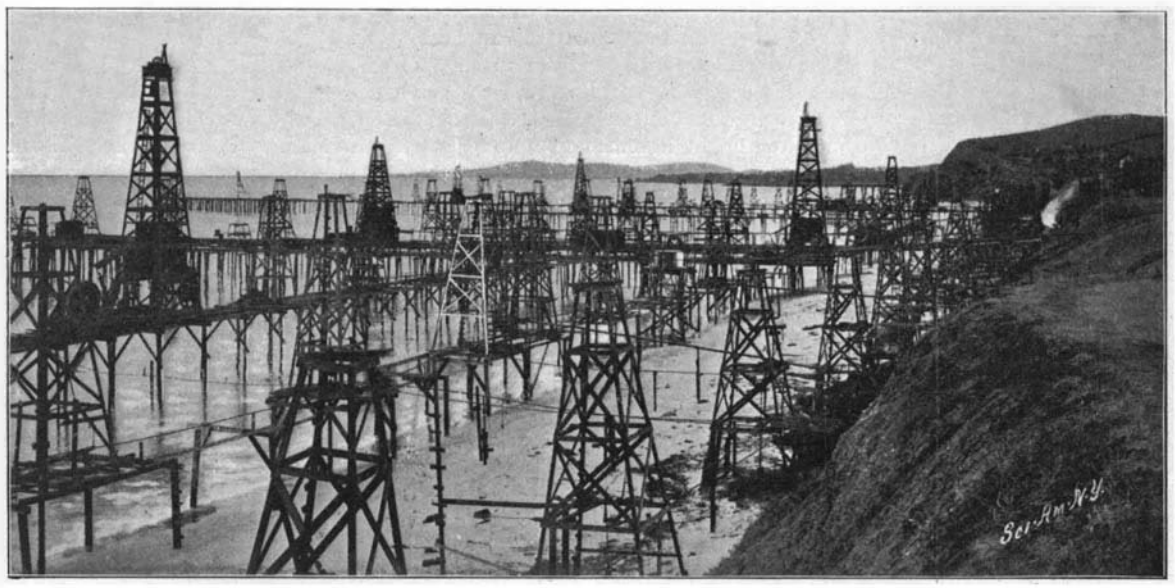
THE DRILLING OF SUBMARINE OIL WELLS AS PERFORMED AT SUMMERLAND, CAL.

BY DWIGHT KEMPTON.

At Summerland, Cal., there are about one hundred submarine oil wells in successful operation, and as many more wells scattered along the beach between the limits of the highest and lowest tides. The wells farthest from shore are in from 15 to 25 feet of water at low tide. The method of drilling these wells as compared with the gigantic projects proposed for reclamation by walling off the sea on the coasts of Bi-bi-Eibat and the island of Swjitoi, or the draining of Romany Lake at Baku, for the purpose of drilling petroleum wells, is simplicity itself.



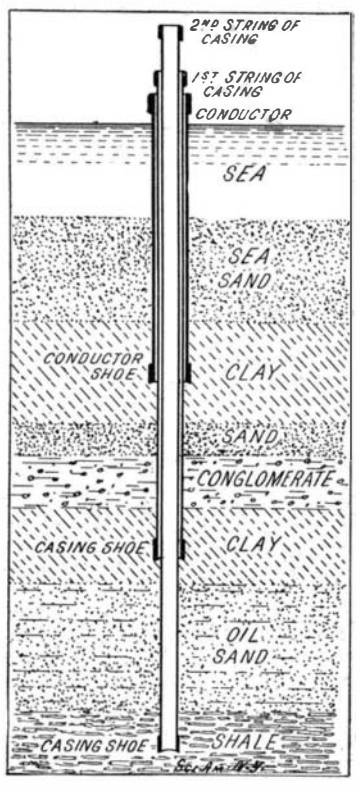
GENERAL VIEW OF THE WELLS AT THEIR THICKEST PART.

The drilling of submarine oil wells, as performed at Summerland, primarily involves the construction of a wharf from the shore to some point over the oil-producing strata, or across the region where the borings are contemplated. In strength of structure these wharves have been built in considerable variety, from those consisting of a mere double row of piles with 8 x 8 cross-beams and stringers and with a narrow walk from one to five feet wide as the only means of access to the wells situated upon them, to strong and commodious structures thoroughly planked and capable of withstanding either the heaviest southeasters which visit that coast or bear any kind of traffic to which a wharf might be subjected.

A peculiar condition in connection with these wharves, which is of uncommon interest, is their immunity from the teredo. The oil wasted from the many wells both on the wharves and on shore is often seen floating on the surface of the sea. This either drives off the destructive teredo (*Xylotria pennatifera*), which are quite plentiful in those waters, or else makes it impossible for those pests of the sea to find lodgment in the oil-coated piles. The oldest piles have been driven nearly four years, and there has been no deterioration whatever in any of the wharves due to shipworms or any other form of marine life.

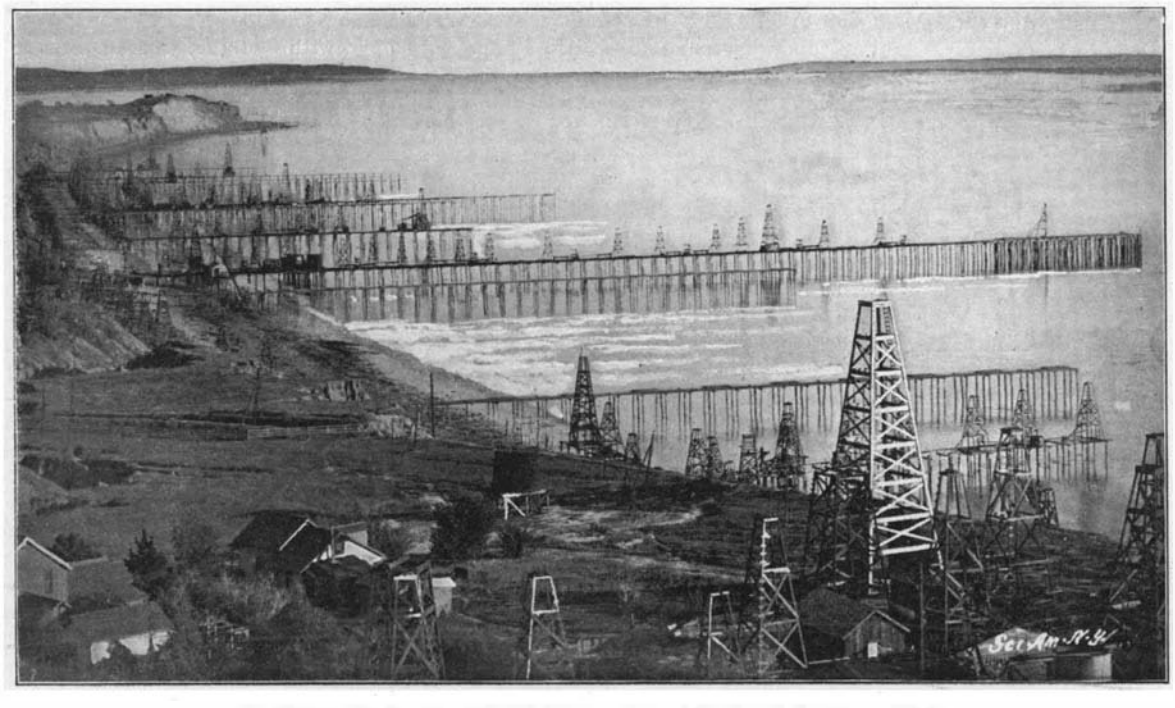
Upon the completion of the wharf, or so much of it as is necessary for the immediate purpose, the drilling machinery is assembled at the location for a well. In beginning the drilling operations the first important work to be done is in putting down what is locally termed a "conductor." The conductor consists merely of oil-well casing of a size larger than that with which the well would have been started were there no sea to contend with. Often casing of inferior quality is used for this purpose, and it is sometimes put down without a shoe where the previous borings indicate that no cobblestones will be met in passing through the sea sand. Usually 9⅝ casing is used, but for the shallower wells 7⅝ is sometimes adopted.

In starting the conductor in from 15 to 25 feet of water, two joints of 9⅝ casing are screwed together, making a length of from 30 to 45 feet, or of sufficient length so that when the shoe or bottom end is resting on the sand under the water, the top end will extend well up toward the top of the roof in the derrick. In setting it, the conductor is held suspended by the sand line in an upright position with the shoe about a foot above the sand. It is then plumbed as nearly as can be, and, watching a favorable opportunity when the wash of the water is least violent, it is suddenly dropped to the sand. It is then accurately plumbed while resting on the ground under the ocean, and is secured in its vertical position by means of boards nailed to the derrick floor in such a way that their edges bear against the casing from four different directions. The drilling stem, which has been previously fitted with a driving head and clamps, is then run into the conductor, and it is driven into the sand as far as it will safely go. Then the clamps are removed and the drill set to work, and by alternate drivings and drillings the conductor is worked through the sand to the clay beneath, where it is discontinued. By the time the top of the conductor has been driven to the level of the derrick floor the bottom end has become so deeply embedded in the sand that the stays can be removed and the casing driven beneath the derrick to a point near the level of the water underneath. Should it then prove too short to penetrate the sand,



SECTIONAL DIAGRAM SHOWING THE RELATION OF THE CONDUCTOR TO THE REST OF THE CASING IN A SUBMARINE OIL WELL.

other lengths are screwed on and the operations continued until that object is attained. When the conductor has been driven a few feet into the clay underlying the sea sand, the ocean is as effectually shut off from the well, for all practical purposes, as if it was held back by a dike or sea wall. However, there is still danger of letting the ocean water into the well through the carelessness or incompetence of the driller. It is quite essential to change the drilling bit to the next smaller size immediately on stopping the conductor or whenever it is decided to go no farther with any size of casing, and also to keep the casing following closely after the drill. Otherwise, when drilling ahead of a conductor or casing that is permanently stopped, before reducing the size of the bit, there is danger of water breaking through from above into the new boring; and when drilling too far ahead of the casing the tools are liable to gain more and more swing, cutting the hole larger and larger, especially in either clay or shale strata, thus creating a cavity of much greater diameter than the casing will fill and which frequently becomes a watercourse outside of the casing for the ruin not only of the well, but also of the adjacent oil territory. In other respects the drilling of submarine wells differs little from those put down on land.



GENERAL VIEW OF SUMMERLAND, CAL., SUBMARINE OIL FIELDS.

Ball Lightning at Sea.

Robert Seyboth, of the United States Weather Bureau, tells of an experience with ball lightning while at sea in Hudson Bay in 1867. The phenomenon was witnessed during a storm.

"Happening to secure the upper hold on the foretopsail brace, the writer facing sternward, again noticed the evil-looking thunderhead, apparently but a few yards above the mizzen truck, and, while waiting in silent expectancy for the thing to come, saw a ball of fire the size of a man's head detach itself from the cloud and sail quite leisurely to the mizzen truck, striking which it exploded with a deafening crash and sent a shower of hissing sparks over rigging and deck.

"Of the immediate consequences, save one, the writer can only speak from hearsay. When he regained consciousness he found himself sitting, propped up against the weather side of the mainmast, paralyzed in the right half of his body, and his shipmates busily engaged, some in clearing away the wreckage of the shattered mainmast, others in sounding the pump to discover whether or not the bolt had knocked a hole in the vessel's bottom. The latter calamity was probably averted by the fact that the lightning had found an easier escape to the water by way of the anchor chains, through the hawsepipes, as both anchors had been made ready to let drop in case of the vessel's inability to weather the rocks. The one exception above noted, and which he has accepted as a proof that the velocity of thought is greater than that of lightning, was his distinct realization, at the critical moment, that he had been struck by lightning and was being hurled to the deck, though consciousness failed him before he struck it. He also had time to formulate the thought, 'Well, it is all over with you this time,' and feel rather gratified at the supposed fact. There was absolutely no pain felt, not even an unpleasant sensation; on the contrary, he seemed to sink into an agreeably restful position, though, according to his shipmates' statements, he was hurled with great violence into the lee scuppers. Of the other men on deck, especially those having hold of the brace, every one was more or less shocked, but none were rendered insensible. The writer's uppermost hold on the rope had evidently deflected the greater part of the charge through his body. The paralysis of his right side was gradually succeeded by a prickling sensation, and the movement of his limbs had again become possible by the time the watch was told to go below."