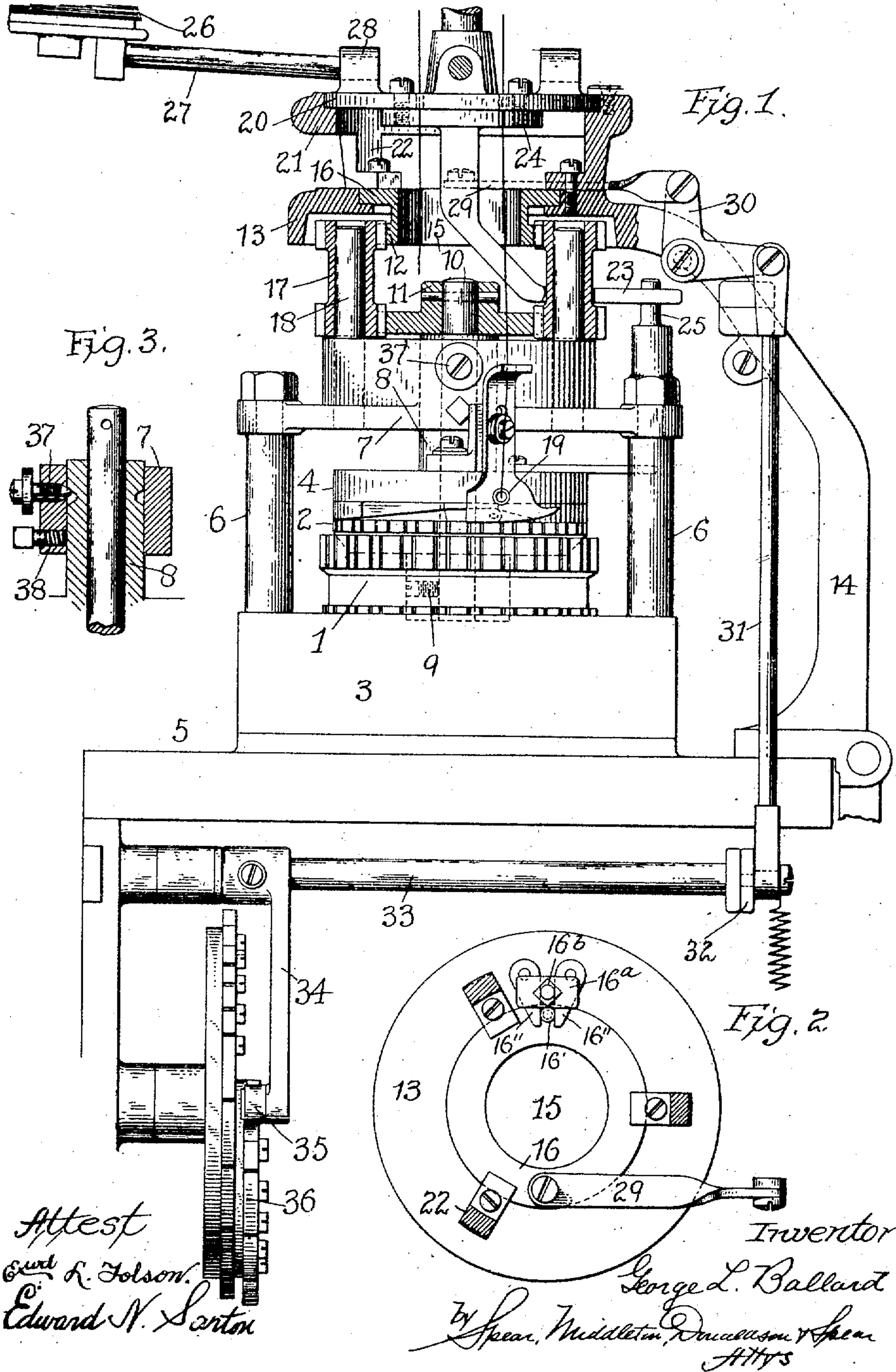


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CIRCULAR KNITTING MACHINE.
APPLICATION FILED MAY 28, 1908.

963,679.

Patented July 5, 1910.



UNITED STATES PATENT OFFICE.

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CIRCULAR-KNITTING MACHINE.

963,679.

Specification of Letters Patent.

Patented July 5, 1910.

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To all whom it may concern:

Be it known that I, GEORGE LAWSON BALLARD, a subject of the King of Great Britain, and a resident of Norristown, Pennsylvania, have invented certain new and useful Improvements in Circular-Knitting Machines, of which the following is a specification.

My invention relates to circular knitting machines of the type having a needle cylinder and dial and it comprehends means for maintaining the cylinder and dial in proper circumferential relation in respect to each other.

In knitting machine practice as it exists to-day it is customary to hold the needle cylinder and dial in position circumferentially in relation to each other by dogs or projections on these parts which engage each other and prevent circumferential displacement of one member in relation to the other, whether the machine be of the type in which the cylinder and dial rotate or of that form of machine in which the cylinder and dial are held stationary and their cam carriers revolve. In either style of machine the use of the engaging dogs is objectionable as the fabric has to pass down between these dogs and it is liable to become marred or streaked by contact therewith and in the case of welts, lumps, and the like the said dogs or lugs offer obstructions to the free passage of the fabric to the take up.

One object I have in view is to avoid the use of these dogs or lugs and to provide means entirely outside of the path of the fabric for maintaining the needle cylinder and dial in their proper circumferential relative positions.

I have shown my invention in connection with a machine of the type in which the needle cylinder and dial are stationary and the cam carriers rotate.

A further object of my invention is to provide means whereby different relative positions—as between the cylinder and dial needles—may be secured, the dial being shifted so that the needles of the dial and cylinder are changed from a one-and-one to a two-and-two relation, that is, from an arrangement in which the needles of the dial and cylinder alternate singly with each other to one in which pairs of the dial needles alternate with pairs of the cylinder needle, the former arrangement producing

in the fabric ribs alternating singly or one-and-one and the latter producing ribs alternating in pairs, and in carrying out this part of my invention I utilize a portion of the connecting and controlling means between the cylinder and dial to secure the adjustment between the said parts, the change in the relation of the parts being effected while the machine is running.

I have also provided means whereby the bobbin stand may be conveniently connected with the rotary parts of the machine to rotate therewith.

The invention consists in the features and combination and arrangement of parts hereinafter described and particularly pointed out in the claims.

In the accompanying drawings—Figure 1 is a front view of a knitting machine embodying my invention, parts being in section; Fig. 2 is a plan view of detail parts; Fig. 3 is a sectional view of a detail.

In these drawings, 1 indicates the cylinder and 2 the dial of a circular knitting machine, 3 is the cam ring of the cylinder and 4 the cam carrier for the dial.

The cylinder is fixed rigidly to the base ring or plate 5 as in ordinary practice, and the cam ring 3 is rotated through suitable gearing as ordinarily indicated at X, and as is well understood by those skilled in the art. From the cam ring 3 posts 6 extend up and carry the cross piece 7 and in this cross piece the sleeve 8 is held as will be hereinafter described to revolve with the cross head 7 and thus rotate the dial cam carrier 4 which is fixed thereto or formed therewith. The dial is fixed by a set screw 9 to a stem 10 passing loosely through the sleeve, the upper end of the stem having fixed thereto a member 11 which is in the form of a toothed wheel or gear. By this means the stem together with the dial attached thereto is supported, but it is capable of being rotated from its fixed position as will be hereinafter described for the purpose of changing the relation of the needle from a one-and-one order to a two-and-two order. For holding the dial in relation to the needle cylinder I employ a circular rack or gear 12 held substantially fixed in a frame or ring 13 supported from the fixed base 5 by a bracket 14 said rack or gear, however, being capable of slight circumferential adjust-

ment, as will be hereinafter described for racking the dial from a one-and-one to a two-and-two relation. This circular rack or gear is open centrally as at 15, it being supported entirely by its annular flange 16 resting in a seat in the frame or ring 13. This annular rack is connected with or locked to the dial gear 11 by gear members 17 each of which has teeth meshing with both the gear 11 and the annular rack or gear 12, for which purpose each gear member may have, as shown, a set of teeth at both their upper and lower ends or these teeth may be otherwise constructed and arranged. These gear members are adapted to turn freely on pins or posts 18 fixed to and extending up from the crosshead 7 of the revolving cam ring of the needle cylinder. I may employ either one or, as shown, a plurality of these interlocking gears or members 17. They serve to connect the dial with the cylinder and hold these parts in their predetermined circumferential relation. The cylinder being stationary and the bracket 14 holding the rack or gear 12 being connected therewith or with the stationary framework which supports the cylinder the interlocking gears will lock or connect the gear 11 of the dial with the said gear or rack 12 so that these two gears will be held as one body and the gear 11 will be maintained against circumferential movement in relation to the rack, the interlocking gear simply having a planetary movement in respect to the members 11 and 12 due to the revolution of the head 7 which carries said interlocking gears.

The yarn passes to the needles down through the open space 15 as indicated at 4 and through a thread guide or guides one of which is shown at 19, and thus while the free feeding of the yarn is not interfered with the dial and cylinder are in effect locked together by the interlocking gears wholly independent of or aside from the path of the fabric on its way from the machine to the take up.

The bobbin stand is shown at 20 arranged to rotate in a supplemental bracket or ring 21 supported by the feet 22 from the ring or bracket 13, said bobbin plate or stand revolving in this ring or bracket. It derives its motion from the arm 23 having a head or plate screwed thereto at 24 the other end of the arm engaging a pin 25 extending up from the crosshead 7. A part of one of the bobbins is indicated at 26 and its supporting arm at 27, this being held in the stud 28 on the revolving bobbin stand. There may be any suitable number of bobbins supported on the bobbin stand.

In the foregoing description I have assumed that the annular rack or gear 12 is held fixed in place in any suitable manner, such, for instance, as by a pin or stud 16'

on the flange 16 fitting between stops 16'' supported on the ring or bracket 13. These stops are pivoted to the ring so that they may be adjusted in relation to the space between them but in whatever adjustment they are held rigidly by a clamping plate 16^a and a screw 16^b. The parts as shown in Fig. 2 are in position to hold the ring against movement in either direction and the interlocking gear 17 will now hold the gear 11 in conformity with the rigid position of the gear 12 and consequently the dial will be held rigid in relation to the rigid cylinder. Where, however, I desire to have the machine capable of racking the dial to change from a one-and-one to a two-and-two relation of the needles, I control the rack or gear 12 by means which is capable of adjusting the rack or gear, which adjustment, being transmitted through the planetary gear or gears 17, will cause a rotary adjustment of the dial in respect to the cylinder for the racking effect just described. This adjusting means for the circular rack or gear consists of the link 29 pivoted to the flange 16 of the said gear and pivoted also to a bell crank lever 30 pivoted on the bracket 14, said bell crank lever being connected by a link 31 with an arm 32 on a rock shaft 33, said rock shaft having thereon another arm 34 provided with a roller 35 arranged to be engaged by a pattern wheel 36. These connections, when the racking of the dial is to take place, are operated to turn the circular rack or gear 12 and this movement will be transmitted through the gear 17 to the dial gear 11 which will be revolved or adjusted circumferentially and thus rack the dial in relation to the cylinder, it being understood, of course, that the rotary motion of the gear 17 imparted to it by the movement of the circular-rack or gear 12 is additional to that which said gear 17 derives from its revolution around the gears 11 and 12 with the cross head 7.

In order to accurately limit the amount of racking or adjusting movement imparted to the dial I provide the adjustable stops 16'' above described which can be separated from each other the required distance to allow the stop pin 16' and its circular rack or gear to have the necessary amount of movement for the racking of the dial.

My needle dial may be readily adjusted vertically in relation to the cylinder by a conically pointed screw 37 passing through the cross head 7 to engage a V-shaped groove in the sleeve 8. By turning the screw inwardly the sleeve and dial will be raised while an outward movement of the screw will result in the sleeve and dial falling by gravity. When the desired adjustment has been secured the sleeve and dial are fixed by a set screw 38.

A suitable spring may be employed for

moving the adjusting connections leading to the circular rack or gear in the opposite direction from that effected by the pattern wheel.

5 It will be observed that the planetary or interlocking gear, revolving as it does around the axis of the machine, follows the rotary movement of the yarn feed. Further, by using a pair of interlocking gears at
10 substantially diametrically opposite points a "couple" action is secured and side thrust on the bearings of the revolving parts is avoided.

I claim—

15 1. In combination in a circular knitting machine, a cylinder, a dial, an annular member above the dial having its interior free for the passage of the yarn, a peripheral support for the said annular member, and
20 connections leading from the annular member to the dial and cylinder respectively by which said parts are maintained in their relation to each other circumferentially, and means for guiding the yarn down through
25 said annular member, substantially as described.

2. In a circular knitting machine, a rotary head, a fixed cylinder, a dial, rotary cylinder and dial cams on the head, a dial stem, a
30 gear fixed thereon, an annular gear above the dial stem and gear and having an open interior for the passage of the thread, a fixed support for said annular gear, and a planetary gear connecting the dial gear with
35 the annular gear and carried by the rotary head, substantially as described.

3. In a circular knitting machine, a rotary head, a fixed cylinder, a dial, rotary cylinder and dial cams on the head, a dial stem, a
40 gear fixed thereon, an annular gear above the dial stem and gear and having an open interior for the passage of the thread, a fixed support for the annular gear, a planetary gear connecting the dial gear with the
45 annular gear and carried by the rotary head, and an outer thread guide for directing the thread through the annular gear, thence past the periphery of dial gear to the needles, substantially as described.

50 4. In combination with a cylinder a dial, an annular gear or rack axially above the dial having a free interior, the gear connected with the dial, a planetary locking gear between the gears mentioned, and means for
55 shifting the annular gear or rack, substantially as described.

5. In combination with a fixed cylinder a dial, an annular rack or gear above the dial having a free interior, a gear connected with
60 the dial, a revolving head, an interlocking gear carried thereby and meshing with the gears first mentioned, a fixed bracket in which the annular gear is supported and in which it is adapted to be shifted, and means
65 for shifting the annular gear to thereby

actuate the dial gear to change the circumferential relation between the dial and the cylinder, substantially as described.

6. In combination with a fixed cylinder a dial, an annular rack or gear above the dial, a gear connected with the dial, a revolving
70 head, an interlocking gear carried thereby and meshing with the gears first mentioned, a fixed bracket in which the annular gear is supported and in which it is adapted to be shifted, and means for shifting the annular
75 gear to thereby actuate the dial gear to change the circumferential relation between the dial and the cylinder, said means comprising the link, bell crank lever, and connections leading therefrom to pattern mechanism, substantially as described.

7. In combination with a cylinder and dial, an annular rack arranged above the dial, a gear connected with the dial, an interlocking gear between the annular rack and
85 dial gear, a revolving head carrying said interlocking gear, a rotary bobbin stand and a connection from the revolving head to the said bobbin stand, said connection extending
90 through the annular gear, substantially as described.

8. In combination with the needle cylinder a dial, a gear connected with the dial, a gear in connection with the cylinder, an interlocking gear meshing with the gears first
95 mentioned, means for adjusting one of the gears and adjustable stops to limit the adjustment of the said gear, substantially as described.

9. In combination with the needle cylinder a dial, a gear connected with the dial, a gear in connection with the cylinder, an interlocking gear meshing with the gears first
105 mentioned, means for adjusting one of the gears and adjustable stops to limit the adjustment of the said gear, said stops consisting of the pivoted members, the pin on the gear working between the same, and clamping means for the said pivoted members, substantially as described.

10. In a circular knitting machine a fixed needle cylinder, a dial, revolving cams for the cylinder and dial needles, a revolving
115 yarn feed, and means rotating with the cams and following the rotating yarn feed for holding the dial in circumferential relation to the needle cylinder, said means comprising the two gears and a pair of interlocking
120 gears, the interlocking gears being arranged at substantially diametrically opposite points, substantially as described.

11. In a circular knitting machine of the type having a fixed cylinder and dial with revolving cam carriers and thread guide, a
125 gear connection between the cylinder and dial comprising an annular rack having its interior free for the passage of the thread, a dial gear, an interlocking planetary gear carried by the revolving head of the ma- 130

chine, and rotating on its own axis, and
connecting the annular rack with the dial
gear, a fixed bracket supporting the annular
gear, and means for automatically shifting
5 the annular rack, substantially as described.

12. In a circular knitting machine of the
type having a fixed cylinder and dial with
revolving cam carriers and thread guide, a
gear connection between the cylinder and
10 dial comprising an annular rack having its
interior free for the passage of the thread,
a gear connected with the dial, an interlock-
ing planetary gear carried by the revolving

head of the machine and rotating on its own
axis, and connecting the annular rack with 15
the dial, and a fixed bracket supporting the
annular gear, the said annular rack being
shiftable circumferentially in the said
bracket for racking, substantially as de-
scribed. 20

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

GEORGE LAWSON BALLARD.

Witnesses:

E. R. ROBERTS,
OWEN BALLARD.