sands) contain petroleums in the same district and none at all in other districts with the very same sequence of formations, it must be due to some source for the petroleums outside of all these sediments, and to some infiltration, at a period more recent than the youngest productive formation, from a source beneath the oldest.

In all cases, therefore, the anticlinal theory of petroleum accumulations from sources within the sediments themselves fails to explain how the petroleums could possibly enter the porous portions of the sands, and remain there, and not continue their migration to the surface. On the contrary, solfataric petroleum emanations, through the agency of rock disturbances and fissuring, may enter and be retained in a patch of porous sands entirely surrounded by impervious rocks and there separate their component hydrocarbons and associated gases and vapors more or less according to gravity, the gas working its way to the higher parts of the porous sands, the water, if any, remaining in the lower parts, and the oil floating on the water, between it and the gas. In dry sands, such as the deep sands of Pennsylvania and West Virginia, the oil will naturally work down more or less to the lower part of the porous portions impregnated and will often be found in synclines. That part of the anticlinal theory which provides for a certain amount of separation of the water and of the different petroleums once they have reached a porous reservoir, is, of course, true. But even this has been much exaggerated; since the sand reservoirs in the oil and gas fields are very irregularly porous, and far from forming ideal tanks like a bottle or a room. Many impervious streaks or patches of various forms are found in the very heart of their porous portions, and they are seldom continuously porous over large areas. During the periods of disturbance there was also much fissuring and jointing; and, under the strong pressures of the gas always present in the petroleum emanations, these irregular tanks could not be filled up in the theoretical manner mentioned above. Every day, in the drilling of wells this theoretical arrangement of gas first, in the higher portions of the reservoirs, then oil and then water, is entirely reversed. Every day dry holes or oil wells, or salt-water wells are "drilled in" on the top of the anticlines while large gas wells are obtained away down on the slopes or at the bottom of synclines. On the other hand, many anticlines are barren of petroleums, although these anticlines are developed in sedimentary formations where every requisite condition demanded by the anticlinal thory is absolutely fulfilled; namely, fossiliferous strata; porous arched reservoirs; impervious covers; and water in the porous rocks; but where the essential factor is missing, namely, the rock disturbance producing the necessary fissure through which the solfataric hydrocarbon emanations could force their way up to the porous reservoirs.

The structure of many an oil or gas field has no resemblance to an anticlinal structure. A. Beeby Thompson in a paper read before the Institution of Mining and Metallurgy of London, England, in which he reviews the relationship of structure to the occurrence of petroleum, graphically illustrates by many good sections the great diversity of oil and gas field structures and thus plainly demonstrates the reverse of what he advances in the text: namely, that oil and gas fields are generally connected with anticlines and that "an anticlinal structure favors the accumulation of oil" and "played a most important part in the formation of oil fields." Indeed, a number of prolific and prominent oil fields are shown by Mr. Thompson's diagrams to exist in strata presenting structural conditions entirely different from anticlines. Other instances and examples to show that oil and gas fields are found under all sorts of structural conditions have been often furnished by other writers in their studies of the different oil fields of the world, especially of America. It has been found necessary really to transform the anticlinal theory by expanding it into a structural theory including all sorts of other forms. This structural theory was elaborated by F. G. Clapp in his papers in Economic Geology (vol. v, No. 6, Sept., 1910, pp. 503 to 521, and vol. vii, No. 4, June, 1912, pp. 364 to 381). What the author principally proves from his classification of oil and gas fields is really petroleum deposits are not dependent on or controlled by any kind of structure whatever. Such deposits are found, according to this classification: (1) on strong anticlines standing alone; (2) on well-defined alternating anticlines and synclines; (3) on monoclines with change in rate of dip; (4) on structural terraces; (5) on broad geanticlinal folds; (6) on bulged anticlinals; (7) in saline domes; (8) around volcanic rocks; (9) along sealed faults; (10) sealed in by asphaltic deposits; (11) at contact of sedimentary and crystalline rocks; (12) in joint cracks of sedimentary rocks; and (13) in crystalline rocks. To these classes of deposits may be added the following: (14) on gentle slopes or monoclines without any change in the rate of dip, as the Welland field, Ontario, the Madill field in Oklahoma, etc.; (15) in vertical veins cutting across the strata such as the gilsonite veins in Utah, the albertite vein in New Brunswick, Canada, and the grahamite vein near Cairo, West Va.; (16) in quicksilver and other metallic veins; (17) in and along volcanic or igneous dikes; (18) in meteorites; (19) in the volcanic emanations of to-day; and (20) in synclines.

With so many different classes of petroleum deposits, it is clear that the structure in itself is not the controlling factor and that too much weight has been attached to the form of folding of the sediments surrounding the petroleum deposits. In order to make the anticlinal theory fit everywhere unwarranted new names have been given and supernatural properties have been attributed to certain structures (such as "arrested anticlines" and "quaquaversal domes") which in no possible way could of themselves affect the oil or gas accumulations.

Even along the Appalachian oil belt, which is supposed to give many typical examples of anticlinal structures, it is well known that the oil and gas fields are really in the bottom of a deep geo-syncline between the Cincinnati anticline and the Appalachian uplift. These so-called anticlines, on which the oil and gas fields have been developed in that region, are mere wrinkles of small amplitude in the bottom of that deep geo-syncline. The height of each wrinkle is only a few hundred feet at the most, and therefore (if the sands were continuously porous, and the strata in general were as permeable as the anticlinal theory requires to explain the accumulation of the large quantities of petroleums obtained), the oil and the gas would not have stopped on or near the summit of arch of these wrinkles of porous sands, but, if the covers of these sands were impervious, would have traveled along the sands from one arch to the other and gradually up the western or the southern slope of the geo-syncline until reaching the surface at the outcrops of the sands in Ohio, or northern Pennsylvania and New York State. Many differences in pressure have been noted between the gas found on one of the wrinkles and that in the same sand on the adjoining one. The few hundred feet of water in the syncline between these