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Schlumberger

OIL and GAS DIVISION

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ATTACHMENT TO WCR
REPORT ON THE WHITING-1
GLOBAL
WHITING-1
(W807)

Schlumberger

GLOBAL
ESSO
WHITING-1

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REPORT ON THE WHITING-1 GLOBAL

Schlumberger were requested to perform a "GLOBAL" analysis on Whiting-1 after the well was completed.

GLOBAL is Schlumberger's most sophisticated open hole interpretation program currently available and has the following features:-

1. Uses an error model to relate tool responses to petrophysical parameters such as porosity, lithology and fluid saturation.
2. Uses probability concepts to compute a maximum likelihood solution.
3. Provides a quality control curve that indicates how well the answer fits a chosen model and also whether the model is inadequate, or if insufficient information is available to solve the interpretation problem.
4. Uses all available information - as many valid log measurements as there are available, geological constraints and local knowledge.

Local knowledge includes such things as R_w , Swirr, hydrocarbon densities etc.

The usual procedure for GLOBAL interpretations is as follows:-

1. The logs are received and edited by Schlumberger.
2. Environmental corrections are made for FDC, CNL, GR, Dt. etc.
3. R_{wa} is computed using the deep resistivity and the neutron-density cross-plot porosity.
4. The resistivity logs are corrected for invasion using RTGLOBAL.
5. A GLOBAL pass is made and forwarded to the client.

This pass is usually considered the basis for discussion as far as the geological and local knowledge inputs are considered. At this stage a model for the final pass is worked out. Depending on the complexity of the interval being interpreted, it may be necessary to make more than one pass before finalizing the interpretation.

This procedure is outlined in Fig 1.

The two passes received by Esso Sydney to date represent the initial two passes and were sent to generate feedback upon which a final product could be based.

(1) FORMATION SALINITIES, WATER SATURATIONS AND POSOSITIES

- a. The selection of R_w is probably the most critical point in any interpretation. We had no knowledge of variations of R_w between water bearing intervals and oil bearing intervals. The S.P. had been interpreted as suffering from shale baseline shifts and constant R_w was used for oil and water intervals. However, we changed the value of R_w to be in line with your suggestions.

Fig. 2 shows our interpretation of the S.P. baseline and its positive sand deflections. Table 1 shows the R_w values used.

- b. The two initial passes sent to Esso had no corrections to the neutron for excavation effect. This can be seen by the unsatisfactory reconstruction of the neutron log in the gas bearing intervals. (See Fig.3)

After correction for excavation effect the neutron correction is much improved. This lead to a more realistic evaluation of porosity in the gas bearing intervals. (See Fig.4)

Hydrocarbon Type

GLOBAL does not calculate hydrocarbon densities. These values, which depend on local knowledge, have to be zoned and input by the log analyst. The values initially chosen were taken based on the FDC-CNL separations. For the final calculations the remarks in Esso report on this evaluation were used.

Lithology

The initial pass of GLOBAL used a sand-shale-silt model. After discussion with Esso and consultation of the mud log dolomite was included in the model. It was obvious from the large volume of dolomite calculated throughout the entire logged interval that some constraints had to be applied. This was done for the final computation by limiting dolomite to the following intervals.

1635 - 1620
1491 - 1486
1425 - 1419
1318 - 1313

The photo-electric effect curve recorded with the LDT tool is a very powerful aid for complex lithology analysis, especially when gas is present. Unfortunately it could not be used for this evaluation as the curve had been greatly affected by the presence of Barite in the mud.

Conclusions

GLOBAL is a very powerful interpretation program. The quality of the output improves directly in proportion to the consultation between the Oil Company and Schlumberger. The quality of the results also improves as Schlumberger builds its own local knowledge and experience.

This will only be achieved if we are given the opportunity of carrying out further processings for Esso.

We thank Esso for the opportunity of doing this work for them and hope we will be allowed to do further GLOBAL interpretations in the future.

References

GLOBAL, A NEW APPROACH TO COMPUTER
PROCESSED LOG INTERPRETATION - C. MAYER, A. SIBBIT

THE EXCAVATION EFFECT - O. LIU, F. SEGESMAN

TABLE 1

Rw values used:

<u>Depth</u>	<u>Rw</u>	<u>Temp. Deg. C</u>
3000-2650	0.3	121.0
2650-1850	0.16	109.0
1850-1800	0.4	82.3
1800-1724	1.4	80.6
1724-1714	0.11	78.0
1714-1664	1.4	77.7
1664-1653	0.12	76.0
1653-1491	1.5	75.7
1491-1480	0.12	70.2
1480-1250	1.56	69.8

GLOBAL INTERPRETATION FLOWCHART

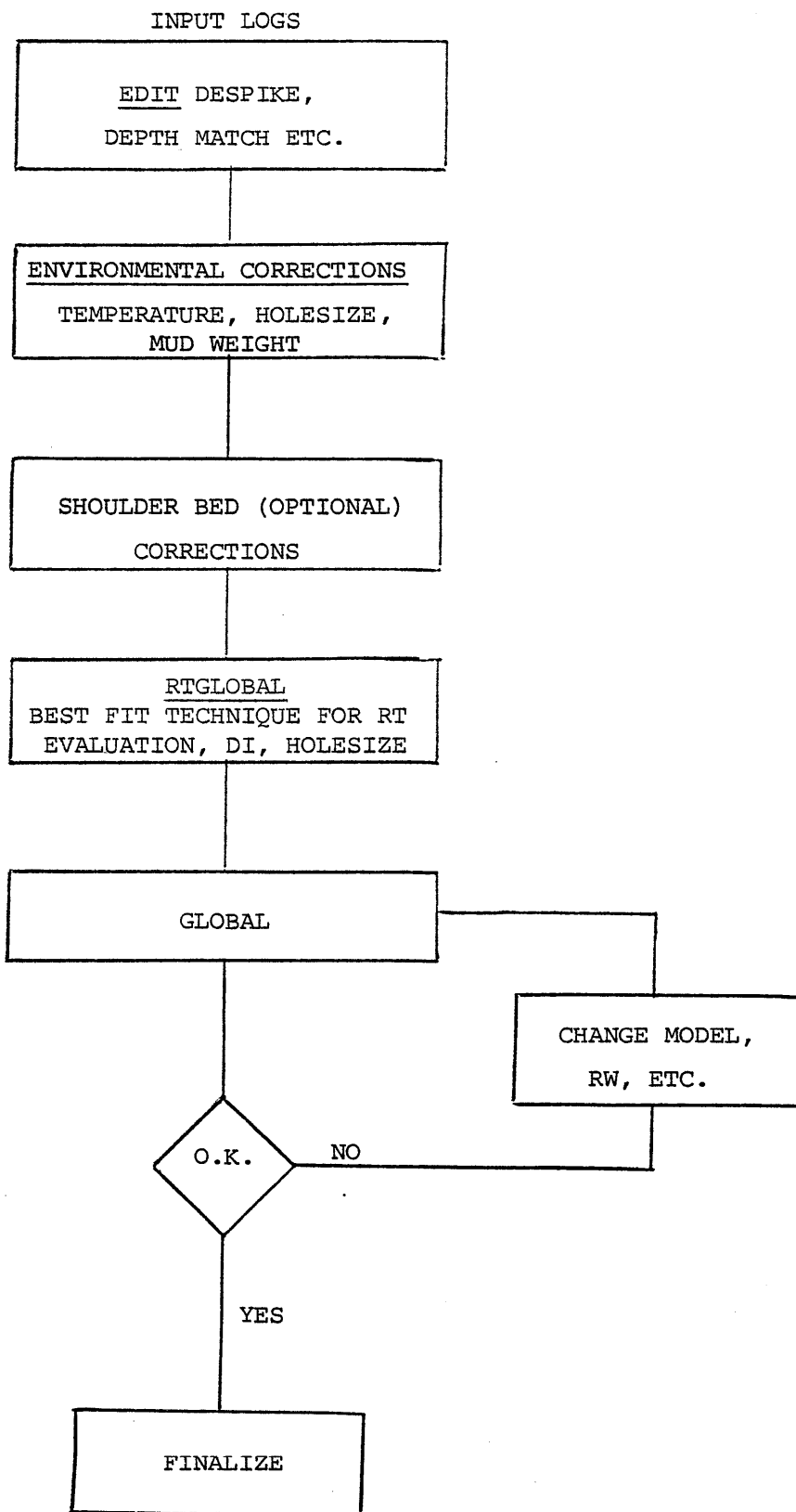
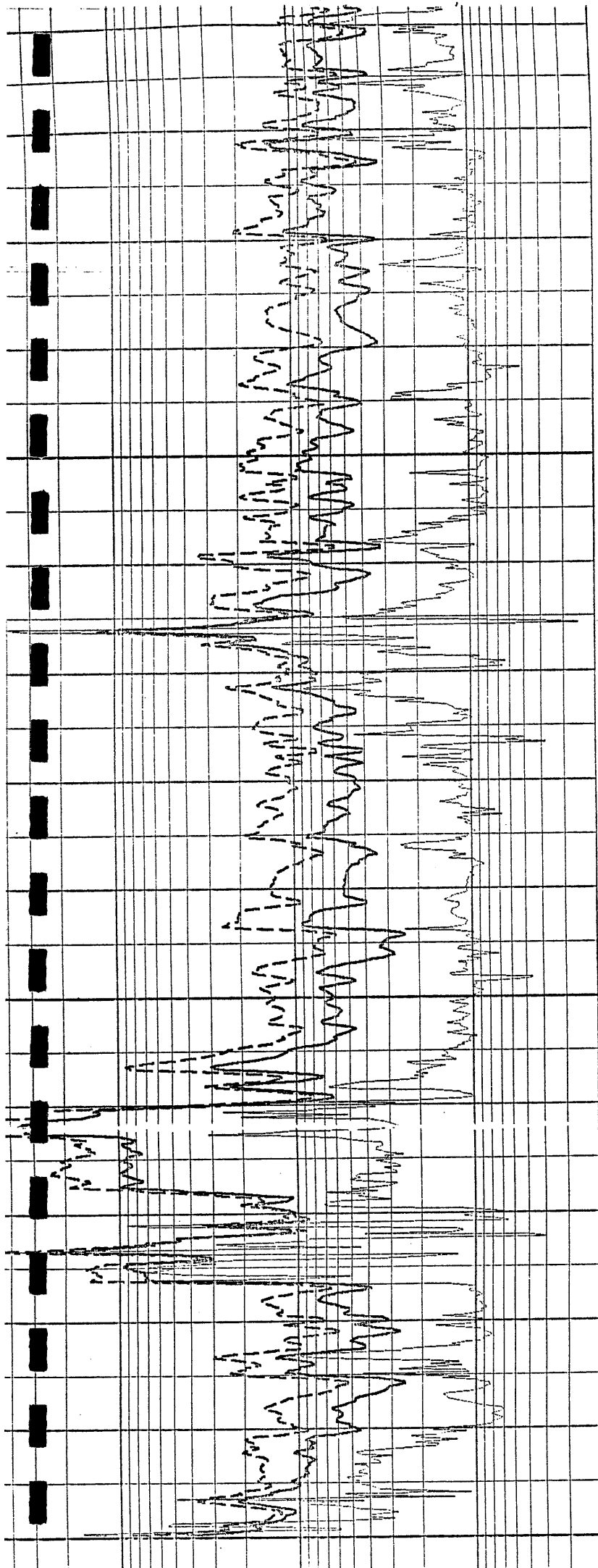


FIG. 1.



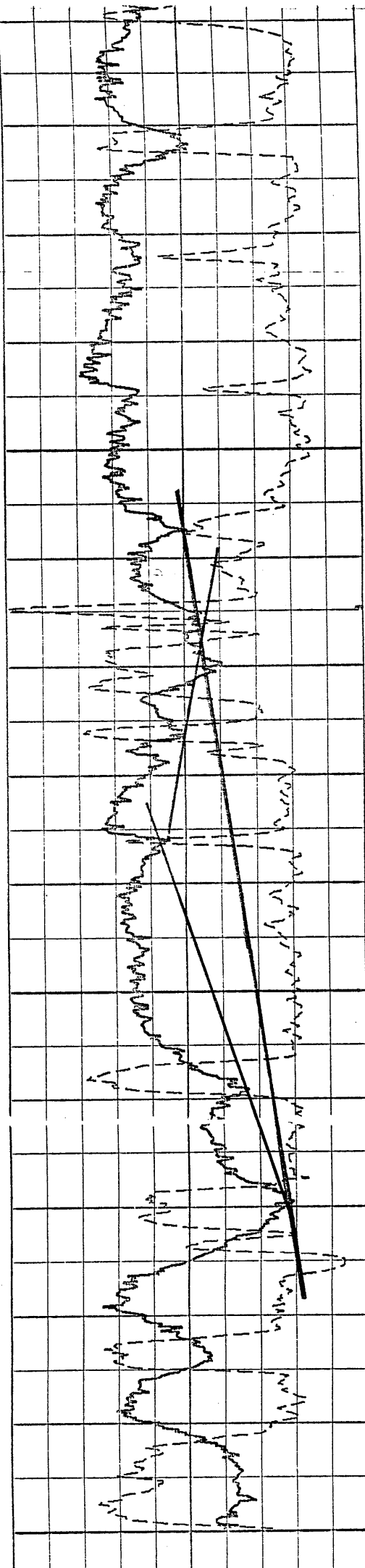
1550

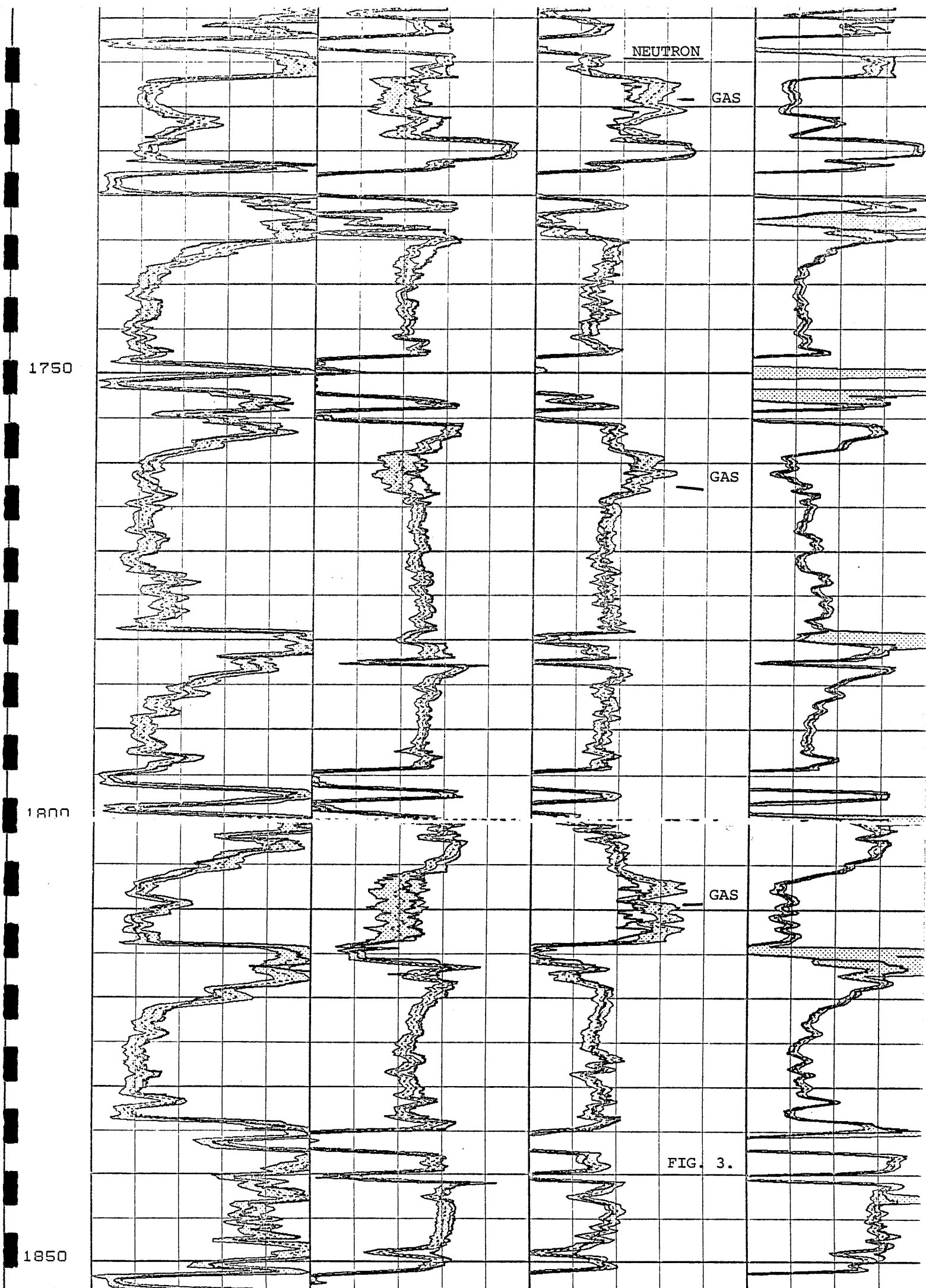
WATER

1500

OIL

FIG. 2.





NEUTRON

GAS

GAS

GAS

1750

1800

1850

FIG. 3.

1700

1750

1800

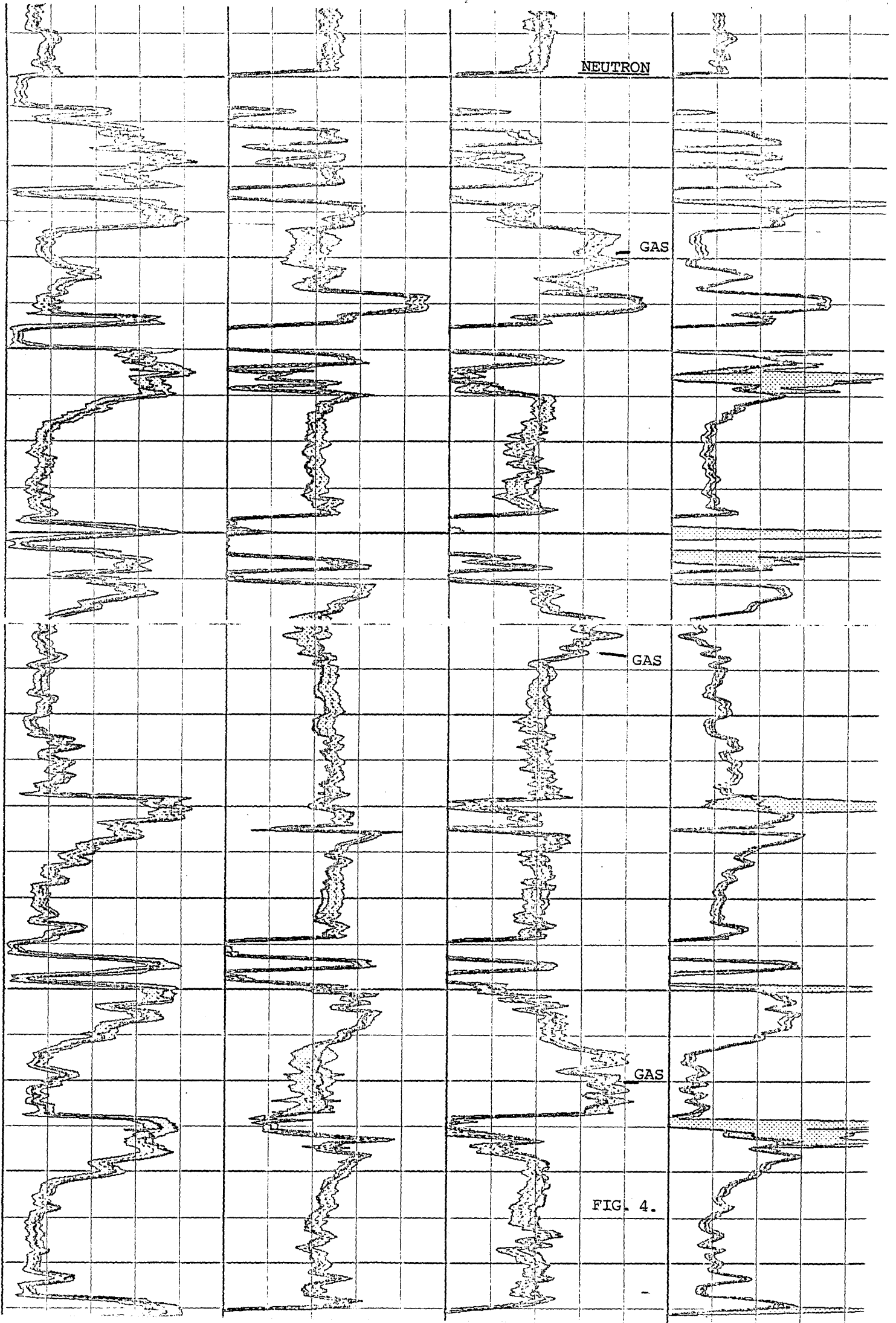


FIG. 4.