OIL HUNTING

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The actual finding of oil is perhaps one of the least understood phases of the oil industry. Everywhere one reads of oil gushers, deep wells, and the refining processes, but seldom hears of the geophysicist and the geologist. These men seem to be classed in a separate world and are associated by the majority of people only with lists of long names, intricate formulae, and mathematics. In reality the geophysicist and geologist have become important cogs in the machinery of the oil industry.

One of the first geologists in the United States to make clear the relation of the then little known science to the location of probable oil fields was I. C. White. At that time White was derided by members of his own profession. The fact that the geologist knew little of the problems of the driller and that at first he sniffed at springs and seepages when looking for traces of oil led to his being dubbed "oil smeller," "rock hound," and "wrinkle chaser." In comparatively recent years the oil producer has found that the geologist can save him money; for although he cannot definitely say where to drill for the elusive treasure, he can frequently say where it is not to be found, thereby saving many "dry holes."

The so-called oil "pools" are not actually pools of oil as one might suppose from their name, but are really areas of rock beneath the surface of the earth which are saturated with oil. The three main types of rock that are capable of oil saturation are:

1. Limestone, which is made up mainly of accumulations of shells, coral, and other marine life. Some examples of petroleum found in limestone "pools" can be found in the western part of Texas and Persia.
2. Conglomerates or gravel and boulders consolidated into rock.
3. Sandstones, which are made up of small particles of quartz held together by iron oxide, calcium carbonate, or some other such substance. Sandstone beds hold most of the world's oil.

Since oil has been formed from deposits of decayed animal and vegetable matter converted into petroleum by intense heat and pressure of the earth, oil is found in the sedimentary rocks. Besides the porous stone previously mentioned, a bed of some unporous substance (usually shale) above and below the porous stone is necessary in order to trap the oil. Oil will travel considerable distance through sand unless some fold occurs to stop it. The popular impression is that an anticline or upward arch is the only structure for which the geologist looks in his search for a "trap," but on the contrary this is but one of the many structures which may trap the oil. The following are the most important:

1. *Folds*—The anticlines or upward arches which underlie the larger part of the oil fields of the world; they may be slight dips such as underlie the oil fields of Oklahoma or steep anticlines such as are found in California.

2. *Domes*—There are several kinds of domes but in general they are like large inverted bowls.

a. *Salt Domes*—Salt is crystallized at the juncture of faults and shoves up the rocks over it in the form of a dome.

b. *Structural Domes*—The best examples of this type of dome is found in the Rocky Mountains and consists of nothing more than a simple arching of the earth's crust.

c. *Volcanic Domes* — These domes occur where a piece of granite or other igneous rock has forced its way upward through a sedimentary or porous bed and arched it.

3. *Monoclines*—Structures of this type occur in Ohio, Indiana, and Venezuela. A good example of such a structure is a slightly tipped table top. In this kind of structure oil is found only where some change in angle or direction of dip occurs to trap the fluid.

4. *Unconformities* — Many of the producing fields of Venezuela are due to this type structure which is nothing more than some "wrinkle" in the earth's structure that helps to seal off an oil deposit.

5. *Faults*—These are known as breaks in the strata and their chief value is to trap oil deposits that otherwise would have escaped.

After locating the outcroppings of the various strata and after making sure that the porous stone is surrounded by impervious rock which will hold in any possible oil, the geologist proceeds to determine the size and shape of the structure. The topography of the surface may give him the whole story and then again it may tell him nothing. For often our hills and valleys were created by glaciers which wore down the soft material and left the harder substances, all of which has no relation at all to the inclination of underground strata.

By studying the angle and direction of inclination of the various out-cropping strata the geologist may gain some idea as to how they extend underground. By measuring the distance between outcroppings of the same strata, and the angle and direction of inclination and combining this with other data he may gain an even better idea of the structure that lies under his feet.

WHERE TO DRILL?

After the structure has been approximated only one more question remains to be answered—where to drill? When an area extends over several square miles, how does the geologist know how to recommend drilling in one particular spot rather than one fifty or sixty feet away? The answer is that he does not but he does know that most oil sand also contains a certain amount of water and gas. The water, being heavier, sinks to the bottom and the gas which is lighter rises to the top leaving the oil in the middle. After having mapped out his structure and finding it favorable enough to drill a test well, the geologist can only pick out the highest point of the structure from his map and advise to drill there. If the well hap-

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pens to hit the gas he recommends that the drilling be done further down the structure. If, on the other hand, water is struck the drilling is carried further up on the structure.

After all, the success of a geologist in this field depends largely on luck, for he may advise the drilling of many test wells and map hundreds of structures and never find a single producer. In fact if one out of every twenty-five fields recommended is a producing field he is considered as having done well; and if three out of every ten wells that he advises on that particular field are "producers" it is a fine average.

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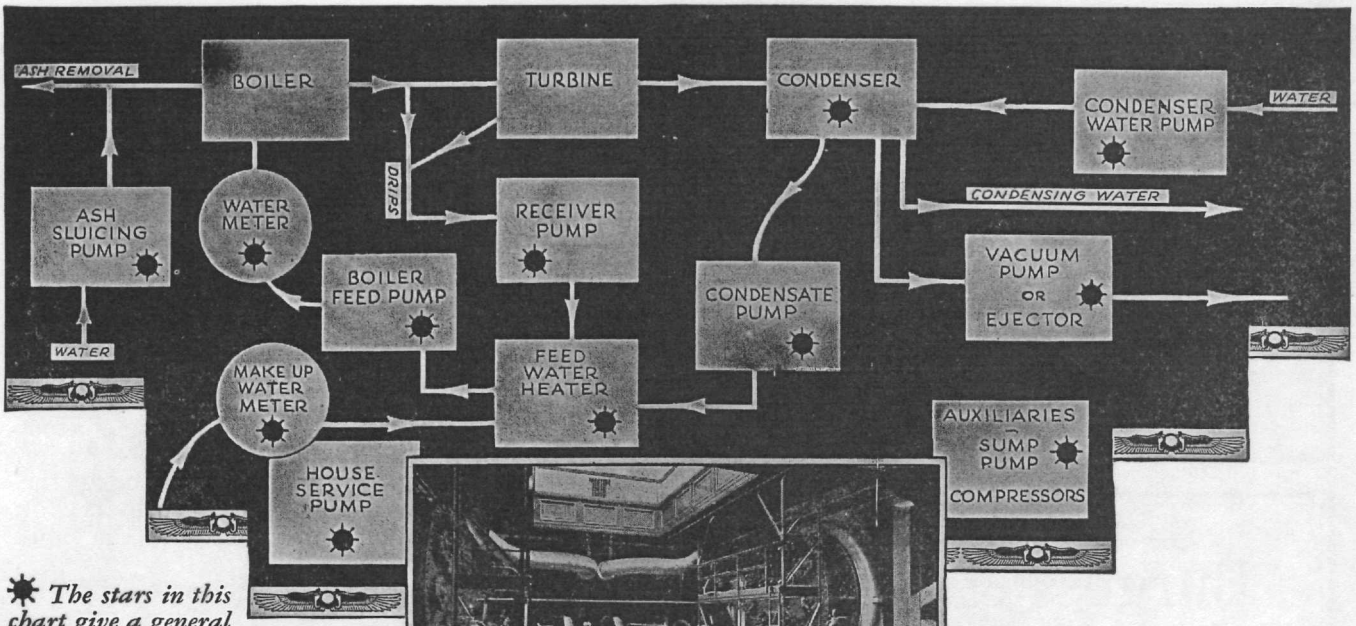

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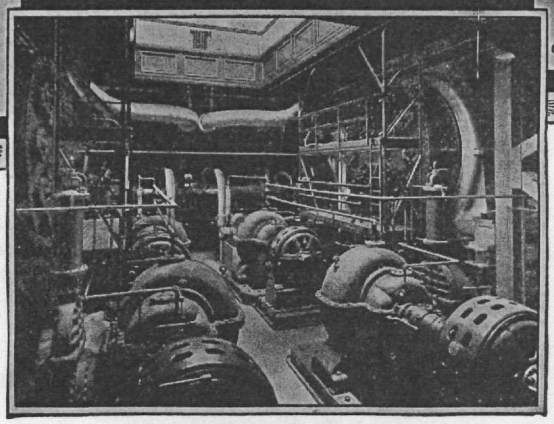

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