C. NEER.

STEAM ENGINE GOVERNOR.

No. 175,839. Patented April 11, 1876.

Fig. 5.

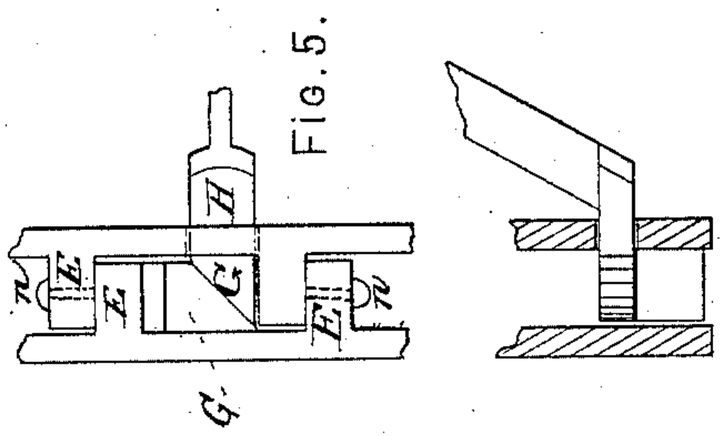


Fig. 2.

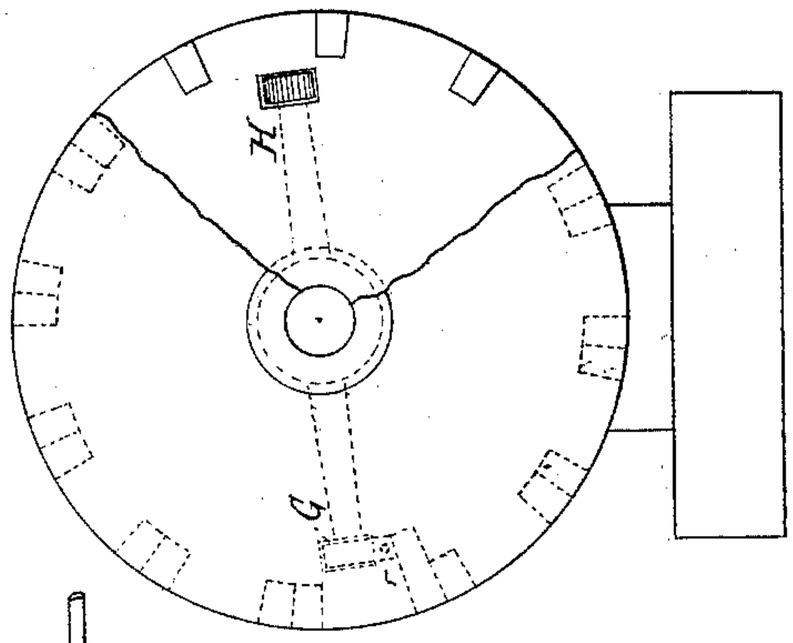


Fig. 4.

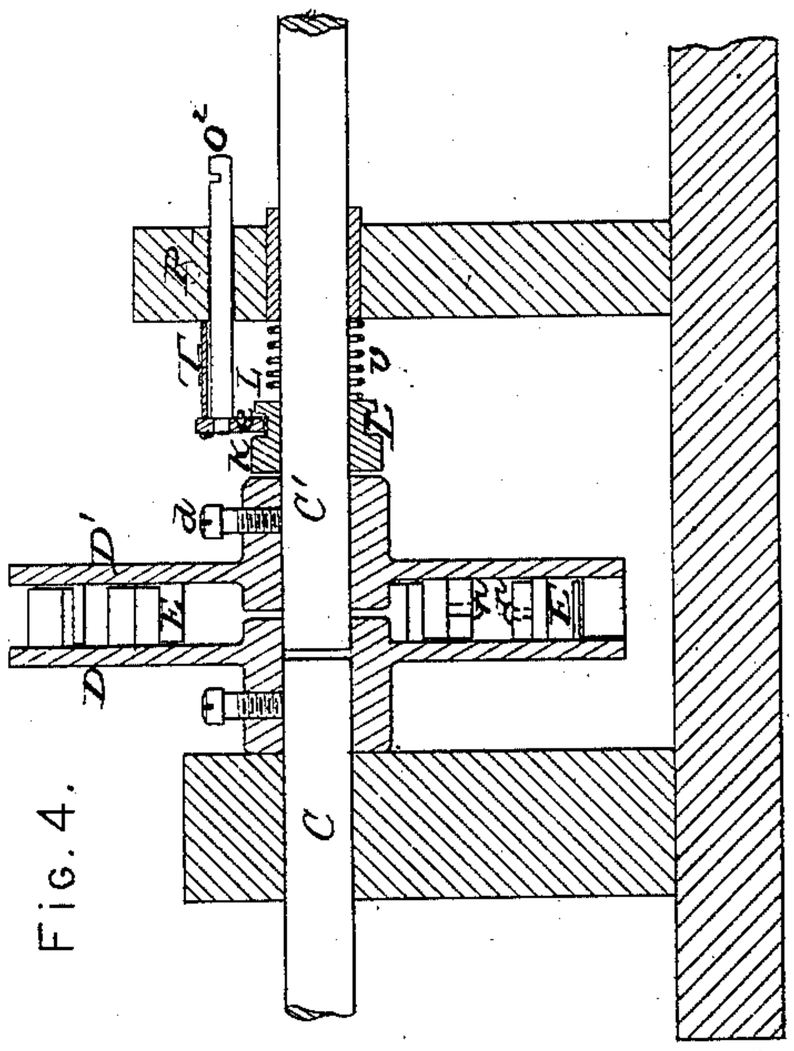


Fig. 1.

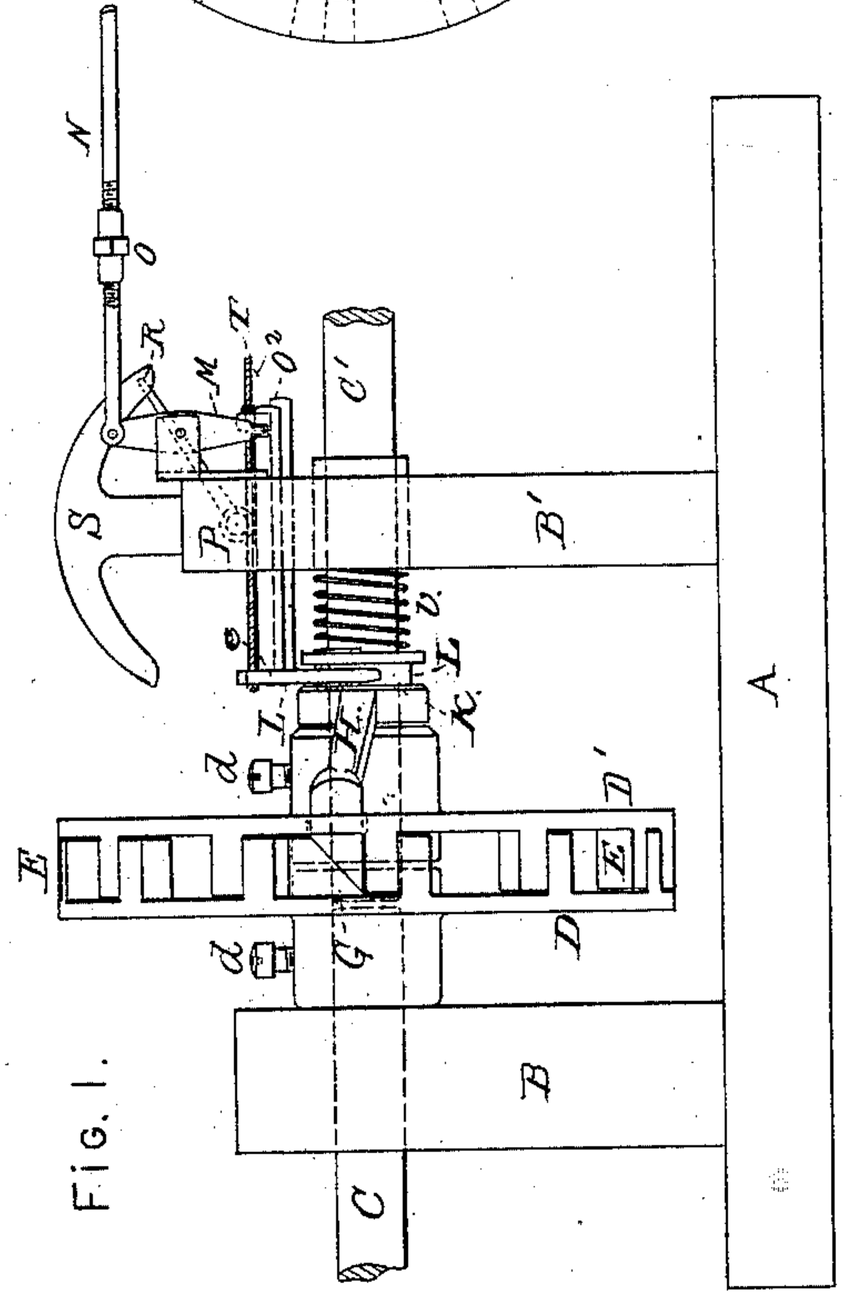
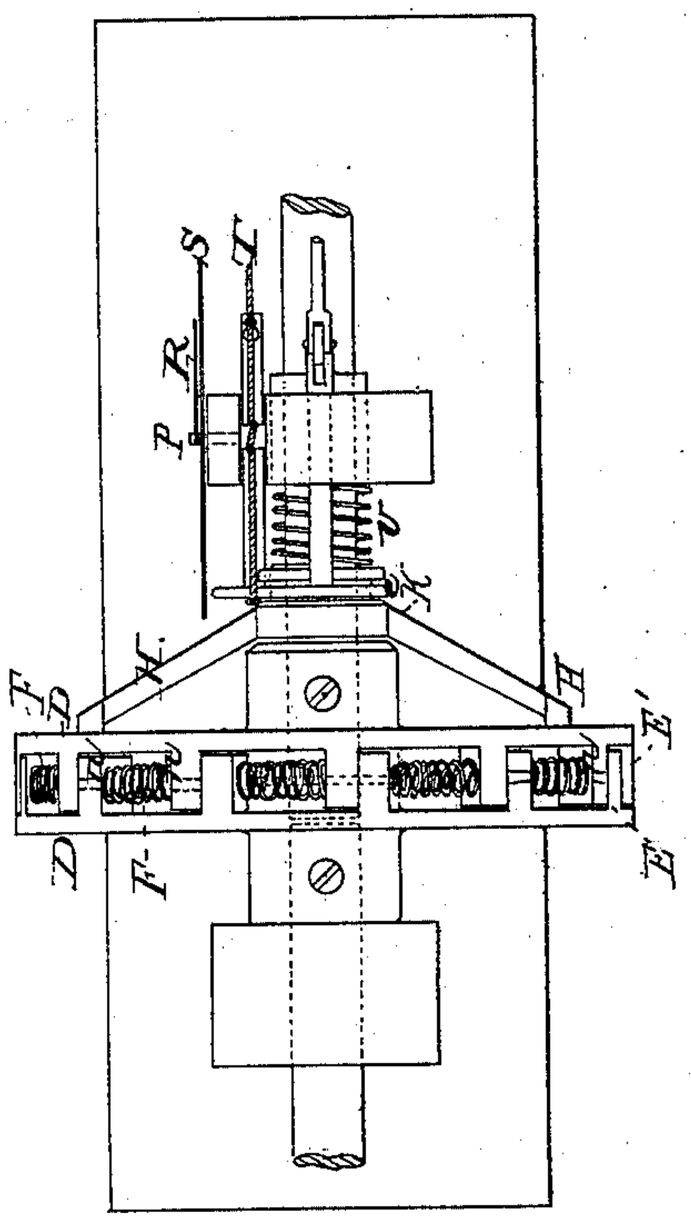


Fig. 3.



WITNESSES.

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IMPROVEMENT IN STEAM-ENGINE GOVERNORS.

Specification forming part of Letters Patent No. **175,839**, dated April 11, 1876; application filed September 28, 1874.

To all whom it may concern:

Be it known that I, CHARLES NEER, of the city of Brooklyn, county of Kings and State of New York, have invented a new and useful Improvement in Controlling, Regulating, and Indicating Apparatus for Machinery propelled by steam, water, or other motive power, which improvement is fully set forth in the following specification, reference being had to the accompanying drawings.

The object of my invention is, first, to regulate or control the motion of the machinery to which it is attached; and, secondly, to measure or indicate the degree or amount of force or power transmitted by said machinery, both of which is effected by the devices constituting my invention by the pressure or resistance exerted on said devices, irrespective of the speed of the machinery to which it is attached, a direct communication being formed between said controlling or regulating apparatus, and the devices for regulating the amount of steam or other power admitted to the engine or driving-machinery, so that when there is enough of steam or other power, as the case may be, admitted to the primary propeller or engine to move the machinery the necessary amount in excess of this is let on or cut off in proportion to the increase or decrease of the resistance offered by the machinery to be propelled, without regard to speed of motion.

In the drawings forming part of this application, Figure 1 represents a side elevation of my regulating and indicating apparatus. Fig. 2 shows an end elevation with the graduated index-plate removed, and a portion of one of the disks broken away, showing a part of the inside face of the opposite disk. Fig. 3 is a top or plan view, showing the coiled springs F between the right-angled projections E on the insides of the disks D and D′, also the shafts C and C′, coiled spring V on same, and arms H H, and grooved collar K. Fig. 4 is a vertical section through the center of the main shafts C and C′. Fig. 5 is an enlarged view of the incline cams or abutments G on the inside face of the disk D, which, by their action, in combination with the inclined or beveled ends of the arms H, operate the controlling and indicating apparatus.

By reference to the drawings it may be seen that the apparatus may be attached to the main shaft C′, or it may be mounted or supported for temporary purposes, or, if desired, permanently upon a frame, as seen at A, B, and B′ in Fig. 1, or it may be suspended by hangers to overhead timbers, in which case the hangers would take the place of the uprights B and B′ shown in Fig. 1; but said frame and hangers are not claimed as any part of my invention. If said frame or hangers are used the shaft or shafts C and C′ are journaled therein, as shown in Figs. 1 and 4. D and D′ are two disks mounted upon a shaft or separate shafts connected by the said disks, as shown in Figs. 1, 3, and 4, the disks being fastened to their respective shafts in any well-known manner making the attachments rigid and strong. The main driving-shaft C′ may pass entirely through disk D′, and into disk D far enough to steady them concentrically and yet to allow the end of the said shaft that penetrates the disk D to work freely therein. When the disks are both on one shaft disk D should be loose, and a pulley for a belt attached to it, so that power may be taken from said shaft by means of said pulley and belt. Upon the inner faces of the disks D and D′, and near their outer periphery, are formed projections or studs, E, Figs. 1, 3, and 4, which extend out from and at right angles with the faces of said disks, and in such a manner that the front sides of the studs of the disk D will be in contact with the back sides of the studs of the disk D′ forming stops to the back pressure of the coiled springs F when the machinery is at rest.

Between one or more pairs of the opposing studs or projections E is placed a coiled spring or springs, as seen at F, Fig. 3, one end of which rests against a stud on one disk and the other end against a corresponding stud on the other disk, so as to resist the power or force applied to the driving-shaft C′ and its action on the shaft C, except through the springs F, which are placed between the studs E, as seen in Fig. 3. It is intended, when necessary, to place a coiled spring in each of the recesses or spaces between the studs E of the said disks, and, if desired to increase still further the resisting power of the apparatus, two coiled springs, one within the other,

may be placed in each of the said spaces between the studs; and when less resisting power is needed, the number of the springs may be correspondingly reduced, so that by either the number of the springs used or by their strength, or by both combined, the desired power of resistance to correspond with the power to be transmitted through the disks and springs can be readily obtained. The said springs are held in their respective places by the pins or rivet-heads *n*, which are placed in the studs E, as seen in Figs. 3, 4, and 5, on or over which the springs are placed. There must, under all circumstances, be enough of elastic resistance in the springs so interposed between the studs of their respective disks to more than equal the greatest force or pressure of the propelling power or motor upon them, and yet their strength or resisting force must not be so great as to hold the studs of the two disks together on their respective faces, opposite to the springs, when the minimum power or force is being exerted or transmitted, as in either case the springs could not operate to produce the desired effect, but the springs should commence to yield with the commencement of the force exerted upon them. At one or more points, preferably two, on the inner face of the disk D, a cam or cams or incline planes G, Figs. 1 and 5, are placed, the faces of which are at an angle of about forty-five degrees with respect to the face of the disk, so that the arm or arms H, having correspondingly inclined or beveled ends which project through mortises in the opposite disk, abut or press against the inclined faces of the cams G attached to the inner face of the disk D, as seen in Figs. 1 and 3. Said arms H are attached to a loose collar, K, which is placed on the shaft C′, near to the disk D′, Figs. 1 and 3, on said collar, and outside of the said arms H is formed a circular or circumferential groove, L, into which is fitted a semicircular plate or fork, *e*. This plate or fork is so fitted and adjusted to said groove as to allow the collar K, in which said groove L is formed, to revolve freely, while said plate or fork remains stationary. This plate is attached to a rod, O^2, Figs. 1 and 4, which rod is directly, or through intermediate devices, connected with the valves or devices regulating the amount of steam or other power admitted to the primary driving machine or engine, as seen at M, N, and O, Fig. 1. On and around the shaft C′, and alongside of the grooved collar K, is coiled a spring, V, one end of which presses against the grooved collar K and the other against a collar or pin rigidly placed on or in the shaft C′, as shown in Figs. 1, 3, and 4. At right angles with said rod O^2, and either above or below it, is placed a rod, P, supported on any suitable bearings, as seen at Figs. 1, 3, and 4, and on one end of said rod P is placed a hand or pointer, shown in dotted lines at R on the dial or graduated plate S, said dial being suitably placed to allow the shaft or rod P to pass through it so that the hand or pointer R can freely traverse its face backward and forward, as the shaft or rod P, on which it is placed, oscillates. The said dial S is graduated, as hereinafter described, in order to show the degree or amount of pressure or power transmitted.

In order to correctly graduate the dial S so that it will, by the aid of the hand or pointer R, indicate the degree of power transmitted through the disks D and D′, it is necessary to ascertain the exact amount or degree of compression of the springs F which any given amount of force or power exerted upon them by the disk D′ will produce, and this, too, through the whole range of their compressibility from its minimum to its maximum, and to mark or graduate the dial S correspondingly. This may be done in different ways, one of which may be by applying, in any convenient way, to the disk D′ a horizontal lever of suitable length and strength, and placing upon it a weight which would exert on said disk a force equal to a given amount of power, say a one-horse power; then, by either doubling the said weight, or by doubling its distance on said lever from the center of the disk D′, the force exerted on it would be doubled, or equal to a two-horse power; and, by tripling or quadrupling either the weight or its distance from the center of the disk D′ the force or power exerted upon it will be increased correspondingly, equaling a three or four horse power, as the case may be; and thus the increasing process may be continued throughout the whole range of the compressibility of the springs F. Of course, in this process the disk D must be prevented from moving; then, as by the force applied by the said lever to the disk D′, as above described, it is caused to advance relatively on the disk D, the cams or inclined planes G on disk D operate on those on the ends of the arms H, which protrude through the mortises in the disk D′, as before mentioned, forcing them backward, and thus, as hereinafter described, the indicating-hand R is operated; and as the different degrees of force applied to the disk D′ in the above-described process will be indicated by correspondingly different positions of the hand R on the dial S, marking all these different positions on it, the dial S will be correctly graduated, and this graduation will be correct for all of my machines using the same number and strength of springs F as are used in the above-described process. It is clear that the said process must be repeated for each different number or strength of springs F, to be used in order to have the graduation of the dial S to correspond therewith, and the graduations of the dial, made as above described, will be correct for all machines using the same number and strength of springs F as are used in making their respective graduations.

In order to secure the proper motion of the hand R on the dial S to correctly indicate the amount of power transmitted through the

disks D and D′ the following-described devices are used: Attached in any suitable way to the rod O^2 at or near its ends is a cord, T. This cord passes once or oftener around the shaft or rod P, on which the hand R is placed. This cord is so attached to the rod P by a staple-pin or otherwise that it cannot slip thereon, and its ends, being attached to the corresponding ends of the shaft or rod O^2, as the latter moves endwise, carrying the cord T with it, and the latter passing around the said rod P will, of course, oscillate it in accordance with the motion of the rod and its cord; and as the hand R is attached to the oscillating rod P it will move on the dial accordingly, thus indicating the amount of power transmitted through the disks D and D′. In place of the said cord a rack on the rod O^2, and a pinion corresponding therewith on the rod P, may be used if preferred, as it will produce the same result.

Now, from the foregoing description, it is obvious that the operation of the devices constituting my invention will be as follows, viz: The disk D′ being rigidly attached to the main driving-shaft C′, and the disk D to the shaft C to be driven, and there being no means of transmitting either power or motion the one to the other except through the coiled springs F, which are interposed between the studs E of their respective disks, the studs E of the driving-disk D′, when it is put in motion, pressing against the springs F, and they, in turn, pressing against the studs E of the disk D to be driven, when the pressure is sufficient to overcome the resistance offered by the machinery to be moved by the disk D, then both disks will move on together as long as the resistance remains the same; but it will be readily seen that, as the driving-disk D′ commences and continues to move up to the point where the pressure on the springs F is sufficient to overcome the resistance offered by the disk D, that the disk D′ is steadily moving forward on disk D, the interposed springs F yielding to the pressure exerted upon them by the forward motion of the disk D′. It will also be seen that if the motion of the disk D′ be uniform, and the resistance of disk D be increased, that the disk D′ will, in relative position, advance on disk D in a degree corresponding with the increase of said resistance, and a decrease of said resistance will produce the opposite effect in regard to the relative position of the two disks.

It will also be seen that as disk D′ advances upon disk D, carrying the arms H with it, and they being in contact with the cams or incline planes G of the disk D, said cams must force the arms H backward in their respective mortises in the disk D′, and said arms H being attached to the grooved collar K, said collar will be forced backward from the disk D′, and against the coiled spring V, which is placed on the shaft C′ adjoining said collar, said spring V is calculated to press up against the collar K with sufficient force to keep the beveled ends of the arms H always in close contact with the cams G on the disk D. When said arms H and grooved collar K are, by the advancing motion of the disk D′ upon the disk D, forced backward, as above stated, the semicircular plate or fork *e*, which works in the groove L of the collar K, and the rod O^2, upon which said plate or fork *e* is placed, moves backward with them, and, as the rod O^2, at its outer end, is connected by any suitable devices—as M N O in Fig. 1—with the valves or devices for regulating the supply of steam or other power to be admitted to the driving machinery or engine, it will be seen that the supply of the steam or other power will be regulated entirely by the degree of resistance exerted through the disk D without regard to its speed, and in this way the least increase or decrease of the said resistance instantly produces a corresponding change in the supply of the motive power, increasing it when the said resistance increases, and decreasing it when the resistance is decreased, and thus a regular motion in the whole machinery is maintained; and, as the increase or decrease of back pressure or resistance offered by the disk D operates the arms H, grooved collar K, semicircular plate or fork *e*, and rod O^2, as above described, and as the cord T, which is attached to the said rod O^2, as seen in Figs. 1, 3, and 4, passes around and is fastened to the rod P, as before described, it follows that the backward and forward motion of the rod O^2 and its cord T will produce an oscillating motion in the rod P, and, as it carries on its end, which protrudes through the dial S, the hand or indicator R, which moves in correspondence with the oscillations of the rod P, and as the said hand R is immediately in front of the graduated dial S, it shows at all times the exact amount of power which is being transmitted through the said disks D and D′ and springs F.

Having thus fully described my invention, and the manner of using the same, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of the two disks D and D′, formed with projections or studs E at right angles with the faces of the said disks, with the coiled springs F, arranged between the said projections or studs E of the disks, substantially as and for the purposes set forth.

2. The combination of the disks D D′, their studs or projections E and springs F, with the cams or incline planes G, arms H, and collar K, and spring V, substantially as and for the purpose described.

3. The combination, substantially as herein set forth, of the two disks D and D′, having the projections E, the coiled springs F, arranged between said projection, the cams

G, arms H, collar K, rod O^2, lever M, rod N, and screw-nut O, as and for the purpose set forth and described.

4. The combination with the disks D and D′, their projections E, coiled springs F, cams G, arms H, and collar K, of the arm or rod O^2, pointer R, and graduated scale S, substantially as and for the purpose set forth.

5. The combination of the rod O^2, when connected with the rod P, as described, with the hand or indicator R and graduated dial-plate S, or their equivalents, substantially as and for the purpose specified.

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Witnesses:
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J. M. ADAMS.