Mexican Petroleum

Description of properties of the

PAN AMERICAN PETROLEUM & TRANSPORT COMPANY (*Feb. 2, 1916*)

and principal subsidiaries

MEXICAN PETROLEUM COMPANY (CALIFORNIA) (*Dec. 20, 1900*)

HUASTECA PETROLEUM COMPANY (*Feb. 12, 1907*)

MEXICAN PETROLEUM COMPANY, LIMITED, OF DELAWARE (*Feb. 16, 1907*)

MEXICAN PETROLEUM CORPORATION (*May 17, 1915*)

THE CALORIC COMPANY (*March 21, 1916*)

PAN AMERICAN PETROLEUM COMPANY (*Sept. 11, 1916*)

MEXICAN PETROLEUM CORPORATION OF LOUISIANA, INCORPORATED (*Feb. 5, 1918*)

BRITISH MEXICAN PETROLEUM COMPANY, LIMITED (*July 15, 1919*)

and other Data.

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MR. EDWARD L. DOHENY, PRESIDENT.

CHAPTER IV.

THREE FAMOUS GUSHERS

CENTURIES before the sources of petroleum were reached by the drill, it was obtained from shallow pits sunk where there were exudes, and raised in buckets by a windlass, or the oil was skimmed from the surface of the water upon which it floated. Primitive methods are still employed both in Europe and Asia, and in some places in the East hand-dug wells reach a depth of many hundred feet. Such wells yield relatively a small quantity of oil and have few speculative features, but the wells drilled today by machinery have all the elements of speculation, and range from non-productive "dry holes" to "gushers." On the basis of the character of the yield they are classed as "gushing," "pumping" and "bailing." Gushers are also referred to as "fountains," "spouters," and "flowing wells." Whatever term is used to designate the gusher, it implies that the flow of the oil is due to the pressure of imprisoned forces of Nature released by the drill.

Pumping and Bailing Wells—The most common way of extracting petroleum from wells is by pumping. This is done by inserting in the well a string of tubing, at the lower end of which a pump barrel is attached. The pumps are frequently worked by a transmission system, by which a number of wells are pumped simultaneously from a central power plant; in this way the cost of production is greatly reduced.

In some oil-fields there is so much sand accompanying the oil that it is impracticable to use the ordinary pumping apparatus, and recourse is had to bailing. These bailers are long cylindrical tubes, fitted with valves at their bases, which are

lowered into the well by means of wire cables. They are used to clear the accumulated mud and sand from the bottom of the hole, and to raise the oil. When the bailer is brought to the surface, the oil is emptied into a "bailing tub" before it flows to the receptacles, where the sand is allowed to settle, prior to its removal to the main storage.

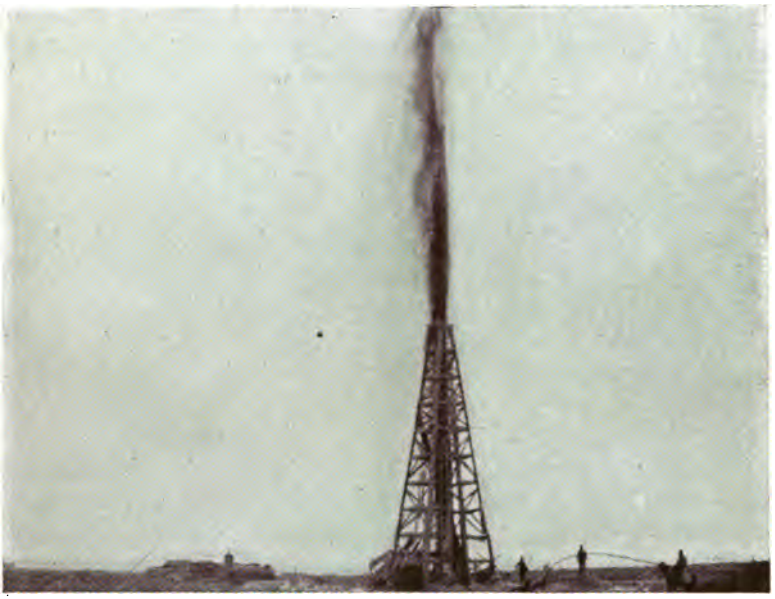
Gushers—The discovery of a new oil-producing territory is frequently announced by what is known as a "gusher." The

By Courtesy of Oil Well Supply Co.
PUMPING OIL BY HAND AT BINAGADI, RUSSIA.

oil and gas, in such cases, issue from the well at enormous pressure, and this is sometimes so powerful that the drilling tools are ejected. The oil escapes in a fountain which towers high above the derrick and drilling plant, often reducing it to matchwood, just as if a charge of TNT had been placed within the derrick and exploded.

In the early days gushers were often allowed to have full and unrestricted play, merely as a spectacle, and crowds of people made long and tedious journeys to see the wonderful phenom-

enon of oil shooting from the earth in a huge fountain. Such fountains, or "spouters," were frequent in Russia, where the loss of oil was great and the owners often ruined. Certain mechanical devices of recent invention enable gushers to be controlled, and the flow from the largest well hitherto discovered—Cerro Azul



By Courtesy of Oil Well Supply Co.
LUCAS GUSHER, TEXAS.

No. 4—is regulated with as much security and precision as a gas jet.

Baku Gusher—One of the most impressive of the earlier wells was the Droojba fountain, which Marvin graphically describes. It commenced flowing on September 1, 1883, at the rate of 40,000 barrels per day:

"The fountain was a splendid spectacle—it was the largest

ever known in Baku. When the first outburst took place, the oil knocked off the roof and part of the sides of the derrick, but there was a beam left at the top against which the oil burst with a roar in its upward course, and which served in a measure to check its velocity. The derrick itself was 70 feet high, and the oil and the sand, after bursting through the roof and sides, flowed fully three times higher, forming a greyish-black fountain, the column clearly defined on the southern side, but merging in a cloud of spray 30 yards broad on the other. A strong southerly wind enabled us to approach within a few yards of the crater on the former side, and to look down into the sandy basin formed round about the bottom of the derrick, where the oil was bubbling round the stalk of the oil shoot like a geyser. The diameter of the tube up which the oil was rushing was ten inches. On issuing from this, the fountain formed a clearly defined stem about 18 inches thick and shot up to the top of the derrick, where, in striking against the beam, which was already worn half through by the friction, it got broadened out a little. Thence continuing its course, more than 200 feet high, it curled over and fell in a dense cloud to the ground on the north side, forming a sandbank, over which the olive-colored oil ran in innumerable channels towards the lakes of petroleum that had been formed on the surrounding estates. Now and again the sand flowing up with the oil would obstruct the pipe, or a stone would clog the course; then the column would sink for a few seconds lower than 200 feet, to rise directly afterwards with a burst and a roar to 300. Some idea of the mass of matter thrown up from the well could be formed by a glance at the damage done on the south side in twenty-four hours—a vast shoal of sand having been formed which had buried to the roof some magazines and shops, and had blocked to the height of six or seven feet all the neighboring derricks within a distance of 50 yards. Some of the sand and oil had been carried by the wind nearly 100 yards from the fountain. Standing on the top of the sand shoal we could see where the oil, after flowing through a score of channels from the ooze, formed in the distance on lower ground a whole series of oil

lakes, some broad enough and deep enough to float a boat in. Beyond this the oil could be seen flowing away in a broad channel towards the sea."

On the 29th of December, 1883, the well was capped, having yielded oil variously estimated from 220,000 to 500,000 tons.

By Courtesy of U. S. Geological Survey
LAKE VIEW GUSHER, CALIFORNIA.

California Gusher—Some of the fields of the United States have furnished great gushers, and of these, few are more interesting than the Lake View gusher of California, which burst forth on March 15, 1910. This strike is due to the persistency and obstinacy of one man. The directors had decided to stop drilling and instructed the engineer accordingly, but he ignored these orders and drove the drill 47 feet deeper. His reward was an ominous rumble on March 15th, which caused the drillers to scatter quickly. Presently, there was a terrific roar accompanied

by a violent hissing, and immediately the top was blown off the derrick by a column of oil. Pieces of rock and debris were hurled into the air, and these missiles menaced the drillers, who sought shelter by escaping to a safe distance from the well. The roar and din of the eruption terrified the population for a mile around, and the oil rose to a height of 140 feet. The spray, which was swept by the wind, drenched the sage brush and saturated the ground. The inhabitants of the adjacent towns hired every type of vehicle, and hastened to witness this impressive spectacle. The greater part of the oil fell around the shattered derrick, which in a short time was isolated in a lake of oil. "Immediately the disintegrated pieces of rock ceased to be discharged, the drilling forces hurriedly strove to control the well, but the flow was so vicious that all attempts failed. Then laborers were crowded on to form additional pits and ponds to collect the flow. Three powerful pumps were brought up, and installed to lift the oil from the sump-hole, which was overflowing, into the huge tanks which had recently been completed nearby. This was the first oil to enter these receptacles, and it was fortunate that these facilities were available, otherwise heavy losses would have been incurred. The pumps had a combined capacity of 25,000 barrels a day, and by running them at full pressure they were able to keep the flow under control. As the tanks became charged, other pumps were set to work driving the oil on a journey of 150 miles from Maricopa to Port Harford, on the Pacific seaboard.

"It was only by titanic labor that the oil losses were reduced to an insignificant degree. When the gusher first broke into activity, the flow was estimated to be over 60,000 barrels per day. The initial pressure becoming expended, the well settled down to a steady flow of about 42,000 to 45,000 barrels per day for six days. Then it ceased suddenly. It had 'sanded up'—that is, the well-hole had become choked with sand and detritus. The engineers, realizing the import of this development, concluded that by pushing their arrangements forward at high speed they would be able to control the well. But they had miscalculated the

enormous forces sleeping below. In a few days the pressure of the accumulation of gases became sufficiently powerful to remove the obstruction. With a deafening report the sand was blown out, and the well resumed spouting 42,000 barrels per day."

By an ingenious device the well was brought under control, and it is said that 2,000,000 barrels of petroleum were saved during the first seven weeks. The well was intermittent in its flow; the quantity lost, however, was insignificant, owing to arrangements made in advance, and the success of the scheme for dealing with the gushing oil.

Mexican Gusher—Since the first gusher was struck in Mexico on May 14, 1901, on the property of the Mexican Petroleum Company, this country has furnished the greatest surprises in the history of oil, and Cerro Azul No. 4 is the most famous of all the fountains of this rich country. It is situated in the center of an extensive valley, which is controlled by the Pan American Petroleum & Transport Company. The yield of this well during the 24 hours prior to its being closed in amounted to 260,858 barrels, which far outstrips the history of any other well in the world.

The story of the bringing in of this well is as fascinating and as thrilling as a romance, and few things show more clearly the scientific advances recently made in mastering Nature's most explosive forces than the fact that the stupendous power of this well is completely under control.

Talbot, in his book "The Oil Conquest of the World," gives an interesting account of the method of handling a gusher many years ago, which is in striking contrast to the plan adopted when Cerro Azul was brought in.

"In the early days when a spouter got out of hand, primitive methods were adopted, and, as may be imagined, proved abortive. The well-drillers, from lack of experience and knowledge, failed to realize the immense forces of Nature. They endeavored to smother the fountain with sand and water. When this failed, a massive square shield was contrived from heavy balks of timber secured together by bolts and dogs. This was manoeuvred into

a convenient position near the well, raised on one edge, and then tipped or pulled over upon the fountain in the manner of a lid shutting a box. The surprise of the toilers, when they saw their cumbersome weighty device shot into the air like a blown egg upon a water-jet or wrenched to matchwood, may be imagined. But it brought home to them the enormous power that is present in a four or six inch solid column of oil when shot from the bowels of the earth."

SOME OF THE EMPLOYEES AT CERRO AZUL CAMP.

We have only to compare this record of a few years ago with the closing in of Cerro Azul No. 4, to realize the advances that have been made in controlling these gushers. Prior to striking the oil, elaborate and extensive preparations had been made by the Company for an expected great flow. Two 8-inch pipe lines leading from Tampico had been completed to within 50 feet of the well, and as a record of the actual work of bringing in the well was desired, the Company had a complete outfit of photographic material set up in the jungle, and a photographer employed to take photographs and moving pictures of the well.

Cerro Azul, or Blue Hill, is situated within an area of about 10,000 acres of rolling plain and hill. Before any development work had been done, it consisted of vast potreros for the grazing of cattle, and of almost impenetrable monte, where the explorer must cut his own path as he proceeds. Within this vast hacienda there are countless live asphalt springs, whose edges are white with the bones of cattle that have been mired in these seepages.

DINING ROOM AND RECREATION HALL AT CERRO AZUL CAMP, 1922.

Before the advent of the oil drillers, these were regarded as deadly traps to be shunned by the natives.

Cerro Azul is about a hundred kilometers from tidewater or any town save a few Mexican villages. Fifty kilometers of road had been carved out of the heart of the jungle, and 47 kilometers of railroad run through valley and over hill to Cerro Azul, which was an outpost of the oil industry. A derrick had been erected in the midst of the jungle near one of those basalt plugs and the well drilled to cap rock in 1915. The casing was cemented and tested to a pressure of 1,050 lbs.

and when work on the well was resumed in February, 1916, Cerro Azul No. 4 was only a name and a number on the Company's books. To the drillers it was a record of geological strata encountered and penetrated; to the Company's accountants a page of figures; to the managers an expectation; and to the other companies in the Southern Fields a source of lively curiosity.

Nothing can be more monotonous than the drilling of an oil well, unless some difficulties are encountered. Day after day two men walk into the derrick and take the place of two others who have worked for twelve hours. Within a few days this scene of ordered and ordinary activity around Cerro Azul No. 4 was to be changed to a place of tense excitement, with all the rush and hurry of a battlefield. The comparative quiet of the jungle with only the creak of the walking-beam, the muffled clang of iron on iron, and the hiss of steam, was first broken by a growling mutter, swelling at length into a menacing roar that shook the earth and was heard like the sound of distant thunder in Casiano, 16 miles distant. A little later, every leaf, every flower, every blade of grass now vivid with the greens and brilliant colors of the tropical jungle, was converted as if by magic into the fantastic dream of some futuristic painter, all a glistening black as if fashioned of highly burnished metal. In the center of this strange picture, amid the ruins of what had been a short while before a sturdy derrick of bolted timber, a column of oil many hundreds of feet high ran straight into the air, thick as a barrel, black as night, and in appearance as smooth as ebony. Cerro Azul No. 4 had come in!

The facts are few and simple. On the night of the ninth of February, 1916, a pocket of gas was struck which forced the water out of the hole through which the drilling was being conducted. During that night a cold rain set in accompanied by a heavy wind; a true "norther" was blowing up. On the morning of the tenth, work was resumed. No trained imagination is needed to picture the tenseness of the moment. That day would give to everyone the answer to his speculations, would show the

drillers the results of their industry, and would justify the judgment of the Company's experts and executives in locating and drilling this well. Every preparation had been made.

FIRST INDICATION OF OIL AT CERRO AZUL NO. 4.

Tanks were ready; two eight-inch pipe lines were laid to within fifty feet of the well. Each man knew his duties, knew what he had to do and how and when to do it. Like Von Moltke, the drilling superintendent might have said that his work was finished, and gone to bed; but, unlike Von Moltke, he

was about to deal with an unknown force, a force more powerful, more uncontrollable, more relentless than any hitherto encountered in the Mexican Fields. A half dozen strokes of the drill, and the cable went slack. The supply of gas to the boiler was immediately shut off. Presently an ominous rumbling far beneath the surface was heard, which quickly deepened in volume, and the workers fled from the derrick. Suddenly a terrific explosion took place, as if some gigantic, slumbering volcano had in a moment burst into fiendish activity. Before the drillers had stumbled fifty feet from the well, the huge drilling tools were shot into the air like a projectile fired from a siege gun; they crashed through the crown block of the derrick, reducing all the upper part to tinder, and describing an abrupt trajectory through the air, broke through the trees 120 feet from the derrick, embedding themselves sixteen feet in the earth. There they stand today, at once a monument to the relentless forces of Nature and an inspiring testimony to the ability of man to overcome great obstacles. Twenty feet from the spot where these tools—weighing about two tons—struck, a moving picture operator, employed to take pictures of the birth of the great well, was grinding his camera, and, true to the traditions of this youngest of industries, stuck to his post and kept on "cranking." His steadfastness has preserved to the Company a unique, valuable record of the birth pangs of Cerro Azul No. 4.

So uncontrollable was the rush of gas that besides throwing the tools out of the hole, it shot the cable through a ten-inch tee below the oil saver, to a distance of 600 feet, and this cable became so tangled and twisted about the head of the well that the tools as they were ejected tore the valve completely away. The gas, having swept away every restraint, and increasing in force and volume every moment, quickly wrecked the remaining part of the derrick down to the fourth girth.

Seven hours later came the oil. The industry is familiar with the pictures taken of this great gusher when at its height, but pictures do little more than suggest the terrible, the

MORE OIL.

awe-inspiring grandeur, the sublimity of the scene. No photograph can convey to the mind the power of this unrestrained force. While the men about the well were working, making preparations for an attempt to close it in, the end of a two-inch manila rope in the hands of one of the operators came over the top of the well. Instantly it was jerked from the man's hands and two hundred yards of stout hempen hawser uncoiled as rapidly as a striking rattlesnake and went spiraling up the column of oil. It was never seen again.

As the volume of oil increased, the column rose higher and higher, until on the morning of the 11th it attained a height of 598 feet, according to measurements by triangulation made by the Company's engineer. Fortunately the land around the well was of such a character that it was possible to save a great proportion of the oil, and also to measure with reasonable accuracy the amount of the flow, which, on the 19th of February had reached, as has already been said, 260,858 barrels in 24 hours. This calculation takes no account of the vast quantity of oil that in the form of spray was carried for about two miles from the well by a strong wind. The great column of oil towering into the air and swayed by the winds which blew from every quarter during the ten days of unrestricted flow literally saturated with petroleum the surrounding country for a distance of about two miles.

It is noteworthy that the well gradually increased its flow from day to day, and it is safe to assume that it had not attained its maximum when brought under control. Owing to the splendid co-operation of the various departments of the Company, more than half a million barrels of the output was saved in temporary reservoirs, into which an "arroyo" had been converted by the natives who worked with most commendable industry. As a means of calculating the flow of oil, the Company's engineer constructed several spillways about five meters in length and checked the rate at which the oil flowed per second through these spillways, also measuring the width and depth of the flow.

THE WELL AT ITS MAXIMUM FLOW BEFORE BEING CLOSED IN.
(260,858 Barrels in 24 Hours)

Precaution was taken that the level of the oil in the several reservoirs further up the creek bed did not vary while the tests were being made, the oil being allowed to flow evenly through spillways of similar capacity in each dam. A considerable time was necessarily occupied in the construction of these reservoirs, and it was February 15th before the rate of flow was first gauged. From that date until February 19th, five days inclusive, the Company's engineer gauged the flow as follows, the flow of oil on February 19th filling a space of 43 centimeters in depth by 63 centimeters in width (although the calculation was based on 40 x 60 centimeters) with a velocity of 2 meters per second:

	Barrels Daily
February 15th	152,000
February 16th	190,209
February 17th	211,008
February 18th	221,186
February 19th	260,858

No photograph could adequately portray the appearance of the men who worked at the well. Their clothes were drenched with oil until their weight became insupportable. Hands, faces, everything were a shining black. Every tool, every piece of equipment, every building within range of the well, glistened and dripped in the sun. Nor could any picture reproduce the atmosphere of the place; the mad battle against time; numberless peons working faithfully to convert the arroyos of the near-by streams into vast temporary reservoirs for the storage of oil; and the preparations already being made for the closing in of the well.

The Company's master mechanic—the late George W. Barnes—and his staff were already busy devising means to do the seemingly impossible. Hardly had the oil begun to flow when many miles to the northward draftsmen, machinists, foundrymen and blacksmiths, were working night and day upon the device that was eventually to bring the well under control. Forges glowed, and lathes turned day and night. At length the

appliance was complete and was rushed by launch to San Geronimo where a train stood ready to receive it. In a few minutes it was speeding on its way to Cerro Azul. This device consisted of heavy tongued and grooved clamps, which were to be placed on the casing. The valve and connections were fitted to the tongue and groove, and were to be moved over the well by means of a screw. It was impossible for the men to work close to the well; consequently a section of pipe 30 feet long was attached to the valve stem.

THE MEN WHO CLOSED IN CERRO AZUL NO. 4.

As a careful general calls his captains together at night to fight out the morrow's battle, so the Company's executives determined that a rehearsal would be necessary in order that each man might know his part; complicated hand signals had also to be devised, for the most stentorian voice dwindled to nothing near the roar of the great well.

The men withdrew to a point where distance deadened the bellow and there the nature and operation of the apparatus were explained to them. Painstakingly, time after time with infinite attention to detail they went over the process to be used.

On the nineteenth of February everything was ready to make the attempt. Nine days had elapsed since the well had been

VALVE PARTIALLY OVER WELL.

brought in. Speed had been used where speed was advisable, and what was more important, and a surer guaranty of success, patience had been exercised where patience was demanded. Not until the last minutiae of the effort were checked over, had the

order been given to go ahead. The table was clamped to the casing, and thirty feet away men began to turn the screw which

VALVE COMPLETELY OVER WELL.

advanced the valve slowly over the casing. It seemed impossible that any appliance devised by man could withstand that force.

THE WELL UNDER CONTROL.

Some of the men fully expected to see the heavy ironwork bent, twisted and cast aside as easily as a man doubles and discards an old pipe cleaner. But the work of the Company's experts and of its Mexican artisans was faithful, honest, unskimped work. When the valve touched the casing it held true in its place, and the body of oil was diverted slightly from the vertical. Men held their breath as they watched with anxious eyes the progress of the valve across the casing. Slowly and evenly just as at the

LEFT: TOOL EJECTED FROM WELL. RIGHT: MOUND OVER WELL.

rehearsals the men kept turning on the screw, slowly the valve moved over the casing, slowly the volume of oil continued to be deflected. The clamps still held. Now the column of oil was deflected at an acute angle to the casing, then suddenly it split into two columns—one rushing straight up again through the valve, the other bending more and more toward the 90 degree angle. Gradually the thin vertical stream became thicker and thicker, and the diverted stream thinner and thinner, until at length, the entire body of oil was rushing through the valve

straight into the air once more, no longer uncontrolled, but within the limits ordained by man. Fittings were made secure and in a short time the oil from Cerro Azul No. 4, humbled and subservient, was running into tanks, as completely under control and as accurately regulated as the water from the hydrant with which the housewife sprinkles her little flower garden.

The quantity of oil taken from the well until December 31, 1921, totalled 57,082,755 barrels. The amount of oil imprisoned here is incalculable.

The log of Cerro Azul No. 4 reads as follows:

Feet	*Feet*	
0–	30	Yellow clay.
30–	35	Gravel.
35–	88	Blue shale, 15½ inch casing set at 78 feet.
88–	245	Gray shale.
245–	265	Brown shale.
265–	542	Gray shale.
542–	560	Hard brown shaly lime, showing of oil at 327 feet.
560–	655	Basalt.
655–	705	Brown shale.
705–	740	Gray shale.
740–	850	Dark shale.
850–	868	Light shale.
868–	875	Shells.
875–	890	Black shale.
890–	1504	Gray shale.
1504–	1616	Brown shale.
1616–	1650	Blue shale.
1650–	1660	Light blue shale.
1660–	1705	Blue shale.
1705–	1720	Light blue shale with "crystals."
1720–	1723	Shell.
1723–	1732	Light blue shale, with sulphur odor; 12½-inch casing set at 1728 feet 5 inches, cemented and tested to 800 pounds.
1732–	1736	White limestone (top of Tamasopo); 8-inch casing set at 1735 feet 4 inches and cemented and tested to 1050 pounds.
1736–	1740	Brown limestone; hole filled with cement 50 feet from bottom of casing. All connections made and shut down until February 8, 1916, when cement was drilled out and deepening began.
1740–	1752	White limestone, with great flow of gas at bottom on morning of February 10th. When successfully closed on Feb. 19th, it was flowing at the rate of 260,858 barrels, as measured by Mr. Kunkel, the engineer for the Huasteca Company. Temperature of oil, 122° Fahrenheit; gravity, 21.4° Baumé. Closed-in or "rock pressure," 1035 pounds.