E. E. PROULX.

ENGINE.

APPLICATION FILED FEB. 21, 1912.

1,046,220.

Patented Dec. 3, 1912.

3 SHEETS—SHEET 1.

Fig. 1.

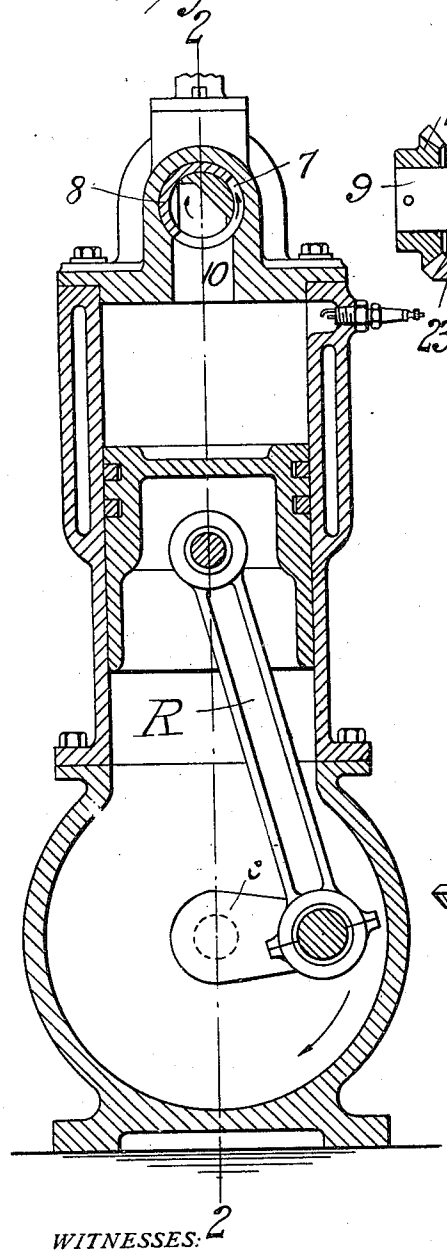
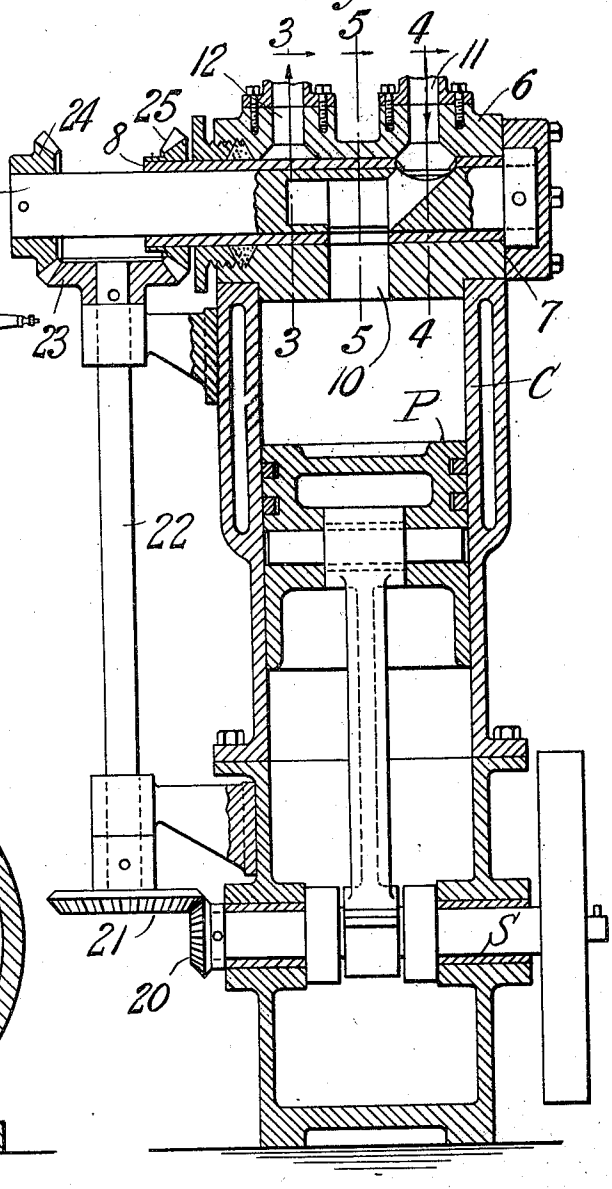


Fig. 2.



WITNESSES:

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2 SHEETS—SHEET 2.

Fig. 3.

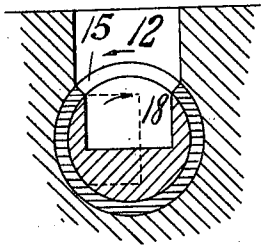


Fig. 4.

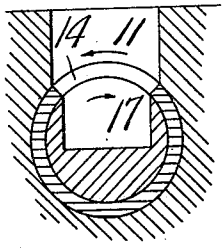


Fig. 5.

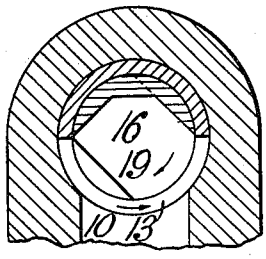


Fig. 6.

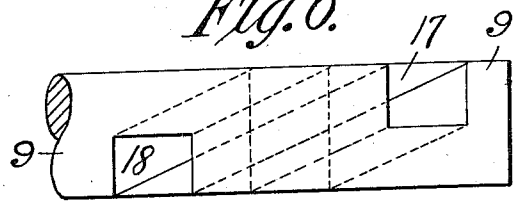


Fig. 10.

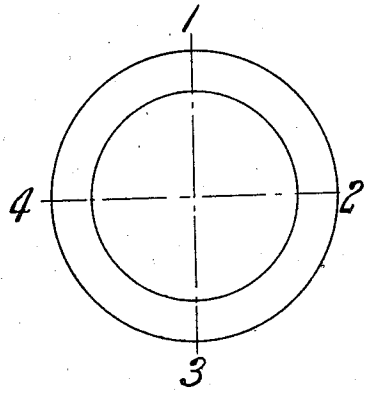


Fig. 7.

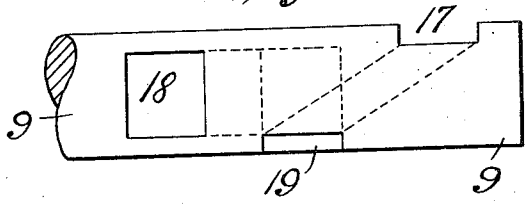


Fig. 8.

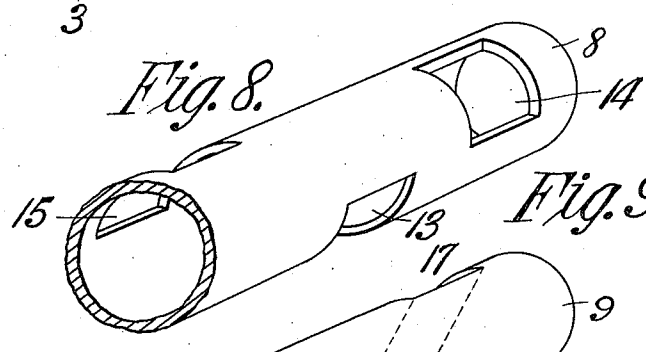
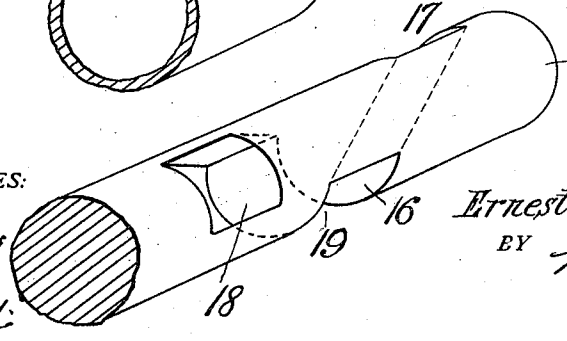


Fig. 9.



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3 SHEETS—SHEET 3.

Fig. 11.

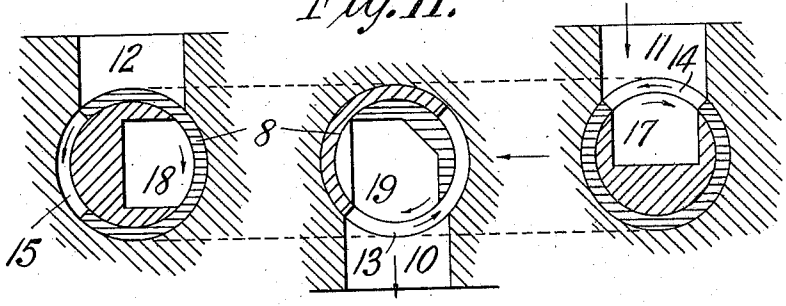


Fig. 12.

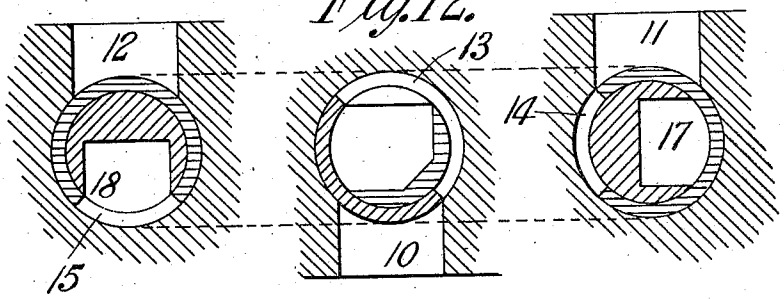


Fig. 13.

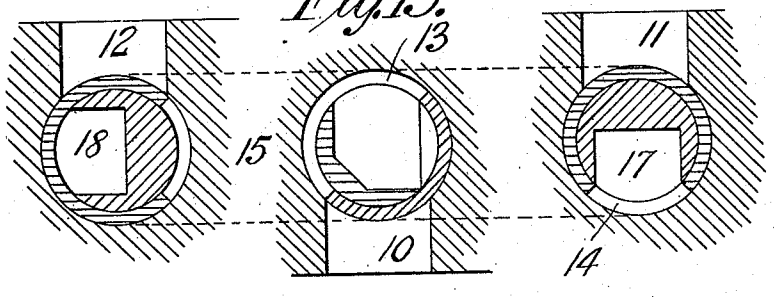
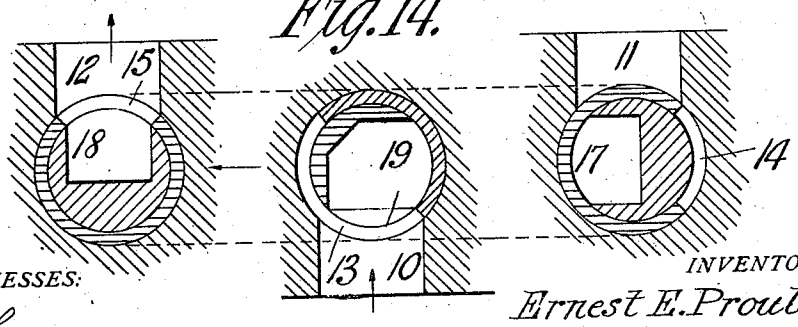


Fig. 14.



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UNITED STATES PATENT OFFICE.

ERNEST E. PROULX, OF WILLIMANSETT, MASSACHUSETTS.

ENGINE.

1,046,220. Specification of Letters Patent. Patented Dec. 3, 1912.

Application filed February 21, 1912. Serial No. 679,001.

To all whom it may concern:

Be it known that I, ERNEST E. PROULX, a citizen of the United States of America, and resident of Willimansett, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Engines, of which the following is a full, clear, and exact description.

This invention has for its object to provide an improved form of valve device, especially applicable to explosive engines, wherein the opening and closing of the ports are caused by two swinging members, and which are moved in opposite directions to effect the opening and closing of the port at double the speed which would result if but a single movable member were used.

A further object is to provide such an arrangement in which the two members are continuously rotated and at a uniform speed relative to the main shaft of the engine.

In the accompanying drawings illustrating one embodiment of my invention:—Figure 1 is a vertical section through an engine of the explosive or internal combustion type. Fig. 2 is a vertical section taken at right angles to Fig. 1 on line 2—2 of Fig. 1. Fig. 3 is a section taken on the line 3—3, Fig. 2. Fig. 4 is a section on the line 4—4, Fig. 2. Fig. 5 is a section on line 5—5, Fig. 2. Fig. 6 is a view showing a portion of the plug member; and Fig. 7 is a similar view with the plug slightly turned. Fig. 8 is a view of a portion of the sleeve member. Fig. 9 is another view of the plug member. Fig. 10 is a diagram indicating the relative positions of the ports. Figs. 11, 12, 13 and 14 are views, each showing sections through the three ports in their timed positions, the four views illustrating the four quarters of their complete revolution.

In Figs. 1 and 2 is shown, somewhat conventionally, an explosive engine comprising a cylinder C having a piston P sliding therein which rotates the main shaft S through the crank *c* and connecting rod R. The cylinder is shown as having at the top a valve device comprising a casing 6 provided with a horizontal cylindrical bore 7. In this bore turns or rotates a sleeve 8 tightly fitting the bore. In the sleeve swings or rotates a plug 9 of cylindrical shape which has a tight fit therein. The casing 6 is shown as having a passage or port 10 leading from the said bore to the cylinder for the passage of the intake gas and also for the exhaust. The casing is also provided with an inlet port 11 and an outlet port 12 which are shown as diametrically opposite the cylinder port 10, where they communicate with the bore 7, and these ports are also disposed on opposite sides of the cylinder port. The sleeve 8 is shown as provided with a port 13 which as the sleeve is turned will register with the cylinder port 10, and which extends about half of the circumference of the sleeve. The sleeve also has a second port 14 arranged to register with the inlet port 11 as the sleeve is turned, and the third port 15 on the opposite side of the cylinder port arranged to register with the exhaust or outlet port 12. It will be observed, as shown in Fig. 8 that these two ports are situated circumferentially beyond the cylinder connecting port 13. Each of these two ports preferably extend a little less than 90 degrees around the sleeve, and hence alternately register with their coöperating ports in the casing. The plug member 9 of the valve device is shown as provided with a chamber 16 which has three ports. The port 17 in the plug is brought to register with the inlet port 14 of the sleeve on turning the plug, and such port is preferably about the same size, extending about 90 degrees or less around the plug. Another port 18 in the plug is brought to register with the port 15 of the sleeve upon turning these two members relatively and is shown as about the same size.

It will be observed that the ports 14 and 15 of the sleeve are spaced apart approximately 90° on the circumference of the sleeve, and the ports 17 and 18 of the plug are similarly positioned with respect to each other. However, since the sleeve and the plug are adapted to be rotated in opposite directions, it will be apparent (see Figs. 11–14 inclusive) that upon the registration of the inlet ports 14 and 17, the outlet ports 15 and 18 will be in diametrically opposite positions, and that upon the registration of the outlet ports 15 and 18, the inlet ports 14 and 17 will be in diametrically opposite positions. Intermediate of these two ports in the plug is a port 19 shown as extending about half a revolution, and is intermediate circumferentially of the two ports 17 and 18; and which port 19 will register with the said port 13 in the sleeve upon the turning of such members relatively. In Fig. 10 is illus-

trated, diagrammatically, the relative positions of these three members. In the sleeve the exhaust port can be considered as extending from 1 to 2, and the inlet port from 2 to 3, but it is understood that these ports are offset longitudinally. The third or cylinder port of the sleeve extends from 3 around to 1 and intermediate of the other two ports as clearly illustrated in the several views. As regards the plug when the inlet port extends from the position of 1 to 2 and is registering with the sleeve port, the exhaust port of the plug will extend from 1 to 4, that is located diametrically offset in the plug and axially beyond the same, as manifest. The cylinder port of the plug, of course, will extend from 4 around to 2, in staggered relation with the other two ports, as clearly set forth. These two valve members are rotated in opposite directions, preferably from the engine shaft and at half the speed of the shaft.

In Fig. 2 the gear 20 on the engine shaft is shown meshing with a gear 21 on an upright shaft 22 suitably mounted to rotate. At the top of the latter shaft is a miter gear 23 meshing with a miter 24 fast on the plug member 9. The gears 23 and 24 are shown as equal, while the gear 21 is double the size of the gear 20, and hence rotated at half the speed which will cause the plug 9 to rotate at half the speed of the engine shaft. The gear 23 also engages a miter gear 25 fast on the sleeve 8 on the opposite side of the gear 23 from the said gear 24, and the gears 23 and 25 being equal will rotate the sleeve at the same speed of the plug but in the opposite direction. From this it will be seen that these two valve members turn at half the engine speed and in contrary directions. Their relative operation in the casing is shown progressively in Figs. 11–14.

In Fig. 11 the left hand view shows the exhaust port closed by the sleeve. At the right in this view, which represents the relative position of the sleeve and ports at the intake, the port 14 in the sleeve is open to the inlet port 11, and the port 17 in the plug also registers with these two ports whereby the charge can be sucked in by the descent of the piston. At the middle of this view is a section through the cylinder port in which it will be seen that the cylinder port 10 now registers with the port 13 in the sleeve, and that the latter registers with the port 19 in the plug. Hence, communication is established between the inlet port 11 and the cylinder port 10.

In Fig. 12 the same views are shown but with the plug and sleeve each advanced a quarter turn and in opposite directions. Here it will be seen that the inlet port 11 is closed by the sleeve and also that the outlet port 12 is closed by the sleeve. This is the compression stroke of the piston, and no gas can escape. During the next quarter of a revolution, which is the explosion stroke of the gas engine, it will be seen from Fig. 13 that both the inlet and exhaust ports 11 and 12 are closed to the cylinder port 10.

In Fig. 14 it will be seen that the cylinder port 10 now registers with a portion of the port 13 of the sleeve; and at the left of this figure it will be seen that the plug communicates through port 15 with the exhaust port 12 of the casing. By comparing the inlet ports in the positions of Fig. 11 with those of Fig. 12, it will be seen that the two members are moving in opposite directions, and hence the port will be quickly closed, and at the middle portion thereof. And comparing the two exhaust positions at the left of Figs. 13 and 14, it will be seen that the exhaust valve opens very quickly and that the same will close also in a very rapid manner.

The invention has been shown as applied to a single cylinder engine, but it is manifest that any number of cylinders, such as 2, 4 or 6, could be placed in alinement connecting with a single driving shaft as is the usual custom; and it is only necessary to extend the plug member 9 and the sleeve member 8 and to arrange the ports therein precisely as set forth hereinabove, and to merely change the relative positions of the ports to effect the proper timing of the several units. By such an arrangement the employment of numerous valves and lifters with the cam shaft is obviated, and a single plug member and sleeve member will perform all of the functions required, and driven continuously in opposite directions as an ordinary half time shaft.

I claim:

1. A valve device comprising a casing having a bore, and having an inlet and an outlet port in the bore and also a cylinder port, a sleeve rotatable in the bore, and a plug rotatably fitting in the sleeve, the sleeve having a port arranged to register with the inlet port in the casing, and a port arranged to register with the exhaust port in the casing, and a third port arranged to register with the cylinder port of the casing, the plug having a chambered portion with a port arranged to register with the inlet port or the sleeve, also a port arranged to register with the outlet port of the sleeve, and also a port arranged to register with the cylinder port of the sleeve.

2. A valve device comprising a casing having a bore, and having an inlet and an outlet port in the bore and also a cylinder port, a sleeve rotatable in the bore, and a plug rotatably fitting in the sleeve, the sleeve having a port arranged to register with the inlet port in the casing, and a port arranged to register with the exhaust port in the casing, and a third port arranged to register

with the cylinder port of the casing, the plug having a chambered portion with a port arranged to register with the inlet port of the sleeve, also a port arranged to register with the outlet port of the sleeve, and also a port arranged to register with the cylinder port of the sleeve, and means for rotating the plug and sleeve in opposite directions.

3. A valve device comprising a casing having a bore, and having an inlet and an outlet port in the bore and also a cylinder port, a sleeve rotatable in the bore, and a plug rotatably fitting in the sleeve, the sleeve having a port arranged to register with the inlet port in the casing, and a port arranged to register with the exhaust port in the casing, and a third port arranged to register with the cylinder port of the casing, the plug having a chambered portion with a port arranged to register with the inlet port of the sleeve, also a port arranged to register with the outlet port of the sleeve, and also a port arranged to register with the cylinder port of the sleeve, and means for rotating the plug and sleeve in opposite directions and at the same speed.

4. A valve device comprising a casing having a bore and having an inlet and an outlet port in the bore, and also a cylinder port in the bore, a sleeve rotatable in said bore and having a port arranged to register with the said inlet port in the casing, the sleeve having another port arranged to be brought to register with the outlet port of the casing when the other said port in the sleeve is not in registering position, and a third port in the sleeve arranged to register with the cylinder port of the casing, a chambered plug rotatable in the sleeve and having a port registering with the cylinder port of the sleeve, the plug having another port registering with the inlet port of the casing, the plug having a third port arranged to register with the outlet port of the sleeve when the latter registers with the outlet port of the casing.

5. In a valve device, a casing having a bore therein provided with an inlet and an outlet port, and also a cylinder port, a sleeve rotatable in the bore of the casing and provided with three ports registering with the said three ports in the casing respectively, a chambered plug rotatable in the sleeve and provided with three ports registering respectively with said three ports of the sleeve, said registering ports of the plug and sleeve being located whereby upon turning the sleeve and plug in opposite directions the inlet port of the casing will be connected with the cylinder port of the casing, and upon further turning of said members in the said directions the cylinder port of the casing will be cut off from the other two ports of the casing, and upon further turning the plug and sleeve in said directions the exhaust port of the casing will be in communication with the cylinder port of the casing.

6. A valve device comprising a casing having a bore provided with inlet and outlet ports at one side disposed longitudinally of the bore, the casing having a cylinder port at the opposite side of the casing from said ports and located circumferentially between the same, a sleeve rotatable in the bore and provided at an intermediate portion with a port arranged to register with the cylinder port of the casing, the sleeve having another port arranged to register with the inlet port of the casing and located beyond the said port of the sleeve in a circumferential direction, the sleeve having a third port arranged to register with the outlet port of the casing and located circumferentially intermediate of said two ports of the sleeve, a chambered plug rotatable in the sleeve and provided with a port arranged to register with the cylinder port of the sleeve, the plug having another port located circumferentially beyond said port and arranged to register with the inlet port of the sleeve, the plug having a third port located circumferentially intermediate of said two ports of the plug and arranged to register with the outlet port of the sleeve.

7. A valve device comprising a casing having a bore provided with inlet and outlet ports at one side disposed longitudinally of the bore, the casing having a cylinder port at the opposite side of the casing from said ports and located circumferentially between the same, a sleeve rotatable in the bore and provided at an intermediate portion with a port arranged to register with the cylinder port of the casing, the sleeve having another port arranged to register with the inlet port of the casing and located beyond the said port of the sleeve in a circumferential direction, the sleeve having a third port arranged to register with the outlet port of the casing and located circumferentially intermediate of said two ports of the sleeve, a chambered plug rotatable in the sleeve and provided with a port arranged to register with the cylinder port of the sleeve, the plug having another port located circumferentially beyond said port and arranged to register with the inlet port of the sleeve, the plug having a third port located circumferentially intermediate of said two ports of the plug and arranged to register with the outlet port of the sleeve, a cylinder connecting with said casing, a piston working in the cylinder, a shaft rotated by the piston, means for rotating said sleeve from said shaft at half the speed of the shaft, and means for rotating said plug from the shaft in a direction opposite to that of the sleeve and at half the speed of the shaft.

8. In an engine, a casing having a bore, and having an inlet and an outlet port in the bore and also a cylinder port, a sleeve rotatable in the bore, and a plug rotatably fitting in the sleeve, the sleeve having a port arranged to register with the inlet port in the casing, and a port arranged to register with the exhaust port in the casing, and a third port arranged to register with the cylinder port of the casing, the plug having a chambered portion with a port arranged to register with the inlet port of the sleeve, also a port arranged to register with the outlet port of the sleeve, and also a port arranged to register with the cylinder port of the sleeve, a cylinder connecting with said casing, a piston working in the cylinder, a shaft rotated by the piston, means for rotating said sleeve from said shaft at half the speed of the shaft, and means for rotating said plug from the shaft in a direction opposite to that of the sleeve and at half the speed of the shaft.

Signed by me at Springfield, Mass., in presence of two subscribing witnesses.

ERNEST E. PROULX.

Witnesses:
WM. S. BELLOWS,
G. R. DRISCOLL.