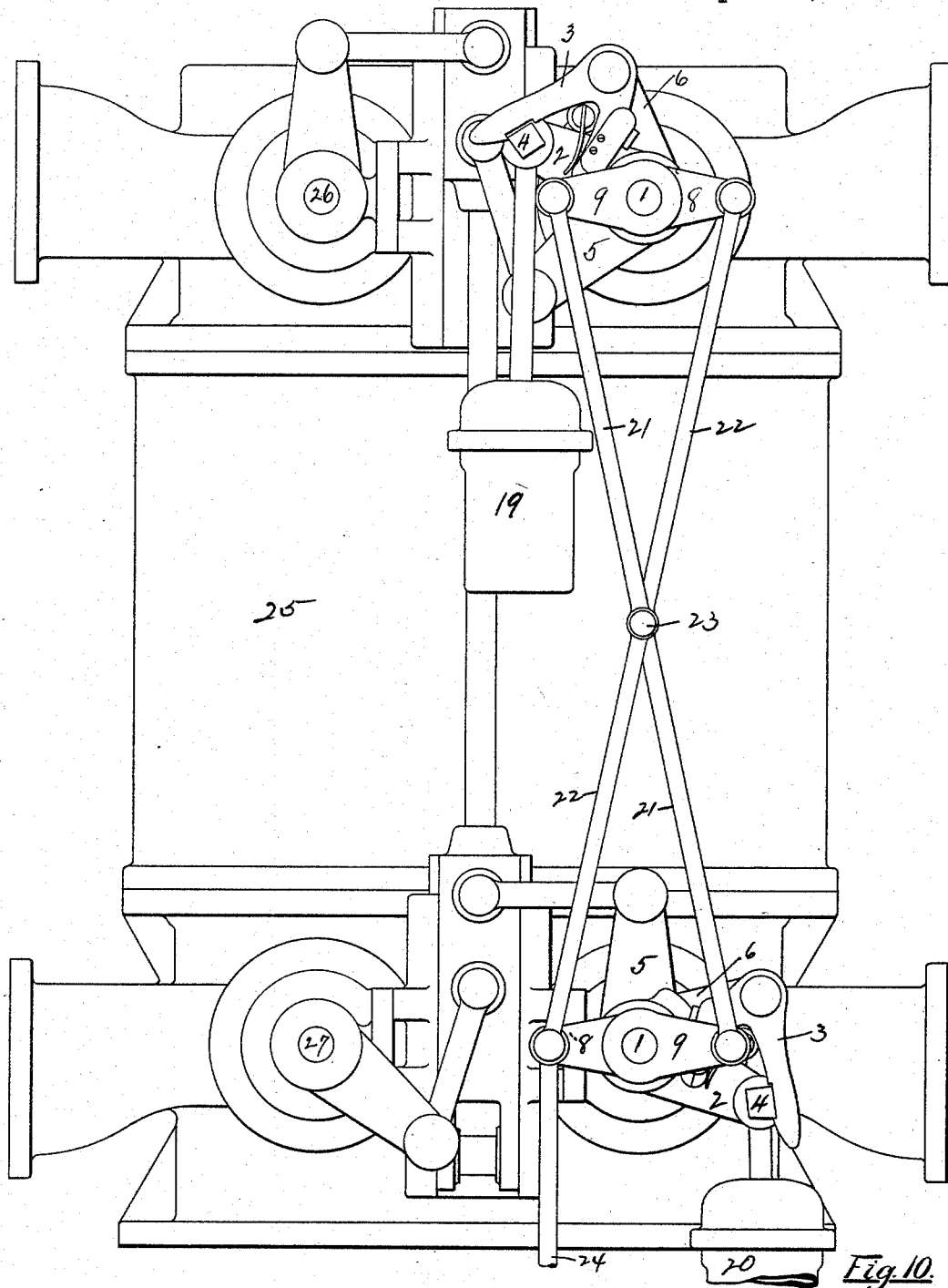
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WITNESSES:-

A. G. Morris
M. J. Canavan

INVENTOR:-

David A. Decrow
by *Brown & Darby* attys

UNITED STATES PATENT OFFICE.

DAVID A. DECROW, OF LOCKPORT, NEW YORK.

VALVE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 526,484, dated September 25, 1894.

Application filed May 28, 1894. Serial No. 512,776. (No model.)

To all whom it may concern:

Be it known that I, DAVID A. DECROW, a citizen of the United States, residing at Lockport, in the county of Niagara and State of New York, have invented new and useful Improvements in Valve Mechanism of Steam-Engines, of which the following is a specification.

This invention relates to the valve mechanism of steam engines, and particularly to the valve mechanism of that class of steam engines known as "liberating-cut off."

The object of this invention is the provision of mechanism for controlling the cut-off devices whereby a range of cut-off may be obtained extending from a point at the beginning of the stroke to any point throughout the entire or full stroke of the engine.

With this object in view the invention consists substantially in the construction, combinations, location and relative arrangement of parts, all as shown in the accompanying drawings, as more fully hereinafter set forth, and finally pointed out in the appended claims.

In the drawings Figure 1 is a detail view in front elevation of mechanism embodying the principles of my invention. Fig. 2 is a plan view of the construction shown in Fig. 1. Fig. 3 is a detail view in side elevation of the pivoted latches detached from the valve stem. Fig. 4 is a detail view in front elevation of the latches, as shown in Fig. 3. Fig. 5 is a detail view in front elevation of the "knock-off" arm for releasing the valve during the first part of the stroke of the engine. Fig. 6 is a detail view in plan of the construction shown in Fig. 5. Fig. 7 is a detail view in front elevation of the knock-off arm for releasing the valve during the last part of the stroke of the engine. Fig. 8 is a detail view in plan of the construction shown in Fig. 7. Fig. 9 is a view in end elevation of the knock-off arm shown in Figs. 7 and 8. Fig. 10 is a general view in front elevation showing my improved valve liberating and cut-off mechanism, as applied to a vertical steam cylinder.

Referring to the drawings, wherein the same reference sign is used to designate the same part wherever it occurs throughout the several views, 1 designates the inlet valve stem. Suitably mounted on valve stem 1 is an arm

2, the hub of which may be secured to the valve stem in any suitable way, as by a pin, spline, key or set-screw, whereby when said arm is rocked the valve stem will be rotated in its bearings 28. To the free end of arms 2 are suitably journaled the dash pots 19, 20, in the usual way.

The valve motion is driven through an arm 5, the hub of which is loosely sleeved on valve stem 1. Cast with driving arm 5 and hub 29, or otherwise suitably secured thereto, to rock therewith, is an arm, 6, bored transversely at the outer free end thereof to receive a pin 7. Said pin is rigidly secured in the bore through arm 6 in any suitable way to prevent said pin from turning therein. Loosely mounted on the outer or projecting end of pin 7 to rock therearound as a pivot is a bell crank lever 3, one arm of which constitutes what I call the primary latch, and is formed with a hook portion adapted to engage the squared portion of the dash pot arm pin 4, and to be disengaged therefrom, as occasion requires, as will more fully hereinafter appear.

It will be seen that when the primary latch 3 is disengaged from the dash pot arm pin 4, the rocking motion imparted to the valve motion driving arm 5 will not effect a rotation of valve stem 1, inasmuch as said driving arm 5 is loosely sleeved on said stem; but when said primary latch engages the dash pot arm pin 4 any rocking motion imparted to the driving arm 5 will effect a rocking of the valve stem 1 through hub 29, arm 6, pin 7, bell crank shaped lever 3 and arm 2, the latter being rigidly mounted on the valve stem, as above explained. It is also apparent that when the primary latch 3 is disengaged from the pin 4 a rotary or rocking motion of valve stem 1 is effected independently of the motion of driving arm 5 through dash pots 19, 20 and arm 2, thus effecting a closing of the valve and the consequent cutting-off of the steam supply.

I will now describe the mechanism for automatically tripping latch 3 to effect the disengagement thereof with pin 4.

Numeral 8 designates what I term the primary knock-off arm. (See Figs. 5 and 6.) This arm is loosely sleeved to rock upon valve stem 1. The hub of the sleeve thereof is provided with a cam projection 16. The outer

free end of said arm 8 is suitably constructed to receive suitable operating mechanisms presently to be described. Also suitably sleeved to rock upon valve stem 1 is the hub of an arm 9, the arm 9 projecting in a direction opposite to that in which arm 8 projects. This arm 9 I designate the secondary knock-off arm and is provided on the hub thereof with a cam projection 17, having an inclined face, as shown, (see Figs. 7, 8 and 9,) and is also suitably constructed at the outer free end thereof to receive suitable operating connections presently to be described. One arm of the bell crank lever constituting the trip latch 3 is arranged in position to be engaged by cams 16 and 17, whereby the other arm of the said trip latch having the hook may be forced out of engagement with pin 4 at the proper time. In order to keep the trip latch in position to be engaged by said cams and normally in position to engage pin 4 on the dash pot arm, I suitably mount in arm 6 a pin 12 rigidly held in said arm 6 but capable of rotary adjustment by means of nut 30. The free end of said bolt is split and mounted in the split thereof is a strong leaf spring in position to engage the inner face of the rearwardly projecting arm of the latch 3 and press the same yieldingly into position to be engaged by the same cams as above explained. The rotary adjustment of pin 12 serves to regulate the tension of spring 10. Pivotaly hung upon the rear face of the arm of bell crank latch 3 is what I designate the secondary latch 13 pivoted to swing in a direction parallel to the length of the pivot of said latch 3, upon a pivot pin 14. The secondary latch 13 is held in position by means of a flat spring 15, secured to the front edge of said arm of the latch, which spring serves not only as a stop for said secondary latch, but permits the same to be rocked about its pivot against a yielding resistance. The end of said secondary latch is provided with a toe, as shown (see Fig. 3) which projects beyond the front edge of said primary latch in position to be engaged by the inclined face of cam 17 when the secondary knock-off arm is moved in one direction, whereby the said pin is rocked upon its pivot and the cam permitted to pass the same, as will more fully hereinafter appear.

In the form shown in Fig. 10 I provide two sets of valve mechanisms as above described, and the outer ends of each pair of primary knock-off arms 8 are connected by a rod 22. Similarly each pair of secondary knock-off arms 9 are connected by a rod 21. The position of one pair of knock-off arms is reversed relatively to the position of the other pair, and consequently rods 21 and 22 cross each other. At the point 23, where said rods cross each other they are pivoted together. It will be seen from this construction that when one of the knock-off arms is moved in one direction the secondary arm of the same pair is simultaneously moved in the opposite direction,

while both the primary and secondary knock-off arms in the other set are by the same movement equally and simultaneously moved in opposite directions and in a direction opposite respectively to the direction in which the arms of the first set move, as will be readily understood, the movement of said arms being a rocking movement around valve stems 1 upon which said arms are loosely sleeved, as above described. The lower primary knock-off arm 8 is connected in a suitable way through rod 24 to the governing mechanism of the engine, whereby the rocking movement of the knock-off arms, and hence the tripping of latch 3 and the movement of valve stems 1 are controlled by the governing mechanism of the engine.

Reference numeral 25 designates an ordinary vertical steam engine; 26 and 27, the exhaust valve stems of the engine.

It will be observed that there are two knock-off arms of each steam valve, adapted to be moved in opposite directions. The function of one knock-off arm is to liberate the cut-off valve on the forward or first movement of the valve motion, that is, during the first half stroke of the engine, and when so set that the valve is not released on the forward movement of the valve motion the other knock-off arm is provided, the function of which is that in its motion in the opposite direction it will be in position to release the valve on the return movement of the valve motion, the relative position of the two knock-off arms being such that when one ceases to act the other is in place to effect the liberating of the valve.

The driving arm 5 has the ordinary movement of the Corliss valve, and it moves in the direction of arrow 25^a during the first half of the stroke of the engine, and in the direction of arrow 26^a during the last half of the stroke of the engine. (See Fig. 1.) The trip latch 3 moves in unison with driving arm 5, as does the dash pot arm 2 when the trip latch is in engagement with pin 4 of said arm. When the driving arm 5 moves in the direction of arrow 25^a the rear face of the spring pressed arm of trip latch 3 comes into contact with cam projection 16 on the hub of primary knock-off arm 8, whereby the latch 3 is disengaged from the dash pot arm pin 4, allowing the valve to be closed by the action of the dash pots 19 or 20, as the case may be, the point of the cut-off being varied by the relative position of the knock-off arm 8 as controlled by the governor. If, however, primary knock-off arm 8 has been moved by the governor to a position that will prevent cam projection 16 from coming in contact with the rear face of the spring pressed arm of trip 3 during the movement of driving arm 5 in the direction of arrow 25^a, it is evident that the secondary knock-off arm 9 which has a simultaneous movement in the opposite direction relative to primary knock-off arm 8, has attained a position for cam 17 of the hub thereof to come

in contact with latch 13 on the rear face of the spring pressed arm of trip latch 3, effecting a disengagement of latch 3 from the dash pot arm pin allowing the valve to be closed by the dash pot, the spring 15 permitting said cam projection 17 to pass the toe of secondary latch 13 during the movement of drive arm 5 in the direction of the arrow 25^a, as will be readily understood.

From the above description it will be seen that the governor and its connection to the knock-off arms may by its movement lengthen or shorten the point of cut-off from a point at the beginning to any point throughout the entire or full stroke of the engine.

The primary latch 3 may be of any suitable or well-known construction, adapted to be tripped by the knock-off arms. The secondary latch 13 may be of many different shapes or forms, so constructed as to permit cam projection 17 on the hub of knock-off arm 9 to pass by the same without tripping latch 3 during the first part of the stroke of the engine, but to be engaged by said projection to effect the disengagement of the latch from the dash pot arm when the said knock-off arm is in a position for releasing the cut-off at a point beyond the half stroke of the engine.

The principle of two knock-off arms may be applied to any of the existing forms of liberating cut-off valve motions for the purpose of extending the range of the cut-off.

While I have shown and described a specific form of mechanism embodying the principles of my invention, I wish it to be distinctly understood that I do not limit myself thereto, as the principles of my invention may be embodied in various forms of mechanism and many variations and changes would readily suggest themselves to any one skilled in the art to which this invention relates and still fall within the scope of my invention.

Having now fully described my invention and having explained the principles thereof and the form of mechanism embodying the same, what I claim as my own invention, and desire to secure by Letters Patent of the United States, is—

1. In a valve gear for steam engines, means for cutting off steam at any point of the stroke of the engine, comprising a pair of knock-off arms and means for operating the same and connections between said knock-off arms and the valve mechanism; as and for the purpose set forth.

2. In a valve gear for steam engines means for cutting off the steam supply at any point of the stroke of the engine, comprising a pair of knock-off arms, and means for automatically moving said arms in opposite directions and means operated thereby for controlling the valve mechanism; as and for the purpose set forth.

3. In a valve gear for steam engines a valve stem, dash pot, rigid connections between said stem and dash pot, a valve mechanism, connections between said valve mechanism and

dash pot and means for automatically tripping said connections at any point throughout the stroke of the engine, comprising a pair of knock-off arms; as and for the purpose set forth.

4. In a valve gear for steam engines, the combination of a valve stem and dash pot, rigid connections between said stem and dash pot, a valve mechanism, connections between said valve mechanism and dash pot, a governor, a pair of knock-off arms and connections between said governor and knock-off arms for moving the latter simultaneously in opposite directions, and devices engaged by said knock-off arms for tripping the connections between said valve mechanism and dash pot; as and for the purpose set forth.

5. In a valve gear for steam engines a valve stem, an arm secured thereto to rock therewith, a dash pot attached to the free end of said arm, a valve mechanism mounted on said valve stem, connections between said valve mechanism and dash pot, whereby said valve mechanism, dash pot and arm are moved simultaneously and in unison, a tripping mechanism for disconnecting said connections, comprising a pair of knock-off arms, a governor and connections between said governor and knock-off arms for moving said arms simultaneously in opposite directions; as and for the purpose set forth.

6. In a valve gear for steam engines a valve stem, an arm rigidly secured thereto to rock therewith, dash pot carried by said arm, a valve mechanism, connections between said valve mechanism and dash pot comprising a pivoted latch, means for tripping said latch comprising a pair of knock-off arms, having cam projections, and means for moving said knock-off arms simultaneously in opposite directions; as and for the purpose set forth.

7. In a valve gear for steam engines a valve stem, a valve mechanism loosely sleeved thereon, an arm rigidly secured to said stem, a dash pot carried by said arm, connections between said valve mechanism and dash pot comprising a pivoted latch, a pair of knock-off arms loosely sleeved upon said stem, having cam projections thereon for engaging and tripping said pivoted latch and means for automatically rocking said arms upon said stem in opposite directions simultaneously; as and for the purpose set forth.

8. In a valve gear for steam engines a valve stem, a dash pot carrying arm rigidly secured thereto, a valve mechanism loosely sleeved on said stem, connections between said valve mechanism and arm comprising a pivoted latch, means for automatically tripping said latch comprising a pair of arms loosely sleeved on said stem, said arms having cam projections, means for yieldingly pressing said latch into position to be engaged by said cam projections, and means for automatically rocking said arms simultaneously in opposite directions; as and for the purpose set forth.

9. In a valve gear for steam engines a valve

mechanism, a pivoted trip latch adapted to move therewith, a pair of knock-off arms having cam projections, a governor, connections between said governor and knock-off arms for rocking the same simultaneously in opposite directions, whereby said pivoted trip latch will be tripped by said cam projections; as and for the purpose set forth.

10. In a valve gear for steam engines a valve stem, a valve mechanism carrying a pivoted pin, means for rocking said valve mechanism around said stem, a trip latch pivoted on said pivoted pin and carrying a secondary latch pivoted thereto, a pair of knock-off arms sleeved around said valve stem and having cam projections, the cam projection on one side of said arms adapted to engage and trip said tripping latch during the first half of each stroke of the engine, the cam on the other of said arms adapted to engage said secondary latch and trip said primary latch during the second half of each stroke of the engine, a governor, and means actuated by said governor for rocking said arms simultaneously in opposite directions; as and for the purpose set forth.

11. In a valve gear for steam engines the combination of a pivoted primary trip latch, a secondary trip latch pivoted to said primary trip latch to rock in a plane at right angles with the plane in which said primary latch rocks, a spring stop for said secondary latch, said secondary latch provided with a projecting toe, a pair of knock-off arms each having a cam, the cam on one of said arms adapted to engage said primary latch and trip the same during the first half of each stroke of the engine, the cam on the other of said arms adapted to engage said secondary trip latch to trip said primary latch during the second half of each stroke of the engine, means for operating said knock-off arms, as and for the purpose set forth.

12. In a valve gear for steam engines a stem, a valve mechanism sleeved to rock thereon, an arm rigidly secured to said valve stem, dash-pot secured to the outer end of said arm, a trip latch carried by said valve mechanism adapted to engage and hold said dash pot whereby said arm and valve mechanism may rock in unison, a spring for normally retaining the engagement between said latch and dash-pot, means for adjusting the tension of said spring, a pair of knock-off arms sleeved on said valve stem carrying cam projections adapted to automatically disengage said trip latch on the dash pot, and means for operating said knock-off arms; as and for the purpose set forth.

13. In a valve gear for steam engines a valve stem, a valve mechanism loosely sleeved on said stem, comprising a hub and two arms, one of said arms being bored transversely, a pin rigidly held in one of said bores, a trip latch pivoted on said pin, a split bolt rotarily adjusted in another of said bores, a spring

carried in the split end of said pin and adapted to engage said trip latch and to be normally held in engagement therewith by said spring, rigid connections between said valve stem and dash pot, means for automatically tripping said tripping latch, as and for the purpose set forth.

14. In a valve gear for steam engines a valve stem, a valve mechanism loosely sleeved thereon, comprising a hub and driving arm and a secondary arm, said secondary arm being transversely bored, a pivoted pin rigidly secured in one of said bores, a split pin carried in another of said bores and capable of rotary adjustment, a tripping latch pivoted on said pivoted pin, a spring carried in the split end of said adjustable pin and adapted to engage said tripping latch, a dash pot adapted to be engaged and held by said tripping latch, rigid connections between said dash pot and valve stem, a secondary latch carried by said tripping latch and spring stop therefor, a pair of knock-off arms loosely sleeved on said stem, each having a cam projection, one of said cam projections adapted during the forward stroke of the engine to engage said tripping latch, and the cam projection on the other of said arms adapted to engage said secondary latch whereby said tripping latch may be disengaged from said dash pot, a governor and connections between said governor and knock-off arms, whereby said arms are rocked simultaneously in opposite directions; as and for the purpose set forth.

15. In a valve gear for steam engines the combination of a pair of valve stems and valve mechanism, a dash pot for each stem, connections between said valve mechanism and dash pot whereby the same may be rocked in unison, means for tripping said connection, comprising a pair of knock-off arms for each valve stem, connections between each knock-off arm on one stem and the corresponding knock-off arm of the other stem, a governor, connections between said governor and one of said arms whereby the movement of one of said arms in one direction will effect a simultaneous movement of all the arms, as and for the purpose set forth.

16. In a valve gear for steam engines a pair of valve stems, a valve mechanism loosely mounted upon each of said stems, a dash pot, rigid connections between said stems and dash pots, connections between said dash pots and valve mechanism, whereby said dash pots, valve mechanism, and valve stems may be rocked in unison, means for disengaging said connections comprising a pair of knock-off arms loosely sleeved on each of said valve stems, a rod connecting each knock-off arm on one stem with the corresponding arm on the other stem, connections between said rods, a governor, connections between said governor and one of said arms, whereby the rocking of one of said arms will simultaneously rock all the arms, the arms of each pair be-

ing rocked in opposite directions, as and for the purpose set forth.

17. In a valve gear for steam engines a primary trip latch in the form of a bell crank lever, a secondary latch pivoted to one arm of said lever, said secondary latch provided with a projecting toe, a spring stop for said secondary latch, a knock-off arm having a cam projection, said cam projection being provided with an inclined face, and means

for operating said knock-off arm, as and for the purpose set forth.

In witness whereof I have hereunto set my hand, this 15th day of May, 1894, in the presence of two subscribing witnesses.

DAVID A. DECROW.

Witnesses:

W. K. HELMERN,
W. H. WELLS, Jr.