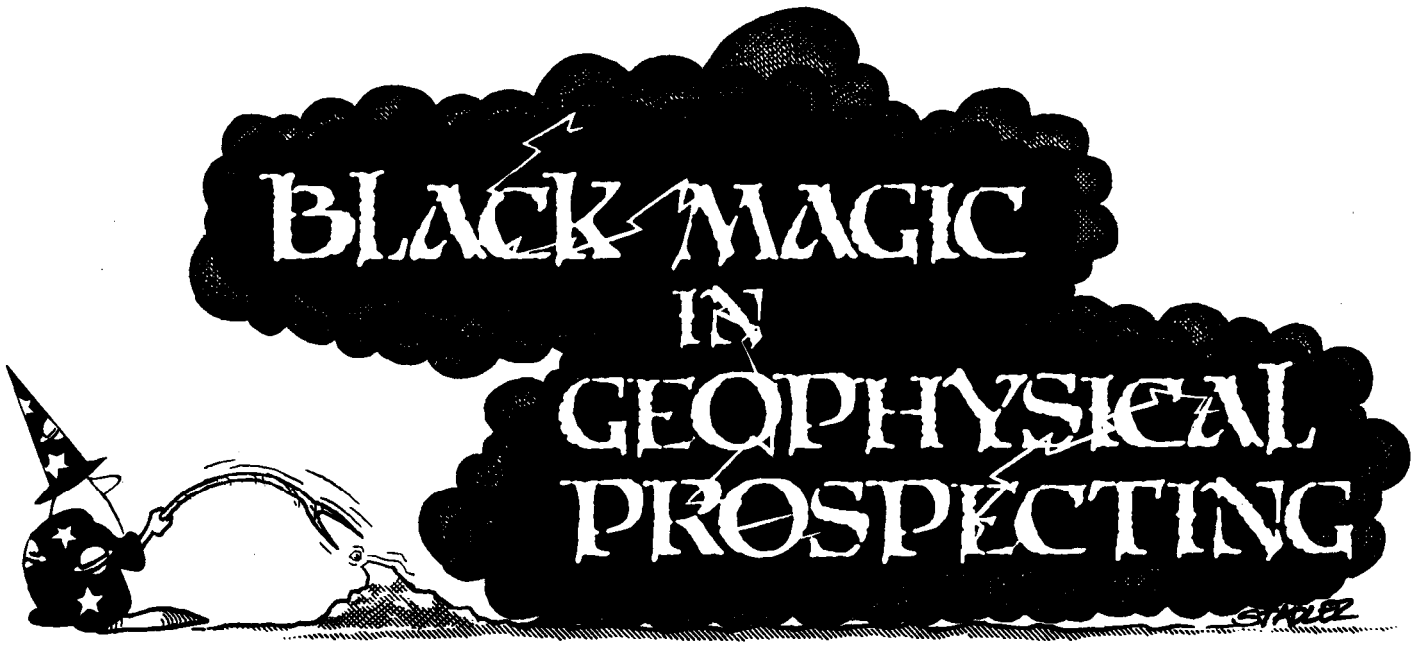


*(*The Leading Edge *Editor's Note: The following article appeared in the premier issue of* Geophysics, *Vol. 1, No. 1, January 1936. F. M. Kannenstine was the editor. The author, Dr. Ludwig W. Blau, was in the geophysics department of Humble Oil & Refining [Exxon]. The article's tone, after 47 years, is as interestingly seriocomic as it was then.)*

1936 Geophysics *Editor's Note: The term "doodle-bug" is coming more and more to mean proposed methods of geophysical prospecting that are neither based upon scientific fact nor upon known or proven properties of oil, minerals and geologic formations. The geophysicist is often consulted concerning the reliability of such a proposed method, and his task then is to explain scientifically just why the proposed method fails and is unsuitable for the intended purpose.*

Because such an explanation may often require a time consuming investigation, the geophysicist may be forced to spend more time on such an investigation than is justified. It is important then that as many as possible of these "new" methods be presented to the membership in order to prevent duplication of these investigations.

Dr. Blau's paper, "Black Magic in Geophysical Prospecting," initiates this department, and it is hoped that the seriousness of the subject will be kept in mind while the reader enjoys the humor in Dr. Blau's paper. Additional papers on doodle-bugs are earnestly requested and the membership is urged to send in a description of any new doodle-bug that is brought to their attention, together with the details of their investigation and the conclusions.

By L. W. BLAU

The rapid growth of the oil industry, and the high profits derived by the more fortunate land and royalty owners from the oil which is so often found by drilling on hitherto relatively worthless land, have so preyed on the imagination of some would-be inventors and miracle men, that hardly a month passes without news of the invention of a purportedly reliable oil finder. Fantastic claims are usually made for these devices and methods; thus, it is claimed to be possible to predict the gravity, quantity of oil, thickness of the oil sand or sands and their depths, as well as the presence and quantity of such useful minerals as salt, sulphur, and potash. It is supposed that in other parts of the country, the same devices would be equally useful in prospecting for gold, silver and other metals.

It is characteristic of these inventors that they stress emphatically the fact that they have never studied any exact science. The assumption seems to be that all the really great inventions are made by people who know nothing about the subject and that training in the exact sciences tends to build up complexes as well as beliefs that certain things can not be done; it is the function of these relatively innocent and untrained inventors to make those inventions which the scientists refuse to tackle.

Another great talking point is that they have worked on the invention for many years, rarely fewer than ten and often seventeen to twenty, the number depending somewhat on the age of the inventor. A third point which is generally emphasized is that the invention has been submitted to great university scientists who were, however, unable to understand it. This inability to comprehend is undoubtedly due to the complexes mentioned above. These scientists are in the majority of cases alleged to be personal friends of the inventors and Nobel Laureates would probably be painfully surprised and astonished if they realized how many inventor-friends they have.

It is further characteristic of the devices that, whatever quantity may be read, the reading is generally high on oil or gas fields. In the case of devices which indicate direction, there is nearly always something which points toward the oil field. The assumption seems to be that a device giving a reading of 10 on an oil field and 200 off the field would be harder to sell than one giving a high reading on the field; by the same reasoning an apparatus pointing away from an oil deposit would not be desirable.

There are, roughly, five different principles which seem to be most useful in the design of oil finders. First, oil, gas, sulphur, even lime and granite, emit corpuscular radiations which can be observed by means of instruments at the surface of the earth. Second, the minerals which it is desired to find radiate vibrations which react upon the observer and enable him to locate them. Third,

substances do not attract according to Newton's law, that is the force of attraction is not proportional to the product of the masses and inversely to the square of the distance; the force of attraction is alleged to vary with the chemical constitution of the substances and there appear to be grave doubts also, to the effect that the exponent in the denominator is much, very much indeed, too large.

Fourth, oil and gas send out electro-magnetic waves which can be received with a sufficiently sensitive and properly tuned radio receiver. Fifth, organic substances exhibit sexual characteristics; sex, being one of the stronger emotions, can therefore be very profitably exploited in oil prospecting if the proper technique is employed.

One of the processes based upon corpuscular radiations comprised a specially sensitized photographic plate contained in a plate holder which was impervious to the radiations from the oil or gas. When one considers that the plate was alleged to be sensitive to radiations from deposits at a depth of 10,000 feet, it becomes evident that the plate holder must have been made of formidable stuff if it prevented exposure from shallow depths.

To find oil, it was necessary to take the plate from the holder, to face north, to turn the plate from an upright to a horizontal position and back to the upright, to reinsert it in the plate holder, between 12:00 and 2:00 o'clock in the daytime, and in the "light" of the moon. Four plates were furnished for a trial; these were to be exposed as directed and returned to the inventor for development and analysis. Although he had one chance in sixteen of guessing all four plates correctly, he made a poor showing.

Another instrument which worked on the same principle consisted of a small box which had a dial and pointer on the front side and several buttons on the back. To take a reading, it was necessary to push one of the buttons; this rotated the pointer into a vertical position. If radiations from oil reached the instrument, the pointer remained in the vertical position or dropped only slightly due to the upward force of the radiations, but when no oil was present the pointer dropped to the horizontal without further ado.

Only the inventor could operate the device. The most attractive feature of the instrument from a prospective operator's viewpoint was that it could be operated only from 11:00 o'clock in the morning until 2:00 o'clock in the afternoon in the vicinity of Houston.

An ordinary electroscope fitted with a specially designed indicator of the rate of discharge has been found to be sensitive to corpuscular radiations from oil; such an instrument could also be employed, so it is claimed, in medical diagnosis and was exceptionally useful in the determination of pregnancy. This device operated during all daylight hours, but could not be used at night; it was not quite as reliable on cloudy, rainy days as we learned after we had had it demonstrated in rainy weather.

The most versatile radiation-sensitive device consisted of a black rubber rod about six inches long on which was mounted a ball bearing; a brass rod carrying an adjustable weight on one end and a removable capsule about 2 inches long and one-fourth inch in diameter at the other end was fastened to the ball bearing and at right angles to the rubber handle. When the handle was held in a vertical position the brass rod could rotate in a horizontal plane. The radiations from the oil were said to issue from the ground in helical paths thus causing the rotation of the movable system. The speed of rotation was indicative of the gravity of the oil and also, in some rather involved manner, of the depth.

When looking for other minerals, it was necessary to remove the oil capsule and substitute it for one which would respond to the particular mineral. For really accurate work, there were additional oil capsules which could be used to determine fine differences in the gravity of oil. It was exceedingly interesting and gratifying to see the device start rotating on approaching a producing well. Needless to say, only the inventor could hold it, and it was necessary for him to be in motion to receive an indication, either walking or riding in an automobile.

A few times, when we "chanced" rather suddenly upon a producer hidden in the timber, we observed violent rotations while a salt water capsule was being used, but who can say that there was no salt water below the oil? In every instance the device indicated oil after an oil capsule was inserted. The device was further demonstrated on an oil tank farm. It gave a rapid rotation on a tank containing 50 feet of East Texas oil and the same speed rotation on a tank containing 10 feet of Conroe crude which had originally been supposed to be full.

The explanation was that the gravity of the oil was responsible. In order to test this explanation further the inventor was asked to try a tank of Sugarland oil; he did not know that the tank was empty at the time. The device rotated faster than ever, supposedly due to the gravity of the Sugarland oil which should have been in the tank.

One of the most interesting inventors of an alleged radiation-sensitive device appeared on the scene very recently. He claimed that he could find salt or oil, that he had "shot" 187 locations, and that in each case he had been right. When questioned about the radiations which he claimed were sent out by salt, he quoted physicists from three great American universities to the effect that "salt is more radioactive than radium itself." The wavelength of the vibrations emanating from salt was alleged to be 0.00005 cm., and he had a book to prove this point. He had found that a lead shield absorbed the radiations and nothing else did. His device enabled him to tune to the vibrations and was the result of ten years' continuous research.

The case is the best demonstration of the truth of the statement, "a little knowledge is a dangerous thing." The inventor had read of artificial radioactivity, discovered by M. and Mme. Joliet; they discovered that *sodium* can be made radioactive by bombarding it with highspeed electrons. The book gave the wavelengths of the *sodium* lines in the spectrum as 0.00005770 and 0.00005791 cm., respectively. Cosmic-ray investigators

use lead shields. The only difference, in the eyes of this inventor, between sodium and salt is a little chlorine; hence salt, sodium chloride, sends out radiations of the same wavelengths as sodium and all he needed was a device for tuning to them.

The most prominent example of an instrument which permits vibrations from buried substances to react upon an observer is the divining rod. Since books have been written upon the subject, it will suffice to mention here that divining rods have indicated oil near an abandoned hole which was drilled into salt water on the north edge of the Conroe field and a salt dome between two producers of the field.

Along the same line, it has been found possible to do geophysical prospecting from maps on which the north direction is indicated, without going on the ground. It is not even necessary for the person so beautifully endowed to be in the same country. Thus one can do prospecting in China without leaving his office in Houston, if only a map of the area in question can be procured. The mechanism of the process is not well understood. To one lacking imagination the description sounds fantastic, but we have the inventor's word of honor that the method works and that he has been able to locate every known oil field of which he ever had a map.

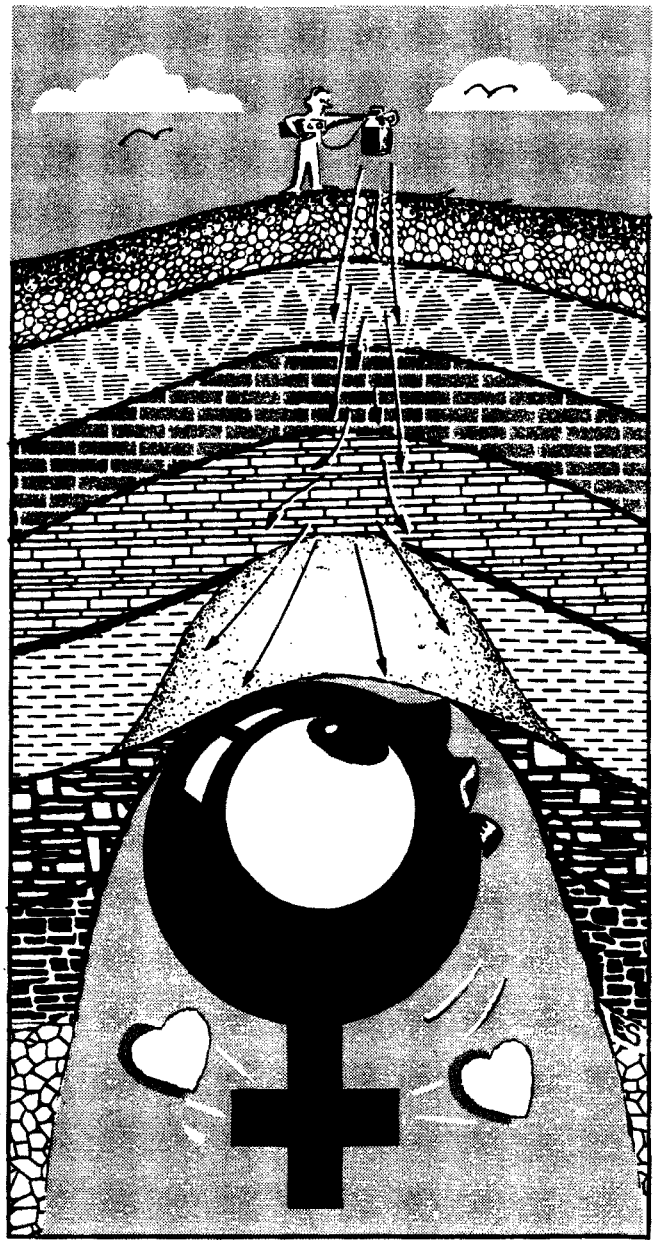
The idea that Newton's Law of Universal Gravitation does not hold has appeared in scientific literature; the subject was investigated by Eötvös and H. A. Wilson who found that the law holds to the limit of accuracy of their experiments, or to about one part in two million.

Having convinced himself that oil attracts oil with greater force than anything else, one inventor provided himself with a small vial containing the "bait" oil; this he mounted at the end of a long slender rod the other end of which was provided with a beautifully engraved and chromium plated handle. Holding the instrument vertically with both hands on the handle, it was found that the "baited," swinging end came to rest in the direction of the greater oil fields; thus it was possible to point out Conroe, East Texas, Sugarland, among others, from a room in a Houston hotel.

When the "bait" was changed to whiskey, the device in the hands of the inventor stubbornly pointed to a leather bag lying on the bed; the inventor asked his friend how this could possibly be explained since they had finished the last bottle that morning and he had not bought more. Upon opening the bag a pint bottle was revealed and the friend admitted having bought it that afternoon without telling the inventor about it. Thus it was proved that the device was not manipulated or influenced by the operator.

Another ingenious device operating on the same principle was made by pouring a few drops of oil into a little vial which was sealed and immersed in a bottle of transparent liquid. The bottle was then corked. When the inventor approached a can of oil standing on the ground the vial was seen to descend in the liquid; on backing away from the oil can, the vial rose in the liquid to its former position. One could hardly refrain from asking permission to make personal tests, but the inventor declined, because the instrument would work only for him and for nobody else. It was different in this respect, and perhaps in this respect only, from the ordinary Cartesian diver.

Two companion inventors discovered that if a bottle of oil was fastened to the end of a green sapling about six feet long and the other end held against the abdomen



of one of them a distant oil field exerted a perceptible force on the bottle, pulling it in the direction of the field. The operator could then exert a force in the other direction, pulling the bottle back toward himself, after which the force from the field again became operative.

An oscillation was thus built up and maintained, and the inventors had learned that each field had its own and characteristic period of oscillation. The periods had been determined for a large number of Gulf Coast fields. There was good reason for believing that these men were sincere and that they had done all this tedious work.

A Louisiana inventor built an instrument for sulphur finding. Delicately poised weights of sulphur were observed by means of an optical system; when everything was balanced one could read the direction of the sulphur deposit on a divided circle, the distance on a dial, and the depth could be calculated. The range of the device was 150 miles; the inventor was thus able to work approximately 70,000 square miles without leaving his office. An instrument for finding oil is now being developed against the time when all the sulphur shall have been discovered.

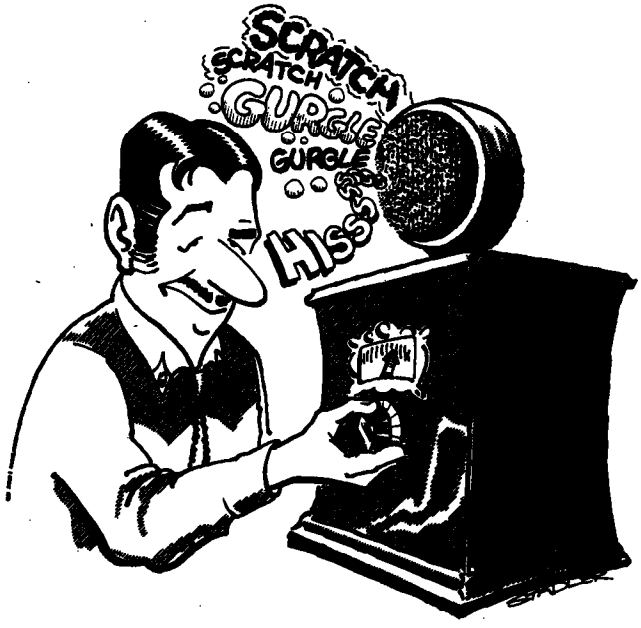
If Newton's law does not hold, it is a mistake to use torsion balances with gold weights. Salt masses ought to be used for finding salt domes; after these have been located it will be necessary to substitute sulphur masses to locate the sulphur deposits. The development work on this new type of torsion balance has been done in Europe; at the present time, attempts are being made to extend the principle to oil finding, but it has been reliably reported that no usable container for oil has as yet been found. It seems that all solids thus far tried for containers cancel the force of attraction between the oil in situ and the oil sample in the bottle. It is apparent that this device will be extremely valuable if the difficulties can be overcome.

Claims are made that very short radio waves penetrate through great depths of ground and are copiously reflected from oil and gas sands. No definite information about the wavelengths used seems to be available, but they are alleged to be very short.

Two inventors appeared with a box on which was mounted a glass tube containing a red liquid similar to the fuel gauge on automobiles. A pair of aluminum chains was attached to each of two opposite sides of the box; one pair of chains had a conical aluminum cup fastened to the end of each chain while brass rods were attached to the ends of the other chains. One of the inventors took a cup in each hand, while the other held the rods and pushed against the cups with a rod inserted in each cup. The deeper the oil, the more the men had to push against each other; it was explained that the intensity of the electromagnetic waves sent out by the little box depended upon the force exerted between the brass rods and the aluminum cups.

When the waves reached the oil or gas sand, the red liquid began to rise; the height to which it rose depended upon the thickness of the oil sand, and gas sands had been found to give a smaller effect than oil sands. The men estimated the depth of the sand from the force which they had exerted; it is remarkable that they were thus able to give depths to a few feet in several thousand.

A better device was built by a young man who discovered that the short electromagnetic waves emanating from oil and gas sands could be caused to modulate the wave of a radio transmitter; the modulated wave actuated a loud speaker. It was the thrill of a lifetime to drive to an oil field with everybody quiet, hardly able to bear the suspense, and not a sound coming from the loud speaker. Upon reaching the first producer, a faint scratching could be heard which was soon followed by a gurgling sound, caused, so said the inventor, by the flowing of the oil in the pool. Upon driving toward the middle of the field the gurgling became more distinct, then fainter, and ceased altogether on top of the field; soon, however, a hissing noise was heard which was due to the gas in the gas cap! The device was perfect; there was no chance for misinterpretations, because no other substances gurgled or hissed. Salt water gave no sound whatever. Also, the waves emerged vertically, so that one could be sure that the oil was directly below the instrument when the gurgling was heard.



What seemed like a similar device, perhaps utilizing the same principle, was offered for sale by two foreigners. They connected their radio receiver to a telephone bell; when the receiver was vertically above the oil the bell rang and kept on ringing until the field had been crossed. This scheme is inferior to the previous one because it does not permit of differentiation between oil and gas.

Another inventor used a short-wave transmitter and a wire, about 100 feet long, which was laid on the ground as an antenna. He stated that he had difficulty in Oklahoma at times, because the rocks were too hard and dry; in the Gulf Coast there was no trouble on account of the soft and water-logged sediments. There were three dials on the little beautifully finished box; one indicated resistance, the next capacity, and the third, the B-battery voltage. The dials were adjusted until a standing wave was set up between the transmitter and the oil sand. The three readings of the resistance, capacity and voltage were then multiplied to give the depth of the sand in feet.

It is not known how a certain investigator discovered that oil exhibits female characteristics; be that as it may, he alleged that oil was essentially female. Having made this startling discovery he began a search for a male substance, preferably a liquid, which could be used in finding oil. After many years of painstaking investigation, he found such a liquid; he had a jug of it, filled to the stopper. The presence of oil was shown by the response of a suitably connected indicator. LE