

with each other, although it is only fair to say that the same effect would have been obtained if an unlined hole had been drilled through an uncomplicated part of the reservoir.

One of the most telling parts of the argument now published is the calculation which it has been possible to make of the hydrostatic pressure of the petroleum occurring in the successive layers of sandstone. Although it seems that the pressure of the hydrocarbons in the first 2,000 feet or so of the reservoir is that corresponding to an equivalent depth of water, the deeper strata contain hydrocarbons at greater pressure. Moreover, it appears that the lower layers contain larger quantities of gas, which means that the petroleum which they contain is less viscous and less dense than at lesser depths.

Mr McCulloh says that these relationships can account satisfactorily for the sequence of events following the blow-out. The first observation was that a

McCulloh comes to direct criticism, however, is his approving quotation of a statement that in "modern soundly engineered deep drilling" it is necessary accurately to predict the pressures likely to build up in the successive formations of the reservoir as well as the liability of some of these to fracture.

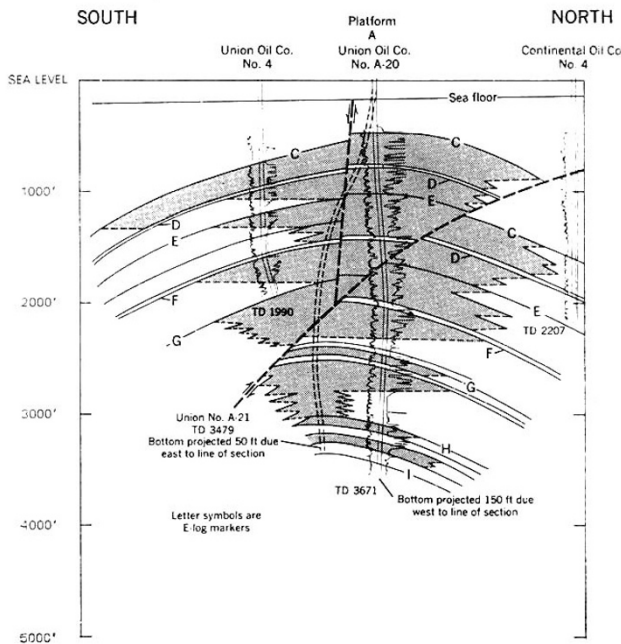
As things have turned out, it seems that the best cure has been more drilling. By now, more than a score of wells have been sunk into the formation, partly in the hope of drawing off enough oil to reduce the pressure and the risk of further seepages.

METEOROLOGY

**Centenary for Weather Bureau**

THE United States Weather Bureau has been celebrating the centenary of its legal foundation on February 9, 1870, with an international conference on meteorology and other appropriate festivities. Although the conference itself may have been a somewhat sleepy occasion, the centenary does seem to have come aptly at a time when the new methods of meteorology are promising to transform the character of the work. This no doubt was a part of the motive for the way in which Dr Robert M. White, the administrator of the Environmental Science Services Administration, welcomed the coming of "big science" to meteorology, but it was clear last week that many of his listeners were still steeped in the old traditions of meteorology—the cataloguing of tornadoes in the prairies and the daring use of high-flying kites as ways of collecting upper atmosphere measurements.

The Weather Bureau began life as the Division of Telegrams and Reports for the Benefit of Commerce. Although the US Army seems to have been the first, in 1812, to persuade its scattered men to keep weather records, the coming of the telegraph allowed Professor Joseph Henry at the Smithsonian Institution to begin collecting observations systematically, chiefly with the help of telegraph operators. The need for a continuing organization was urged both by Henry and by Cleveland Abbe, the director of the Cincinnati Observatory, who began to set up his own system for correlating observations in 1869, after Henry's network had been partly dispersed during the Civil War. Eventually, the argu-



Transverse section through anticline showing position of boreholes and faults (heavy broken line).

"heavy condensate mist" followed the mud blown out of the hole, but that after the drill pipe had been dropped back down the hole, it seemed for a time that the well had been successfully closed off again.

The first signs of trouble were the appearance of turbulent boiling of the sea something like a quarter of a mile from the drilling rig about two hours after the blow-out. Mr McCulloh says that the time lag would have been that required for the surface stratum to be fractured under the pressure of petroleum from the deeper layers of the reservoir, in exactly the way in which it is a part of normal petroleum practice to use large hydrostatic pressures for increasing the permeability of oil-bearing strata and thus the productivity of wells. He also points to the significant way in which drilling fluid was quickly lost from the well while cutting through the upper layers of rock, indicating unusually permeable material. The nearest Mr

GRATITUDE

WELCOMING the United States budget for 1971, Dr William D. McElroy, Director of the National Science Foundation, said: "It is a real pleasure for us that President Nixon, who is so deeply concerned with all of the Nation's problems, has recognized the importance of scientific research and has provided an increase over the amounts appropriated by the Congress last year. The National Science Foundation has, in turn, responded to the President's challenge to help reduce inflation while making progress in the most necessary Federal problems. Our budget will enable us to maintain a vigorous although austere programme of support for basic research and graduate education. . . ."