PIONEER OIL REFINERY
1876

The First Successful Refinery in California

NATIONAL HISTORIC MECHANICAL ENGINEERING LANDMARK
1975
Newhall, California

THE AMERICAN SOCIETY
OF
MECHANICAL ENGINEERS

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Chevron

Standard Oil Company of California,
Western Operations, Inc.

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PIONEER OIL REFINERY

I BACKGROUND

The origin of petroleum is locked away with many other secrets of the earth, and it has been awaiting man's use for millions of years. The first natural source of energy was wood. In parts of the old world its source became partially depleted by the 15th Century. Next coal was used as an energy source, particularly for heating. Whale oil was used as a fluid for lighting, starting about the time of the founding of this Republic. Oil was known in antiquity, but not extensively used. The Egyptians used crude petroleum to help preserve their mummies and grease the wheels of their chariots. The Romans also used oil for the latter purpose. The early Spanish settlers in California knew of oil as a valuable roofing material. The early American settlers realized the value of this material as evidenced by the will of George Washington, in which he listed an oil spring on his land as a valuable possession.

THE ROLE OF MECHANICAL ENGINEERING

Mechanical Engineering played a valuable role in the first commercial development of oil in the United States. George H. Bissell, a New York lawyer, purchased a 100 - acre plot of land near Titusville, Pennsylvania which contained several oil springs. In New York, he formed the first petroleum Company in the United States, "The Pennsylvania Rock Oil Company." Bissell had noted that salt wells were drilled and pumped by tools suspended from a wooden frame or derrick. This method, involving mechanical engineering fundamentals, appeared to be far superior to collecting oil in ditches or skimming oil from the surfaces of ponds. Bissell prepared to drill for oil using the latest technology. He hired Edwin L. Drake, a minor stockholder to direct activities. He was assisted by an experienced salt well driller, William A. Smith, and his two sons.

The drilling apparatus consisted of a bit that was attached to the end of a (suspended) rope. This "drill" was powered by a steam engine through a wooden windlass. Drilling progress was made at the rate of three feet per day or even less. Starting in June 1859, drilling operations continued until a depth of 69½ feet was reached on August 27, 1859. Crude oil rose to within a few feet of the top of the well. From this point it was removed to barrels, or concrete lined pits. This was the birthplace of the industry. Within a few years pipelines had replaced barges and rail domestically as the chief method of oil transport. Just a few years later, in the early 1870's, the demand for oil extended to California. Oil explorations were started in the Pico Canyon Area, just west of and not far from present day Newhall California. The Pico Canyon Area is shown on the map (Figure 1).

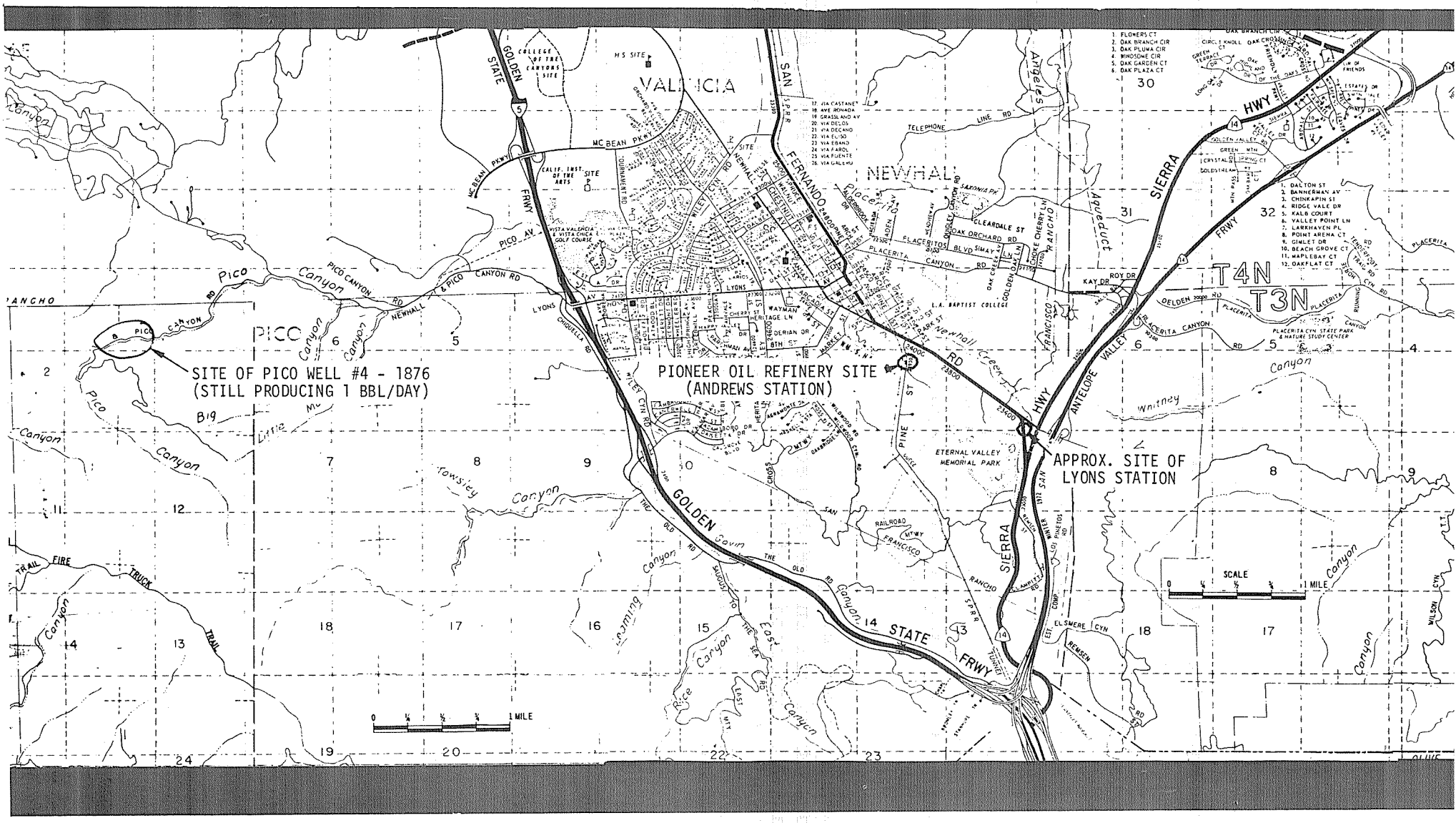

FIGURE 1
MAP OF THE PIONEER OIL REFINERY SITE AND SURROUNDING LOCATIONS

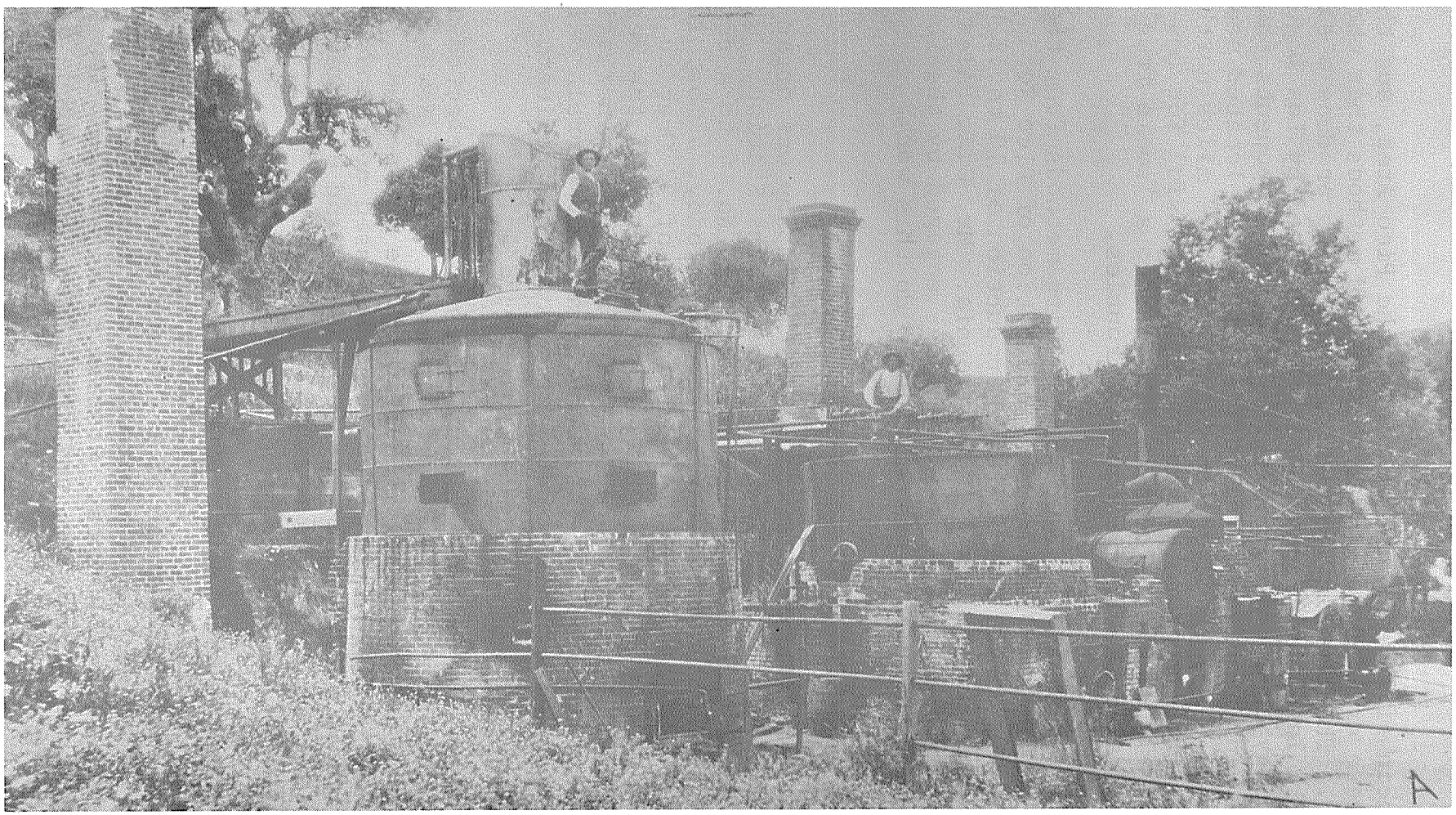

FIGURE 2
A LOOK AT THE REFINERY IN ITS ACTIVE DAYS

PICO CANYON

Four successful wells are traced to the Pico Area, and these early wells were drilled by less sophisticated methods than those used at Titusville. These wells required a refinery to produce a salable product, and in late 1873, construction was started by Los Angeles Petroleum Company on a small unit with principal components that were fabricated in San Francisco. The refinery site was located near Lyons Station (see map), a stage stop approximately three miles north of San Fernando Pass. This venture proved to be unsuccessful for Los Angeles Petroleum. It was unable to turn crude oil into a "smoke free" kerosene. The company was also beset by financial troubles.

Meanwhile application of proven drilling methods from the Pennsylvania Oil Fields greatly improved the production of Pico No. 1, kicking it down to a depth of 120 feet, with a production of 10 to 12 barrels daily, the best of any oil well in California. Mr. C.A. "Alex" Mentry, an experienced driller from Pennsylvania was engaged by the former leasers of the refinery at Lyons Station to do this work.

CALIFORNIA STAR OIL WORKS ORGANIZED

In 1876, the California Star Oil Works Company was organized and in June a 20 barrel still was installed near Lyons Station. Using improved drilling practices, Mentry drilled Pico No. 4 to a depth of 370 feet, with an output of 25 barrels a day. Today, almost 100 years later, Pico No. 4 still produces a barrel a day of 37 Gravity Oil. It is now the oldest working oil well in the history of the West. Mentry also used new drilling practices on Pico No. 1, increasing its depth to 175 feet and tripling its production to 30 barrels daily. The success at Pico No. 1 made the installation of a new refinery virtually mandatory.

The location of the new refinery (see map) was selected at Andrews Station on the outskirts of the present town of Newhall. The newly constructed Southern Pacific Railroad line between San Francisco and Los Angeles by-passed Lyons Station, but passed near Andrews Station. This appeared to be the logical site for the new and enlarged refinery.

II THE OIL REFINERY

Construction at the Newhall site was carefully supervised by J.A. Scott, an experienced oilman. The refinery was completed in August 1876. Figure 2 shows an old photograph of the installation. Figure 3 is a somewhat later photo of the old installation. The still shown on the right hand side no longer exists. Storage tanks of 20 to 100 barrels were scattered about a hillside, and from these tanks, crude oil flowed by gravity into the stills below. Two of the stills, 15 and 20 barrels in capacity had been moved from the unsuccessful installation at Lyons

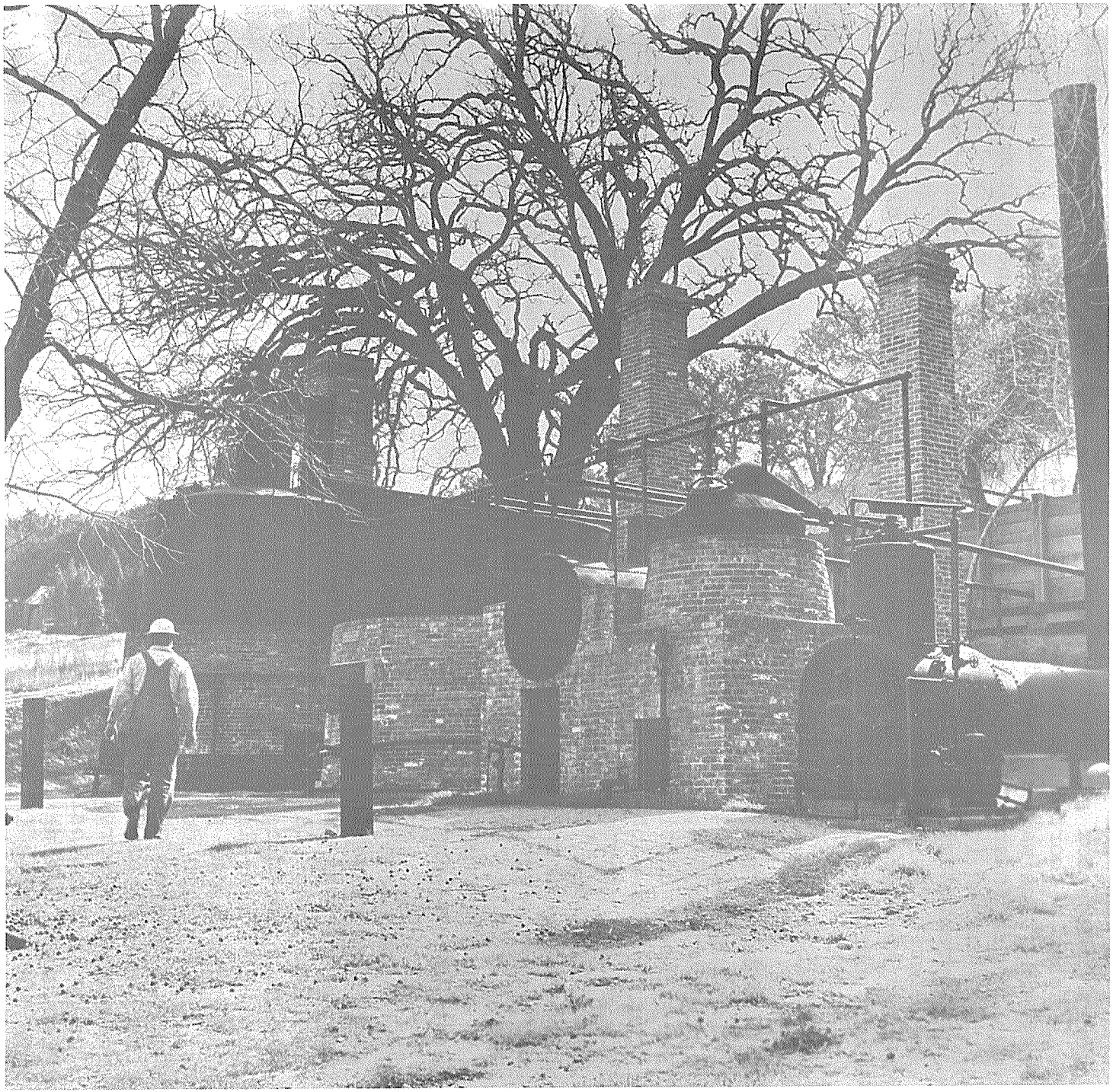

FIGURE 3
CONTINUING PROGRESS

Station, where the lack of a railroad connection spelled an end to the venture there. A new still, 120 barrels capacity and of the so called cheesebox type, was installed at the Andrews Station, Newhall site. This was close to the newly opened Southern Pacific Railroad tracks. All three stills were set on brick foundations and were direct fired. A fourth cheesebox still of the same capacity as No. 3, namely 150 barrels, was added a short time later. The heavier residual oil from earlier refining runs was used as fuel, with steam being injected into the oil to atomize it and to intensify the heat. Petroleum gases from the hot stills passed into a condenser made of a wood box, 5' x 5' x 125' containing approximately 1400 feet of two inch and three inch iron pipe submerged in water. The condensed oils then flowed to a lead-lined agitator, where they were treated with chemicals and agitated with air to improve their burning quality.

PRODUCTS

At Andrews Station, California Star turned out several products including small quantities of benzene, and a 300 degree fire test safety illuminating oil, for use on ships, railroads, factories and mines. The company continued to produce a light lubricating oil (24 degree gravity) for machinery, and a heavy lubricant (19 degree gravity) for saw mills, quartz mills, and railroad journal boxes. However, kerosene in two grades, "Lustre" and "Prime White," were the breadwinners. Kerosene refining was still a difficult task, for the oil had to be run and rerun several times in order to turn out a salable product. According to the testimony of D.G. Scofield, an investor in California Star, the actual output of kerosene at Andrews Station "never averaged more than 750 gallons per day."

Shortly after the completion of the Pioneer Refinery, Mentry's well deepening campaign, stalled by a water shortage, was resumed. Mentry laid a one and one half mile pipeline from a nearby canyon to provide adequate water for steam drilling machinery. Well No. 3, now down to 170 feet, produced 5 barrels daily. No. 2, at 240 feet in October 1876, pumped 30 barrels daily, a production also maintained at 300 feet. No. 4 gave an awesome performance. In November 1876, it spurted to the top of the 65 foot derrick, and then flowed at 70 barrels per day before being finished off at 560 feet. The combined output of the wells in the Pico Canyon District was considerably more than the output of the refinery. Mentry reduced pumping on the other wells while waiting for No. 4 to subside. He built two additional 500 barrel tanks in the Pico area, making the total storage there at 3000 barrels in addition to the 300 barrels in the refinery. Figure No. 4 shows Standard Oil operations in Pico Canyon in later years.

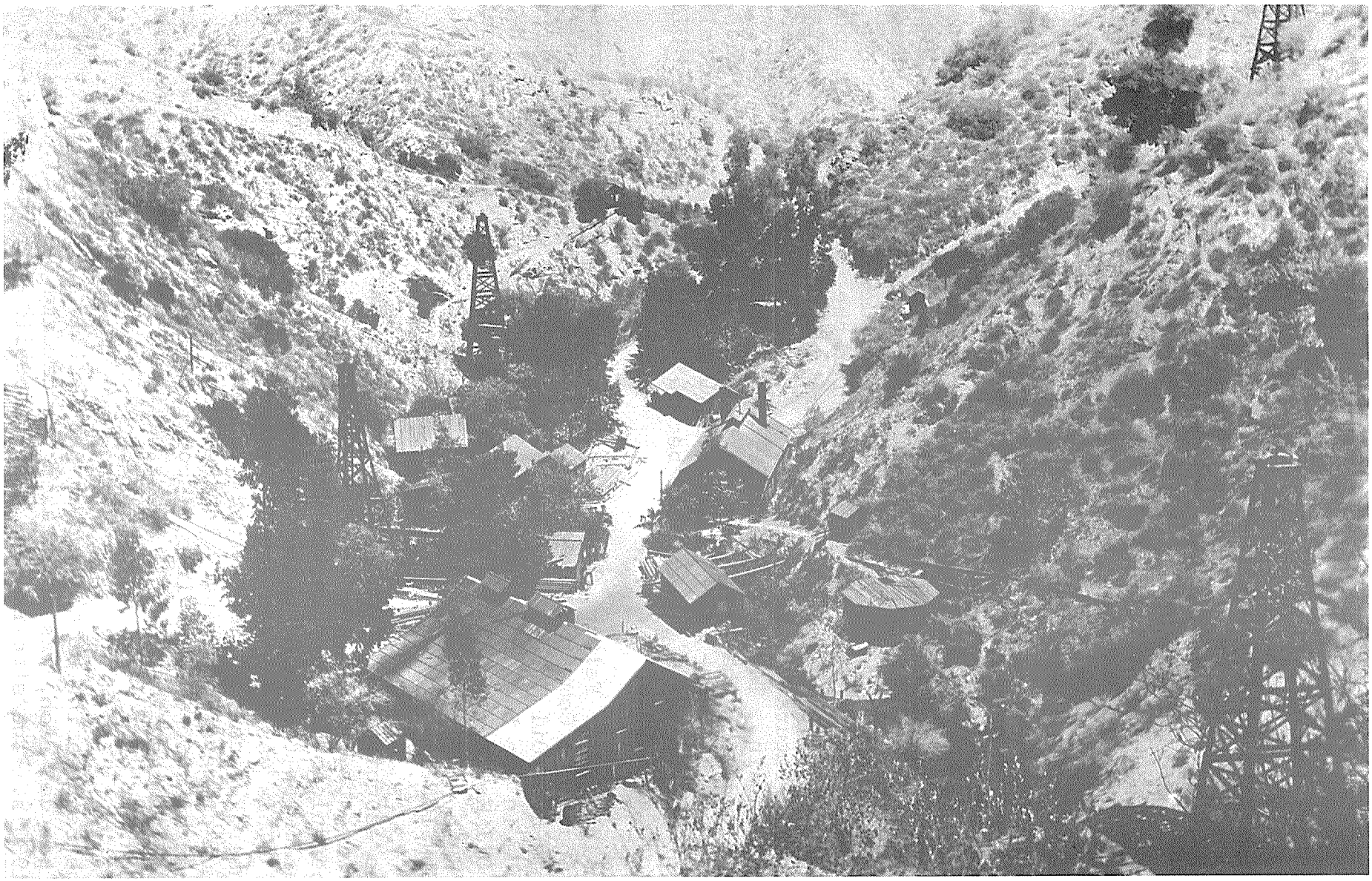

FIGURE 4
STANDARD OIL OPERATIONS IN PICO CANYON - NOV. 1910

TRADE

Another significant step, following the incorporation and building of the California Star Oil Works was to market J.A. Scotts' Lustre Kerosene in San Francisco. An initial shipment was made in June 1876, and a promise of much larger deliveries must have taken into account the predicted production of the new Ventura Refinery. The oil arrived in the San Francisco market at a propitious moment, just as Eastern kerosene started a steep price climb. Devoe's Brilliant,-the leading Eastern kerosene on the San Francisco market, jumped from 25 cents a gallon in June 1876, to 37 cents at the end of August to 44 cents in December. These higher prices coincided with a decline in eastern inventories during that same year. The prospect of large quantities of California kerosene, and of better quality, quickened interest in the California Star Oil Works Company.

Two keen observers of the changing oil scene, in California were San Francisco oil merchant F.B. Taylor, and his junior partner, Demetrius G. Scofield. For two or three months in the summer of 1876, they studied the outlook before deciding to enter the California Oil Industry. They became interested in California Star, and the San Fernando District. Oil lands in Ventura County were leased, both on private ranches and on the public domain. Taylor and Scofield were looking to build an integrated industry that would supply needed oil to California and bordering areas. Their efforts measurably advanced the cause of oil in California. Later D.G. Scofield became President of Standard Oil Company of California.

In 1879, C.N. Felton, later a senator from California, formed the Pacific Coast Oil Company, and acquired a controlling interest in the California Star Oil Works. Felton built a new and much larger refinery at Alameda in the Bay Area, about 1880. Thereafter, the use of the Pioneer Oil Refinery declined and in 1888 it was closed down altogether.

II CONCLUSION

The economic situation in the whale oil business (used for lighting) coupled with the increased demand for lubricants, spurred the development of the petroleum industry in the United States. The giant leap forward took place with the commercial development at Titusville Pennsylvania in 1859. This was followed some 17 years later with the building of the Pioneer Refinery at Andrews Station (Newhall) California, the first successful commercial refinery in the West, embodying developments introduced since the Titusville discovery. The Pioneer Refinery served the Western Market for some 15 years until it too, gave way to technical progress.

The restoration of the two largest stills have a capacity of 150 barrels per day each, was undertaken by Standard Oil Co. of California in the 1930's. The site is open for the public to enjoy and to look

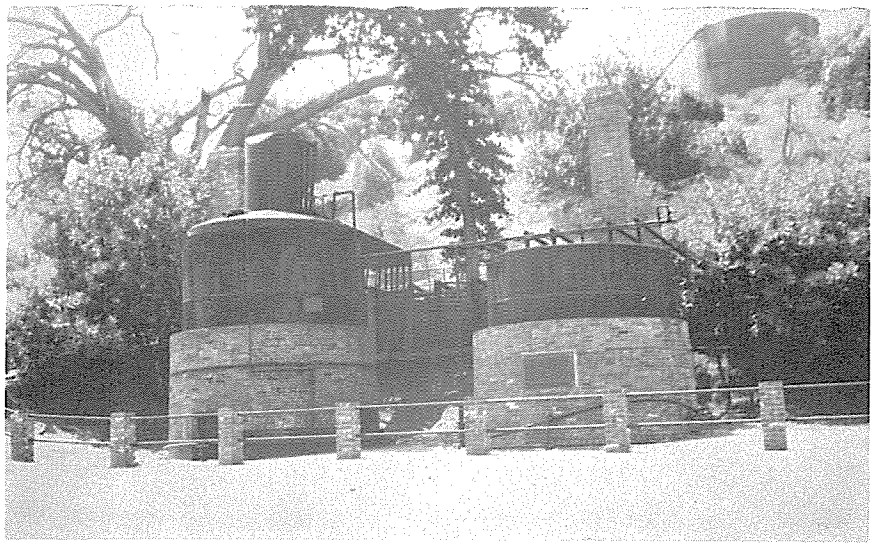

FIGURE 5
ABOVE ARE TWO RESTORES 150 BBL STILLS AND A CRUDE OIL STORAGE TANK ON THE HILLSIDE ABOVE. STANDARD OIL'S OWN DEDICATION PLAQUE IS MOUNTED ON STILL NO. 3

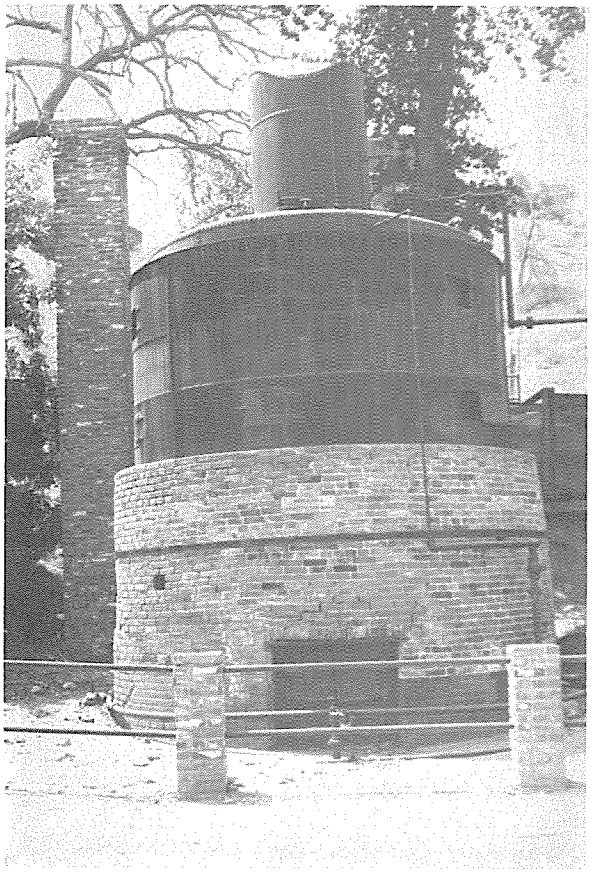

FIGURE 6
THIS IS A CLOSER VIEW OF NO. 4 STILL, THE ONE THAT WILL BEAR THE ASME HISTORICAL PLAQUE. BRICK STACK AT THE LEFT AND MANIFOLD ENCLOSING PIPES TO CONDENSER ARE ON TOP.

on the days when the industry was in its infancy. It is located off Pine Street, Newhall.

The remaining equipment of the Pioneer Oil Refinery are shown in the following series of photographs.

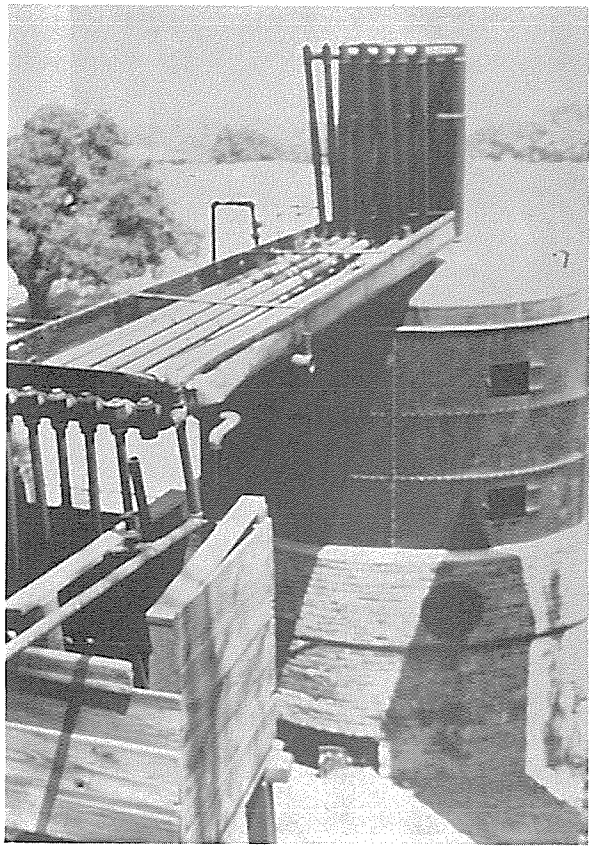

FIGURE 7
PIPING FROM THE TOP OF STILL NO. 4 IS CONNECTED TO THE WATER FILLED CONDENSER BOX.

FIGURE 8
TWO OF THE OLD RIVET CONSTRUCTION PRODUCT STORAGE TANKS ARE SHOWN HERE.

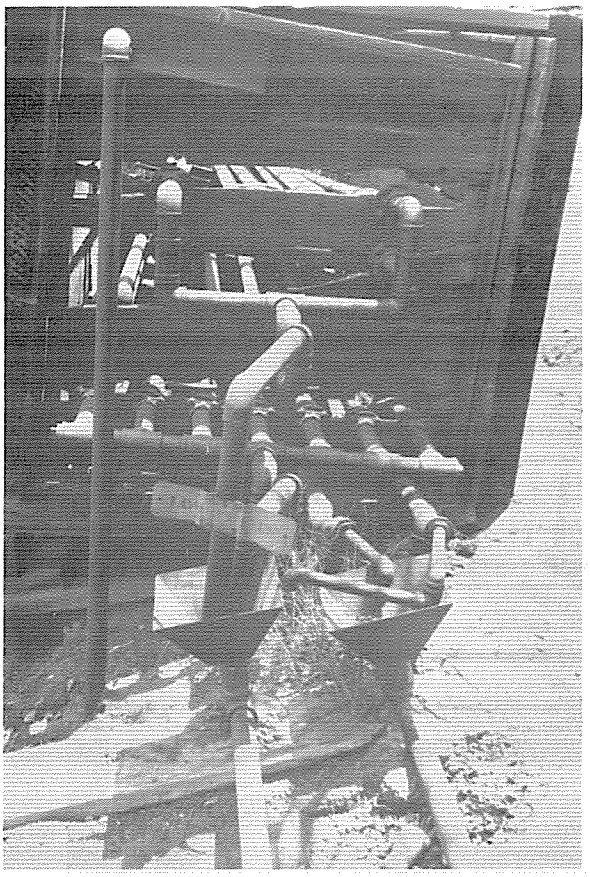

FIGURE 9
AN END VIEW OF THE CONDENSER BOX ON THE HILLSIDE ABOVE THE STILLS, SHOWING THE VARIOUS LAYERS OF PIPING AND FUNNELS TO COLLECT THE PRODUCT.

FIGURE 10
A LOOK AT THE PIPE FITTINGS NEAR STORAGE TANKS.

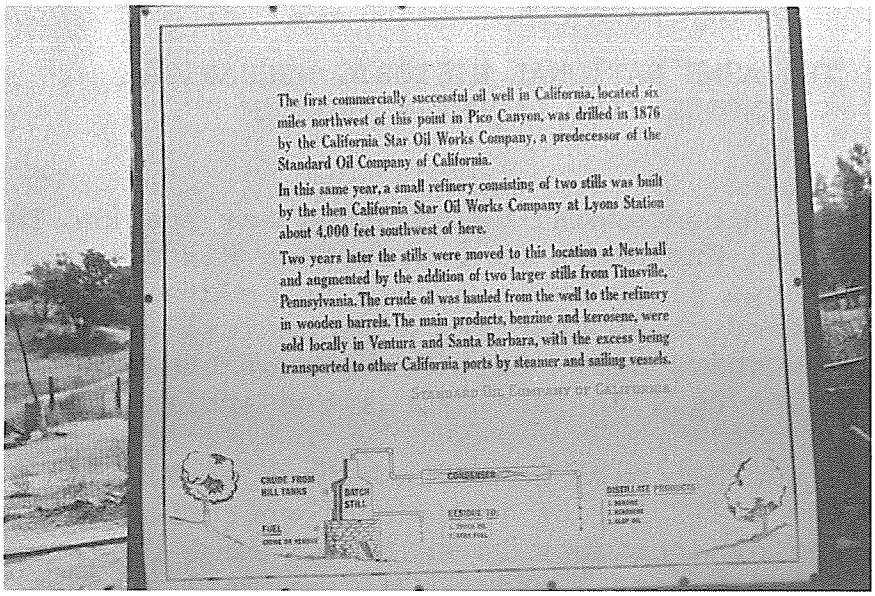

FIGURE 11

STANDARD OIL'S INFORMATION SIGN ILLUSTRATES THE PRODUCTION PROCESS.

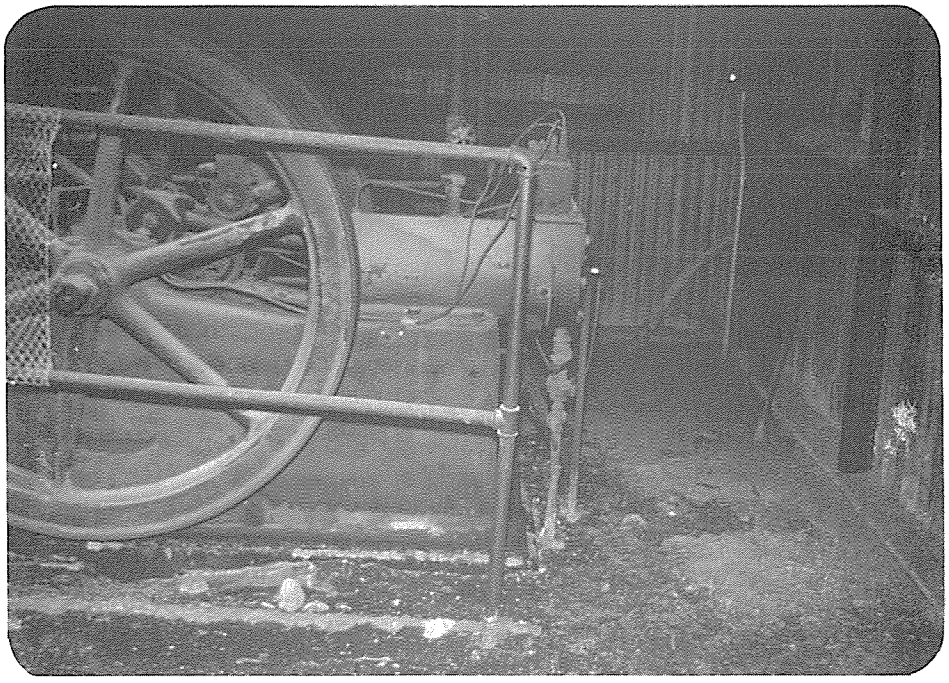

FIGURE 12

SINGLE CYLINDER-HIT AND MISS IGNITION-OIL ENGINE THAT DROVE A THREE CYLINDER PUMP BY BELT.

THE ASME NATIONAL HISTORIC MECHANICAL ENGINEERING LANDMARK PROGRAM

This nation's Bicentennial Celebration has sparked The American Society of Mechanical Engineers to institute a History and Heritage Committee. The charge given these people is to use volunteer assistance to gather data on everything that has a mechanical engineering connection 75 or so years ago. Each Section of the ASME has such a committee to gather data on local sites and artifacts.

The History and Heritage Committees have settled on attaining two objectives: (1) a listing of industrial operations and related mechanical engineering artifacts in what they have designated as a "Historic Engineering Record," and (2) a "National Historic Mechanical Engineering Landmarks" program. The former is a record of detailed studies of sites in each local area; the latter is a demarcation of local sites which are of national significance -- people or events which have contributed to the general development of mankind.

The overall o jective of the ASME's History and Heritage Committees is to promote a general awareness of our technological heritage among both engineers and the general public. To attain this objective, new material is continually being gathered with a veiw toward publishing a supplement to the local Record when sufficient new sites and artifacts of mechanical engineering have been uncovered.

The Pioneer Oil Refinery is the eighth landmark to be designated since the program began in 1973. The first seven include:

Ferries and Cliff House Cable Railway Power House, San Francisco-1973
Leavitt Pumping Engine, Chestnut Hill Pumping Station, Brookline, MA-1973
A.B. Wood Low Head High Volume Screw Pump, New Orleans, LA-1974
Portsmouth-Kittery Naval Shipbuilding Activity, Portsmouth, NH-1975
102-inch Boyden Hydraulic Turbines, Cohoes, NY-1975
5000 KW Vertical Curtis Steam Turbine-Generator, Schenectady, NY-1975
Saugus Iron Works, Saugus, MA-1975