J. S. JONES.

SWITCH.

APPLICATION FILED MAY 23, 1919.

1,409,008.

Patented Mar. 7, 1922.

2 SHEETS—SHEET 1.

Fig. 1,

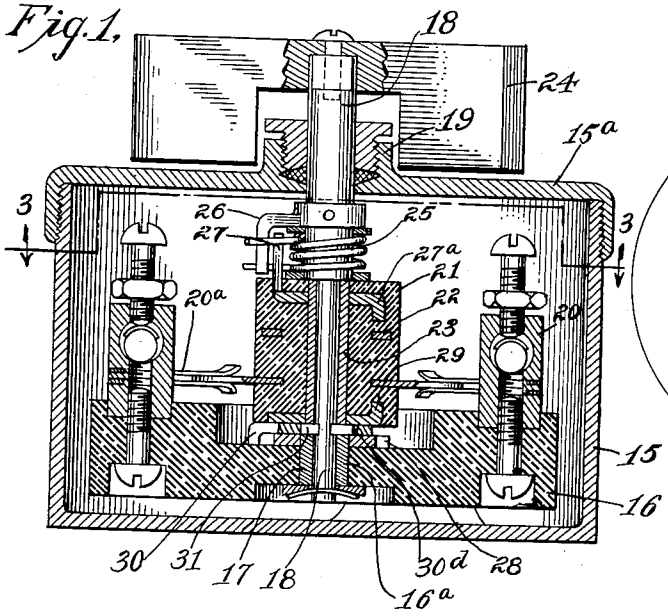


Fig. 2,

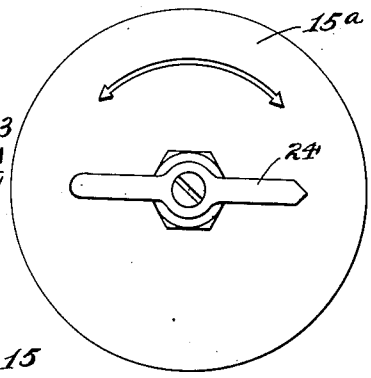


Fig. 5,

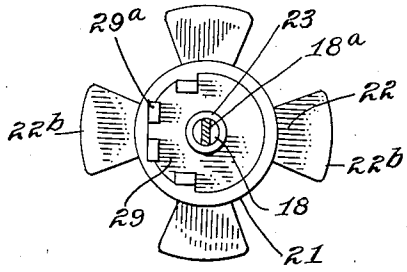
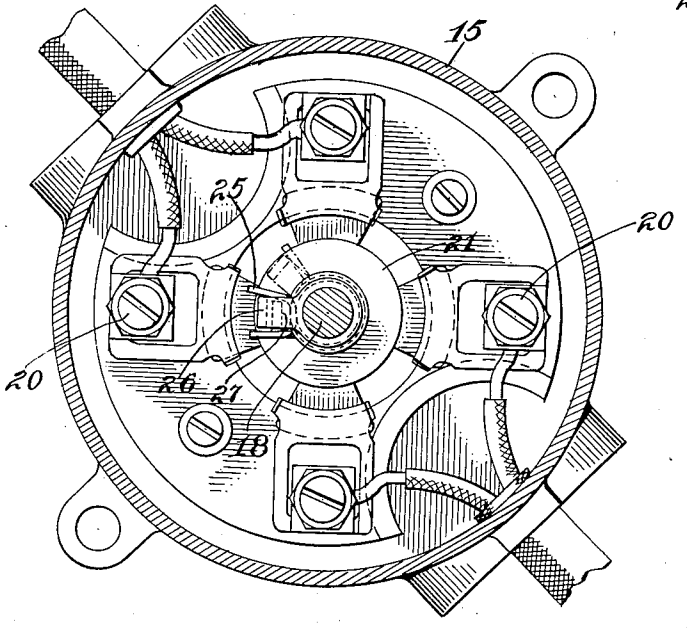


Fig. 3,



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2 SHEETS—SHEET 2.

Fig. 4.

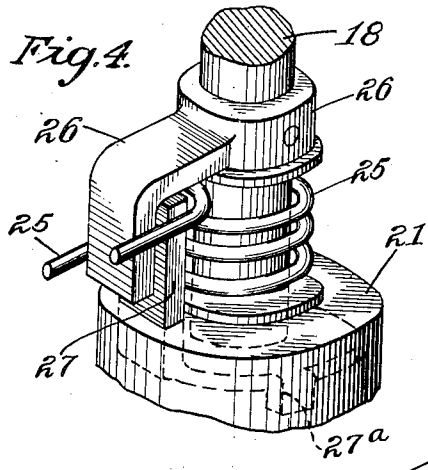


Fig. 6.

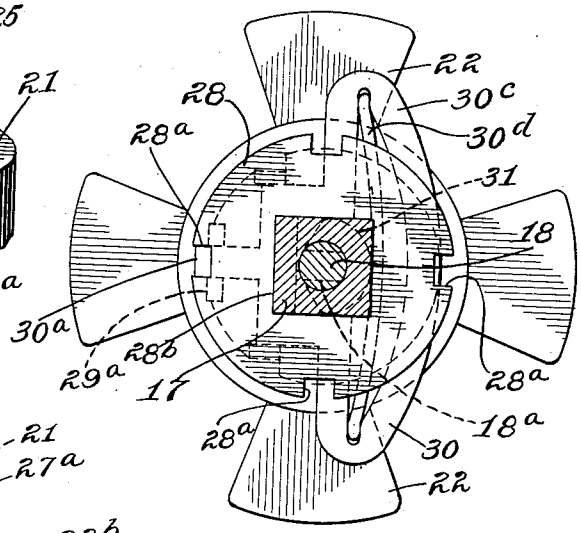


Fig. 8.

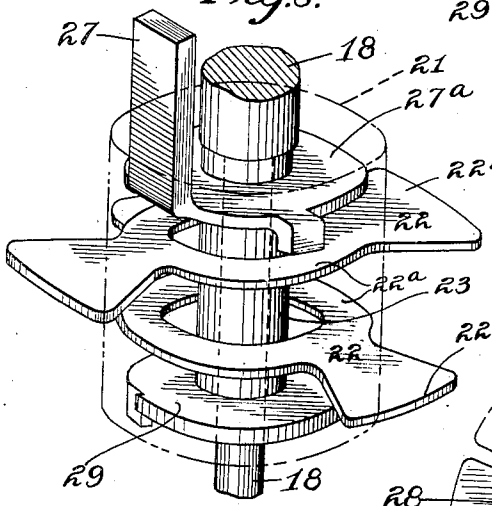


Fig 7.

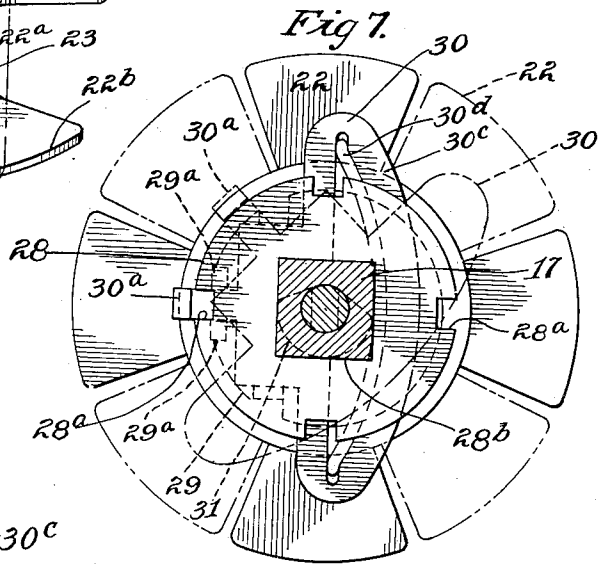
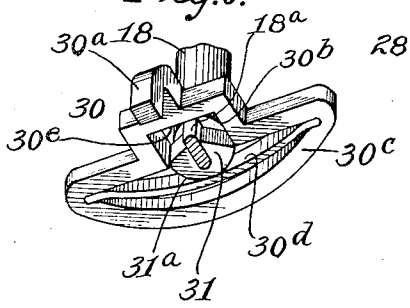


Fig. 9.



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UNITED STATES PATENT OFFICE.

JOSEPH STANSBURY JONES, OF BROOKLYN, NEW YORK.

SWITCH.

1,409,008. Specification of Letters Patent. Patented Mar. 7, 1922.

Application filed May 23, 1919. Serial No. 299,288.

To all whom it may concern:

Be it known that I, JOSEPH STANSBURY JONES, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Switches, of which the following is a specification.

This invention relates to improvements in switches, and more particularly to the type known as snap switches.

The present invention pertains especially to snap switches of the double-throw type, viz: switches in which the make and break movements may be provided in either direction of angular movement, the movement of the operating element from circuit-opening to circuit-closing position—or vice versa—being in either angular direction, the movement setting the internal structure to cause the latter to follow the direction of element operation as in ordinary "snap switch" operation.

The present invention employs a number of the features of the disclosure of my prior Patent No. 1,217,114, February 20, 1917, said patented structure, however, being of the single-throw type, in that the operating element is limited to but one direction of angular movement. While present structure is similar to that of the patent in the inclusion of a spring intermediate the operating element and the contact-carrying rotor, and, the use of a control mechanism which permits the rotor to advance under spring tension, the difference in problems presented in changing from single-throw to double-throw structures prevent use of the entire structure of the earlier patent. The principal changes are provided in connection with the spring and the control mechanism, thus permitting the use of the general form of structure and the advantages provided thereby, adding thereto the advantages obtained by the operation under double-throw instead of single-throw conditions.

Other objects are to provide a structure which is simple and efficient in operation, durable in construction, neat and attractive in appearance, and which can be manufactured at a relatively low cost.

To these and other ends, the nature of which will be readily understood as the invention is hereinafter disclosed, said invention consists in the improved construction and combination of parts, hereinafter fully described, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

In the accompanying drawings, in which similar reference characters indicate similar parts in each of the views.

Figure 1 is a central vertical sectional view.

Figure 2 is a top plan view.

Figure 3 is a section taken on line 3—3 of Figure 1.

Figure 4 is a perspective sectional view showing the tension-applying structure.

Figure 5 is a bottom plan view of the rotor.

Figure 6 is a sectional view taken on line 6—6 of Figure 1, the parts being shown in normal position.

Figure 7 is a similar view with parts shifted to permit rotor movement, the view showing in dotted lines, an advance position of the rotor.

Figure 8 is a perspective view of the rotor.

Figure 9 is a perspective view of the shiftable control element.

In the drawings, 15 indicates the casing having removable cover 15^a, the casing having the usual leading-in openings. 16 indicates the base of insulating material, the base having a suitable contour and having a central opening 16^a to receive a non-rotatable bearing or bushing 17 through which the lower end of shaft or spindle 18 passes, the latter being removably held against material longitudinal movement in suitable manner. The upper end of spindle 18 is supported by cover 15^a in suitable manner, the drawings indicating the use of a suitable packing gland formation 19.

Base 16 carries binding posts 20 carrying clips 20^a between which the contacts of the rotor pass as in the patented structure, the posts being arranged to carry the clips at the proper distances from the base to accommodate for the positions of the contact blades. As shown, the rotor carries two blade members, each of which is operative to connect the clips of two terminal binding posts, so that the switch is adapted to control two circuits if desired, the clips of diametrically opposite posts 20 being located in the same plane which differs from the plane of the clips of the other set of posts, the planes intersecting the axis of the rotor.

Obviously, the switch may be operated with but a single circuit, by omitting circuit connections to one pair of terminal posts.

The rotating element or rotor 21 is of the general type referred to in the prior patent, in that its body is of insulating material molded about the blade contacts 22 each of which is in the form of a ring portion 22^a carrying diametrically opposite fan-tail contact members 22^b, the latter projecting outwardly from the insulating body. The body is provided with a central longitudinal opening through which spindle 18 extends, a bushing 23 being mounted within the opening and forming a bearing for the rotor.

Spindle 18 and the rotor are movable relatively to each other rotatively, spindle 18 being given its movement by suitable means, as for instance, a handle 24—or a removable key element may be employed. Rotor movements, however, are provided by the action of a spring placed under tension by the spindle movements, the tension becoming effective to restore the normal relation between the spindle and rotor through the action of certain control mechanism, the latter being operative in producing the tension power, then made temporarily inactive to permit tension activity, and restored by the "follow-up" movements of the rotor.

The tension means employed is in the form of a coil spring 25 which has its coil surrounding the spindle at a point beyond the plane of the rotor body—shown as above in Fig. 1—the ends of the coil extending outwardly in more or less parallelism.

Spindle 18 carries an arm 26 and the rotor body carries a finger 27 both of which pass between the two ends of spring 25 (see Fig. 4) the arm and finger being spaced from each other on a radial line extending from the spindle axis.

Arm 26 is pinned or otherwise secured to the spindle and rotates therewith, while finger 27 is formed as a projection carried by a plate 27^a embedded in the rotor body and projecting from one end of the rotor. The ends of the spring are shown as extending on different planes of intersection of the spring axis, and as both arm 26 and finger 27 are designed to operate with either end of the spring, as presently pointed out, these elements have a sufficient length to permit this action to take place.

The control mechanism embodies an element held against movement, an element movable with the rotor and an element movable with the spindle, these elements having configurations and operating cycles such as to normally maintain the rotor in its set position, maintaining this position during initial spindle movement to place spring 25 under tension, and then releasing the rotor restraint in the presence of this tension to permit the rotor to advance under the tension action and thus restore the normal set relation of the rotor. These elements are as follows:—

28 indicates the stationary element, shown as having the form of a lock-plate carried by bushing 17 and shown as having a plurality of notches or recesses 28^a spaced equidistant on the periphery of the plate. These notches or recesses correspond in number to the number of positions of the switch— shown as four in the present embodiment. As shown in Fig. 1 this plate 28 is located on bushing 17 above base 16—the latter being shown as recessed in the present embodiment. Element 28 is provided with a central opening 28^b having a contour substantially complemental to that of bushing 17—a non-circular contour—thus maintaining the positions of notches 28^a.

The rotor-carried element is indicated at 29, being in the form of a plate carried by and axially aligned with the rotor, bushing 23 preferably extending through an opening formed in the plate. The plate is held fixedly relative to the rotor by any suitable means, as by being embedded therein, or having lugs embedded within the material, or both. The exposed face of plate 29 is provided with a plurality of projections or lugs which form guides for a second member 30 of this element, said latter element being movable with the rotor but also having an additional reciprocating movement in directions transverse to the rotor axis.

Said member 30 is shown in detail in Fig. 9, in which 30^a indicates a finger projecting laterally of the plane of the member and adapted to co-operate with notches 28^a, a U-shaped portion 30^b through which the spindle extends, a laterally-extending portion 30^c having an opening communicating with the interior of portion 30^b, and a resilient member 30^d—which may be in the form of a leaf spring—located in portion 30^c, the spring and finger being located on opposite sides of the member axis—the latter extending through the opening of portion 30^b. Lugs 29^a are relatively positioned to prevent relative rotative movement of member 30 and the rotor and yet permit slidable movements of the member to engage and disengage finger 30^a and a notch 28^a.

Element 30 is located in the plane of a recessed portion or portions 18^a of spindle 18, and the latter carries a member 31—operating on the order of a cam—which is located in the opening of portion 30^b, having a face 31^a which normally contacts with spring 30^d—as in Fig. 9—but which is movable into contact with walls of the opening of portion 30^b. In its normal position, member 31 places spring 30^d under tension to draw finger 30^a toward the spindle axis—to enter a notch 28^a—but under rotative movement of

the spindle, face 31^a contacts with a wall 30^e of the opening of portion 30^b, shifting member 30 to carry its finger out of the notch.

There is direct co-operation between the tension means and the control mechanism as will be understood from the following:—

In normal position of the parts—whether the circuit be open or closed—finger 30^a is in engagement with one of the notches 28^a, thus locking the rotor against movement; at this time the tension means is substantially free from tension, excepting such as may be provided by friction of contacting parts.

When it is desired to snap the switch, the handle is moved rotatively, thus beginning rotation of spindle 18. Since however, there is no positive connection between the spindle and rotor, and the latter is held from rotative movement by engagement of finger 30^a with a notch 28^a, this movement of the spindle becomes effective to place tension on the spring by reason of the contact of arm 26 with one end of spring 25 while the opposite end of the spring is held by finger 27—the action being similar regardless of the direction of rotation of the spindle. At the same time movement of the spindle shifts the position of member 31 in a direction to cause its face 31^a to contact wall 30^e, thereby forcing a change in position of member 30 in a direction to take finger 30^a from notch 28^a. When movement of member 30 has been sufficient to release finger 30^a—at which time the spring tension has assumed considerable value—this tension is made effective on the rotor through finger 27 to cause the rotor to advance in a corresponding direction, moving the rotor—and finger 30^a—an angular distance to carry finger 30^a out of position to return to the notch which it has left.

As will be readily understood, this angular movement of member 30 not only changes the relative positions of finger 30^a and notch 28^a, but at the same time changes the relation of face 31^a and wall 30^e, with the result that face 31^a again becomes active on spring 30^d and tends to return member 30 to its normal position. This complete movement is prevented, however, by contact of finger 30^a with the periphery of member 29 so that the lock control is held inactive to permit spring 25 to continue its action on the rotor, this latter continuing until finger 30^a comes opposite the succeeding notch 28^a—at which time the normal relation of face 31^a and spring 30^d has been restored and finger 30^a passes into engagement with its notch, locking the parts in normal position.

Obviously, handle 24 need be moved only an angular distance equal to that desired of the rotor, and the casing may carry the usual indications to regulate this length of movement.

As will be understood, the arrangement by which the rotor is placed under tension is operative in either direction of rotation of the spindle arm 26 being made operative on one end or the other of spring 25 while finger 27^a holds the opposite end of the spring from movement until the rotor is itself free to move through the action of the control mechanism, this latter taking place through the action of face 31^a and member 30, the particular time when finger 30^a is actually released from its notch 28^a being determined by the relative configurations of members 30 and 31. And since the movement of the rotor under the action of the tension automatically tends to place spring 30^d under tension by reason of its contact with face 31^a it will be understood that finger 30^a will not only enter the succeeding notch 28^a with certainty but finger 30^a will tend to ride in frictional engagement with the edge of plate 28 and may thus tend to restrict speed and ensure that overrunning of the rotor will be prevented, especially since the movement is also resisted by the entrance of the contact blades into the clips.

As will be understood springs 25 and 30^d form separate tension means, spring 25 being normally at its minimum tension value while spring 30^d is normally at an intermediate value. This relation is temporarily changed during the operation of the switch, spring 25 reaching its maximum tension value as finger 30^a is about to be released, at which time spring 30^d is substantially at its minimum value. Rotor movement then causes the tension value of spring 25 to decrease to its minimum, while the tension value of spring 30^d is raised to its maximum—reached just prior to the entrance of finger 30^a into its notch by reason of the restraint in inward movement of finger 30^a while face 31^a is operating on spring 30^d—spring 30^d returning to its normal tension value by the inward movement of finger 30^a into its notch.

Obviously, the fact that spring 25 is located external of the rotor becomes advantageous in that it permits the moulding of the rotor to be had about the bushing in which the spindle itself is guided, greatly simplifying the general arrangement and rendering it less likely to be disarranged in use. And as all rotor-carried parts are practically embedded in the insulating material which forms the body portion of the rotor, the parts are held firmly and may be of configurations of a strong and substantial character, ensuring serviceable conditions even under heavy service.

While I have herein shown and described a preferred form of structure, it will be readily understood that changes or modifications therein may be found desirable or essential to meet the exigencies of use, and I desire to be understood as reserving the

right to make any and all such changes or modifications therein as may be found desirable or necessary in so far as the same may fall within the spirit and scope of the invention as expressed in the accompanying claims when broadly construed.

Having thus described my invention, what I claim as new, is:—

1. A snap switch comprising an insulating base, a substantially barrel-shaped rotor of insulating material, a stem passing freely through the rotor and having a bearing in the base and provided with a handle, fixed contacts carried by the base and cooperating contacts carried by the rotor, a fixed latch plate having notches and concentric portions between the notches, a latch connected to rotate with the rotor and guided for lateral movement in respect to the rotor and latch plate and having a tooth to engage the latch notches, a cam carried by the stem and engaging a cam opening in the latch, a spring on the rotatable latch arranged to engage the cam and yieldingly urge the rotatable latch member to notch engaging position, a spring mechanism at the other end of the rotor from the latch mechanism providing means for urging the rotor to move in either direction in accordance with rotation of the stem, the latch mechanism serving to provide a quick snap action of the rotor in either direction of rotation.

2. In a snap switch, a rotor, means controlled by the position of the rotor for making and breaking a circuit, and means for shifting said rotor from one predetermined position to another to make or break the circuit, including a spindle, means for exerting rotative pressure upon the rotor when the spindle is revolved, a shiftable latch engaging the rotor, a plurality of spaced latch engaging members adapted to maintain the rotor in any one of a plurality of fixed positions by engagement with said latch, a resilient member connected to the latch, means for normally maintaining the resilient member in position to force the latch into engagement with any one of said members, shiftable upon rotation of said spindle to release the pressure of said resilient member upon the latch and shift the latch out of engagement with said members, permitting rotation of the rotor through said pressure.

3. In a snap switch, a rotor, means controlled by the position of the rotor for making and breaking a circuit, and means for shifting said rotor from one predetermined position to another to make or break the circuit, including manually operable means for exerting rotative pressure upon the rotor, a latch engaging the rotor, fixed means engaging the latch to maintain the rotor in fixed position, and means for normally maintaining said latch in engagement with said fixed means by resilient pressure, adapted to release said resilient pressure and force the latch out of engagement with the fixed means upon manipulation of the manually operable means to permit revolution of the rotor.

4. In a snap switch, a rotor, means controlled by the position of the rotor for making and breaking a circuit, and means for shifting said rotor from one predetermined position to another to make or break the circuit, including a spindle, a resilient connection between the spindle and rotor to impel the rotor rotatively, latch means for holding the rotor in fixed position against the action of said resilient connection when the spindle is rotated, resilient means for maintaining said latch in active position, and means operative upon rotation of the spindle to release said resilient means, shift the latch into inoperative position and permit the rotation of the rotor to restore the normal relation between spindle and rotor, in which the resilient means is again active to force said latch into operative position and hold the rotor in fixed position.

5. In a snap switch, a rotor, means controlled by the position of the rotor for making and breaking a circuit, and means for shifting said rotor from one predetermined position to another to make or break the circuit, including a spindle coaxial with the rotor, a spring connecting the spindle and rotor tending to impel the rotor rotatively, a latch slidably mounted on the rotor, a plurality of fixed latch engaging members, resilient means for holding said latch in engagement with one of said fixed members, and latch controlling means connected to said spindle for normally holding said resilient means in active position adapted upon rotation of the spindle to release said resilient means and shift the latch into operative position, permitting the rotation of the rotor through the action of said spring to restore its normal relation with the spindle in which the resilient means is operative to engage the latch with another fixed member.

6. In a snap switch, a rotor, means controlled by the position of the rotor for making and breaking a circuit, and means for shifting said rotor from one predetermined position to another to make or break the circuit, including a spindle coaxial with the rotor, a spring connecting the spindle and rotor tending to move the rotor rotatively, a latch slidably mounted on the rotor, a fixed member having a periphery concentric with the axis of the rotor and provided with a plurality of spaced latch engaging elements on said periphery, resilient means for normally maintaining said latch in engagement with one of the elements, actuating means connected to the spindle for

releasing said resilient means and the latch upon rotation of the spindle to permit revolution of the rotor into normal relation with the spindle, said actuating means being operative to renew the pressure of the spring against the latch as the rotor approaches normal position in relation to the spindle, so as to force the latch into increasingly forcible frictional engagement with the concentric periphery of said fixed member.

7. In a snap switch, a rotor, means controlled by the position of the rotor for making and breaking a circuit, and means for shifting said rotor from one predetermined position to another to make or break the circuit, including a spindle coaxial with the rotor, a spring resiliently connecting the spindle and rotor tending to produce homologous rotation, a latch slidably mounted on the rotor, a fixed element having a plurality of spaced latch members, a second spring, a cam element mounted on the spindle and adapted to force said second spring into engagement with the latch to hold it in operative position when the rotor and spindle are in normal relation, and adapted, upon rotation of the spindle through a predetermined angle, to release said spring and shift the latch into inoperative position to permit the revolution of the rotor into normal engagement with the spindle, said revolution restoring the normal engagement between the cam member and the second spring to resiliently force the latch into operative position.

In testimony whereof I have hereunto set my hand.

JOSEPH STANSBURY JONES.