(No Model.) 4 Sheets—Sheet 1.

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GOVERNOR FOR STEAM ENGINES.

No. 494,746. Patented Apr. 4, 1893.

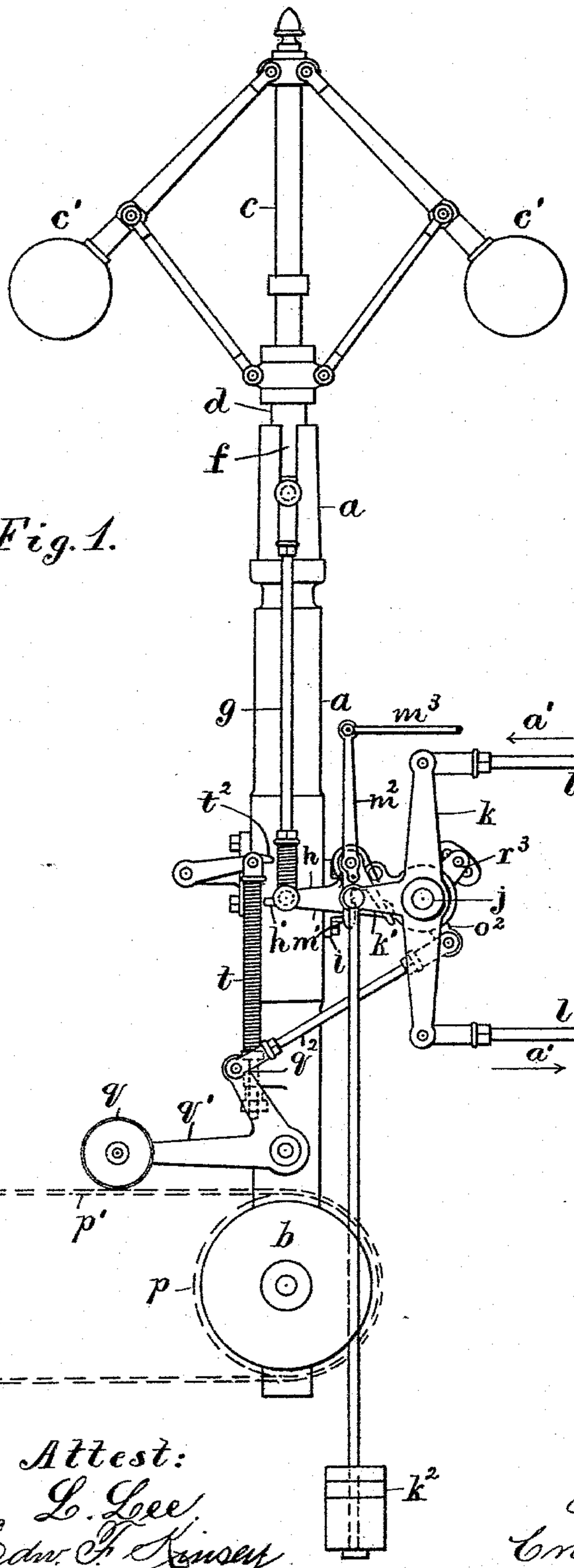

Fig. 1.

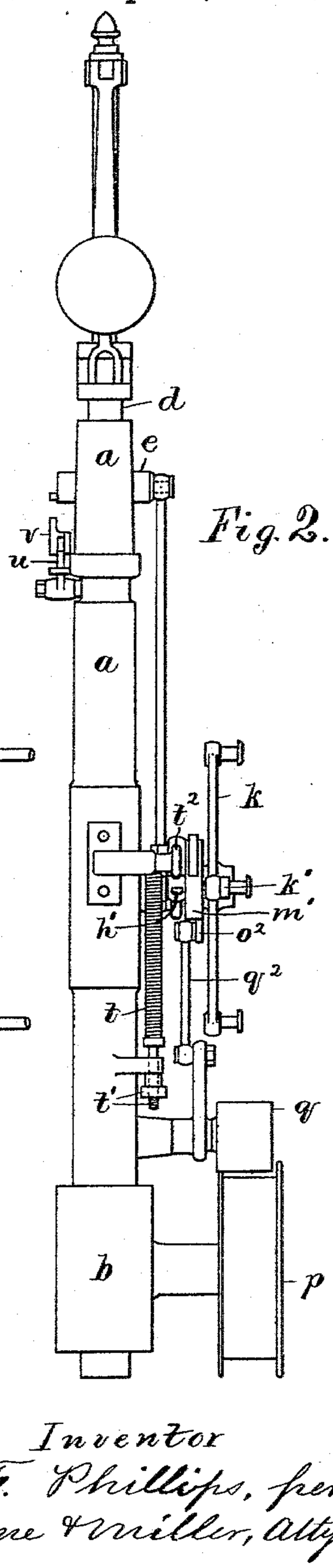

Fig. 2.

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Fig. 3.

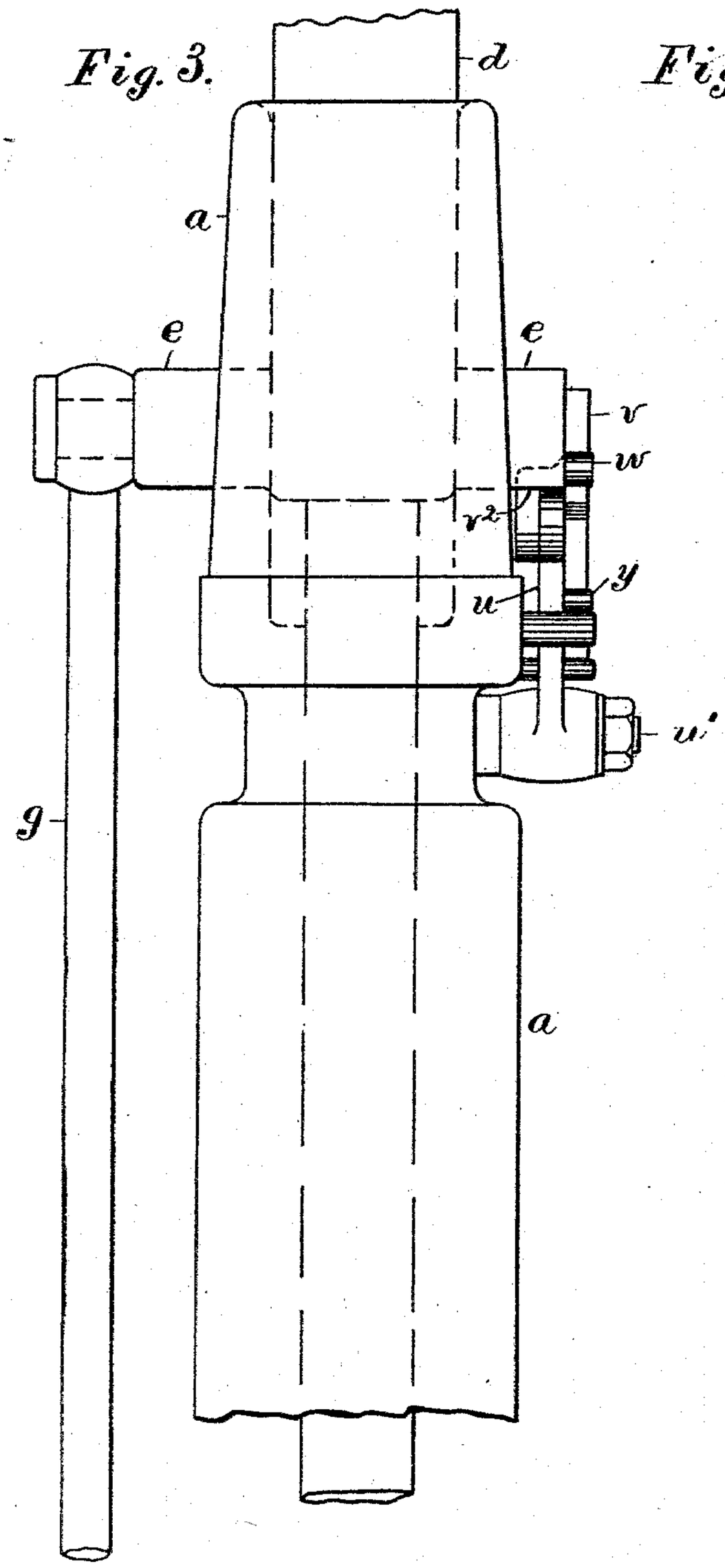
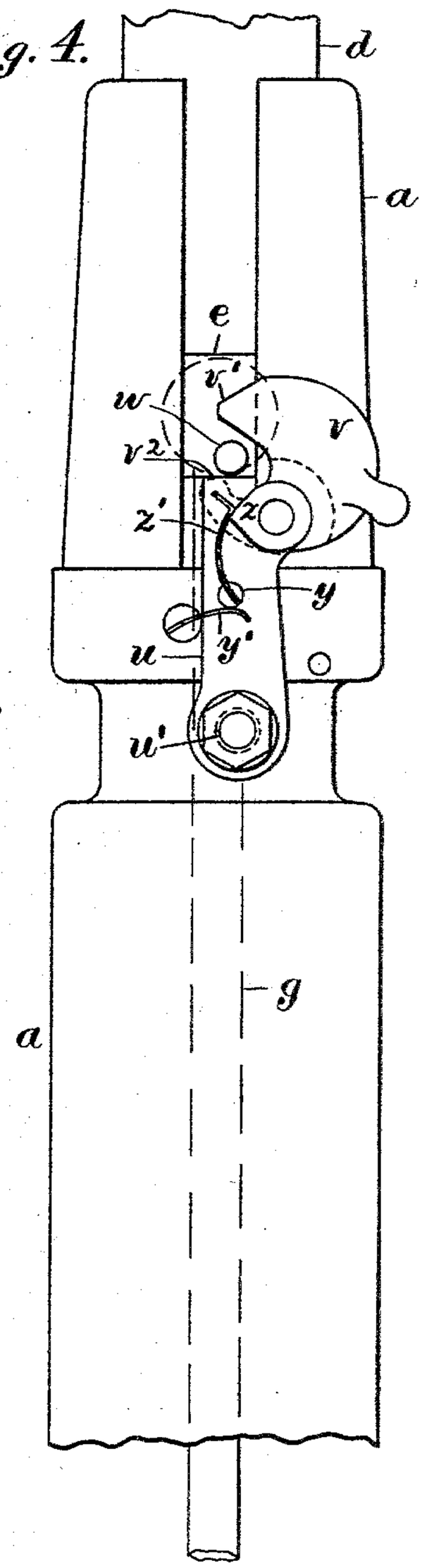


Fig. 4.



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GOVERNOR FOR STEAM ENGINES.

No. 494,746. Patented Apr. 4, 1893.

Fig. 5.

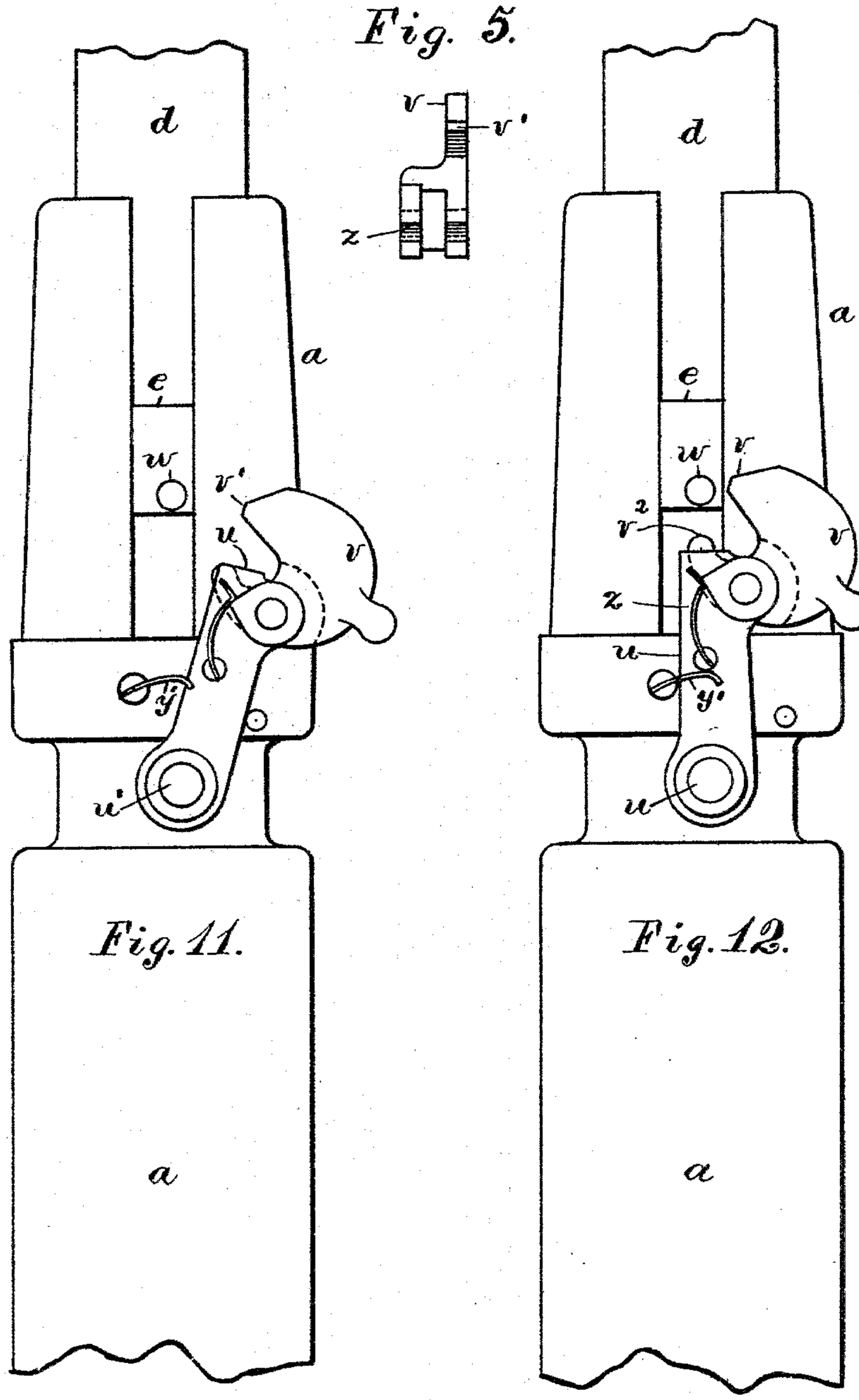

Fig. 11.

Fig. 12.

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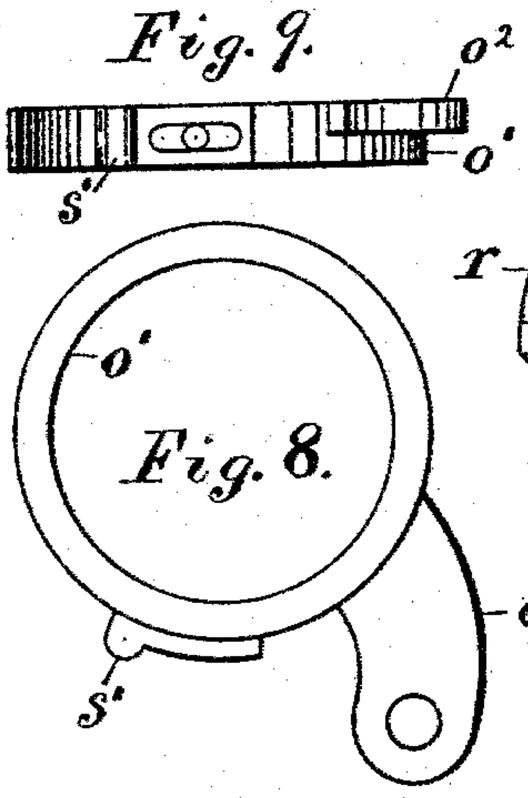

Fig. 8.

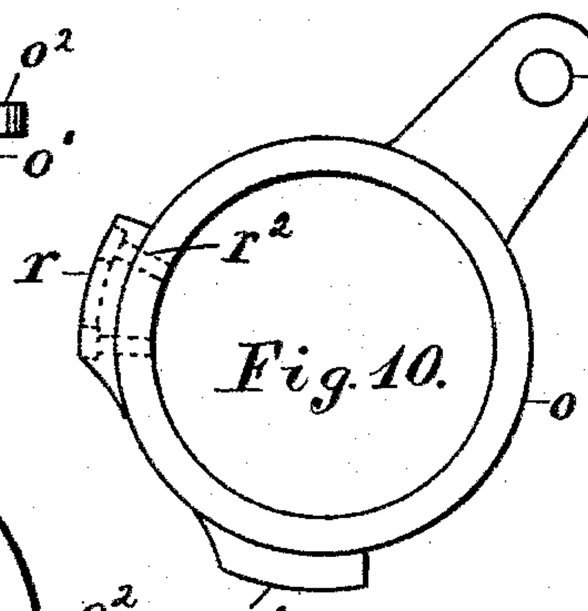

Fig. 10.

Fig. 6.

Fig. 7.

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UNITED STATES PATENT OFFICE.

FRANKLIN PHILLIPS, OF NEWARK, NEW JERSEY.

GOVERNOR FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 494,746, dated April 4, 1893.

Application filed September 15, 1892. Serial No. 446,027. (No model.)

To all whom it may concern:

Be it known that I, FRANKLIN PHILLIPS, a citizen of the United States, residing at Newark, Essex county, New Jersey, have invented certain new and useful Improvements in Governors for Steam-Engines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The present improvements are applicable to the governors used for regulating the cut-off valves in Corliss or other engines. In such engines as the Corliss the governor varies the point of cut-off by shifting a so-called cut-off cam, which interposes a cut-off toe in the path of the latch which connects the engine eccentric with the valve spindle, and such cut-off cam is commonly provided with what is termed a safety toe which in case the governor balls fall by any accident, detaches the said latch and wholly prevents the opening of the valves. With the valves in such position, the engine cannot be started; and as such movement of the safety toe is caused by the falling of the governor balls whenever the engine is stopped, it has been customary to provide a dog which could be set by the engineer, before stopping the engine, to prevent the governor sleeve from moving to its lowest point. Such adjustment of the dog prevents the safety toe from affecting the cut-off latches, and leaves the valves in an operative condition to start the engine. It is obvious that if the dog is not removed after the engine is started, the governor will be prevented, in case of an accident, from actuating the safety toe and disengaging the engine valves in the desired manner. Such dogs have heretofore been dependent upon the care and attention of the engineer to shift them from their operative position as soon as the engine was started, and the safety toe would of course be rendered inoperative by any neglect of the engineer.

It is therefore one object of the present invention to set the dog automatically in its safety position by the first movement of the governor, after starting.

The invention also provides a latch connection between the governor sleeve and the links which connect the same with the cut-off cams, and a toe adapted to detach the latch upon the breaking or yielding of the governor belt, or on any other abnormal movement of the engine attachments.

The invention also provides a collar and cams to detach the latch at suitable limits of speed, and to thus stop the engine when such limits are exceeded.

The invention also provides a spring resistance which is opposed to the movement of the governor sleeve when a specific speed of the engine is attained.

The operation of the cut-off valves and their latches is already well known, and the annexed drawings therefore only show the governing devices, with the links which are commonly connected to the cut-off cams.

In the drawings, Figure 1 is a side elevation of the governor and its attachments. Fig. 2 is an edge view of the same. Fig. 3 shows the head of the governor post with an edge view of the improved dog. Fig. 4 is a side view of the same showing the dog with the governor sleeve arrested. Fig. 5 is an edge view of the cam detached from the dog. Fig. 6 is an elevation of the detaching devices with the link arms shown in dotted lines only. Fig. 7 is a plan of the parts shown in Fig. 6. Fig. 8 is an elevation of the safety toe column. Fig. 9 is an edge view of the same, and Fig. 10 is an elevation of the cam collar. Fig. 11 is a view like Fig. 4 with the dog thrown out by the starting up of the governor, and Fig. 12 is a similar view with the dog set in readiness to stop the engine.

The governor column *a* is shown with the pulley *p* near the bottom, which would be connected, by suitable gearing within a box *b* at the base of the column, to the governor spindle *c*. The balls *c'* of the governor are shown linked as usual to a sleeve *d*, which is formed with a cross bar *e* adapted to slide up and down in a vertical slot *f*. The sleeve is connected by link *g* with a lever *h* pivoted upon a bearing *i* at one side of the column. The gearing also sustains upon its fulcrum *j* the double armed lever *k* to which the links *l* are attached for actuating the cut-off cams upon the engine valve gearing. The lever *k* is provided with an arm *k'* to which a weight k^2 is attached, which operates normally to shift the links in the direction of the arrows *a'*, and to turn the cut-off cams upon the en-

gine with the safety toe in the path of the cut-off latch. Such a movement stops the engine by detaching the valves from their driving gearing; and the dog u is pivoted upon one side of the column a, to intercept the downward movement of the cross bar e at a predetermined point, which prevents the unlatching of the engine valves. The dog is formed as a hinged arm pivoted to a stud u' upon the column, and provided near its upper end with a rotatable cam v having lugs or projections v' and v^2 adapted to engage a pin w projected from the bar e. The cam v is provided with a wedge-shaped tooth z which is opposed by a similar tooth upon a spring z', and is thus forced by the spring into the lower position shown in Fig. 4 or the upper position shown in Fig. 12.

In Fig. 12, the dog is shown adapted to arrest the bar e preliminary to the stopping of the engine and the cam is set with the lug v^2 projected above the end of the dog in the downward path of the pin w. When thus set, the dog is overbalanced by the weight of the cam upon one side of the pivot u', and is held in position by the contact of a pin y with the curved end of a short spring y', which releases the pin when the dog is moved slightly on its pivot. The falling of the governor balls, when the engine is stopped, throws the bar e into the position shown in Fig. 4, by which the pin w presses the lug v^2 downward and rotates the cam with the lug v' into the upward path of the pin. The spring z' holds the cam in such position with sufficient force to release the dog from the frictional hold of the spring y' when the engine is started and the governor lifts the bar e. When such movement occurs the pin w presses the lug v' (upon the cam) outwardly and throws the dog into the position shown in Fig. 11 by which it is entirely cleared from the under side of the bar e. The starting of the engine thus operates automatically to remove the dog from the path of the bar, so that a stoppage of the governor and the consequent falling of the balls may shift the links l in the direction of the arrows a' as desired. By such automatic removal of the dog from the path of the governor sleeve, the engineer is required only to place the dog under the bar e when he is about to stop the engine, and is not required to remove the dog therefrom after the engine is started. The possibility of accident arising from the neglect of the engineer to thus remove the dog is wholly avoided.

The lever h and the arms k are connected by a latch similar to that used in the Corliss valve gearing, and the detachment of such latch permits the weight k^2 to turn the arms k in the direction of the arrows a', which actuates the safety toes of the valve gearing and prevents the valves from opening. The arm k', as shown in Figs. 6 and 7 is provided with a sharp cornered stud m, and the arm h is provided with a pivoted latch m' adapted to hook beneath the same, so that the weight k^2 strains upon the link g and normally opposes the lifting of the governor balls c'. The two collars o, o', are fitted to turn upon the hub n of the arm h, and are adjusted as hereinafter described. The collar o is provided with cams r, r', adapted to disengage the latch m' by contact with an arm and block s attached to the latch, and the collar o' is provided with a safety toe s' adapted also to disengage the latch when contacting with the block s.

The cams r, r', as shown in Fig. 6, are set at equal distances from the block s when the governor balls are at their normal or medium elevation, and a variation of the governor speed, above or below the normal, moves the arm h so that the block s contacts with one of the cams and thus disengages the latch m'. When this occurs the governor is wholly detached from the links l, and the weight k^2 operates to shift the links in the direction of the arrows a' and unlatches the engine valves as desired. The cams r, r', are made adjustable upon the collar o by means of screws r^2, and the collar is held in any desired position by means of an arm having a bolt r^3 fitted to a segment r^4 upon the bearing i. The cams may thus be set to automatically arrest the movements of the engine when the governor speed exceeds any predetermined limit above or below the normal. The collar o', provided with the safety toe s', may be actuated by any abnormal movement of the engine; and is shown herein connected with a pulley q which rests upon the slack side of the governor belt p'. The pulley is connected by a bell crank q' and a link q^2 with an arm o^2 upon the collar o'. The toe s' is so adjusted upon the collar as to clear the block s when the arm h vibrates through its normal range of movement, but is adapted to interfere with the block whenever the pulley q is permitted any abnormal movement by the slackening or breaking of the belt p'. Such an action of the belt thus throws the toe s' into contact with the block s, and detaches the latch m' as desired.

A spring t is provided adjacent to the end of the arm h, with an adjusting screw and nut t' applied to a bearing at its lower end, and a pivoted finger t^2 is attached to the upper end of the spring and projected in the path of a finger h' upon the end of the arm h. The finger t^2 is adjusted to intercept the finger h' when the governor balls rise to a predetermined height, and the spring thereafter resists the expansion of the balls, and necessitates a greater increase of speed to bring the block s in contact with the cam r. The maximum speed at which the latch m' may be disengaged is therefore adjustable by varying the resistance of the spring t by the nut t'.

The movement of the collar o' may be effected by connecting it with any other part of the engine than the belt p', and the engine may thus be stopped by the operation of the safety toe s', in case of derangement or ab-

normal movement of such part. With these improvements the control of the engine is rendered much more perfect and far more independent of the skill and care of the engineer.

The operation of the latch m' which detaches the governor from the double armed lever k is obviously the same whatever the nature of the valve mechanism with which the lever is connected, and the detachable latch with the means for disconnecting the governor from the lever k may therefore be used with a single armed lever and a single link l connected with any valve mechanism adapted to stop the engine in the manner described.

In Figs. 1 and 2 an arm m^2 is shown attached directly to the latch m' and provided with rod m^3 which when actuated by any suitable means may be operated to detach the latch and thus sever the connection between the governor sleeve and the lever k independent of the cams r, r', and safety toe s'. Such independent means may be actuated by electrical or other agency from any remote point, and may thus be employed to stop the engine in case of accident to the shafting or any machinery to which the engine is connected. Such means may be operated electrically and the electric connections extended to various points so that the stoppage of the engine may be effected from a variety of such points with the same facility.

A spring may be used to perform the same function as the weight k^2 in automatically shifting the lever k and the link or links l, and other kinds of clutch mechanism beside the latch m' may be used to connect the governor sleeve detachably to the lever k which actuates the stop mechanism of the engine.

Whatever style of clutch mechanism be used as an equivalent for the latch m' suitable means would be provided for disengaging it when the speed of the governor varied beyond certain limits, and independent means as the arm m^2 and rod m^3 may also be applied directly to such clutch mechanism for stopping the engine independently of the governor.

The safety appliances described herein may be used with any other class of engine although it is illustrated herein in connection with the governor regulating appliances for a Corliss engine.

What is claimed herein is—

1. The combination, with the governor sleeve d and cross bar e, of a removable dog adapted to intercept the sleeve, a device as the spring y' for holding the dog in its operative position, and a lug upon the dog projected in the path of the bar to automatically displace the dog when the governor is set in motion, as set forth.

2. The combination, with the governor column a, the sleeve d, and the cross bar e, of the dog u pivoted upon the column and overweighted at one side, the spring y' to hold the dog in the downward path of the cross bar, the rotatable cam v provided with the lugs v' and v^2 as set forth, and the pin w projected from the cross bar and adapted to engage the lugs in opposite directions, as herein set forth.

3. The combination, with the governor column a, the sleeve d, and the cross bar e, of the dog u pivoted upon the column and overweighted at one side, the spring y' to hold the dog in the downward path of the cross bar, the rotatable cam v having the tooth z, and provided with the lugs v' and v^2 as set forth, the spring z' pressed upon the tooth z, and the pin w projected from the cross bar and adapted to engage the lugs in opposite directions, as set forth.

4. The combination, with an engine governor, of the bearing i mounted upon the governor column, the lever k connected with the link l, for the purpose set forth, and provided with the weight k^2, the link g and lever h connected with the governor sleeve, the latch m' connecting the lever h with the lever k, and the collar o secured adjustably to the bearing i and provided with the cams r, r', to detach the latch at suitable limits of speed, substantially as set forth.

5. The combination, with an engine governor, of the bearing i mounted upon the governor column, the lever k connected with the link l, for the purpose set forth, and provided with the weight k^2, the link g and lever h connected with the governor sleeve, the latch m' connecting the lever h with the lever k, the collar o provided with dogs r, r', and fixed adjustably upon the bearing i, and the collar o' provided with the safety toe s' and actuated by the link q^2, substantially as herein set forth.

6. The combination, with an engine governor, of the bearing i mounted upon the governor column, the lever k connected with the link l, for the purpose set forth, and provided with the weight k^2, the link g and lever h connected with the governor sleeve, the latch m' connecting the lever h with the lever k, means for detaching the latch as set forth, and the finger t^2 provided with the adjustable spring t and actuated by the arm h upon an abnormal increase of speed in the governor, substantially as herein set forth.

7. The combination, with an engine governor, of a lever k provided with weight k' and connected with a link l, as set forth, a latch or clutch connection between the governor sleeve and lever k, and means as the arm m^2 and rod m^3 applied directly to such latch or clutch to disengage the sleeve from the lever k, as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

FRANKLIN PHILLIPS.

Witnesses:
J. A. THOMSON,
T. S. CRANE.