SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO., - - Editors and Proprietors

Published Weekly at

No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845).....$3.00 a year
Scientific American Supplement (Established 1876)..... 5.00 "
Scientific American Building Monthly (Established 1885)..... 2.50 "
Scientific American Export Edition (Established 1878)..... 3.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.

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MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, JUNE 18, 1904.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

MILITARY AND STRATEGICAL VALUE OF OIL FUEL.

It is for very weighty reasons that the United States navy has been engaged in a most searching investigation of the question of oil fuel for the navy. Although it is true that the whole industrial world will be benefited by the voluminous data of the most reliable character that will be available, it was, primarily, to learn the exact value to the navy as regards the efficiency of its ships, both individually, considered as fighting units, and collectively, in respect of their strategical efficiency in relation to the fleets and fortifications of friend and foe, that this investigation was begun some two years ago.

The superior advantages of oil fuel over coal as affecting the design of warships and their subsequent handling are well known. In the first place, oil, because of its superior heating qualities, weighs less and occupies less bulk, compared on a basis of total thermal value, than coal. Therefore, the difference in weight and bulk in a ship designed to use oil fuel represents so much weight that may be worked into that ship to improve her qualities, either by building her stronger in the hull, or by making a proportionate increase in the weight of her armor or in the number of her guns, or by providing her with a larger fuel supply.

Oil fuel has, moreover, the valuable quality that it can be stowed in the water-tight compartments of the double bottom of the ship, thereby permitting the very considerable space which is taken up by coal bunkers to be utilized by the naval constructor for other purposes, if he so desires. The effect of the substitution of oil fuel on the personnel of the ship would be to make a great reduction in the fire-room staff, the crowd of stokers being replaced by a few men with some slight engineering knowledge, who would be easily able to look after all the necessary pipe connections and burners for carrying the oil to the boilers and properly burning it in the furnaces. Furthermore, much of the delay, and all of the dirt and inconveniences, which make the work of coaling a ship the *bête noir* of the naval man, would be removed; since the oil could be piped by gravity from the tanks of the fuel supply station, or pumped from the fuel supply ship, directly into the tanks of the warship. Finally, there is the welcome riddance of ashes, with their necessary installment of ash hoists and chutes, to say nothing of the labor involved in their removal.

The question of the extensive use of oil fuel in the navy has a special strategical importance for the United States, and this for the reason that we are next to the largest, if not the largest, producers of oil fuel in the world. Comparing our position with regard to this question with that of other great naval powers, it may truly be said the oil fuel question is paramount, no other leading naval power being able to tap its supply of oil directly from so many widely-scattered centers. Thus, the great oil fields of Louisiana and Texas lie within pipe-line distance of the Gulf of Mexico, the value of the naval control of which by the United States is universally admitted, particularly with reference to its relation to the Panama Canal. The oil fields of Pennsylvania are connected by pipe line with the three great ports of Baltimore, Philadelphia, and New York, thereby serving the ships of the North Atlantic station at three different points; while on the Pacific coast, the port of San Francisco is similarly connected with the oil fields of California; and, from this last source, it would be possible to keep supplied the storage tanks of fuel stations at three widely distributed points, namely, the Hawaiian Islands, the Philippines, and the Aleutian Islands. Of course, it must be recognized that the storage of fuel at various stations answering to coaling stations would require special provisions as compared with the storage of coal, since the oil must necessarily be placed beyond the reach of shell-fire from a hostile fleet. To this, however, oil fuel would lend itself admirably, since the tanks could be placed inland, beyond the range of hostile fire, and the oil piped from these tanks to the docks. A further valuable advantage of the use of oil would be that the most important problem of coaling at sea would be simplified; since it would be sufficient to connect the tanks of the fuel supply ship by flexible hose with the fuel tanks of the warship, and pipe the oil from one to the other while the supply ship was in tow.

SURFACE INDICATIONS OF OIL.

The discovery of new oil fields in Kentucky, and the bringing in of gushers from time to time in fields hitherto unsuspected of being oil-bearing, has served to create great excitement in a part of the public mind. Prospectors study the trend of the land, and owners of real estate easily become convinced that their holdings will produce oil in vast quantities, if only some company could be persuaded to drill. It is a fact that large oil producers do not prospect; they leave that dangerous business to the professional "wildcatter," and when he has located a new, rich territory, they buy him out.

The greater part of the facts with which geologists have to deal possess for the general public a recondite character. They concern things which are not within the limits of familiar experience, and are usually treated in such a manner as to befuddle the understanding of the unschooled in geological lore. Perhaps no question pertaining to geology has been so earnestly and so often asked as, "What are the signs that reveal the presence of oil?" But the Sphinx of geology remains silent, notwithstanding wealth beyond the dreams of avarice waits upon him who, judging from surface indications, might infallibly point out the presence of oil beneath. So eager are men to have the question answered, that they strain the facts that are well known to exist, and persuade themselves that they have discovered the secret sign which nature has set upon her treasure house. When this thirst for wealth takes hold of one, nothing will quench its fire but actual experiment.

It may be generally said upon the highest authority, and in the light of experience in every oil field in the world, that surface indications cannot be relied upon to reveal the presence of petroleum in the underlying strata. It would seem that nothing has been more positively and definitely settled than this; and yet with the spread of discoveries of new fields, also spreads the belief that such and such localities are situated over inexhaustible quantities of the fluid. Every day brings confirmation of this.

Now, in countless neighborhoods, and practically in every State in the Union, there are "signs" of oil that incite the finder to extravagant statements and rouse his wildest hopes. The spring that trickles from the rocks bears upon its clear water little globules of oil, apparently brought from the depths of the earth; the stagnant pond nestling among the little hills has an oily cast, and a smell of oil pervades the air about the place. These signs are taken to mean that there is an immense reservoir of oil, so full that it is fairly bursting, and some of the overflow has appeared upon the surface. No heed is given to the fact that in order to reach the surface those few drops of oil would have penetrated hundreds of feet of rock and shale which overtop the oil-bearing strata in every field and form an impervious cover to prevent the escape of oil. Those surface indications mentioned are common manifestations. They indicate the presence of decaying or decayed vegetable or animal matter in the depths from which they spring. A rotting carcass in the pond will create a gas, and ultimately globules of oil will float to the surface. In the absence of animal matter, then, the appearance of the oil signs may be accounted for by rotting vegetable matter, which has accumulated year after year, until the chemical change has been effected, and oil appears where once was vegetable life. In the case of the spring bursting from the depths of the earth bearing particles of oil upon its surface, it must be admitted that there are some very creditable and learned geologists and oil experts who insist that it is a "sign" of oil in immense quantities. It cannot be taken as an infallible sign, however, nor should any importance be given it at all. As has been said, though, so eager are persons to discover a deposit of oil in their land, that even slight indications produce a very great hope and incite to wildest speculation. The spring water in percolating through the rocks has come in contact with a slight deposit of decayed vegetable matter, which it has caught up and carried to the surface of the earth. Geologists' theories in some instances controvert this statement, and credit the presence of oil on the water of a spring to the fact, which is claimed to be self-evident, of the uprising of oil particles from a reservoir below. It seems altogether probable that the oil found in the rocks at various depths is of widely different ages, according to the location in which it is found. That which is observed to rise above the surface on the streams of springs may be but comparatively a few years old, while that found in the stratum underlying the shale and rock certainly is centuries old. There are Cambrian, Ordovician, Silurian, Devonian, Carboniferous, Triassic, Jurassic, Cretaceous, and Tertiary petroleums. Each of these varieties is found in a geological structure which is unlike any of the others in points of age and formation. Hence the position seems well taken that the surface oil appearing on streams of water may be of comparatively recent creation. The best authorities agree that the oil found in the reservoirs underlying the overtopping and impervious shales is not being added to, that its volume remains stationary, and when it is exhausted there will be no source from which the supply can be renewed.

The facts of geology seem to show, too, that it is exceedingly improbable that oil has been transferred in a large way from one formation to another in the geologic column. That there has been some transfer of oil in the rocks is beyond question. It is associated with water, and gravitation will always raise it to the highest point in the stratum in which it happens to be. As in the case of the spring, the water in rising to the surface caught up the particles of oil, and conducted them to the exit in its formation. Doubtless, or at least very probably, the oil had appeared in the stratum which contained the water from a substratum, from which it had escaped through some crack or orifice, and assisted thereto by a mounting stream of water or shale gas, which latter is to be found in almost every crack and crevice of stratified rock of a porous nature. If the reservoir in which the modicum of oil was contained were fractured at the summit of an arch, the oil, which is very mobile, will follow the lines of escape to the surface, and, as a matter of course, diffuse itself through any porous beds of stone or shale which the fracture crosses. With these escapes of oil we are very familiar. We call them surface indications, and some geologists aver that they may lead to the storehouse from which they escaped. This has never been proved, so far as known, and it is extremely doubtful if its truth can be demonstrated; for it would be a devious course to follow the track of a particle of oil through cracks in the rock so fine as to be all but imperceptible. A porous rock is often found stored with petroleum or its by-products, evidently derived from a stratum or bed directly underlying it. The most common form of such occurrence is a sandstone overlying a carbonaceous shale.

When such a series rises to the surface, the porous rock is often charged with maltha, resulting from the oxidation of the original petroleum. If this sandstone is used for building purposes, the tar is often seen exuding from it, even for a term of years. Tar-springs, so called, have a like origin, the escaping water of the porous rock carrying out some of the inspissated petroleum.

So much for the actual and visible presence of oil on the surface in relation to its value as an indication of the stored reservoirs of the fluid below. The usual forms of surface indications are as described, but there are others said to be vastly superior to the foregoing. To repeat the reported experience of Capt. Lucas, who discovered the great Beaumont, Texas, field, will sufficiently describe these "superior" indications. Capt. Lucas is said to have followed the surface indications from Louisiana to Beaumont. This was done with full knowledge that when the signs appeared for which he was looking, oil would be discovered in exhaustless quantities. The probability is that this story is not correctly stated. He is said to have followed the synclines, monoclines, and anticlines from Louisiana to Beaumont, in spite of the fact that those structures are far below the surface of the earth, the contour of which has never been known to have been revealed, or indicated, or suggested by the outlines of the earth's surface.

To repeat what has so often been said, if research in oil fields has proved anything, it is that surface indications do not indicate the presence of oil in reservoirs below.

FINE PERFORMANCE OF THE BATTLESHIP "KENTUCKY."

BY LIEUT. R. W. MC NEELY, U. S. N.

The U. S. S. "Kentucky," which has just returned from the Asiatic station, made some remarkable records at recent target practice with some of her guns, these results being largely due to new devices invented by her officers. In these improvements the question of sights for naval guns was the one that received most attention; for it was discovered that, when more care was taken to plot the exact spot of fall of shots, our sights were of too frail and obsolete design; for such close observation and good shooting cannot be accomplished unless one has good sights.

The custom formerly had been for each gun pointer