

# The "Spiralarm Automatic Firedamp Detector Lamps"

*Manfred Stutzer, Ludwigshafen, Germany  
and Peter Appleton, Wigston, England*

In 1860, James Henry Naylor established the J.H. Naylor Ltd., Brass Founders and Manufacturers, Central Brass Works, Wigan, Lancashire. This article describes the development of his "Spiralarm" safety lamps. It is the intention of the authors to write a separate article about all other Naylor safety lamps.

## I. Principles of Gas Testing:

There are several ways in which firedamp may be detected and its proportion in mine air determined, but the treatment here is confined to those with which the mine deputy is likely to have contact.

a) The size and intensity of the firedamp cap on a testing flame depends on the proportion of firedamp present within the testing limits (for a flame safety lamp).

b) When methane is completely burnt in air, the contraction in volume of the mixture after cooling is twice the volume of the firedamp present in the original sample. This is due to the condensation of steam which is a product of the combustion, and can be measured by a McLuckie Methanometer.

c) The burning of firedamp around a heated platinum wire increases the temperature of the wire according to

## THE SPIRALARM

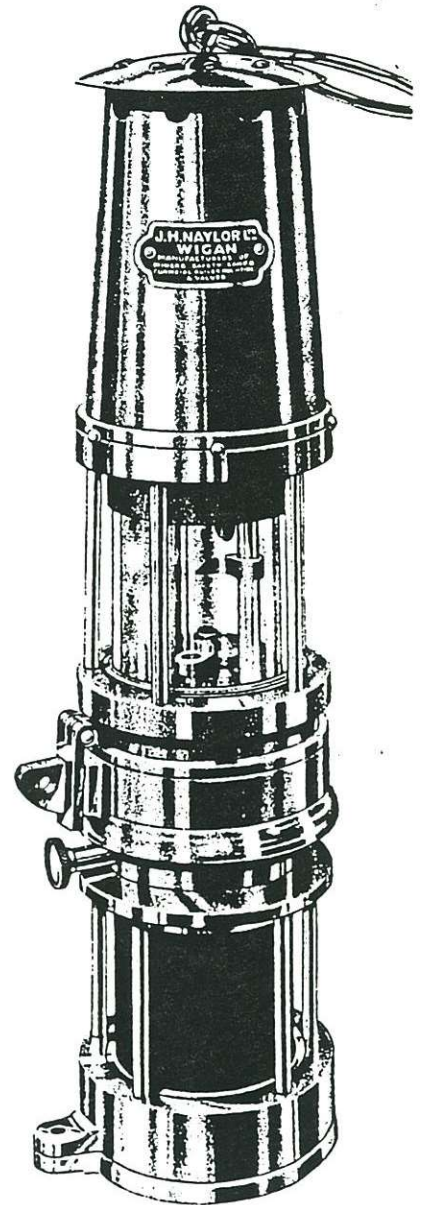
*An Automatic Detector  
of Combustible Gases in  
any atmosphere*

ROBUST, SIMPLE AND  
ECONOMICAL

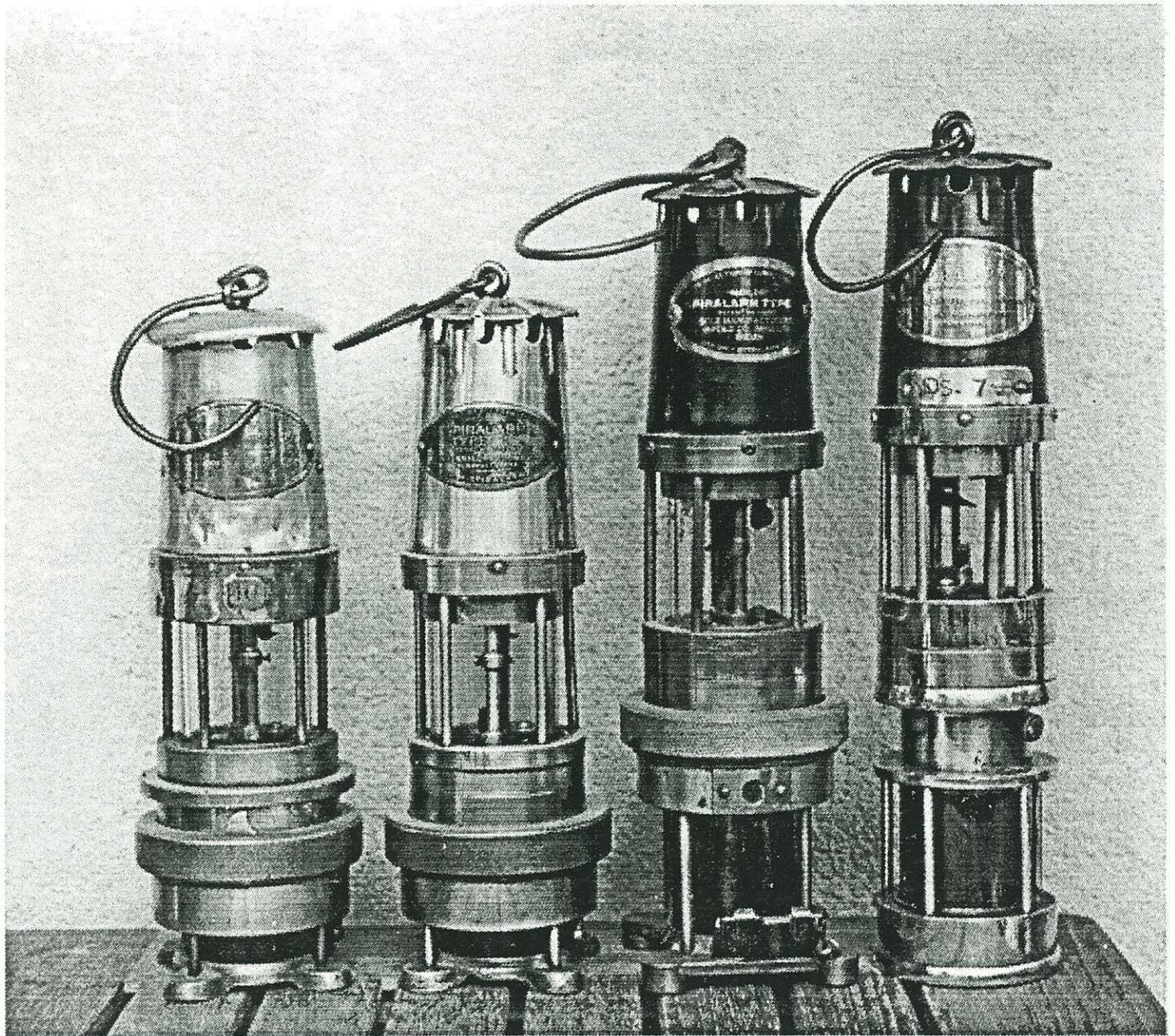
For the protection of life wherever inflammable gases are present the Spiralarm fills a long-felt need. It is composed of a Miner's Flame Safety Lamp of approved design. The steel gauzes and gas-tight joints ensure that no ignition of explosive gases can be caused by the presence of the testing flame. The Spiralarm is designed to meet the requirements of Local Authorities, Petrol Companies, Collieries, works where inflammable gases are present, and for any undertakings where life is endangered by the presence of inflammable gases.

*Full particulars obtainable from*  
**J. H. NAYLOR LTD.**  
**CENTRAL BRASS WORKS**  
**WIGAN**

Telephone - - - Wigan 3676  
Telegrams - "Naylor Wicnd Wigan"



*Advertisement 1935 for one of the first "Spiralarm" designs.*



*Four different Spiralarms.*

*Left to right: Type M, ca. 1955, Type S, ca. 1970, Type S, ca. 1960, Type M, ca. 1940.*

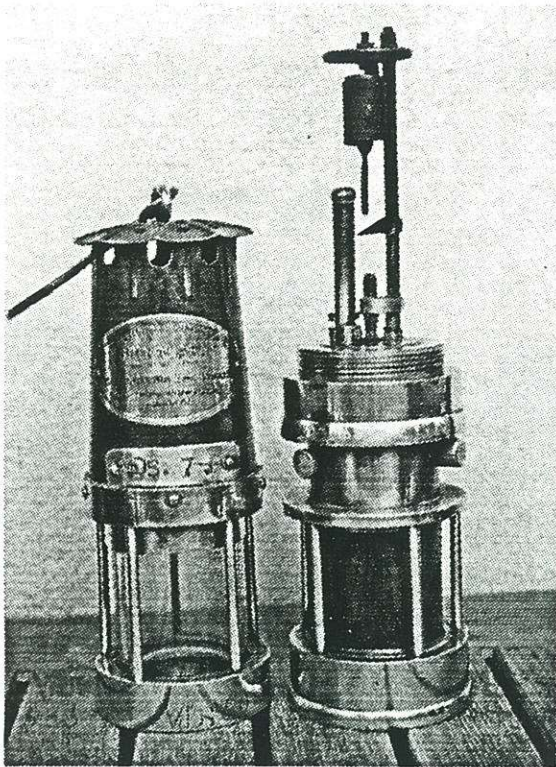
the proportion of firedamp. The metal increases its electrical resistance as its temperature rises, and this increment is measured by the "Wheatstone bridge" and recorded as percentage firedamp (CEAG Methanometer).

d) Firedamp diffuses into a porous pot more quickly than air and, inside,

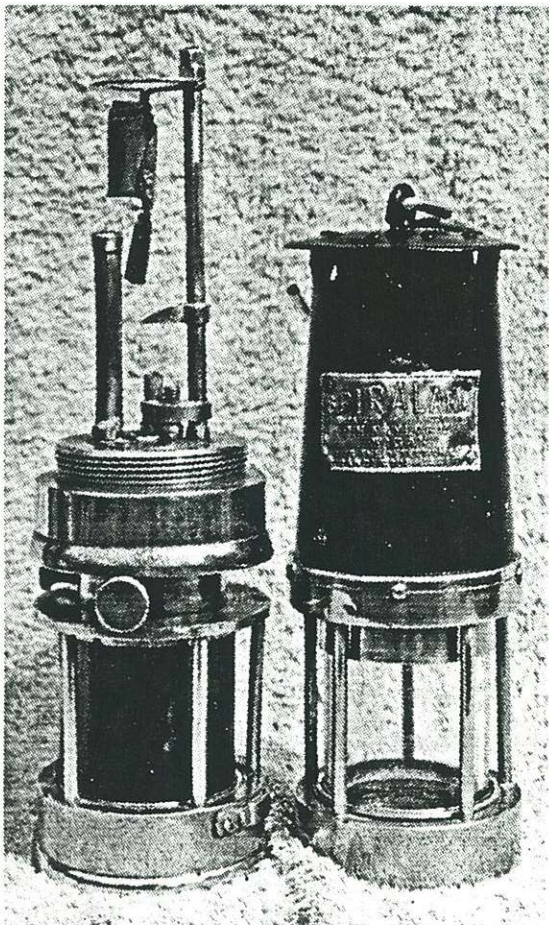
its combustion causes contraction. This sets up a pressure difference which operates a diaphragm controlling a pen or circuit maker or breaker (as in the Ringrose firedamp detector lamp).

e) The ordinary flame of a safety lamp gives an invisible cap in proportion to the firedamp percentage

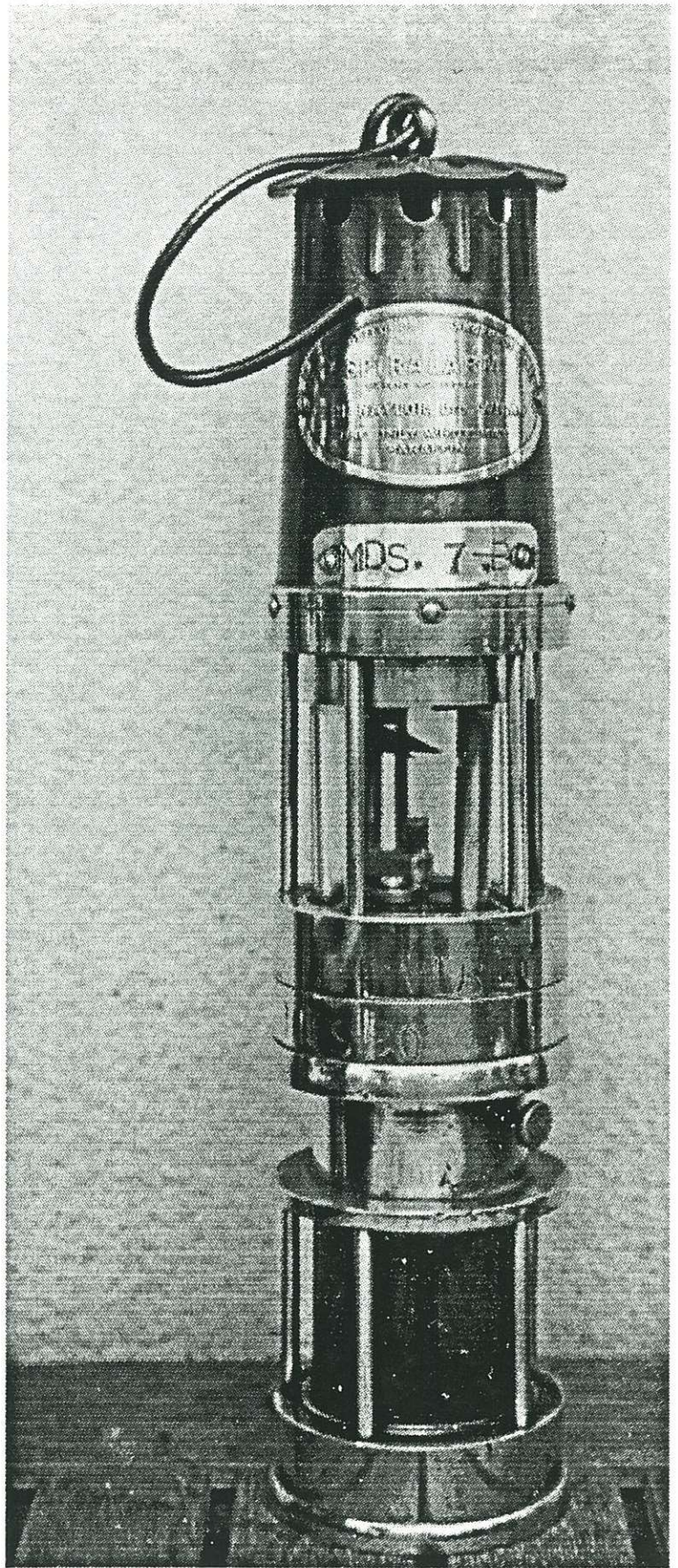
and this is made to heat a bimetallic strip which moves in relation to its temperature. This movement operates an electric switch which brings an alarm into circuit (the Spiralarm-Lamp).



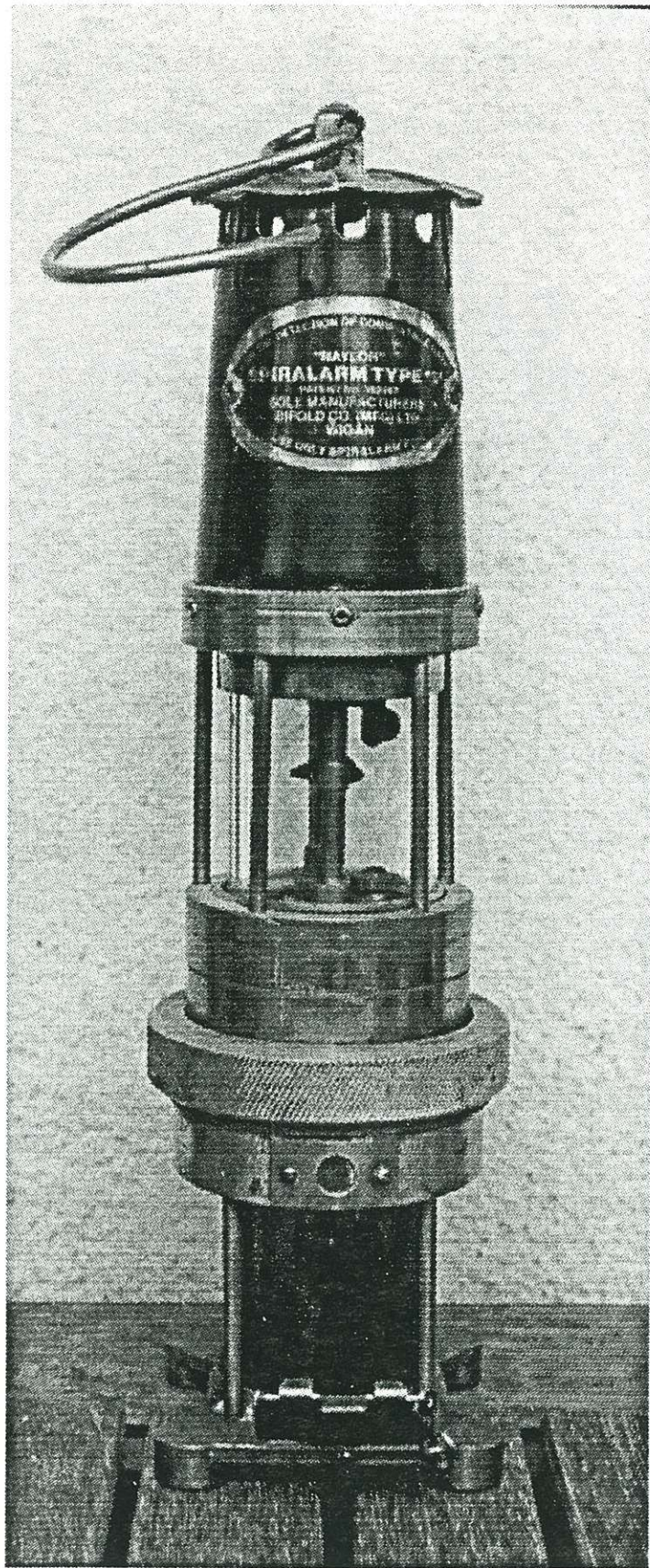
*Breakdown of Type M, ca. 1940.*



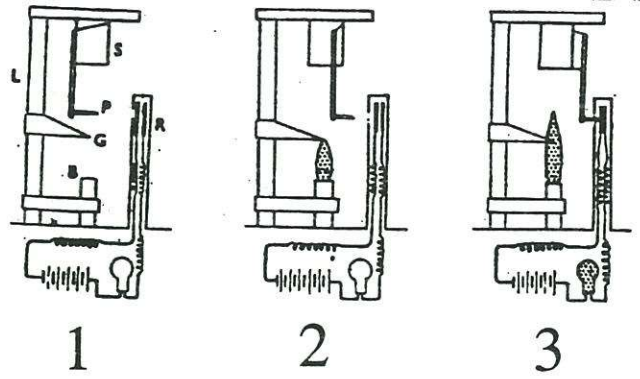
*Breakdown of Type M, ca. 1935.*



*Spiralarm Type M, ca. 1940.*



*Spiralarm -Lamp Type S, ca. 1960.*



1

Shows the relative position of the spiral, contact pin and contact strips when the lamp is unlit.

2

When the lamp has been lit, the resulting heat causes the spiral S to unwind a certain amount so that the contact pin P moves closer to the contact strips R. Under normal air conditions the lamp flame burns constantly at the height of the pointer gauge G. irrespective of the temperature of the surrounding air.

3

If inflammable gas is present in sufficient quantity, 1 1/4 % or 2 1/2 % according to the setting of the device, the flame increases in size and the greater heat produced causes the spiral to unwind still further, so that the contact pin P enters the small aperture in the contact tube and presses together the two contact strips, so completing the electric circuit of the device. This lights up the small Edison electric lamp and the red glass at the base of the lamp.



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*... bet your life!*

Many industries—and foreign countries—have been quick to follow Britain's lead, where over a dozen collieries have depended upon SPIRALARM'S accuracy and visible danger signal for seven years.

**SPIRALARM Automatic Gas Alarm**  
*(Ministry of Fuel & Power Approval No. 6)*


*The certain detector of Firedamp and other gases*

**J. H. NAYLOR LIMITED, Central Brass Works, Wigan**  
Telephone: Wigan 3676      Telegrams: Safety, Wigan

Advertisement 1954 for Spiralarm-Lamp Type M.

**WORKING  
AND MAINTENANCE  
INSTRUCTIONS**

**THE NAYLOR  
"SPIRALARM"**



**MINISTRY OF FUEL AND  
POWER FIRBDAMP DETECTOR  
APPROVAL No. 6 - 26/11/49**

**J. H. NAYLOR LIMITED . WIGAN**

Cover for instruction manual.

## II. Regulations:

In safety lamp mines, at least one detector must be provided by the owners;

- a) for every eight men or fraction of eight on a long wall face
- b) for each working place in other workings
- c) in every stone drift
- d) for every place where a set of men is working in the return on repairs
- e) with each electric motor running at or within 100 yards of the face.

The persons carrying these lamps are to be appointed by the manager for the purpose and may carry no other lamp except with the written permission of the manager. The workman carrying a detector must have been trained in its use and certified by an approved person as competent to determine firedamp percentages by means of gas caps on the lowered flame. The manager is to give directions as to the times and number of occasions for such tests to be made, and workmen in charge of detectors must use them in accordance with the instructions of the manager, undermanager, or other official of the mine. If a workman detects firedamp where an electric motor is working, he must inform the motorman who must cut off the power from the motor.

*Safety with Service*

NAYLOR TYPE 'M'

# SPIRALARM



The CERTAIN DETECTOR OF  
Firedamp and other gases.

Highly sensitive and fully automatic in operation the SPIRALARM provides a sure detection of inflammable gases. In the United Kingdom and throughout the world, thousands of Spiralarms are in use daily—and, they give trouble-free service. You can "depend" on Spiralarm.

Spiralarm is now made in brass with stainless steel bonnet to comply with N.C.B. regulations concerning magnesium and aluminium alloy.

MINISTRY OF FUEL & POWER APPROVAL NO.



SEND FOR  
LEAFLET TODAY!

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Telephone: Wigan 3676

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*Spiralarm Type M.*

*Advertisement 1955 of Spiralarm Type M.*

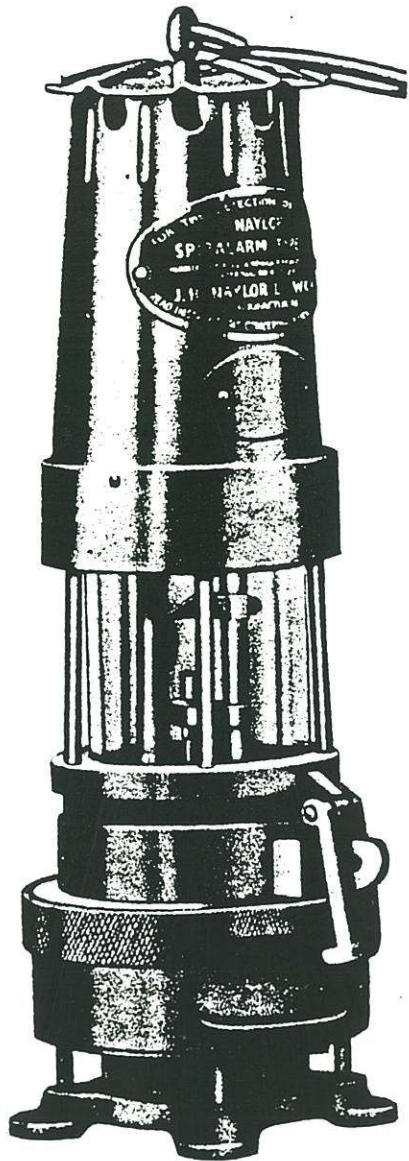
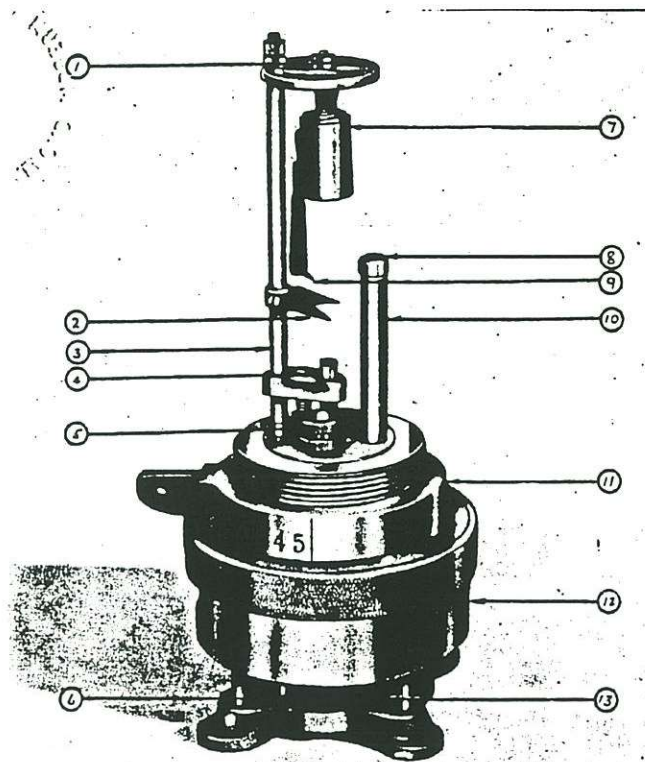


Fig. 2. Internal construction of Spiralarm

- |                       |                 |                          |
|-----------------------|-----------------|--------------------------|
| 1. Holding Nut.       | 6. Switch.      | 10. Contact Tube.        |
| 2. Pointer.           | 7. Spiral.      | 11. Fuel Container.      |
| 3. Supporting Pillar. | 8. Brass Cap.   | 12. Battery Compartment. |
| 4. Burner.            | 9. Contact Pin. | 13. Red Glass.           |
| 5. Filling Screw.     |                 |                          |



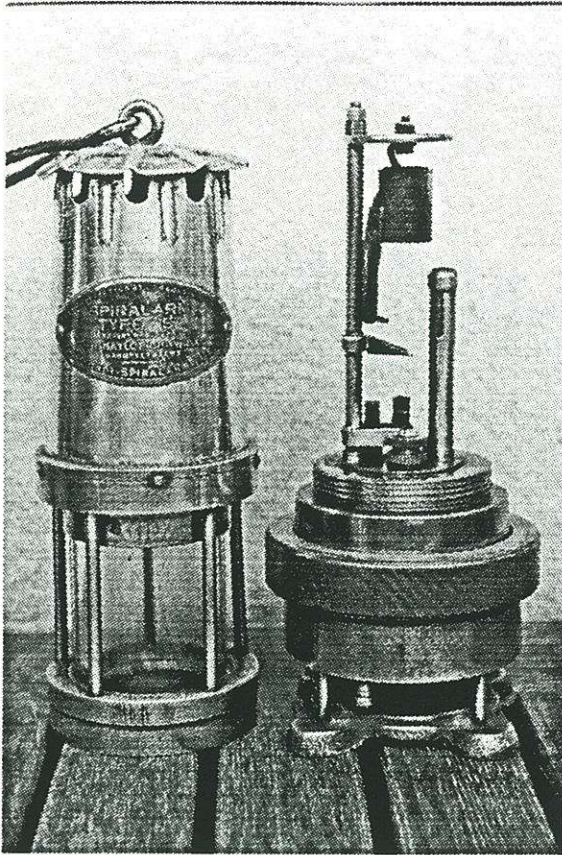
*Spiralarm Type M, with locking mechanism.*

### Principle of the Spiralarm Firedamp Detector:

The approved Spiralarm detector consists of a permitted flame safety lamp with a bimetallic strip coiled above the flame, an electric contact operated by the coil, and a small battery with a 2.5 volt red bulb housed in the base. The flame is set to a gauge and causes the strip to uncoil, but not enough to close the contact. If firedamp is present the extra heat tends to complete the action and the red light comes on. It can be set to operate at either 1 1/4 % or 2 1/2% methane.

The first "Spiralarm Automatic Firedamp Detector Lamps" were introduced about 1935 by J. H. Naylor. In 1950 the "Spiralarm-Lamp" Type M was approved by the Ministry of Fuel and Power. Type M of the "Spiralarm-Lamp" was produced until around 1970.

The existing Type S was not approved to be used in mines. Type S has been designed to meet the requirements of public authorities, public works contractors, petrol producers, oil tank operators and other undertakings where inflammable gases endanger life.



*Spiralarm-Lamp Type S, ca. 1970. Assembled lamp is right, breakdown above.*

Peter Appleton contacted Mr. Fishwick, a former technical director of Bifold Co. (Manufacturing) Ltd., in Lancashire, a sister company of Naylor. According to Mr. Fishwick, the production of the Type S lamp was ceased around 1987. Service for Type S lamps was provided by Mr. Orris Jones up to 1995.

