G. W. Rains,

Governer.

No. 28,502. Patented May 29, 1860.

Fig 1

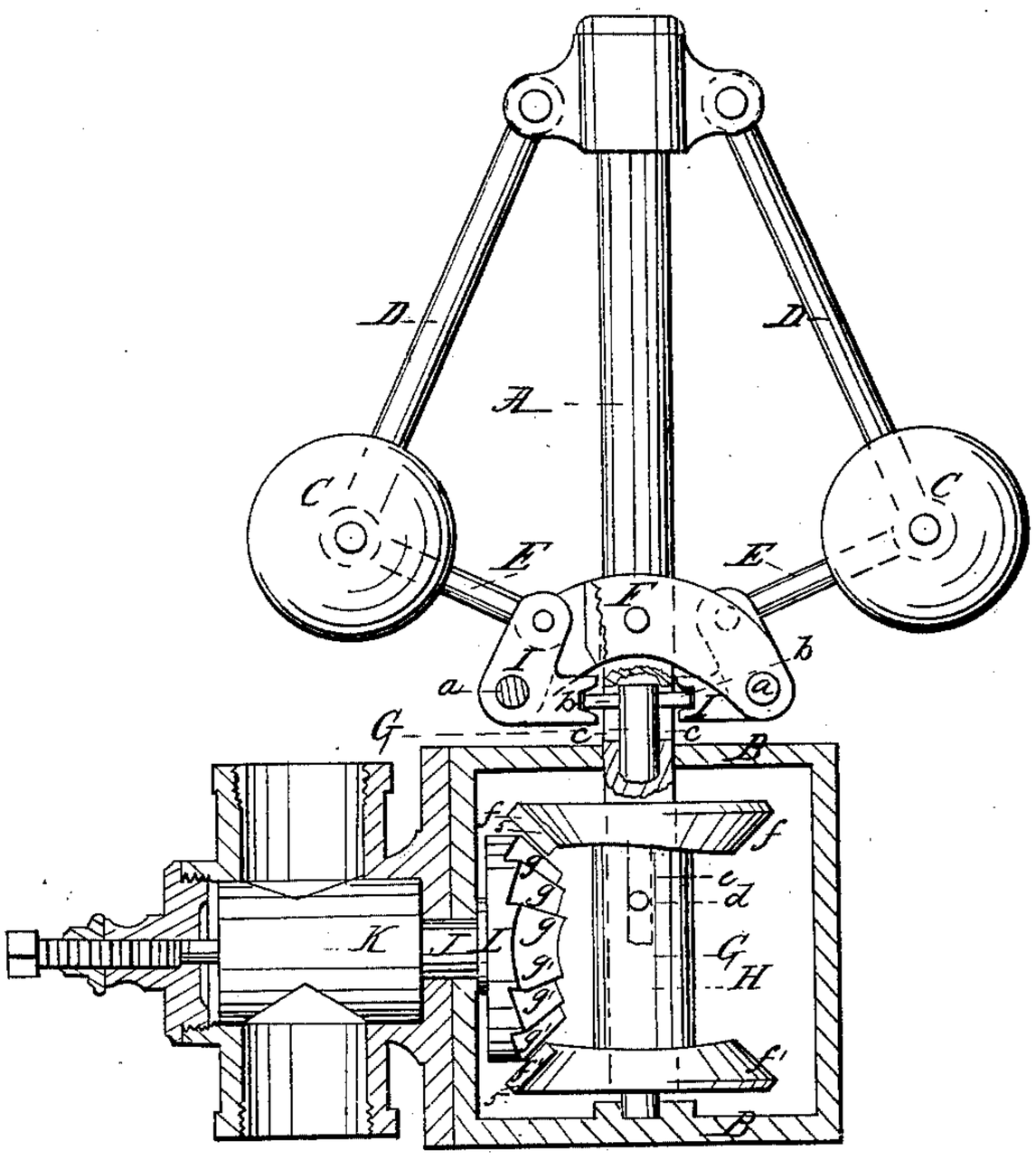


Fig 3.

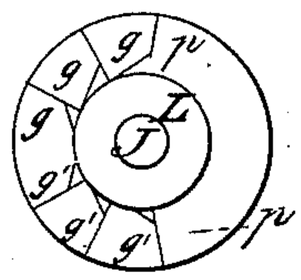


Fig 2.

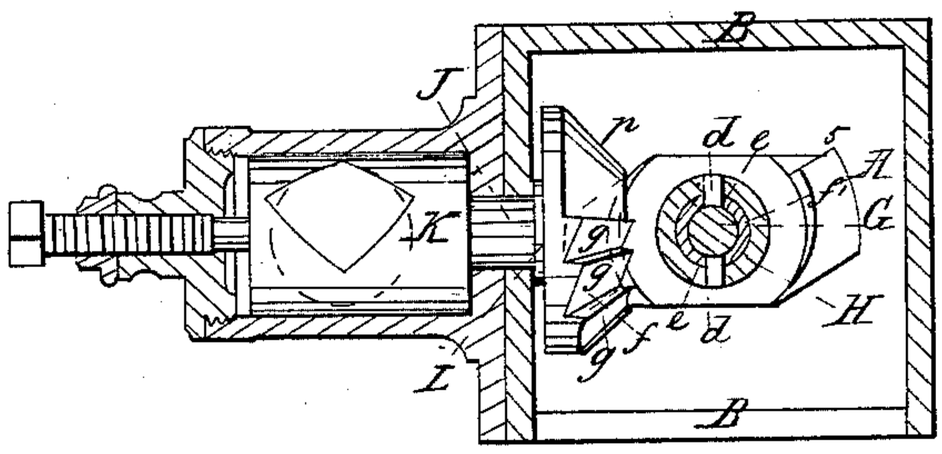
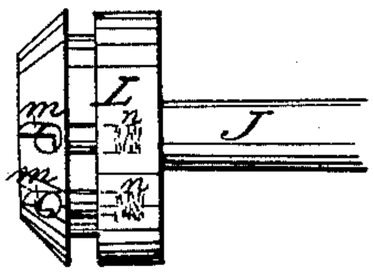


Fig 4.



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UNITED STATES PATENT OFFICE.

GEO. W. RAINS, OF NEWBURGH, NEW YORK.

GOVERNOR FOR STEAM-ENGINES.

Specification of Letters Patent No. 28,502, dated May 29, 1860.

To all whom it may concern:

Be it known that I, GEORGE W. RAINS, of Newburgh, in the county of Orange and State of New York, have invented a new and useful Improvement in the Means of Transmitting the Action of the Governor of a Steam-Engine or other Motor to its Regulating-Valve; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an elevation partly in section of the governor and regulating valve of a steam engine illustrating my invention. Fig. 2 is a horizontal section of the same. Fig. 3 is a face view of the toothed wheel on the valve stem. Fig. 4 is a side view exhibiting a modification of the above mentioned wheel.

Similar letters of reference indicating corresponding parts in the several figures.

The objects of my invention is to apply the governor in connection with the throttle or regulating valve that the necessary movement of the said valve may be imparted to it by the rotary motion of the governor and not directly by the act of the charge of the planes of revolution thereof, such movement may be effected very quickly, and that as soon as it has been effected the governor shall detach itself from the valve and remain detached therefrom till further action becomes necessary to regulate the engine or motor.

To enable others skilled in the art to make and use my invention I will proceed to describe its construction and operation.

The governor represented is of the kind commonly known as the ball governor.

A, is the main spindle fitted to bearings in the top and bottom of a box B.

C, C, are the balls; D, D, are the arms to which the balls are attached, connected at their upper ends with the spindle in the usual manner and connected at their lower ends by links E, E, with the short elbow levers I, I, which work on fulcra *a*, *a*, in a cross head F, that is secured to the spindle, the said elbow levers being notched to receive the ends of a pin *b*, which passes loosely through vertical slots *c*, *c*, in the spindle the said pin being fast in a rod G, which is fitted to work longitudinally inside of the spindle A.

H, is the sleeve fitted to slide up and down the lower part of spindle A, in the usual manner and arranged within the box B, and connected with the rod G, by a pin *d*, passing through it and the said rod, and through slots *e*, *e*, in the sides of the spindle, the said rod G, and pins *b*, and *d*, making such a connection of the sleeve H, with the elbow levers I, I, that the said levers will cause the said sleeve to move up and down the spindle A, as the balls rise and fall with variations in the velocity of revolution of the spindle, and making such a connection of the said sleeve with the main spindle A, that it will rotate with the said spindle.

The arrangement of the parts of the governor are such that the joints all form nearly right angles and the links E, E, are connected at the centers of the balls and hence the movement of the sleeve up and down the rod is caused to be nearly equal to the movement of the balls toward and from the spindle.

On the upper part of the sleeve H, there are arranged directly opposite each other, two teeth *f*, *f*, of a ratchet like character, but beveled on their lower sides like the teeth of a miter gear; and on the lower part of the said sleeve there are two teeth *f′*, *f′*, precisely similar to *f*, *f*, except that their bevel is on the upper side. The faces 5, 5, of these teeth have all the same direction. Opposite to the space between these teeth there is arranged in suitable bearings the horizontal spindle or shaft J, which may constitute the stem of the throttle or regulating valve K, or may have any suitable connection with such valve that will enable it to open and close the said valve by a small portion say about one fourth of the revolution of the said spindle or shaft. This spindle or shaft J, carries a miter toothed wheel L, which is of such size relatively to the distance between the teeth *f*, *f*, and those *f′*, *f′*, and so arranged relatively to the sleeve H, that by the movement of the said sleeve up or down the governor spindle either the teeth *f*, *f*, or those *f′*, *f′*, may be caused to act upon the teeth of the said wheel in their revolution or that both sets of teeth *f*, *f*, and *f′*, *f′*, may clear the said wheel in their revolution. The teeth *g*, *g*, and *g′*, *g′*, of the wheel H, are of the same ratchet like character to those *f*, *f*, and *f′*, *f′*. They extend only a portion of the way around the wheel leaving a blank space *p*, *p*, as shown in Fig. 3, and half of

them g, g, face in one direction and the other half g', g', in the opposite direction, so that those g, g, will face the teeth f, f, and those g', g', will face the teeth f', f', and they are so arranged relatively to the opening of the valve that when the valve is about half way open the series g, g, occupy a similar or nearly similar position above the center to that which the series g', g', occupy below the center as illustrated by Fig. 4.

The operation is as follows: While the engine is running at the desired uniform speeds the sleeve H, is held at such a height that neither the teeth f, f, nor those f', f', will come into contact with the teeth of the wheel L, but in the first revolution of the governor at a slightly diminished speed the sleeve will be lowered and one of the teeth f, f, come into operation on one of the teeth g, g, but without entering the whole depth of the said tooth and so turn the wheel slightly in a direction to give more opening to the valve, or in the first revolution at a speed above what is desired the sleeve will be raised and one of the teeth f', f', will come into operation on one of the teeth g', g', and so turn the wheel in a direction to give less opening to the valve. If the movement thus given to the valve be sufficient, the balls will at once resume their proper plane of revolution and the sleeve be restored to the position in which its teeth do not act upon the wheel L, and the valve remains stationary and entirely disconnected from the governor so long as the same uniform speed is maintained. Should, however, the small movement given to the valve by this operation of a single tooth of the sleeve be insufficient the sleeve will continue to descend or ascend as the case may be, and the other tooth f, or f', of the sleeve or the same tooth in its next revolution will act again on the same tooth g, or g', of the wheel L, or on the next tooth of the same series and produce a further movement of the valve in the same direction. By the above operation the valve will be opened gradually, but in case of a very sudden change of speed, as when the whole or greater part of the work is thrown off or on the engine, the sleeve is at once raised or lowered so far that one of its teeth f, f, or f', f', will engage with one of the teeth g, g, or g', g', of the wheel L, to their full depth and so produce a sufficient movement of the said wheel to close or open the valve entirely during a small portion of the revolution of the engine, at the same time bringing the blank space r, r, opposite to the teeth f, f, or f', f', which have operated and preventing any further action on the valve till the other set of teeth on the sleeve are brought into operation. This blank space r, r, on the wheel L, is of great importance to the successful operation of the governor. The whole work thus performed by the governor is simply to move the sleeve and its teeth f, f, and f', f', up and down the spindle in which respect the operation is the same as when a pair of miter gears are used upon the spindle in connection with the miter gear on the valve stem, but in other respects the operation is very different, as a small variation of speed is followed by a graduated movement of the valve which is in proportion to such variation and such movement is effected almost instantaneously and the governor at once disconnected from the valve without waiting for the change in the plane of revolution of the balls consequent upon the action of the valve, to take place; and if the governor is driven by toothed gearing which it always should be, a proper arrangement of the teeth f, f, and f', f', may be made to effect the regulation always at the time the engine is passing its center at which time the change of opening of the valve will have the greatest effect.

The valve employed may be of any kind that is sufficiently balanced and otherwise so constructed that it will remain in any position in which it may be left by the governor.

The teeth of the wheel L, may be fitted to slide in and out from the said wheel and have springs applied behind them in such a manner that they may yield and allow the teeth f, f, and f', f', to pass them in case of their riding over each other. This is illustrated in Fig. 4, where m, m, represent the sliding teeth and n, n, the springs applied between them. Or instead of the teeth of the wheel L, being applied in this way the teeth of the sleeve H, may be applied in a similar manner.

It some cases it may be desirable only to have a single tooth f, on the upper part of the sleeve H, and a single one f', on the lower part thereof and in other cases it may be desirable to have more than two of each of such teeth.

I do not claim broadly the use of bevel gearing to transmit the action of the governor to a throttle valve or regulating valve; but

What I claim as my invention and desire to secure by Letters Patent is—

The employment in combination with a wheel L, having teeth on a portion only of its circumference applied in connection with the regulating valve, substantially as herein described of two teeth or sets of teeth f, f, and f', f', not forming continuous series, on the governor sleeve, the whole arranged and operating substantially as herein specified.

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