W. RISLEY.

ROTARY ENGINE.

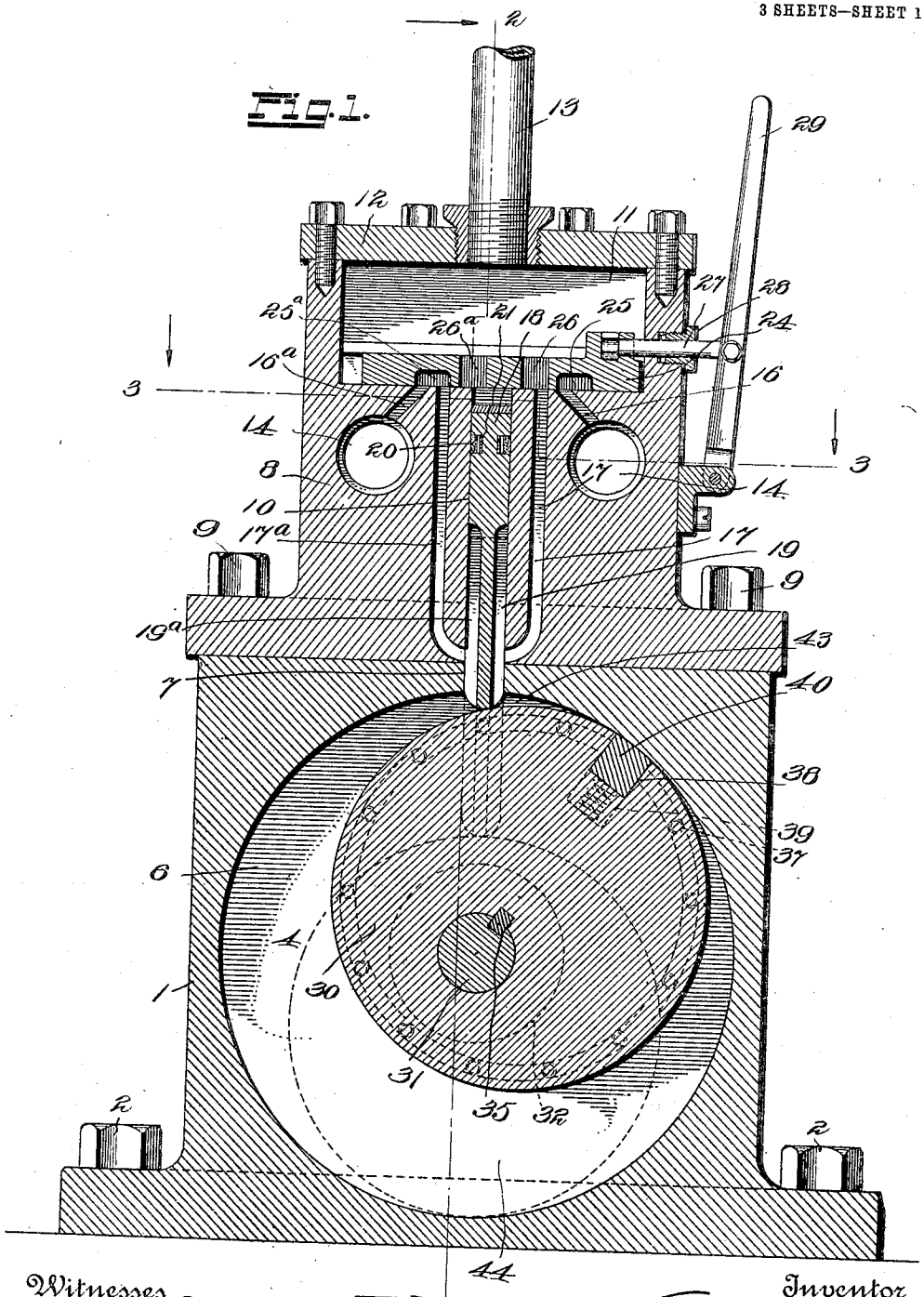
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902,762.

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3 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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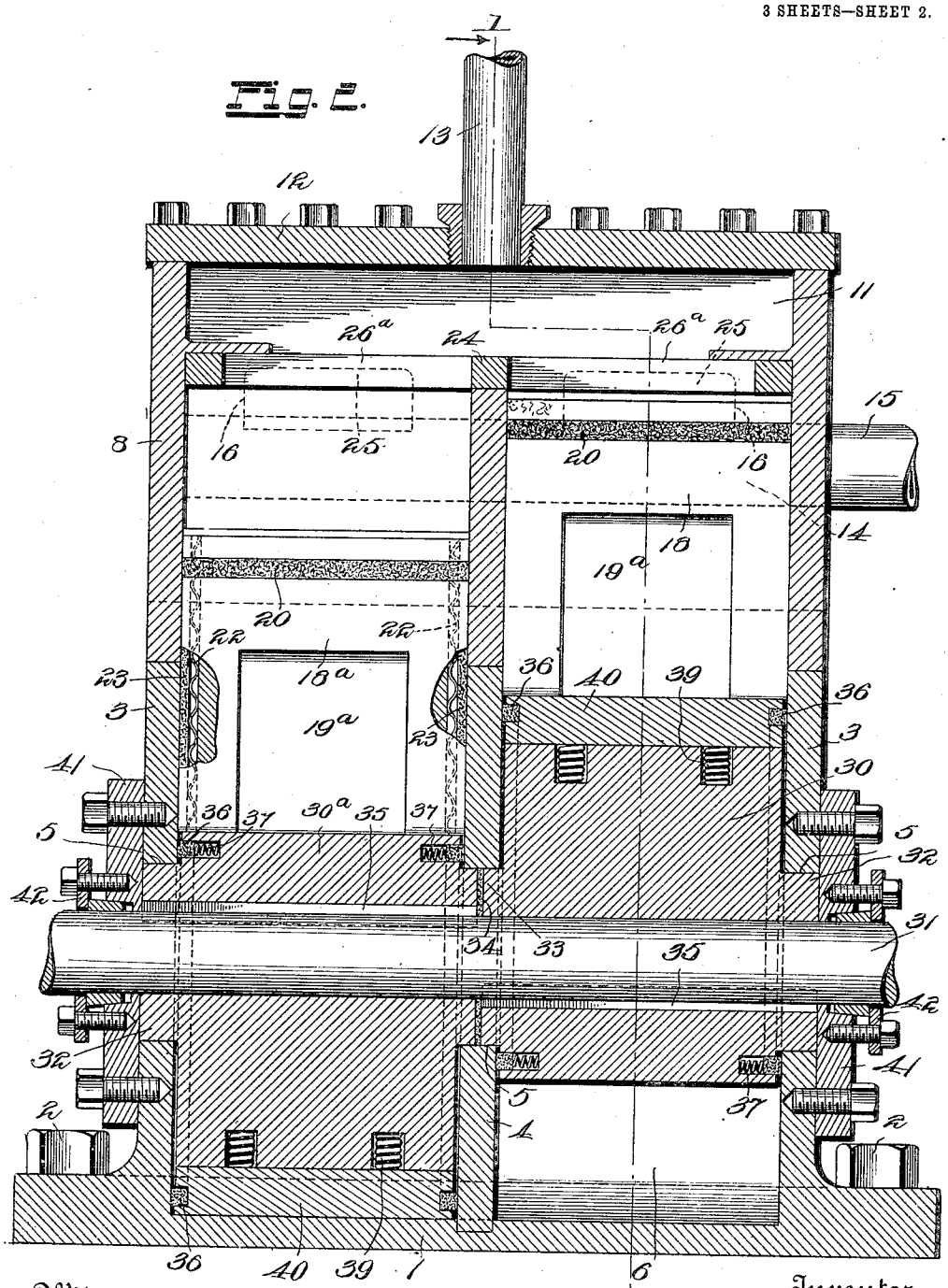
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3 SHEETS—SHEET 2.

Fig. 2.



Witnesses

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3 SHEETS—SHEET 3.

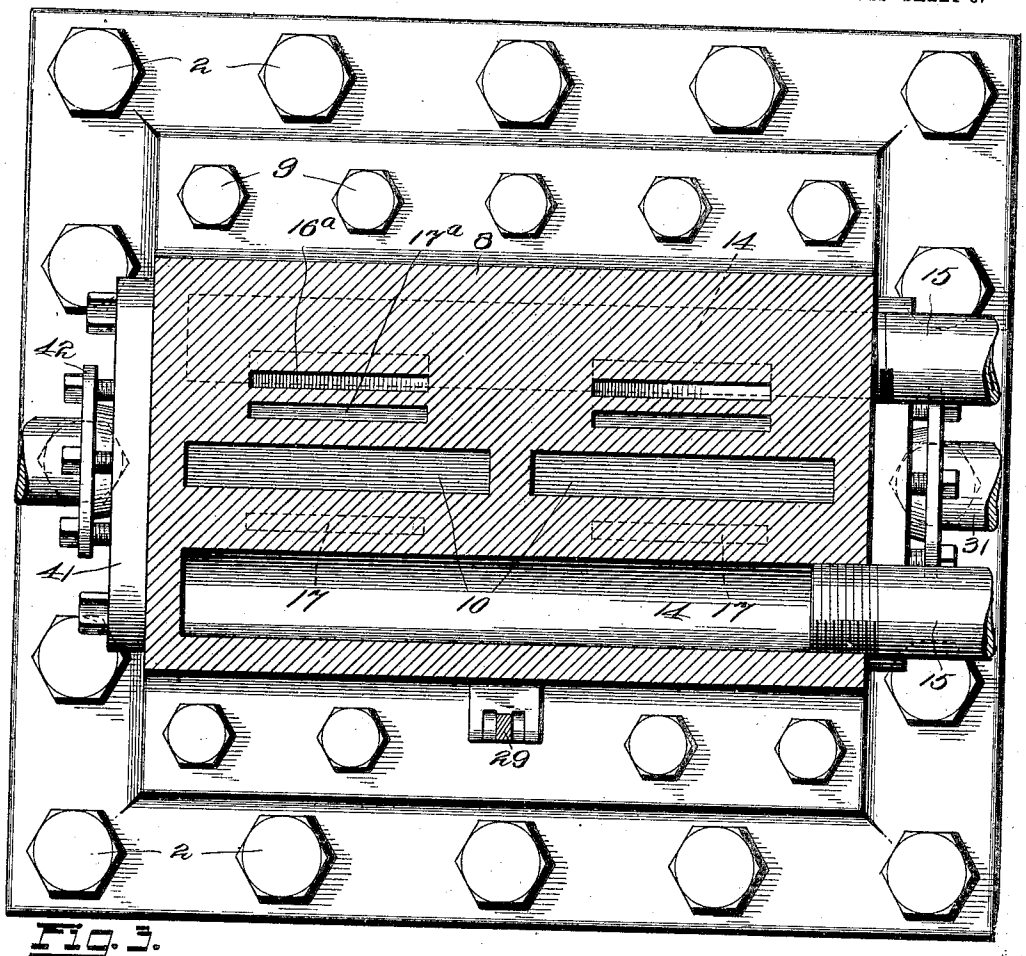


Fig. 3.

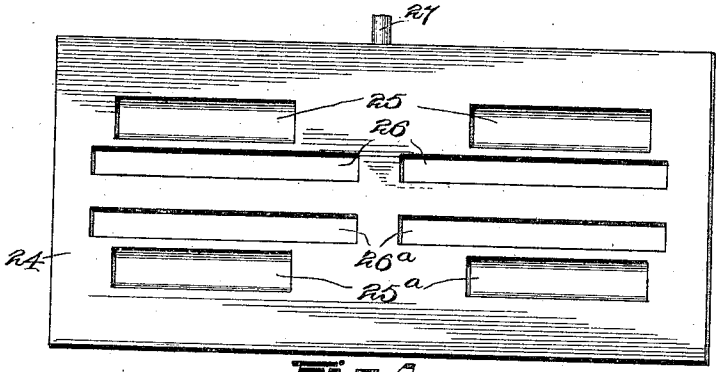


Fig. 4.

Witnesses

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UNITED STATES PATENT OFFICE.

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ROTARY ENGINE.

No. 902,762. Specification of Letters Patent. Patented Nov. 3, 1908.

Application filed February 24, 1908. Serial No. 417,407.

To all whom it may concern:

Be it known that I, WARD RISLEY, a citizen of the United States, residing at Jacksboro, in the county of Jack and State of Texas, have invented certain new and useful Improvements in Rotary Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in engines or motors, and while the principles of the invention may be applied to other types of fluid-operated rotary engines, internal combustion engines, pumps and analogous machines, either by reversal of the operation, or by the addition of obvious details, still for the purpose of disclosure and for simplicity of illustration the invention is shown and described as a rotary steam engine.

In its application as a rotary steam engine one of the objects is to provide a reversible engine employing either a single cylinder or a plurality of cylinders.

Another object is to provide means whereby one of the walls of the cylinder is a movable wall coöperating with a fixed annular wall and a movable abutment to provide a non-communicating live steam chamber and a dead steam chamber, the live steam chamber being adapted to increase in area during a stroke of the piston not only in a circumferential direction, but also in a radial direction, whereby the inlet end of said live steam chamber has greater volume than the opposite end.

Another object of the invention, which is primarily accomplished by the previously mentioned means, is to provide means for introducing the effective force of the live steam against the rotating piston at an angle substantially at right angles to the longest diameter of the piston, or a plane passing through the axis of said piston and its point of contact with the outer stationary wall of the cylinder, whereby the most effective power is obtained during substantially the whole stroke of the piston.

Other objects and advantages will appear from the following specification, the principal features of novelty being pointed out in the claims, and to more clearly describe the invention in detail reference is had to the accompanying drawings illustrating a practical embodiment of the same, in which—

Figure 1 is a vertical sectional view through one cylinder of a two-cylinder engine on the line 1—1 of Fig. 2. Fig. 2 is a vertical section on the line 2—2 of Fig. 1, but with the pistons at slightly different positions, the piston in Fig. 1 being shown as having started on its cycle, while the corresponding piston in Fig. 2 shows it on dead center. Fig. 3 is a horizontal section on the line 3—3 of Fig. 1, and Fig. 4 is a bottom plan view of the reversing valve.

1 designates the base provided with the usual apertures receiving bolts 2 to secure the engine to its bed, and this base has the integral side walls or heads 3 and a central wall 4 where a two-cylinder engine is employed. These walls are provided with alining openings 5 to receive and form a bearing for shoulders on the rotary pistons hereinafter referred to. The base 1 at right angles to said walls 4 is bored out, and cooperating with said walls forms the annular cylinder spaces 6, the upper walls of which are provided with slots 7 opening in said chambers 6 for a purpose hereinafter referred to.

The base 1 is surmounted by a substantially solid head 8 which is secured to said base by the usual bolts 9, and this top portion or head is provided with slots 10 registering at one of their ends with said slots 7, and at their other ends communicating with a steam chest 11 formed on said head 8, and provided with a suitably secured cover plate 12 having a live steam pipe 13 bushed therein, as customary.

The head 8 is provided with exhaust chambers 14, which may be cylindrical in form and communicate with exhaust pipes 15, said chambers preferably extending substantially in the direction of the engine shaft. 16, 16^a designate exhaust ports, shown as cut at an angle in said head 8, and forming passages between said exhaust chambers 14 and the steam chest, but of course a valve mechanism prevents the discharge of the exhaust into the steam chest, as will hereinafter appear.

17, 17^a designate inlet and outlet ports extending through said top 8 from the steam chest, and at the base of said top member communicating with said slot 10. 18, 18^a

are a pair of automatically-controlled members mounted in the slots 10, and forming abutments or dividing walls between the live and dead steam chambers of said cylinders. These abutments, as clearly shown in Figs. 1 and 2, are provided on opposite faces with alining, but non-communicating recesses 19, 19ª, which extend from substantially the center of said members and terminate at the lower ends thereof and form inlet and exhaust ports, respectively, communicating between the ports 17, 17ª and the live and dead steam chambers of the cylinders. The upper ends of these abutments on their flat faces are provided with recesses containing suitable packing 20, and in this packing are inclosed suitable spring members 21 substantially of the configuration as shown at 22 in Fig. 2, the springs 22 in said latter figure similarly resting in recesses formed in the edge faces of said abutments and engaging packing 23 to prevent leakage of steam around the faces of said abutments while in their displaced positions, as hereinafter referred to.

24 designates the reversing valve shown in bottom plan in Fig. 4. This valve is shown as of the sliding type, and on its underneath face is provided with passageways 25, 25ª. The valve is also provided with the elongated slots 26, 26ª forming ports communicating between the inlet ports 17 or 17ª, as the case might be, and with the slot 10 in the head member, it being understood that these ports 26, 26ª are located between the passageways 25 and 25ª, and are of such a distance apart that when one port is in communication with the ports 17 or 17ª, the other one communicates with the slot 10 above the head of its abutment, but the degree of communication being only sufficient to maintain a head of live steam above said abutment, and thus tend to force said abutments downwardly. It will also be understood that a similar set of ports is provided in the valve at its other end, when a two-cylinder engine is employed as in the present case. This slide valve is operated by a valve rod 27, bushed in the steam chest, as at 28, and connected to an operating lever 29, as shown.

The pistons consist of cylindrical members 30 and 30ª, mounted eccentrically on the shaft 31, and provided with shoulders 32, 33, supported in the openings or bearings 5, and the shoulders 33 being provided with interposed packing means 34 to prevent the escape of steam from one cylinder into the other around said pistons. The pistons may be secured to the shaft by the keys 35, as usual.

The side faces of the pistons are circumferentially grooved to receive the packing rings 36 of any suitable material, which packing rings are forced outwardly against the heads of the cylinders by any suitable means, such as the coil springs 37, shown more clearly in Fig. 2, as set in recesses communicating with said circumferential recesses.

The pistons are also provided with transverse recesses 38 on their peripheral faces at a position where the longest diameter of said piston lies, and inwardly of these recesses are provided further pockets 39 for the reception of coil springs, which springs are adapted to force outwardly transverse packing rods 40 mounted in said recesses 38, and which rods form the positions of contact between said pistons and the annular walls of said cylinders.

The packing rings 36 previously referred to also are inset in the ends of these packing rods 40, as shown more clearly in Fig. 2.

The ends of the shaft 31, in addition to the bearings formed by the shoulders 32 and 33 of the pistons, are further supported by the bearing plates 41 provided with the bushing members 42.

In operation, with the parts being shown in the position illustrated in Fig. 1, and referring to one cylinder only, live steam passes from the steam chest through the ports 26, 17 and 19 into the space 43, or live steam chamber, which at this position is of very small volume, and the piston being eccentrically mounted the force of the steam is directed substantially at right angles to a plane passing through the shaft and said packing member 40, and as the piston moves in its cycle the steam following the curve of the annular wall is deflected substantially at right angles at substantially all times against said piston, which forms a moving wall of the steam chamber, while at the same time the volume of the space 43 increases not only in a circumferential direction, but also at the entrance to the live steam chamber 43. At the same time the dead or expanded steam contained in the chamber 44, which, at this position is of very great volume, passes out through the ports 19ª, 17ª, 25ª, 16ª into the exhaust chamber 14. At the same time the abutment 18 is always maintained in position against the peripheral face of the piston by the direct pressure of live steam from the steam chest through the port 26ª and into the slot 10 above said abutment, the abutment being forced upwardly by the eccentrically mounted piston and downwardly by the direct application of live steam at substantially all times.

It will be manifest that to reverse the engine it will be simply necessary to throw the valve 24 in the opposite direction, when the port 26ª will be shifted over the port 17ª (now becoming the inlet port), the port 26 over the slot 10 and the passageway 25 over the port 17 (now becoming the outlet port).

While the operation has only been described with reference to one cylinder, when two cylinders are employed, the operation,

of course, is exactly the same, as the valve 24 is provided with two sets of ports and the piston 30ª is reversely mounted with respect to the piston 30.

Having thus described the invention, what I claim is:—

1. The combination with an annular cylinder, a piston therefor and a steam chest; of a sliding abutment operating in a passageway between said cylinder and steam chest and projecting against said piston; inlet and outlet ports between said steam chest and said cylinder; and a valve in said steam chest controlling said inlet and outlet ports and providing means to maintain a head of steam at all times against the outer end of said sliding abutment, substantially as described.

2. The combination with an annular cylinder, a piston therefor and a steam chest; of a valved abutment slidingly mounted in a passageway between said steam chest and said cylinder; inlet and outlet ports between said chest and opposite sides of said passageway; exhaust ports between said chest and atmosphere; and a valve in said steam chest provided with ports forming communicating passages between said steam chest and passageway, between said steam chest and the inlet port, and between the outlet port and the exhaust port, substantially as described.

3. The combination of an annular cylinder, a cylindrical piston rotatably mounted therein and engaging the annular wall of said cylinder at a position on the periphery of said piston, the annular wall of said cylinder being provided with a slot, a head member mounted above said cylinder having a steam chest associated therewith and provided with a slot alining with the aforesaid slot and communicating with said steam chest, inlet and outlet ports cut into said head member and forming communicating passages between said steam chest and the lower end of the slot in said head member, a movable abutment operating in said slots and provided at its inner end with ports communicating with said inlet and outlet ports and the interior of said cylinder, an exhaust port, and a valve operating in said steam chest and provided with ports forming communicating passages between said steam chest and the slot in said head member, between said steam chest and said inlet port and between said outlet port and said exhaust port, substantially as described.

4. The combination of an annular cylinder, a cylindrical piston mounted therein and engaging at one position of its periphery the wall of said annular cylinder, a sliding abutment adapted to project in said cylinder a head member for said cylinder, said head member and cylinder wall being provided with alining slots, an abutment operating in said slots and adapted to project in said cylinder, a steam chest carried by said head member, a port on each side of said slot extending through said head member from said steam chest and communicating with ports formed in the flat faces at the lower end of said sliding abutment, exhaust chambers in said head member, ports leading from said exhaust chambers to said steam chest, and a valve provided with recesses on its underneath face and with a pair of ports intermediate of said recesses and extending through said valve, whereby said ports through said valve coöperate respectively with said ports through said head member and said slot in said head member and said recesses in said valve coöperate respectively with one of said exhaust ports and one of said ports through said head member, substantially as described.

5. The combination of a base provided with an annular cylinder cut therein, an eccentrically-mounted cylindrical piston in said cylinder, a top member surmounting said base provided with a steam chest, and said top and base being provided with slots forming a passageway between said cylinder and said steam chest, ports cut in said top and extending from said steam chest to said slot in said top at its lower end, exhaust chambers formed in said top and provided with passageways extending to said steam chest, an abutment provided at its lower end with ports and operating in said slots, and a reversing valve provided with recesses in its lower face and intermediate ports extending therethrough, substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

WARD RISLEY.

Witnesses:
THOS. D. SPUN,
F. N. MCCLURE.