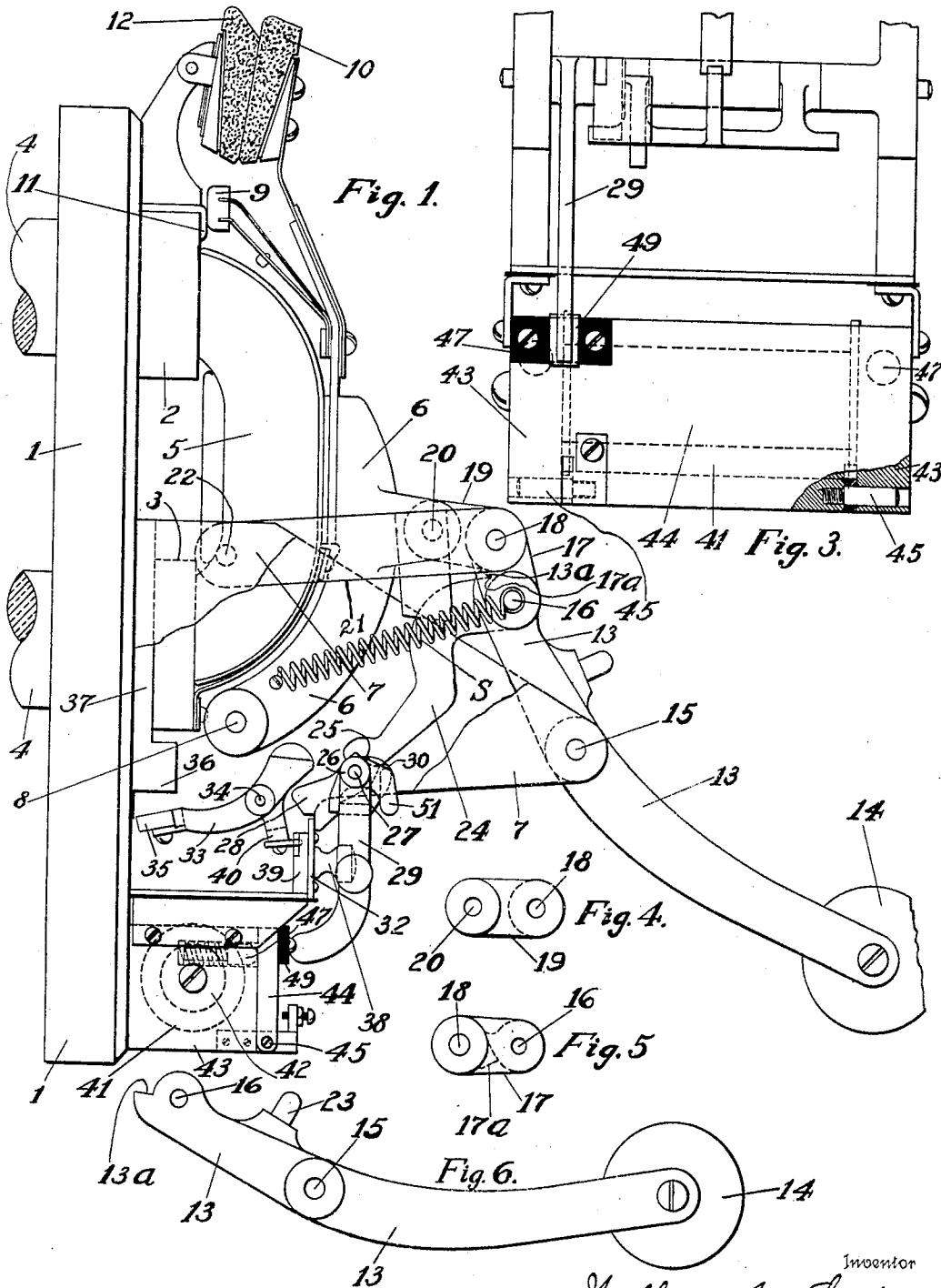


1,122,430.

W. M. SCOTT.
CIRCUIT BREAKER.
APPLICATION FILED FEB. 5, 1912.

Patented Dec. 29, 1914.

2 SHEETS—SHEET 1.



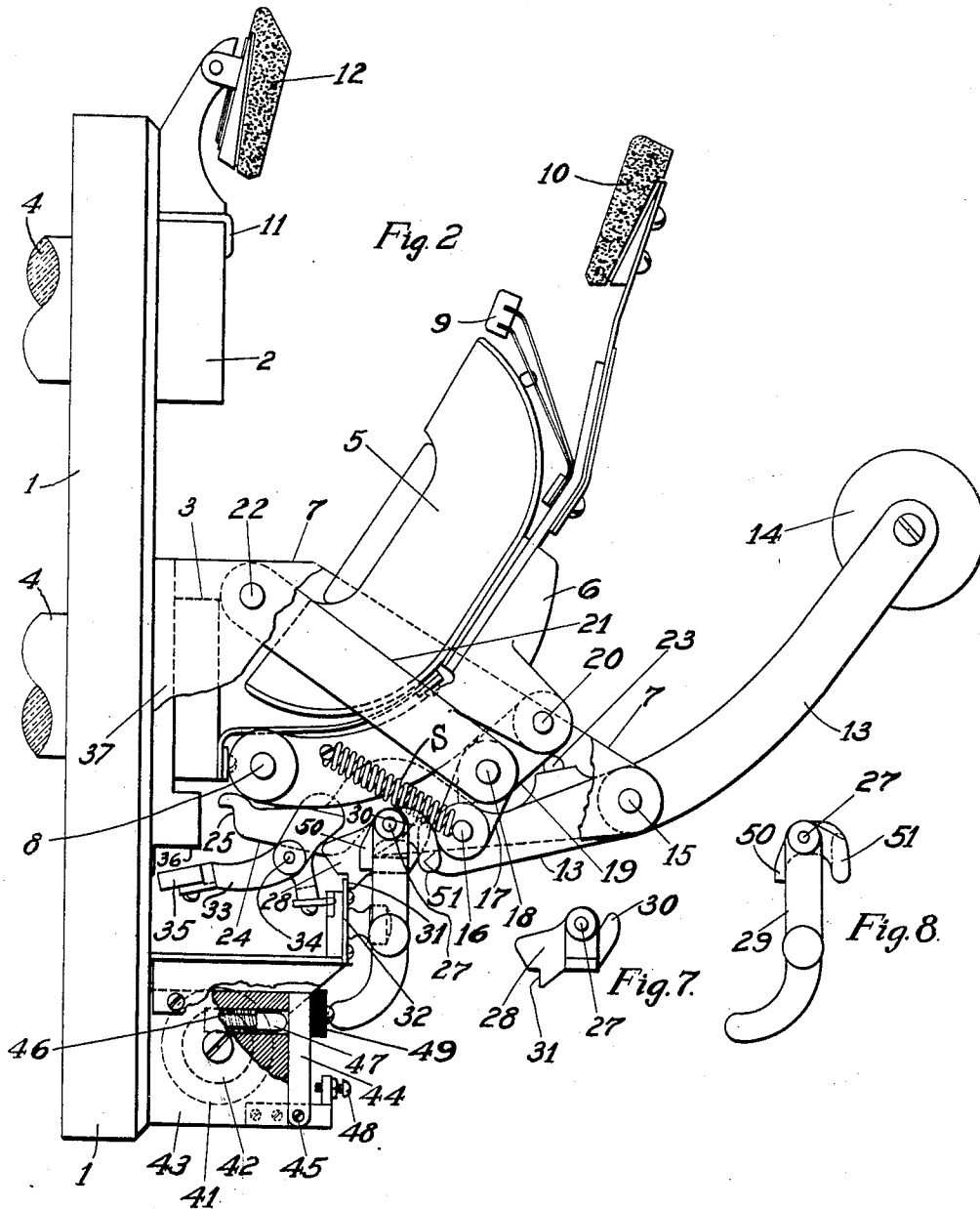
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2 SHEETS—SHEET 2.



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WILLIAM M. SCOTT, OF BERWYN, PENNSYLVANIA.

CIRCUIT-BREAKER.

1,122,430.

Specification of Letters Patent.

Patented Dec. 29, 1914.

Application filed February 5, 1912. Serial No. 675,534.

To all whom it may concern:

Be it known that I, WILLIAM M. SCOTT, a citizen of the United States, residing in Berwyn, in the county of Chester and State of Pennsylvania, have invented a new and useful Circuit-Breaker, of which the following is a specification.

My invention relates to electric switches or circuit breakers and more particularly to electrically controlled switches or circuit breakers.

My invention resides in tripping mechanism actuated in response to deenergization of an electro-magnet, as, for example, an underload or no-voltage magnet. To this end I provide means responsive to the deenergization of a magnet for tripping a switch or circuit breaker, the arrangement being such that when the switch or circuit breaker has opened or moved to abnormal position it automatically restores the armature of the deenergized electro-magnet. I provide means also whereby the switch or circuit breaker may be tripped by other electro-responsive means, the relation being such that either may trip the switch or circuit breaker. And my arrangement is such that in case the first mentioned electro-magnet is not deenergized, the circuit breaker may nevertheless be tripped by the other electro-responsive means and reset or restored to normal position without disturbing the tripping parts controlled by said electro-magnet.

My invention resides in the features hereinafter described and claimed.

For an illustration of one of the forms my invention may take, reference is to be had to the accompanying drawings, in which:

Figure 1 is a side elevational view of an automatic circuit breaker involving my invention and shown in circuit closing position. Fig. 2 is a side elevational view, partly in section, showing the circuit breaker in open position. Fig. 3 is a front elevational view, on enlarged scale, of the underload or no-voltage tripping device and some of the attached parts. Fig. 4 is a side elevational view of one of the switch or circuit breaker operating levers or links. Fig. 5 is a side elevational view of another switch or circuit breaker operating lever or link. Fig. 6 is a side elevational view of the

operator's lever. Fig. 7 is a side elevational view of a part of the tripping mechanism. Fig. 8 is a side elevational view of another part of the tripping mechanism.

Referring to the drawings, a base 1 of slate, marble, or other suitable insulating material, has secured thereon the main terminal blocks 2 and 3 with which electrical communication is afforded through the heavy current conducting studs 4. Adapted to bridge and electrically connect the terminal blocks 2 and 3, and thus close the circuit, is the movable contact member 5 which is preferably a laminated bridging member and as such, particularly when very heavy currents are carried thereby, is a stiff spring which is more or less compressed when in the circuit closing position shown in Fig. 1. The movable contact member 5 is secured upon the arm 6 pivoted to the housing 7 at 8. The intermediate metallic shunt contact 9 and the movable shunt carbon contact 10 are also carried by the pivoted arm 6, and engage respectively the stationary metallic shunt contact 11 and the stationary shunt carbon contact 12. When the member 5 separates from the main terminal blocks 2 and 3, the current is shunted through these shunt contacts which open in succession, the final arc taking place between the carbon contacts 10 and 12.

The operator's lever 13 having a hand grip 14 is pivoted at 15 to the housing 7. Pivoted to the inner end of the operator's lever 13 at 16 is a link 17, shown separately in Fig. 5, to whose other end there is pivoted at 18 another link 19, shown separately in Fig. 4. To the other end of the link 19, at 20, is pivoted the arm 6. Pivoted at 18, independently of the links 17 and 19, is the link or lever 21 pivoted at its inner end at 22 to the housing 7. The link 17, which may be considered as bifurcated or having two side arms, is provided with a surface 17^a adapted to engage the surface 13^a on the operator's lever 13 as shown in Fig. 1, the engagement of these surfaces preventing the over travel of the toggle comprising the links 13 and 17, the end pivots being 15 and 18, and the intermediate pivot is 16. Upon the lever 13 is provided a buffer 23 adapted to be engaged by the link 19 to cushion the same and attached parts when the circuit breaker reaches full open circuit position

as shown in Fig. 2. A second toggle is comprised of the links 21 and 19, the end pivots being 22 and 18, and the intermediate pivot is 20. As shown in Fig. 1, the pivot 20 does not reach the imaginary straight line joining the centers of the pivots 22 and 18 but approaches so close thereto that a toggle action occurs.

A spring S is connected at its one end to the pivoted arm 6 and at its other end to the pivot 16 forming a joint between the toggle links 13 and 17. With the parts in the position shown in Fig. 1, the spring S is under tension.

When the parts are in open circuit position, as shown in Fig. 2, the switch or circuit breaker may be closed by grasping the handle 14 and rotating the operator's lever 13 in a clockwise direction about the pivot 15. In so doing, the closing force is transmitted from the link 13 through the link 17 to the pivot 18 which rotates the lever or link 21 in a counter-clockwise direction about its pivot 22. This rotation of the link 21 is accompanied by a transmission of force from the link 21 through the link 19 to the pivot 20 causing a counter-clockwise rotation of the arm 6 about its pivot 8, thus bringing the bridging member 5 closer and closer to the terminal blocks 2 and 3. When the stiff spring contact 5 engages the main contacts 2 and 3, it strongly opposes further movement, due to its spring characteristics. When this first contact position is reached, the toggles are almost in the position shown in Fig. 1, that is, both toggles are nearly straightened out so that they are exerting nearly their maximum force in directions determined by imaginary straight lines joining their end pivots. That is to say, the toggle 13, 17 is exerting almost its maximum force upwardly on the pivot 18, as viewed in Fig. 1; and the toggle 19, 21 is exerting almost its maximum force toward the left on pivot 20 and, therefore, upon the contact member 5. A further movement of the operator's lever 13 is, as before stated, resisted by the spring of the member 5. But the toggles are now in the position where they are capable of exerting their practically greatest thrusts and, in consequence, an operator is enabled by the further movement of the lever 13 to bring the contact member 5 firmly and securely into engagement with the terminal blocks 2 and 3 by slightly deflecting and bending the stiff spring 5. The parts have now attained the position shown in Fig. 1 and are restrained or latched in that position by the dog or latch member 24 pivoted loosely on the pivot 16 and thrusting at its lower left hand end 25, Fig. 1, against the roller 26, pivoted to the housing at 27. The latch 24 is thus under compression and prevents the collapse of the toggles and the opening of the switch or circuit breaker.

Pivoted preferably coaxially with the pivot 27 are the latch actuator 28, shown separately in Fig. 7, and the tripping member 29, shown separately in Fig. 8. The latch actuator 28 has a nose or projection 30 adapted to engage the under side of the latch 24. The latch actuator 28 has a nose 31 which engages a stationary plate 32 which prevents clockwise rotation of the member 28. The left hand end of the member 28 extends into the path of travel of the armature lever 33 pivoted to the housing at 34 and carrying at its inner end the armature 35 disposed in operative relation to the poles 36 of a mass of iron 37, substantially in the form of a U embracing the lower stud 4 or lower terminal block 3, the current passing through the terminal block 3 magnetizing the member 37 to attract the armature 35. The handle 38 extends through a horizontal slot in the plate 32 and carries at its inner end back of the plate 32 a member 39 which, for different positions of the handle 38 shifts the armature lever 33 to different positions about its pivot 34 due to the cooperation of the arm 40 upon the armature lever 33. This sets the armature 35 to different positions with respect to the poles 36, so that the tripping magnet 36, 35 may be calibrated to trip the breaker upon different current loads.

Supported by the housing is an electromagnet here shown in the form of a cylindrical winding 41 having its axis horizontal and extending parallel to the base 1. The iron core 42, also horizontal, has secured at each of its ends a pole piece 43, and extending across in front of these pole pieces is the armature 44 pivoted at 45. The electromagnet is normally energized by current traversing the winding 41 and thus attracts the armature 44 into the position shown in Figs. 1, 2 and 3, in opposition to the spring 46 in a socket in the pole piece 43, such spring acting upon the plunger 47 pressing against the armature 44. The screw 48 limits the outward movement of the armature 44 away from the poles 43. Upon the armature 44 is secured a block 49 into whose path of travel the lower end of the member 29 extends. The member 29 has a projection 50 adapted to engage the member 28 to rotate the member 28 in a counter-clockwise direction upon its pivot 27, but allowing the member 29 to move in opposite direction without moving the member 28. The member 29 has also the projection 51 extending into the path of travel of the junction of the links 17 and 13.

The operation is as follows: With the parts in circuit closing position, as shown in Fig. 1, the switch or circuit breaker may be tripped by either armature 35 or armature 44. When the armature 35 is attracted by the pole piece 36, as when the current

strength through the switch or circuit breaker attains a predetermined value, the armature lever 33 moves in a clockwise direction about its pivot 34 and its right hand end strikes upon the upper side of the latch actuating member 28 which then rotates in a counter-clockwise direction about its pivot 27 and its nose or projection 30 then strikes the latch 24 moving it slightly in a clockwise direction about its pivot 16 and freeing it from the roller 26. This allows the bridge 5 and spring S to collapse the toggles and the circuit breaker parts fly to the position shown in Fig. 2, breaking the circuit. In this opening movement, spring S contracts pulling arm 6 and pivot 16 toward each other. The counter-clockwise movement of the latch actuator 28 may take place without moving the member 29 as previously described. If the electro-magnet 41 remains energized, its armature 44 remains in the position shown in Figs. 1 and 2, and the member 29 also remains in its position there shown. If, however, the parts are in the circuit closing position as shown in Fig. 1 and the electro-magnet 41 is deenergized, or weakens sufficiently, the spring 46 and gravity move the armature 44 in a clockwise direction about its pivot 45, as viewed in Figs. 1 and 2, the block 49 engaging the lower end of the lever 29 moving the same in a counter-clockwise direction about its pivot 27, whereupon the projection 50 engages the latch actuator 28 carrying the same along in the rotative movement of the member 29 and causing the nose 30 to lift the latch 24, as previously described, whereupon the circuit breaker opens and assumes the position shown in Fig. 2. But as the circuit breaker opens the lower end of the link 17, Fig. 2, or the end of the link 13, engages the projection 51 upon the lever 29, moving it back again to the position shown in Figs. 1 and 2, where it restores the armature 44 to the position shown in Figs. 1 and 2, so that if later the winding 41 is again sufficiently energized the armature 44 is retained by magnetism and the opening or tripping may be repeated. In reclosing the circuit breaker, the operator's lever 13 is moved downwardly, as viewed in Fig. 2, thus causing the first toggle 13, 17 to extend the second toggle 19, 21, and when the parts reach the position shown in Fig. 1 the latch 24 thrusts against the roller 26 and holds the toggles extended. When the latch 24 has been actuated by the latch actuator 28 and during the opening movement of the breaker, the under side of the latch 24 rides upon the roller 26, and when the parts have reached the open circuit position shown in Fig. 2 the depression in the under side of the latch 24 rests upon this roller 26. In reclosing the breaker, the latch 24 while resting on the roller 26 traverses that roller

until the part 25 again thrusts against the roller 26 to hold the parts in the position shown in Fig. 1.

What I claim is:

1. In an electric switch, a base, a movable contact member, means for restraining the same in normal position, a member movable on said base for actuating said restraining means, an electro-magnet and its armature, said armature when released from said electro-magnet actuating said member to trip said contact member, and means thereafter actuating said member to restore said armature to normal position.
2. In an electric switch, a base, a movable contact member, a latch for restraining the same in normal position, a latch actuator pivoted to said base, an electro-magnet and its armature, a member pivoted to said base intervening between said latch and said armature, said armature when released by said electro-magnet actuating said latch to free said contact member, and means responsive to the resultant movement of said contact member actuating said pivoted member for restoring said armature to normal position.
3. In an electric switch, a movable contact member, means for restraining the same in normal position, an electro-magnet normally attracting its armature, said armature when released actuating said restraining means to trip said contact member, a second electro-magnet for independently actuating said restraining means to trip said contact member, and means for automatically restoring said armature to normal position after said contact member has been tripped by either of said electro-magnets.
4. In an electric switch, a base, a movable contact member, a latch for restraining the same in normal position, a latch actuator pivoted to said base independently of said contact member, an electro-magnet and its armature, said armature when released by said electro-magnet operating said latch actuator to trip said latch, and means for restoring said armature to normal position responsive to the resultant movement of said contact member.
5. In an electric switch, a movable contact member, a latch for restraining the same in normal position, a latch actuator, an electro-magnet and its armature, a member intervening between said armature and said latch actuator, whereby upon release of said armature from said electro-magnet said armature actuates said member to move said latch actuator, and means engaging said intervening member responsive to release of said contact member for restoring said armature.
6. In an electric switch, a movable contact member, a latch for restraining the same in normal position, a mechanical latch actuator, an electro-magnet and its armature,

a member intervening between said armature and said latch actuator, whereby upon release of said armature from said electro-magnet said armature actuates said member to move said latch actuator, and means responsive to the resultant movement of said contact member for restoring said armature to normal position.

7. In an electric switch, a movable contact member, a latch for restraining the same in normal position, a latch actuator, an electro-magnet and its armature, a member intervening between said armature and said latch actuator, whereby upon release of said armature from said electro-magnet said armature actuates said member to move said latch actuator, said member adapted to move said latch actuator in one direction only, and means responsive to movement of said contact member for actuating said intervening member in opposite direction to restore said armature.

8. In an electric switch, a movable contact member, a latch for restraining the same in normal position, a mechanical latch actuator, an electro-magnet and its armature, a member intervening between said armature and said latch actuator, whereby upon release of said armature from said electro-magnet said armature actuates said member to move said latch actuator, said member adapted to move said latch actuator in one direction only, and means responsive to the resultant movement of said contact member for actuating said member independently of said latch actuator for restoring said armature to normal position.

9. In an electric switch, a movable contact member, a latch for restraining the same in normal position, a latch actuator, an electro-magnet and its armature, a member intervening between said armature and said latch actuator, whereby upon release of said armature from said electro-magnet said armature actuates said member to move said latch actuator, said member adapted to move said latch actuator in one direction only, and a second electro-magnet and its armature, said second armature when attracted operating said latch actuator independently of said member.

10. In an electric switch, a movable contact member, a latch for restraining the same in normal position, a latch actuator, an electro-magnet and its armature, a member intervening between said armature and said latch actuator, whereby upon release of said armature from said electro-magnet said armature actuates said member to move said latch actuator, said member adapted to move said latch actuator in one direction only, means responsive to the resultant movement

of said contact member for actuating said member independently of said latch actuator for restoring said armature to normal position, and a second electro-magnet and its armature, said second armature when attracted operating said latch actuator independently of said member.

11. In an electric switch, a movable contact member, means for restraining the same in normal position, an electro-magnet and its armature, a movable member actuated by said armature upon its release from said electro-magnet to mechanically trip said switch, and mechanical means moved in response to the movement of said contact member actuating said movable member to restore said armature.

12. In an electric switch, the combination with a movable contact member, of toggle mechanism for actuating the same, means for restraining said contact member in normal position, an electro-magnet and its armature, a movable member independent of said armature actuated by said armature upon its release from said electro-magnet for tripping said contact member, said toggle mechanism actuating said movable member after said contact member has been tripped to restore said armature.

13. In an electric switch, a base, a movable contact member, a latch for restraining the same in normal position, a latch actuator pivoted to said base, an electro-magnet and its armature, a member independent of said armature pivoted to said base and actuated by said armature upon its release from said electro-magnet to engage and actuate said latch actuator to trip said contact member, and mechanical means connected with said contact member actuating said pivoted member to restore said armature after said contact member has been tripped.

14. In an electric switch, the combination with a base, of a movable contact member, toggle mechanism for actuating the same, a dog pivoted to and movable with respect to said toggle mechanism thrusting against said base to restrain said contact member in normal position, a dog actuator pivoted to said base, a plurality of tripping magnets and armatures adapted to control said dog actuator independently of each other, and means connected with said contact member for restoring one of said armatures.

In testimony whereof I have hereunto affixed my signature in the presence of the two subscribing witnesses.

WILLIAM M. SCOTT.

Witnesses:

N. F. WHELAN,
M. A. GILLESPIE.