W. A. JONES.

MECHANICAL MOVEMENT.

APPLICATION FILED APR. 10, 1909.

1,011,126.

Patented Dec. 5, 1911.

4 SHEETS—SHEET 1.

FIG. 2

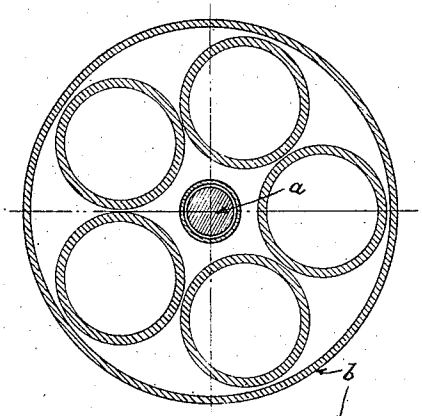


FIG. 4

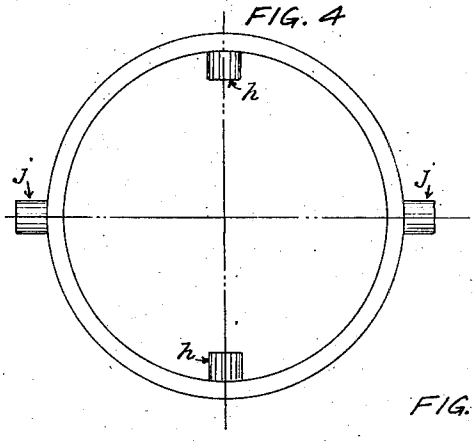


FIG. 3

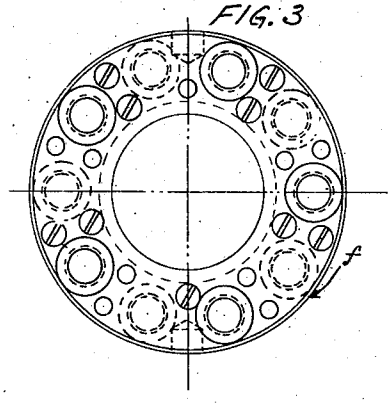
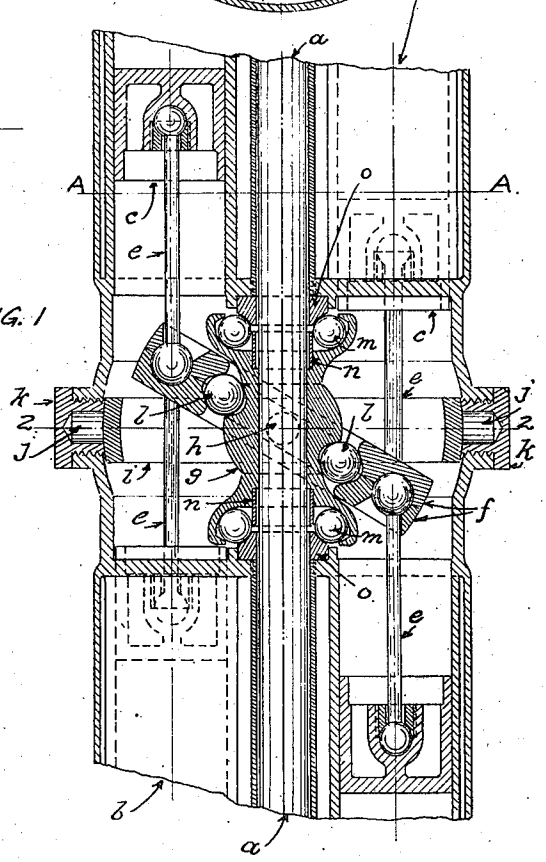


FIG. 1



Wm A Jones.

INVENTOR

WITNESSES

Berg B Whittam

J. Laurence Waldron

W. A. JONES.

MECHANICAL MOVEMENT.

APPLICATION FILED APR. 10, 1909.

1,011,126.

Patented Dec. 5, 1911.

4 SHEETS—SHEET 2.

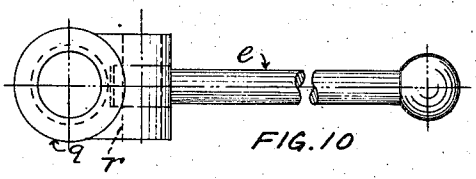


FIG. 10

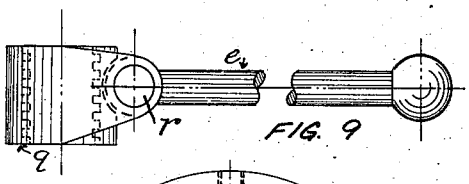


FIG. 9

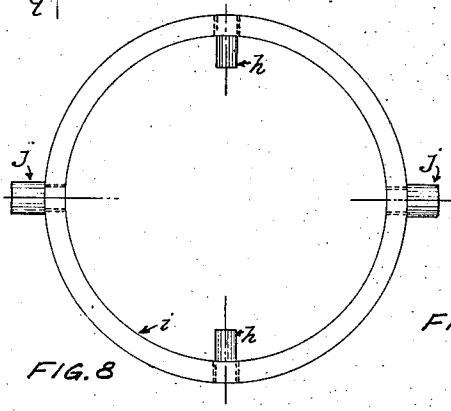


FIG. 8

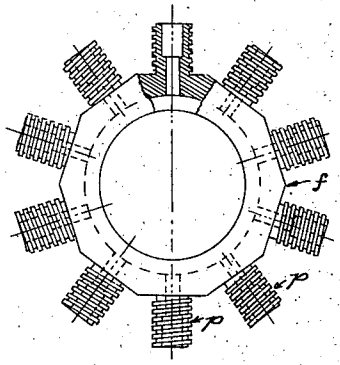


FIG. 7

FIG. 6

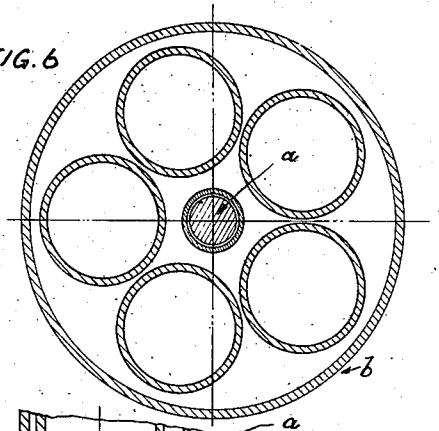
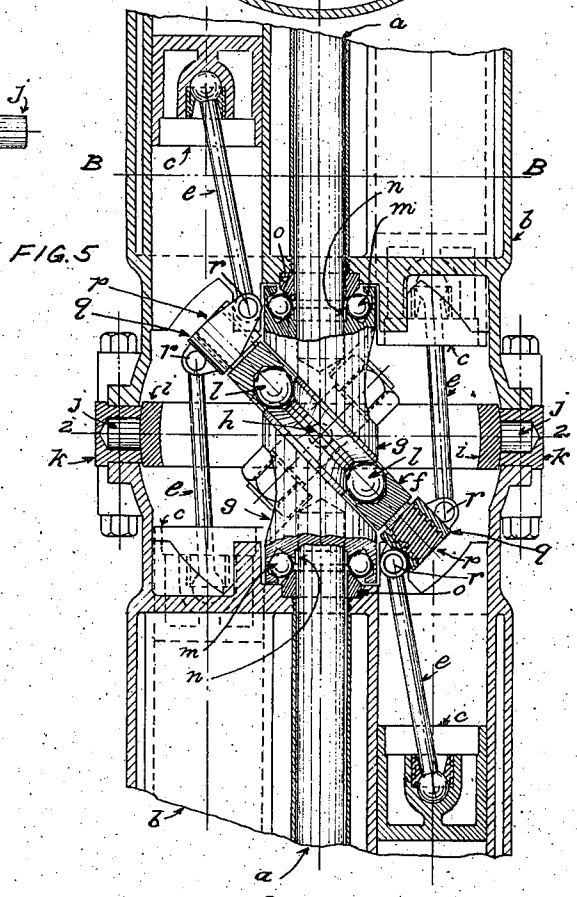


FIG. 5



Wm. A. Jones.

INVENTOR

WITNESSES

Benj. B. Hulbert

J. Laurence Waldron

W. A. JONES.

MECHANICAL MOVEMENT.

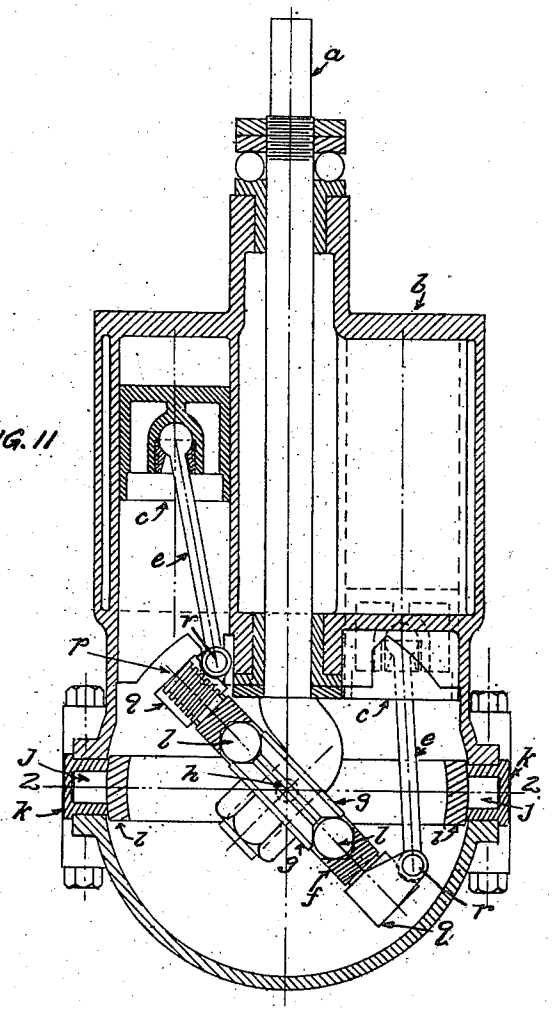
APPLICATION FILED APR. 10, 1909.

1,011,126.

Patented Dec. 5, 1911.

4 SHEETS—SHEET 3.

FIG. 11



WITNESSES

Benj. B. Whittaker

J. Laurence Waldron.

Wm. A. Jones.

INVENTOR

W. A. JONES.

MECHANICAL MOVEMENT.

APPLICATION FILED APR. 10, 1909.

1,011,126.

Patented Dec. 5, 1911.

4 SHEETS—SHEET 4.

FIG. 14

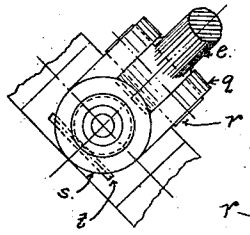


FIG. 12

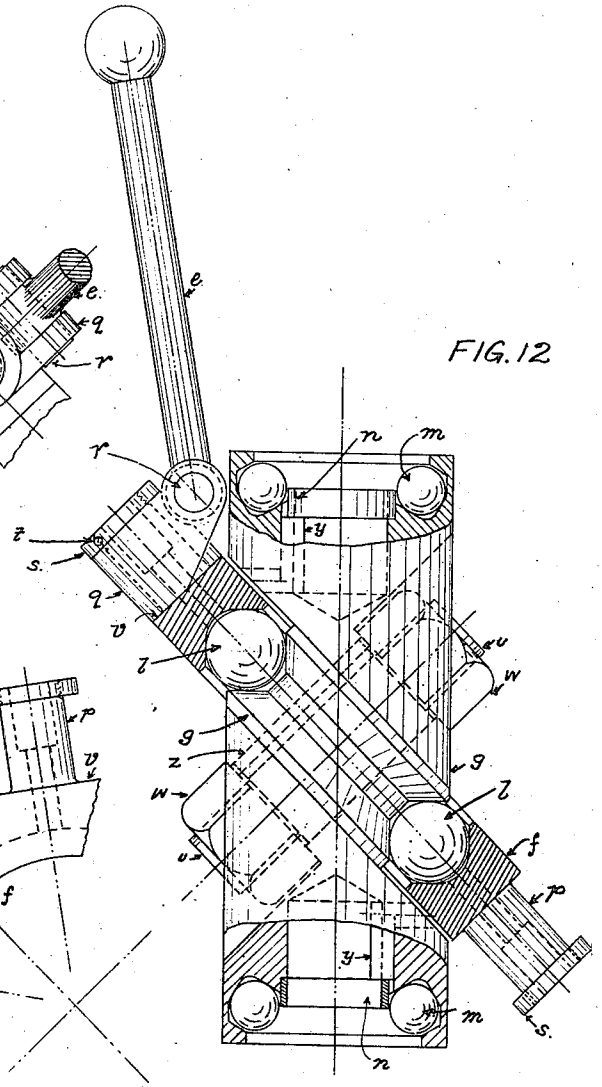
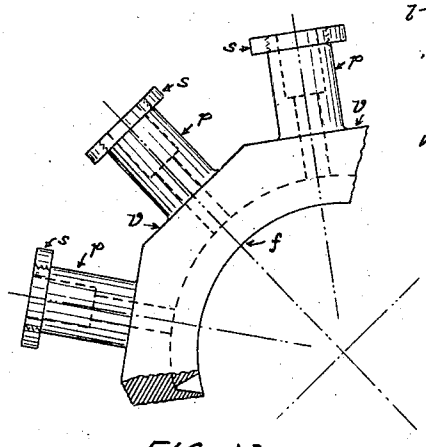


FIG. 13



WITNESSES

Miriam Hubbard

B B Whittam

Wm A. Jones. INVENTOR

UNITED STATES PATENT OFFICE.

WILLIAM ANTHONY JONES, OF WEST NEW BRIGHTON, NEW YORK.

MECHANICAL MOVEMENT.

1,011,126. Specification of Letters Patent. Patented Dec. 5, 1911.

Original application filed May 25, 1908, Serial No. 434,909. Divided and this application filed April 10, 1909. Serial No. 489,241.

To all whom it may concern:

Be it known that I, WILLIAM ANTHONY JONES, a citizen of the United States, and resident of West New Brighton, in the county of Richmond and State of New York, have invented certain new and useful Improvements in Mechanical Movements, of which the following is a specification.

My invention relates to engines and pumps in which there are a number of cylinders arranged around a central shaft to which their axes are parallel and more particularly to the transmission mechanism for converting the reciprocating motion of the pistons in the cylinders into the rotative motion of the central shaft or vice versa.

The mechanism is very compact, admits of a multiplicity of cylinders being applied to one shaft, avoids excessive lateral pressure from the pistons to the cylinders as is frequently the case with crank engines and the consequent wear and leakage of the pistons. Expensive crank forgings are avoided, and the pistons may be readily taken out and replaced.

In the accompanying drawings Figure 1 is a part longitudinal section of an engine which illustrates my invention. Fig. 2 shows a section on the line A A of the engine shown in Fig. 1. Fig. 3 shows a view of the disk. Fig. 4 is a detail view of the disk restraining piece. Fig. 5 is a part longitudinal section of an engine showing another form of my invention. Fig. 6 shows a section on the line B B of Fig. 5. Fig. 7 is a detail view of the disk shown in Fig. 5. Fig. 8 is a view of the disk restraining piece shown in Fig. 5. Figs. 9 and 10 are detail views to a large scale of the connecting rods with nuts and pins shown in Figs. 5 and 11. Fig. 11 shows a slight modification of the mechanism shown in Fig. 5. Fig. 12 is a view of the disk bearing piece, the disk, an intermediate piece and a connecting rod similar to those shown in Fig. 5, except that the bearing between the pins of the disk and the intermediate pieces are cylindrical. Fig. 13 is a view of a piece of the disk, shown in Fig. 12, looking parallel to the axis of the bearing between the disk and the disk bearing piece. Fig. 14 is a view looking parallel to the axis of the cylindrical bearing between one of the projecting pins of the disk and the intermediate piece and shows the intermediate piece and its connection to the rod and to the disk.

Similar parts are referred to by similar letters throughout the several views.

Referring to the drawings, a central shaft, *a*, is surrounded by a casting, *b*, of five cylinders in which pistons, *c*, are fitted. The pistons, *c*, are connected by the rods, *e*, to the wabbler disk, *f*, which has a bearing on a disk bearing piece or oblique crank, *g*, and is restrained from rotating by a disk restraining piece, *i*, whose internally projecting trunnions, *h*, engage the disk, *f*, and whose externally projecting trunnions, *j*, are held in fixed bearings, *k*. The disk bearing piece, *g*, is adapted to revolve with the central shaft about the same axis. The axis of the bearing between the disk, *f*, and the disk bearing piece, *g*, is oblique to the axis of the central shaft, *a*, so that as the central shaft and the disk bearing piece revolve the plane of the disk, *f*, is constantly changing and the pistons reciprocate in their cylinders.

The bearing between the disk, *f*, and the disk bearing piece, *g*, is shown formed of a single line of large steel balls, *l*, retained in a suitable groove in each of the two pieces. For convenience in assembling the pieces of this bearing the disk may be formed of two pieces as shown in Fig. 1 or the disk bearing piece may be divided into two pieces as shown in Fig. 5. In either case the component parts of the divided piece are bolted together to act at one piece after the bearing has been put together. The connections between the connecting rods, *e*, and the disk, *f*, may be universal joints formed of ball and socket joints as shown in Fig. 1 or may be universal joints each formed of two bearings whose axes are approximately at right angles to each other as shown in Figs. 5 and 11.

In Figs. 5 and 11 the disk *f*, is shown with radial screws, *p*, projecting from its edge on which are fitted nuts *q*, to which the connecting rods, *e*, are joined by the pins, *r*. The bearing between, *p*, and, *q*, could be a plain cylindrical bearing with collars at each side of, *q*, to keep it in position.

Fig. 7 is a detail view, partly in section, showing the disk, *f*, separate from the other pieces. Pins, *p*, projecting from its edge are shown hollow and having external threads.

Two of the projecting pins receive the two internal trunnions, *h*, of the disk restraining piece, *i*. The disk, *f*, as indicated has an internal groove which as shown in the assembled views, Figs. 5 and 11, embraces the balls, *i*, and forms a bearing with them.

Fig. 9 is a view looking in a direction at right angles to the axis of the thread in the nut, *q*, of the connecting rod, *e*, the disk piece, *f*, and the nut, *q*, intermediate between them.

Fig. 10 is a detail view looking in a direction parallel to the axis of the thread in the nut, *q*, of the same pieces shown in Fig. 9. In these views the connecting rod, *e*, is shown having an enlarged spherical end at one end and an eye formed at the other end. A pin, *r*, passes through this eye and a similar eye on each side, formed on the nut, *q*, thus joining the connecting rod to the nut, *q*, by a bearing whose axis is at right angles to the axis of the thread in the nut, *q*.

Fig. 12 shows the intermediate piece, *q*, having a plain cylindrical bearing with the projecting pin, *p*, of the disk, *f*. Collars, *s*, screwed onto the pins, *p*, and kept from unscrewing by the pins, "*t*," retain the intermediate pieces, *q*, between themselves and the shoulders, *v*, of the disk *f*, and prevent pieces, *q*, from moving axially on the pins, *p*.

The disk bearing piece, *g*, is hollowed out at each end to receive balls, *m*, which are retained in position by the sleeve, *n*, which is put into position after the balls are in place. These balls run on stationary hard steel cones, *o*. The disk bearing piece, *g*, is hollowed to receive the shaft, *a*, to which it transmits motion.

The cylinder casing which extends from the cylinders at each side of the wabbler mechanism, may consist of two halves which are united centrally of the oblique crank at line 2—2, as shown in Fig. 5. The shaft *a* may consist of two alined sections as shown in this figure. The cylinder casing and shaft *a* may be thus separated at the line 2—2, so that the pistons, piston rods, disk, disk bearing piece and restraining ring may be readily taken out and examined without disconnecting them further.

The mechanisms shown in Fig. 1 and Fig. 5 are adapted to transmit power and motion from ten cylinders, five at each side of the disk. The modification shown in Fig. 11, in which the disk bearing piece is shown carried directly on the shaft without other bearings, is adapted to transmit power and motion from five cylinders all on one side.

It will be seen that by the use of an anti-friction bearing for the wabbler disk of the form I have illustrated, a considerable economy of weight and space is obtained over constructions which dispose the bearing in another position. The balls add to the throw of the crank, and in effect constitute a part thereof. By reason of this, moreover, balls of a larger size may be advantageously used without adding to the weight of the mechanism. It will be noted also that the bending moment due to the oblique crank is not borne by the shaft by reason of the fact that the ends of the crank are journaled upon stationary bearings, which take up both lateral and end thrust.

The intermediate pieces which comprise the universal connections between the rods and the disk allow a greater relative movement between the parts, than can be obtained with ball and socket connections as hitherto used. This is an important advantage for the reason that it permits the use of a crank having a greater angularity with respect to the axis of rotation, than is possible with the use of ball and socket connections. When the latter connections are used, it is practically impossible with the use of practical dimensions of parts to obtain an angle as great at 40 degrees between the geometrical axis of the oblique crank and the axis of rotation. With the form of connection I employ, a considerably greater angle can be obtained. The increase of this angle decreases the percentage of loss in friction, and thus increases the efficiency.

The mechanisms shown are particularly adapted to be used in explosion engines as described and claimed in combination with valve mechanism in my application filed May 25, 1908, and bearing Serial Number 434,909.

What I claim is:—

1. A rotary member having a peripheral groove with its geometrical axis oblique to its axis of rotation, balls in the groove, a disk having an internal groove which embraces the balls and forms a bearing with them, threaded pins projecting from the disk, a ring having external trunnions adapted to be mounted in fixed bearings, and internal trunnions engaging the disk, a plurality of rods connected to the disk and extending on both sides thereof, the connection between the rods and disk comprising intermediate pieces pivotally mounted on said threaded pins and also pivotally connected to the rods, so as to form universal couplings or joints between the rods and disk.

2. A rotary member having a peripheral groove with its geometrical axis oblique to its axis of rotation, balls in the groove, a disk having an internal groove which embraces the balls and forms a bearing with them, threaded pins projecting from the disk, a ring having external trunnions adapted to be mounted in fixed bearings, and internal trunnions engaging the disk, a plurality of rods connected to the disk, the connection between the rods and disk comprising intermediate pieces pivotally mounted

on said threaded pins and also pivotally connected to the rods, so as to form universal couplings or joints between the rods and disk.

3. A rotary member having a peripheral groove with its geometrical axis oblique to its axis of rotation, balls in the groove, a disk having an internal groove which embraces the balls and forms a bearing with them, pins projecting from the disk, a ring having external trunnions adapted to be mounted in fixed bearings, and internal trunnions engaging the disk, a plurality of rods connected to the disk, the connection between the rods and disk comprising intermediate pieces pivotally mounted on said pins and also pivotally connected to the rods, so as to form universal couplings or joints between the rods and disk.

4. A rotary member having a peripheral groove with its geometrical axis oblique to its axis of rotation, balls in the groove, a disk having an internal groove which embraces the balls and forms a bearing with them, a ring having external trunnions adapted to be mounted in fixed bearings, and internal trunnions engaging the disk, a plurality of rods connected to the disk, the connection between the rods and disk comprising intermediate pieces pivotally connected to said disk, and also pivotally connected to the rods, so as to form universal couplings or joints between the rods and disk.

5. A rotary member having a peripheral groove with its geometrical axis oblique to its axis of rotation, a disk mounted on said member and in engagement with said groove, a ring adapted to be pivotally mounted in fixed bearings, and also pivotally connected to the disk on a line transverse to its fixed mounting, said ring serving to restrain the rotation of said disk with the rotary member, and rods having universal connections with the disk.

6. Two alined shafts, an oblique crank feathered to both of said shafts, a wabbler disk mounted on said crank but restrained from rotating therewith, rods connected to said disk and extending on both sides thereof, and a casing inclosing said parts, said casing being split transversely thereof at a plane adjacent to the center of symmetry of the disk and crank.

7. A rotary member having an oblique crank, a wabbler disk mounted on said crank and restrained from rotating therewith, threaded pins projecting from the disk, and rods connected to the disk, the connections between the rods and disk comprising intermediate pieces mounted on said pins and pivotally connected to said rods, the threads of said pins serving to retain the intermediate pieces from disengagement.

8. A rotary member having a peripheral groove with its geometrical axis oblique to its axis of rotation, a disk having an internal groove and a single row of balls forming an antifriction bearing between said grooves, rods connected to the disk, and means for restraining the disk from rotating with the rotary member.

9. A shaft, an oblique crank mounted thereon and connected to rotate therewith, combined thrust and lateral bearings at both ends of the crank, a stationary member through which the shaft passes, and two bearings on said stationary member coöperating with the bearings at the ends of the crank to support the latter independently of the shaft, and entirely relieving the shaft from strains due to the bending movements exerted by the oblique crank.

Signed at West New Brighton in the county of Richmond and State of New York this eighth day of April A. D. 1909.

WILLIAM ANTHONY JONES.

Witnesses:
S. P. JONES,
A. J. DOREMUS.