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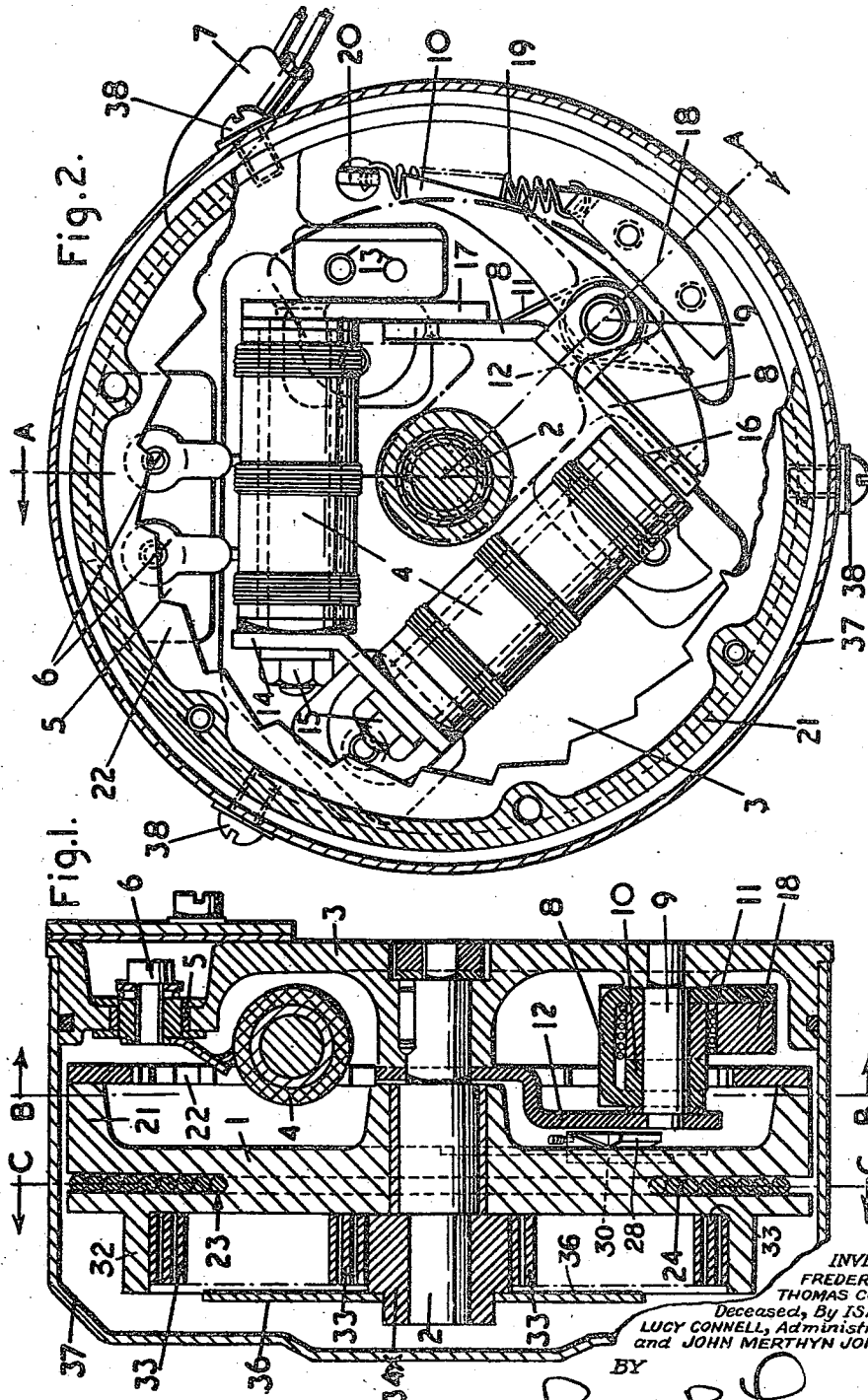
J. M. JONES ET AL

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FUZZING UNIT FOR USE IN DROPPING BOMBS FROM AIRCRAFT

Filed Dec. 11, 1945

2 Sheets-Sheet 1



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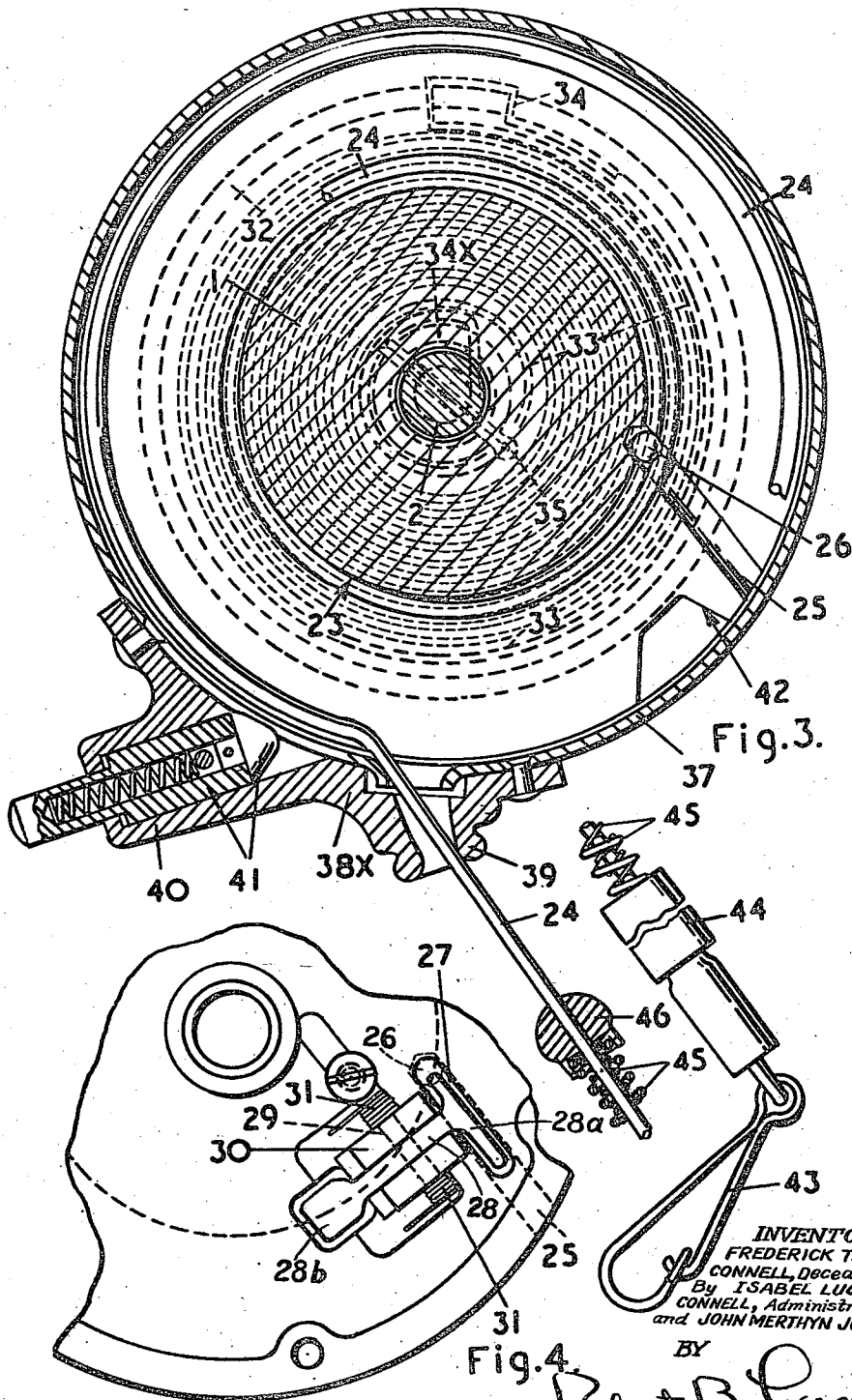
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UNITED STATES PATENT OFFICE

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FUZING UNIT FOR USE IN DROPPING
BOMBS FROM AIRCRAFT

John Merthyn Jones, London, England, and Frederick Thomas Connell, deceased, late of London, England, by Isabel Lucy Connell, administratrix, Southwick, England, assignors to the Minister of Supply in His Majesty's Government of the United Kingdom of Great Britain and Northern Ireland, London, England

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This invention relates to fuzing units for use in dropping bombs from aircraft, and of the kind employing a fuzing wire or the equivalent which requires to be attached to a safety device on the bomb, such for example as a removable safety pin, clip or wire associated with the arming mechanism of the bomb fuze, and to be connected to the fuzing unit in such a manner that when the bomb is released the fuzing wire is either retained by the fuzing unit on the aircraft, so that the bomb drops "live," or is detached from the fuzing unit so that the bomb falls "safe" with the wire, the selection of the "live" and "safe" dropping conditions being made by the pilot or the bomb aimer by appropriate setting of the fuzing unit control.

With fuzing units of this kind the fuzing wire left depending from the fuzing unit after a "live" drop from a wing installation may, if sufficiently long, cause considerable damage to the under-surface of the wing by whipping about in the slipstream, whilst in the case of a "live" drop from a fuselage installation a long depending fuzing wire may foul or interfere with the closing of the bomb cell doors. In order to overcome these disadvantages it has been usual to use a vertical fuzing system in which the fuzing units are positioned vertically above the safety devices on the bombs so that the fuzing wires can be kept as short as possible, but this often entails fitting a bomb carrier with extensions to afford mountings for the fuzing units.

Now the present invention has for its object the provision of a new or improved fuzing unit of the kind referred to which after a "live" drop will prevent the fuzing wire from doing damage to the aircraft structure or from interfering with the proper closing of the bomb cell doors. A further object is to provide a fuzing unit which can be used in a horizontal fuzing system employing long fuzing wires and a bomb carrier which need be of only such a length as to provide for adequate spacing of the crutches for locating and steadying the bomb.

According to the invention, the fuzing unit comprises means adapted to draw-in the fuzing wire automatically after a "live" drop and to permit the fuzing wire to run away freely with the bomb upon a "safe" drop, both at the will of the pilot or the bomb aimer.

The invention will now be more fully described with reference to the embodiment illustrated in the accompanying drawings, wherein:

Fig. 1 is a sectional side elevation of the fuzing unit, the section being taken on the line A—A

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of Fig. 2 which is a sectional front elevation of the unit taken on the line B—B of Fig. 1.

Fig. 3 is a sectional rear elevation taken on the line C—C of Fig. 1, and

Fig. 4 is a fragmentary view of the rear face of the drum or spool of the fuzing unit.

Referring to the drawings, the fuzing unit comprises a drum or spool 1 in the form of a winding reel freely mounted for rotation upon a spindle 2 carried by a back plate 3 constituting the base of the fuzing unit and upon the forward face of which are mounted a two-coil electro-magnet 4, an insulating block 5 carrying terminals 6 which make electrical connections between the electro-magnet and the twin supply lead 7, an armature 8 pivoted on a stud 9, a ratchet pawl 10 also pivoted on the stud 9 and connected to the pivoted armature by a coiled loading spring 11, and a stop plate 12 which is located by engaging the spindle 2 and stud 9 and secured to the base plate 3 by screws 13. The two coils of the electro-magnet 4 are mounted on the base plate 3 by a bracket 14 and screw fixing means 15 to form a V-shaped assembly, the coils being series connected and their ends attached to the terminals 6 respectively, whilst the armature 8 is V-shaped and pivoted at the bottom of its lower arm to the stud 9, the arrangement being such, when the electro-magnet is energised, the armature rocks, one free arm being attracted upwards to the pole piece 16 of one coil and the other free arm being attracted laterally to the extended pole piece 17 of the other coil. The armature lower arm is of duplex form and the rearmost limb thereof is extended beyond the pivot stud 9 and is fitted with a balance weight 18 and is connected by a helical spring 19 to an eye 20 on the base plate 3, said spring 19 normally operating to hold the armature in the inoperative position.

A rearwardly extending peripheral flange 21 on the drum or spool 1 carries an internally toothed ratchet ring 22 for engagement by the spring-loaded ratchet pawl 10 when the electro-magnet is energised, in which event the attraction of the electro-magnet pole pieces 16, 17 overcomes the restraint of the spring 19 so as to rock the armature 8, and the ratchet pawl 10, under the action of its loading spring, follows the rocking movement of the armature 8 so as to enter into operative engagement with the ratchet ring 22 and prevent rotation of the drum or spool 1 in one direction.

A deep circumferential groove, indicated by the reference 23, is formed in the drum or spool 1 to

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accommodate the coils of the fuzing wire 24, the width of the groove being such as to confine the wire to coiling turn upon turn, and in one of the faces defining this groove 23 is formed a tangential channel, indicated by the reference 25, which extends from the periphery to the base of the groove 23 and constitutes a guideway for a phosphor bronze or other ball 26 on the inner end of the fuzing wire 24, the ball 26 being of greater diameter than the groove 23. A slot at 27 extends through the rear wall of the drum or spool 1 into the channel 25, and a detent lever 28 is pivotally mounted at 29 in a bracket 30 sunk in the rear face of the drum or spool 1 and is urged by helical torque springs 31 to cause one end 28a of said detent lever 28 to enter said channel 25 through the slot 27, while the other end 28b engages the stop plate 12, the arrangement being such that when the ball end 26 of the fuzing wire 24 is pushed along the channel 25 to the base of the groove 23, said ball rides under the end 28a of the detent lever 28 which is thereby displaced causing the end 28b to release the stop plate 12.

An annular flange 32 on the forward face of the drum or spool 1 constitutes a housing for a clock-type spiral spring 33 the outer end of which is anchored at 34 to said flange 32 by being reversed upon itself and engaged in slots therethrough, and the inner end of the spring 33 is anchored to a collar 34* which is secured to the spindle 2 by a split pin 35, whilst a disc 36 fixed on the forward end of the spindle 2 covers the inner coils of the spring 33 to prevent the spring flying out when the unit is being dismantled and assembled.

The mechanism carried on the forward face of the back plate 3 is enclosed by a cup-like cover 37 which is detachably secured thereto by fixing screws 38, and the cylindrical wall of cover 37 has riveted thereto at its lower part a moulding 38* affording a fairlead 39 for the cable or fuzing wire 24 and a tangential housing 40 containing a spring-loaded locating plunger 41 which when depressed, can be engaged in a locating recess at 42 in the periphery of the spool 1 to align the channel 25 with the fairlead 39 for the insertion of the ball end 26 of the fuzing wire 24, when spool 1 is wound up and resting under tension.

The outer end of the fuzing wire 24 is fitted with a spring clip 43, for attachment to the pin or other removable safety device on the bomb or other store to be dropped, and a shock absorber comprising a sleeve 44 fixed to the clip end of the wire 24, a pair of concentric helical springs 45 one within the other and threaded over the wire 24 and a ball end 46 through which the wire 24 passes freely and which is secured to the inner end of the outermost spring 45.

A detachable bracket (not shown) with a spring-loaded plunger may be attached to the rear of the back plate 3 by nut and bolt fastenings to provide fixing points for the unit.

Normally the drum spring 33 is initially tensioned before the cover 37 is fitted, by rotating the drum 1 by approximately sixteen turns. The drum or spool 1 is held in this tensioned state by the engagement of the end 28b of the spring-loaded detent lever 28 with the stop plate 12.

When a fuzing wire 24 is inserted as above described, the ball 26 displaces the end 28a of the detent lever 28 said displacement of the detent lever 28 disengaging its opposite end 28b from the stop plate 12 and allowing the spring 33 to come into action to turn the drum or spool 1 so as to

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wind-in the cable or fuzing wire 24 until the ball 46 engages the flared mouth of the fairlead 39. When the fuzing wire 24 is pulled out from the unit and attached by the clip 43 to the pin or other safety device on the bombs or other store to be dropped, the drum or spool 1 is revolved and the spring 33 further tensioned or wound up.

If when the bomb is released from the bomb carrier the electromagnet 4 is not energised, the ratchet pawl 10 is out of engagement with the ratchet ring 22 and under the pull exerted by the falling bomb the fuzing wire 24 is drawn off or unwound from the drum or spool 1, thereby further rotating the latter and in doing so winding-up or still further increasing the tension of its loading spring 33. As the fuzing wire 24 is drawn off and the pull comes upon the final turn on the drum or spool, the ball 26 is disengaged from the spring-loaded detent lever 28 and is pulled through the channel 25 so that the fuzing wire 24 falls away with the bomb which, therefore, is dropped in a "safe" condition. When the ball 26 is disengaged from the detent 28 the spring loading of the latter comes into action and causes the end 28b to engage the stop plate 12 and thereby prevent backward or winding in rotation of the empty drum or spool 1 under its spring tension. A new fuzing wire 24 can now be inserted and wound on to the drum or spool 1 as previously described.

If when the bomb is released from the bomb carrier the electro-magnet 4 is energised, by switching on the appropriate fuzing switch, the armature 8 is attracted to the pole pieces 16, 17, loads the spring 11 and causes it to force the ratchet pawl 10 into engagement with the ratchet ring 22 so as to lock the drum or spool 1 against paying-out rotation, and consequently as the bomb falls away the safety device is withdrawn and the bomb drops "live," whereupon the spring tension of the drum or spool 1 overcoming the spring-loading of the ratchet pawl 10, rotates the drum or spool 1 in a winding-in direction so as to draw-in and coil the fuzing wire 24 until the ball end 46 thereon engages the outer end or flared mouth of the fairlead 39. During this winding-in action the ratchet ring 22 rides over the ratchet pawl 10 although the electro-magnet may still be energised by reason of the spring-loading of the pawl 10.

The twin cable or supply lead 7 passes from the terminal block 5 through a sealing gland and its other end (not shown) may be fitted with a plug for connection to a junction box in the carrier circuit.

In an alternative arrangement, not illustrated, the back plate of the unit may have lugs for direct screwed connection to the bomb carrier, and the terminals may be connected to contacts on the back plate which plug into sockets in the carrier circuit so as to avoid loose leads.

We claim:

1. A fuzing unit for dropping bombs from aircraft and comprising in combination a spring tensioned spool freely mounted for rotation, a fuzing wire wound upon said spool, means for allowing paying-out rotation of said spool when it is desired to drop the bomb "safe" with the fuzing wire attached and for preventing paying-out rotation when it is desired to drop the bomb "live" without the fuzing wire, and means for preventing winding-in rotation of the spool under its spring tension after a "safe" drop and

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for permitting such winding-in rotation of the spool after a "live" drop.

2. A fuzing unit for dropping bombs from aircraft and comprising in combination a spring tensioned spool freely mounted for rotation, a fuzing wire wound upon said spool, ratchet mechanism which allows paying-out rotation of said spool when it is desired to drop the bomb "safe" with the fuzing wire attached and adapted to be actuated to lock said spool against paying-out rotation when it is desired to drop the bomb "live" without the fuzing wire, and detent and stop mechanism adapted to prevent winding-in rotation of the spool under its spring tension after a "safe" drop and to permit such winding-in rotation of the spool after a "live" drop.

3. A fuzing unit for dropping bombs from aircraft and comprising in combination a spool freely mounted for rotation and tensioned by a clock-type spring, a fuzing wire wound upon said spool turn upon turn, a ratchet ring associated with said spool, a pivoted ratchet pawl adapted to cooperate with said ratchet ring, means for actuating said pawl to cause it to engage the ratchet ring to prevent paying out rotation of said spool when it is desired to drop the bomb "live" without the fuzing wire, a spring loaded detent which engages a projection on the inner end of the fuzing wire and a fixed stop with which said detent cooperates to prevent winding-in rotation of the spool after a "safe" drop when the said projection on the fuzing wire has been withdrawn from engagement with the said detent.

4. A fuzing unit for dropping bombs from aircraft and comprising in combination a spool freely mounted for rotation and tensioned by a clock-type spring, a fuzing wire wound upon said spool turn upon turn, a projection on the inner end of said fuzing wire, a ratchet ring associated with said spool, a pivoted ratchet pawl, a pivoted armature, a loading spring connecting the pivoted pawl to said armature, an electro-magnet which when energised attracts said armature so as to cause the pivoted pawl through its loading spring to be rocked into locking engagement with the ratchet ring to prevent paying out rotation of the said spool when it is desired to drop the bomb "live" without the fuzing wire, a fixed stop, a spring-loaded detent which engages the projection on the inner end of the fuzing wire and which when the fuzing wire and projection is withdrawn from its engagement for a "safe" drop, automatically takes up a position so as to cooperate with the said fixed stop and thereby prevent winding-in rotation of the said spool.

5. A fuzing unit for dropping bombs from aircraft and comprising in combination, a back plate, a spindle carried by said back plate, a spool freely mounted for rotation on said spindle, a clock-type spring anchored to said spindle and said spool whereby the latter is tensioned, a fuzing wire wound turn upon turn in a circumferential groove in said spool, a ball on the inner end of said fuzing wire and a tangential channel in said groove to enable said ball to be passed from the periphery to the base of said groove, a ratchet ring fixed to the spool and ad-

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jacent the back plate, an electro-magnet mounted on said back plate and having terminal connections for supply leads, an armature pivoted on said plate and adapted to be attracted by the electro-magnet when energised, a ratchet pawl pivoted on the same fulcrum as the armature and connected to the latter by a loading spring which, when the electro-magnet is energised to attract the armature, causes the pivoted pawl to be rocked into locking engagement with the ratchet ring to prevent paying out rotation of said spool when it is desired to drop the bomb "live" without the fuzing wire, a stop plate fixed to the back plate, and a spring loaded detent which is mounted on the spool and extends through a slot therein into the said tangential channel to engage the ball on the end of the fuzing wire and which when the said ball is withdrawn from its grip, for a "safe" drop, automatically takes up a position in which it cooperates with said stop plate to prevent winding in rotation of the said spool.

6. A fuzing unit for dropping bombs from aircraft and comprising in combination a back plate, a spool freely mounted for rotation on said spindle, a clock-type spring anchored to said spindle and said spool whereby the latter is tensioned, a fuzing wire wound turn upon turn in a circumferential groove in said spool, a ball on the inner end of said fuzing wire and a tangential channel in said groove to enable said ball to be passed from the periphery to the base of said groove, a ratchet ring fixed to the spool and adjacent the back plate, an electro-magnet mounted on said back plate and having terminal connections for supply leads, an armature pivoted on said back plate and adapted to be attracted by the electro-magnet when energised, a ratchet pawl pivoted on the same fulcrum as the armature and connected to the latter by a loading spring which, when the electro-magnet is energised to attract the armature, causes the pivoted pawl to be rocked into locking engagement with the ratchet ring to prevent paying out rotation of said spool when it is desired to drop the bomb "live" without the fuzing wire, a stop plate fixed to the back plate, a spring loaded detent which is mounted on the spool and extends through a slot therein into the said tangential channel to engage the ball on the end of the fuzing wire and which when the said ball is withdrawn from its grip, for a "safe" drop, automatically takes up a position in which it cooperates with said stop plate to prevent winding in rotation of the said spool, a cap-like cover enclosing the spool and associated mechanism on the back plate, a fairlead provided on said cover and through which the fuzing wire passes to said spool, a clip on the outer end of the fuzing wire for attachment to the safety device on the bomb, and a shock absorber on the outer end of said fuzing wire and which limits the winding in of the fuzing wire onto the spool by engaging the end of the fairlead.

ISABEL LUCY CONNELL.

Administratrix of the Estate of Frederick Thomas Connell, Deceased.

JOHN MERTHYN JONES.