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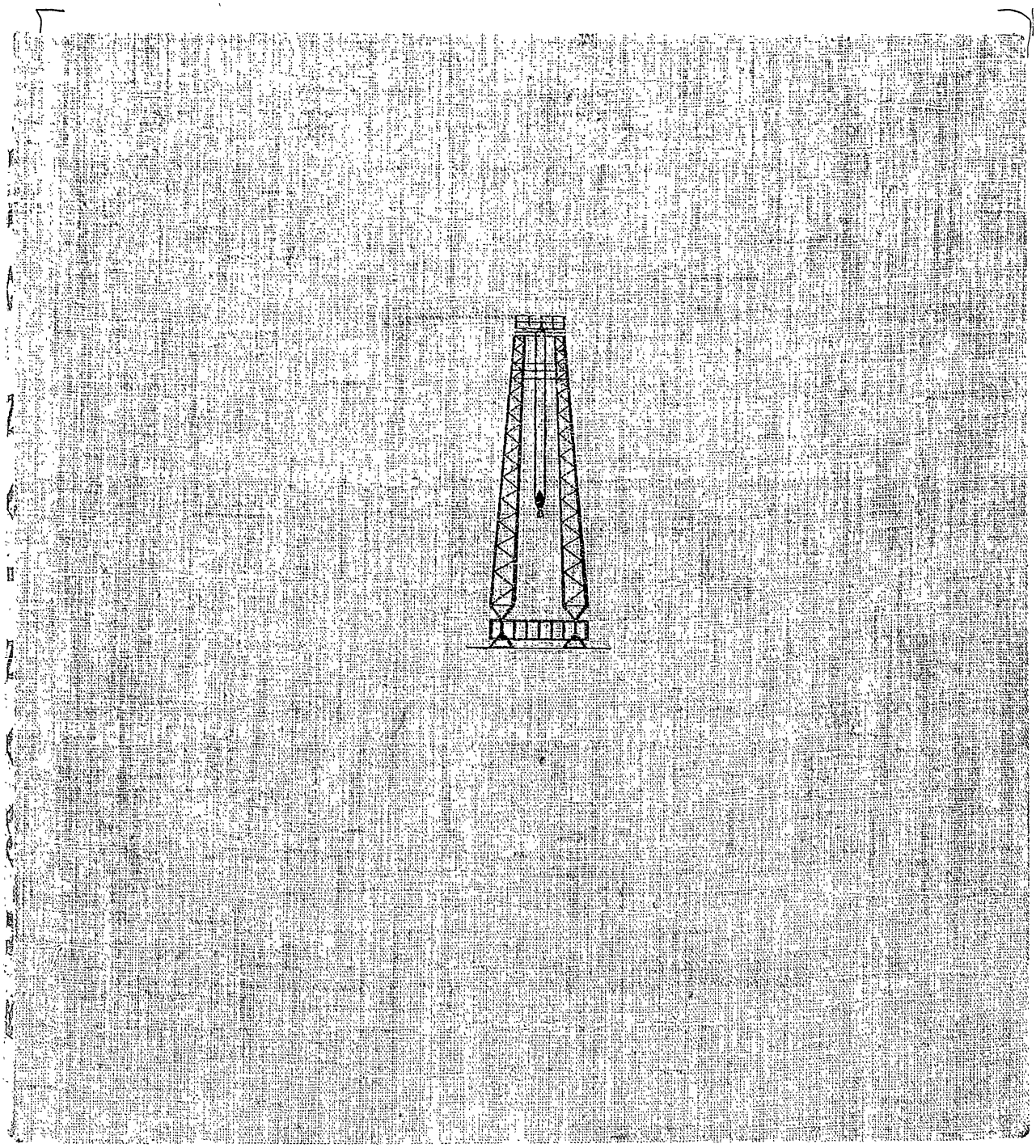

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THE CENTENARY OF RUMANIA'S OIL INDUSTRY

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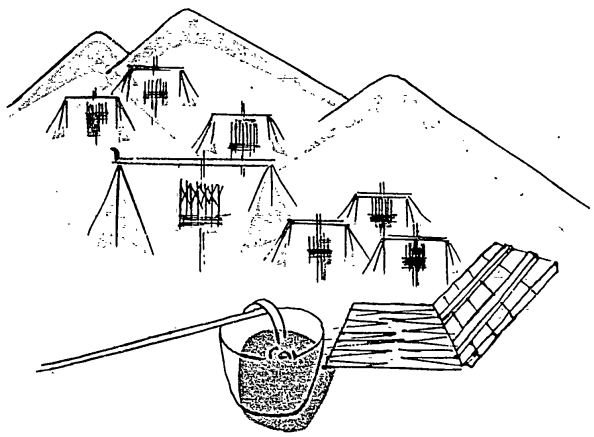


THE BEGINNINGS OF THE RUMANIAN OIL INDUSTRY AND ITS DEVELOPMENT UNTIL THE END OF THE FIRST WORLD WAR

In 1957 the Rumanian oil industry celebrated its first centenary.

The events marking 1857 as the birth year of the Rumanian oil industry were the following:

— the start of Theodor Mehedinţeanu's kerosene refinery at Rîfov and the lighting of Bucharest's streets with kerosene lamps, the first town in the world to be so lit;

— the first official records with regard to the production of crude oil on an industrial scale. The output of crude oil in 1857 was 275 tons.

Crude oil was known and used since ancient times on what is now the territory of the Rumanian People's Republic. The "ever-burning" fires at Lopătari—Buzău, already known at the time of the Romans, were indications of the existence of oil and gas in formations near the surface.

In the Rumanian Principalities, both in Moldavia and in Wallachia, oil was known and used for many hundreds of years.

In the notes left by foreign travellers who had passed on different missions through the Rumanian Principalities and in some autochtonous documents one finds that crude oil was extracted in Rumania as far back as the first half of the 16th century.

These documents mention the existence of oil shafts at Mosoarele, Poeni, Doftana and Păcureţi, the use of oil for medicinal purposes and for the greasing of cart axles, and later the export of crude oil in barrels, to Hungary and Turkey.

The missionary monk Baudinus passed through Moldavia in 1646, and was amazed by the number of pits from which the peasants extracted a black and viscous liquid called by

them *păcura* which they used as medicine in certain illnesses or for greasing the axles of their carts.

In the following century Dimitrie Cantemir, Prince of Moldavia, wrote in his *Descriptio Moldaviae*, published in 1716, that on the banks of the river Tazlăul Sărat, near the village of Moineşti, a mineral resin was oozing out of the earth and used by the peasants for greasing cart axles. On the map of Moldavia drawn by the prince in 1720, he marked the places where crude oil was being extracted at that time.

More detailed information about crude-oil production in the Rumanian Principalities was supplied by some French teachers who lived here between 1760 and 1792 as tutors to children of Rumanian boyars, and also by some foreign dignitaries who passed through the Rumanian Principalities during that period.

Stefan Raicovici, the first Austrian consular agent in Bucharest, who had been the teacher of Prince Alexandru Ipsilanti's children, wrote in 1788 a work entitled: *Osservazioni storiche, naturali e politiche intorno la Valachia e Moldavia*, in which he mentioned the existence of oil seepages in the Rumanian Principalities and the various uses of oil at that time.

A year later the work of another Austrian official, Ritter von Radischitz, was published: *Die Topographische und Statistische Beschaffenheit von der Moldau und der Walachei*. In this book Radischitz mentions Rumanian crude oil, stating that it made good cart grease.

Between 1785 and 1812 the Frenchmen Saint-Cyr, Saint-Luce and Comte de Langevin mentioned in their writings the existence in the Rumanian Principalities of a valuable liquid which the native population called *păcura*.

Andreas Wolf, medical officer of the city of Sibiu, also spoke in one of his works about seepages of "mineral tar," called *pekura* by the Moldavians and used by them for greasing harnesses and carts, as well as a medicine against insect bites.

The first researches of a scientific character into Rumanian oil resources were made by a commission of Russian mineralogists from Petersburg, headed by the scientist Anatol Demidov. Studying the pits at Păcureţi, Demidov found that they were producing about 225,000 kg. of crude oil per annum, the daily output varying between 15 and 80 kg. per pit, which, in his opinion, could be considerably increased.

In the beginnings, at a time when there was no great demand for oil, crude-oil production was limited to the collection of crude oil oozing from the earth in pits dug in valleys or in low-lying ground.

As soon as crude oil began to be used on a larger scale, its collection in pits was gradually abandoned in favour of "washing places" arranged in the beds of rivers, in which the oil carried by the water was gathered. Later deeper pits, called "baths," were dug. Such "baths," 4 to 5 metres long, were carefully excavated to a depth of up to 18 or 20 metres. Their walls were lined with hardwood boards.

Thin oil ran into the pits during the summer and was left exposed to the heat of the sun and the action of the wind for the evaporation of volatile particles, so as to become sufficiently thick for use as wheel grease.

In the course of time, however, the quantities of crude oil extracted from the "pits" and "baths" became insufficient to cover the steadily growing demand. It therefore became necessary to search for oil at greater depth; consequently deeper shafts were dug, resembling water wells. At first this was done in the neighbourhood of oil outcrops and then at ever

greater distances from these. The transversal section of the shaft was as a rule a square, the sides measuring 1.2 to 1.5 metres at the surface, gradually narrowing down to about 80 cm. at the bottom, which is the minimum space required by a man for digging and loading the earth. The walls of these shafts were strengthened with hardwood boards called *ţambre*. When shafts had to be dug in hard rock, as was the case in Moldavia, their section was circular and the walls were lined with wattle.

At first the shafts were no more than 15 or 20 metres deep. Later, when the demand for oil increased, the technique of shaft digging improved, and their average depth reached 40 to 50 metres. Some shafts were sunk to considerably greater depths, exceeding in some cases 200 metres, which represented a remarkable achievement at that time. Such shafts were the "Aneloaia" at Lucăcești, 250 metres deep, the "Sfetescu" at Băicoi, 240 metres and the "Măgura" at Matiţa, 268 metres deep.

To get the earth out of the shaft and for the extraction of the crude oil, big wooden buckets of about 50 litres capacity or else leather sacks of about 100 litres capacity were employed. The buckets or sacks were lifted to the surface with the aid of strong ropes made of lime-tree bark or hemp; later steel cables were used, wound on wooden drums mounted at the mouth of the shafts and worked by hand.

In deeper shafts *hecne* were employed, drums on a vertical axle set in motion by horses. The bucket was hung at the end of the rope descending into the shaft, whose other end was fixed to the rotating drum set in motion by horses walking in a circle.

Working conditions in these shafts were extremely hard and dangerous, because in addition to the ever-present risk of the walls caving in and of explosions, the men had to work standing in oil and in an atmosphere vitiated by gas, without proper ventilation and without light. As the only means of protection the men wore leather suits and placed pails over their fur caps to protect their heads. The shafts were ventilated in a very primitive way by pulling up and down bundles of leafy branches attached at intervals to the bucket rope. To avoid asphyxiation, a shaft digger worked at the bottom of the well for only a few minutes at a time, after which he was pulled up and another man went down.

When shaft diggers were working in oil strata during the winter, snow was thrown down, because its cooling effect reduced the gas emanations. That was the reason for which deep shafts used to be sunk preferably in the winter.

Owing to the presence of gas and the permanent danger of explosion, no artificial lighting could possibly be used in the shaft. The only light came from the sun, and mirrors were placed at the shaft mouth to reflect the sunrays down to the bottom where the men were working.

When the shaft was dug and the oil was flowing into the pit, the extraction was effected with the aid of the same drum, a leather sack or a wooden pail being fixed to the rope.

In the course of the last century the digging of such shafts became a highly specialized job. Whole villages went in for this ocupation. The *moşneni* (free peasants) village of Păcureţi became famous for its shaft diggers, whose speciality was the digging of shafts lined with boards. These men were in demand all over the country for the digging of oil shafts.

Increasing oil output and the steadily growing sales greatly contributed to the flourishing state of many market towns in the oil regions.

In 1827, Ploeşti, well-known today as an oil centre, was only a market town with a population of about 8,000. Thirty years later, due to the development of neighbouring oil-fields, Ploeşti was a real town with shops and inns, to which travellers and merchants came not only from nearby market places and villages, but even from beyond the borders of the country and its population had risen to 26,000.

By 1844 the market town of Moineşti was also a busy oil centre, from which carts laden with barrels of crude oil set out for destinations in the country and abroad.

Contemporary documents show that between 1780 and 1820 a customs duty amounting to 120 bani per barrel of crude oil was charged on oil leaving the Rumanian Principalities.

In 1856 the building of the first industrial establishment connected with oil was begun in the village of Rîfov, near Ploeşti. This was Theodor Mehedinţeanu's refinery which started production in 1857.

This factory produced kerosene from crude oil on an industrial scale, and its refining capacity was 2,700 tons of crude oil p.a., i.e., considerably bigger than the production of 275 tons indicated by Rumanian official statistics for that year.

The construction of the refinery was determined by the results of research undertaken by Alexe Marin, professor of chemistry, Hege, apothecary to the Prince's Court, and T. Mehedinţeanu; they experimented with Păcureţi crude oil, distilling it in a still used by Hege for preparing essences from flowers and plants. By distilling crude oil they obtained a light-coloured liquid (kerosene), which could be burnt in special lamps brought by Mehedinţeanu from abroad; it gave a more powerful light and produced a less unpleasant smell than oil distilled from bituminous shale or colza oil. Apart from that, the new oil did not congeal and was cheaper than either of the above oils.

Encouraged by these results Mehedinţeanu took part in the bidding for the contract to provide street lighting in Bucharest, offering to undertake the job for 335 lei a year per lamp post, as compared with 600 lei demanded by his competitors for lighting the streets with colza or walnut oil.

Bucharest became the first town in the world to be lit by kerosene lamps, a fact which at that time was an astonishing event.

On October 8, 1856, the Bucharest City Council signed an agreement with T. Mehedinţeanu, the latter undertaking to set up lamp-posts for lighting the streets of the capital with kerosene.

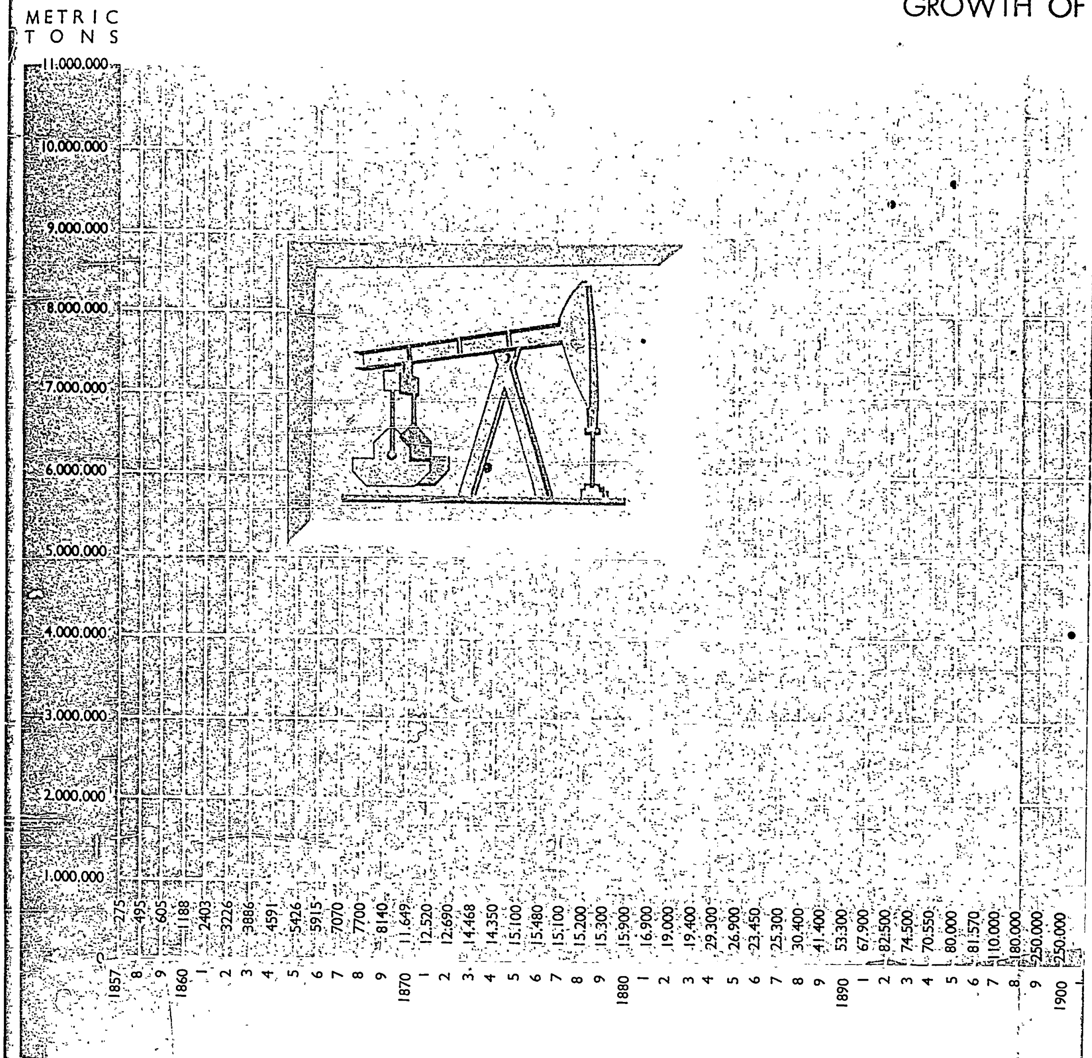
Mehedinţeanu then went to several European countries and finally arrived at Hamburg, where he ordered an oil distilling plant from the firm of C. Moltrecht. This plant was based upon principles arrived at in the course of experiments carried out in Rumania.

The plant consisted of two vertical cylindrical boilers of 10,000 litres capacity each, with domes, dephlegmators and water coolers, burning refinery residues.

Mehedinţeanu's example was followed by a number of other refiners. The E. Wolf metallurgical works in Bucharest built dozens of boilers of the type ordered by Mehedinţeanu and all of them went to various crude oil distilleries at Teţcani, Valea Arinilor (Moineşti) and a number of other places.

In 1871 Grigore Monteoru, encouraged by Mehedinţeanu's success, built a refinery next to the Monteoru railway station, 10 km. from Buzău; this refinery could process 9,000 tons

GROWTH OF



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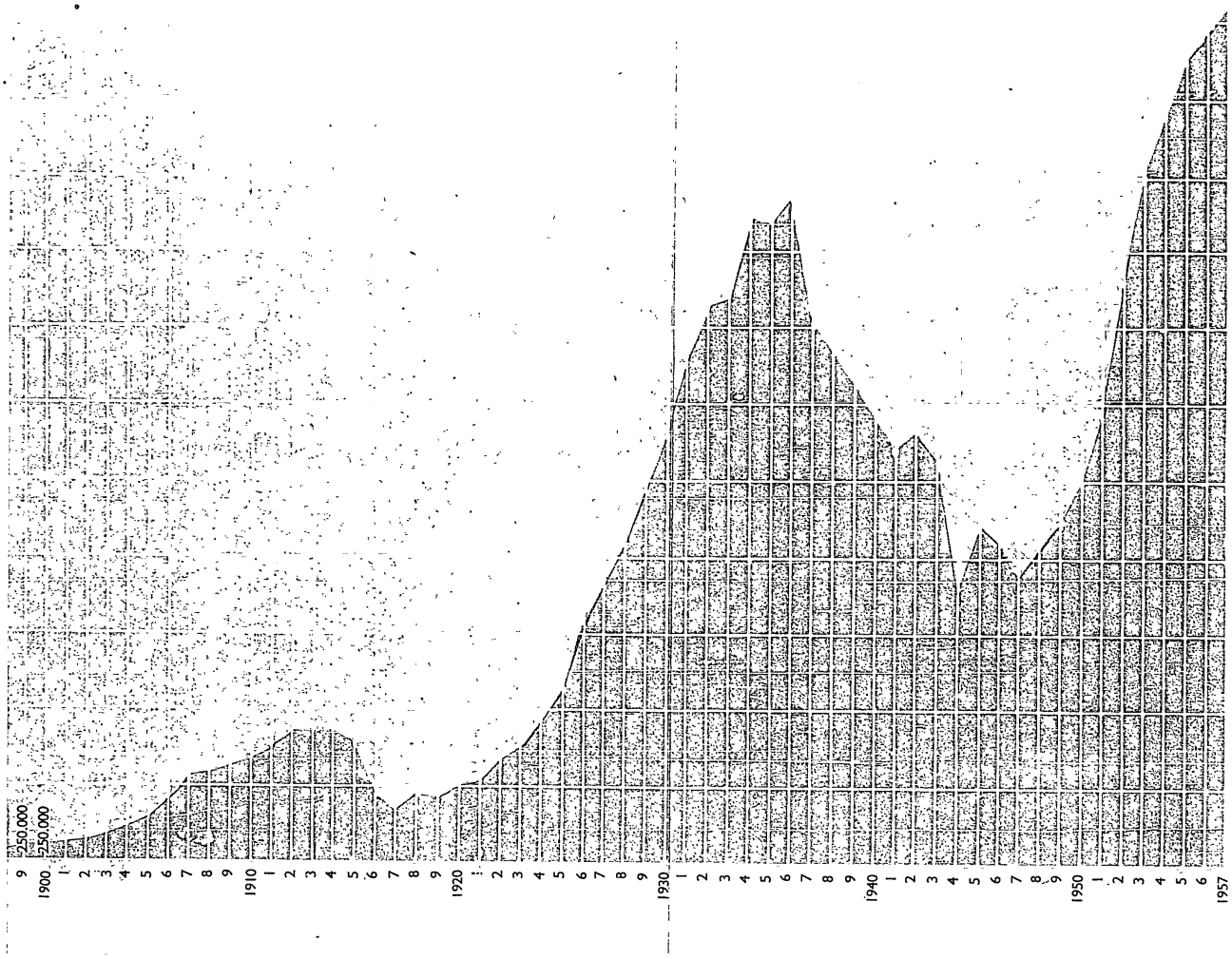
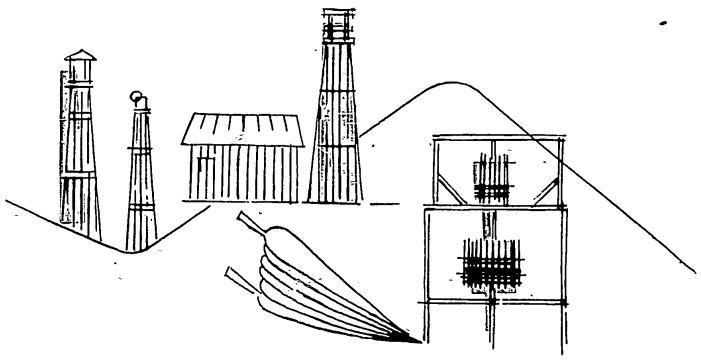




of crude oil p.a.; in 1873 he introduced some additional equipment and started producing lubricating oils from the distillation residues.

The demand for crude oil and kerosene grew at such a rate that, as the economist Dionisie Pop-Marţian pointed out, there were 101 crude oil merchants in Wallachia alone, as proved by the "occupation statistics" for 1860, and 58 kerosene manufacturers in 1863, according to the "statistics of industrial establishments."

Kerosene acquired outstanding importance in the national economy of the country and this determined the government of the day to enact a law in 1895 which imposed certain standards of quality for kerosene produced by Rumanian distilleries; among the conditions was the minimum flash point of 23° (Abel-Pensky).

The use of kerosene for home lighting spread very rapidly, greatly boosting the extraction of crude oil. In order to comply with the ever growing demand for crude oil, shaft digging had to be intensified and at the same time the methods of sinking shafts and extracting oil had to be improved. For this reason numerous oil shafts were sunk to ever greater depths. But as the depth of the shafts increased, the serious risks and dangers encountered by the diggers grew enormously.

In 1857 sheet-iron pipes were introduced for the ventilation of the shafts. The air was blown through them with the aid of bellows that were similar to those used in primitive smithies. Another safety measure adopted in some deep shafts, was the use of two *hecne* one of which was kept working while the other was kept in reserve, ready for use at any time.

In spite of these measures, cases of asphyxiation were common occurrences. A good many accidents were registered as being provoked by the slip of sand, the breaking of ropes, or by explosions due to sparks produced when hitting a sandstone layer.

Ever growing difficulties were encountered in the digging of deep shafts, affecting first and foremost the profits of the oil firms and determining the introduction of mechanical methods of well drilling, alongside the old-fashioned shaft digging. The first attempts were quite rudimentary, work being carried out by percussion with the aid of wooden rods worked by hand, i.e., a method known to the Chinese more than 2,000 years ago.

In 1861 the first well of this kind was drilled to a depth of 150 metres, at Mosoarele, near Tîrgu Ocna.

In 1863 an attempt was made to drill a well in the Drăgăneasa oilfields, using cable percussion for the first time and in 1879 Grigore Monteoru drilled three wells at Sărata with this method. The drilling of these wells was done under difficult conditions caused by repeated alternations of hard and soft rocks and the very great dip of the layers, as well as by the deficiencies and the rudimentary character of the drilling rigs.

Rumanian technicians and workmen not only learned quickly how to use such equipment but also improved it, adapting it to Rumanian geological conditions, and succeeded in drilling a great number of productive wells in the regions of Cîmpina, Buştenari and Băicoi. Some of these wells are still in existence. In 1895 Polish engineers introduced to Rumania the drilling method with steel rods, which became the prevailing method in Rumanian oilfields up to the First World War.

In 1896 the hydraulic percussion method appeared, which permitted the attaining of much higher drilling speeds.

In 1904 A. Raky, who had been working for a long time in Rumanian oilfields, made an important improvement of the hydraulic percussion drilling method by applying an elastic suspension between the walking-beam and the drilling rods, so that a greater number of percussions became possible which, implicitly, meant a higher penetration rate of the drilling bit. Due to this modification the number of fishing jobs dropped, as the bits no longer remained stuck in the bottom and the stress applied to the drilling rods was reduced.

In 1910 experiments were carried out at Cîmpina using a percussion drilling method with a bottom motor driven by water — an invention made by Beldiman, a Rumanian engineer. The motor was mounted above the drilling bit and was driven by a current of water pumped through the drilling rods, transmitting to the bit up to 200 percussions per minute. In 1912 a test was made in the same oilfield with a drilling tool designed by the Rumanian engineer Cantili; it consisted of a reamer with two adjustable blades. Neither of these systems produced results justifying their use on a wide scale.

Some 800 oil wells were drilled by 1915; 92 per cent of them by the rod percussion system, 3 per cent by the cable tool system, and 5 per cent by the hydraulic percussion system.

Rotary hydraulic drilling was tried out in Rumania for the first time in 1901, on a well 300 metre deep. In 1906 this method was experimented with in drilling a well in the Teţcani—Moldavia oilfield, and later in drilling a well at Moreni and four at Păcureţi. The wells, however, could not be completed because of technical difficulties and the existence of extremely hard layers of rock. In spite of these failures a new attempt was made in 1911, when a well was successfully drilled at Filipeştii de Pădure to a depth of 1,170 metres.

Hydraulic rotary drilling finally came to stay when a 700-metre deep well was drilled at Bana—Moreni in 1914, in the record time of only 16 days.

Until 1889 the casing of wells was done with riveted sheet iron tubes or, sometimes, in the case of shallow wells, with cast-iron tubes. In that year casing pipes drawn from steel bars were used for the first time; since then riveted pipes continued to be used only in shallow wells or for surface strings.

The number of casing strings in a well was very great, at times reaching 10 or even 11. That is why the drilling of wells started with pipes of 700—800 mm. in diameter at the surface, gradually diminishing to 100 mm. at a depth of about 800 metres.

In addition to high penetration rates, the rotary hydraulic drilling method permitted a reduction in the number of casing strings to three at the most, owing to the fact that the bore hole could be drilled uncased for long distances.

From now on only seamless steel casings were used in drilling wells.

In the pits the water was shut off with clay compressed by beating it with mallets behind the boards, lining the walls of the shafts, and in wells by pressing the casing strings into an impervious layer of clay.

Cementing behind the casing strings was also used, up to a height of a few metres, with a mixture of sand and slow-setting cement.

The output of crude oil, which was 250,000 tons in 1900, increased to 1,847,875 tons in 1913, due mainly to the exploitation of gushers in the rich oilfields of Cîmpina, Bușțenari, Colibași, Buzău, Sărata Monteoru and Moinești.

The first "gusher" was completed in 1883 in the Drăgăneasa-Cîmpina oilfield. The eruption was free, the oil gushing through the derrick into the air, rising to a great height and being collected upon falling to the ground in so-called *batale* (pits) dug round the well.

In order to avoid too wide a scattering of oil and gas around the well and to reduce the danger of fire, the derricks were lined with boards and sheet iron since 1899, with a heavy bell-shaped cast-iron piece called *linză* fixed near the top.

The crude oil gushing out of the well mouth fell down after hitting the *linză* and ran into specially prepared troughs, while the gas leaving the well with the oil was absorbed by exhausters and directed into the network of gas pipelines. This primitive arrangement was the first attempt to separate crude oil and gas.

The consequence of free eruption was a tremendous pressure decline in the oilfields, because of the complete degasifying of the oil-bearing formations. Huge quantities of oil remained in these formations and could only be partially extracted with great difficulty and at a very high cost. Because of this many wells and even whole oilfields were considered to be no longer paying propositions and were consequently abandoned.

The Stejarul oilfield at Bușteni, once famous for its production, was completely abandoned for this very reason. The Cîmpina oilfield which produced 100,000 tons in 1901, yielded 333,000 in 1910; due to irrational exploitation by free eruption, the output dropped to only 57,600 tons by 1916.

When free eruption stopped, the extraction of oil continued by bailing with the aid of the so-called *lingura de lăcărit* (production bailer), run with the same equipment which was used in drilling the well.

Concurrently with the increasing depths of the wells and the development of hydraulic rotary drilling, the diameters of the casing strings were reduced, so that the production obtained by bailing became rather small. In 1909 production of crude oil by swabbing replaced bailing. Swabbing was done with the aid of special 5 to 7-inch production strings, known as "swabbing casing strings." At first these strings stood at the bottom of the well, being perforated in their lower portion, but later they were suspended above the pay-sand, as it was found that they often got stuck on the bottom owing to collapse or deviation of the strings.

The daily output of crude oil by swabbing was much higher than could be obtained by bailing; in the Moreni oilfield, for instance, 300 tons a day were extracted from a well, using a 7-inch swab.

At Drăgăneasa-Cîmpina pumping was started as far back as 1884 and it was later adopted on a large scale at Buştenari and in the Moldavian oilfields.

These primitive production pumps had a steel pipe body and a piston, with hemp rope packings or cup-shaped leather gaskets.

In 1903 attempts were made to use devices for controlling flowing wells. These outfits which were only a kind of big safety valve, did not work when eruptions became violent, because they soon became clogged with sand blown out of the well with the oil. In 1912 Rumanian engineers constructed a valve with a cylindrical piston, working hydraulically from a distance. The results of tests made on gushers were very successful.

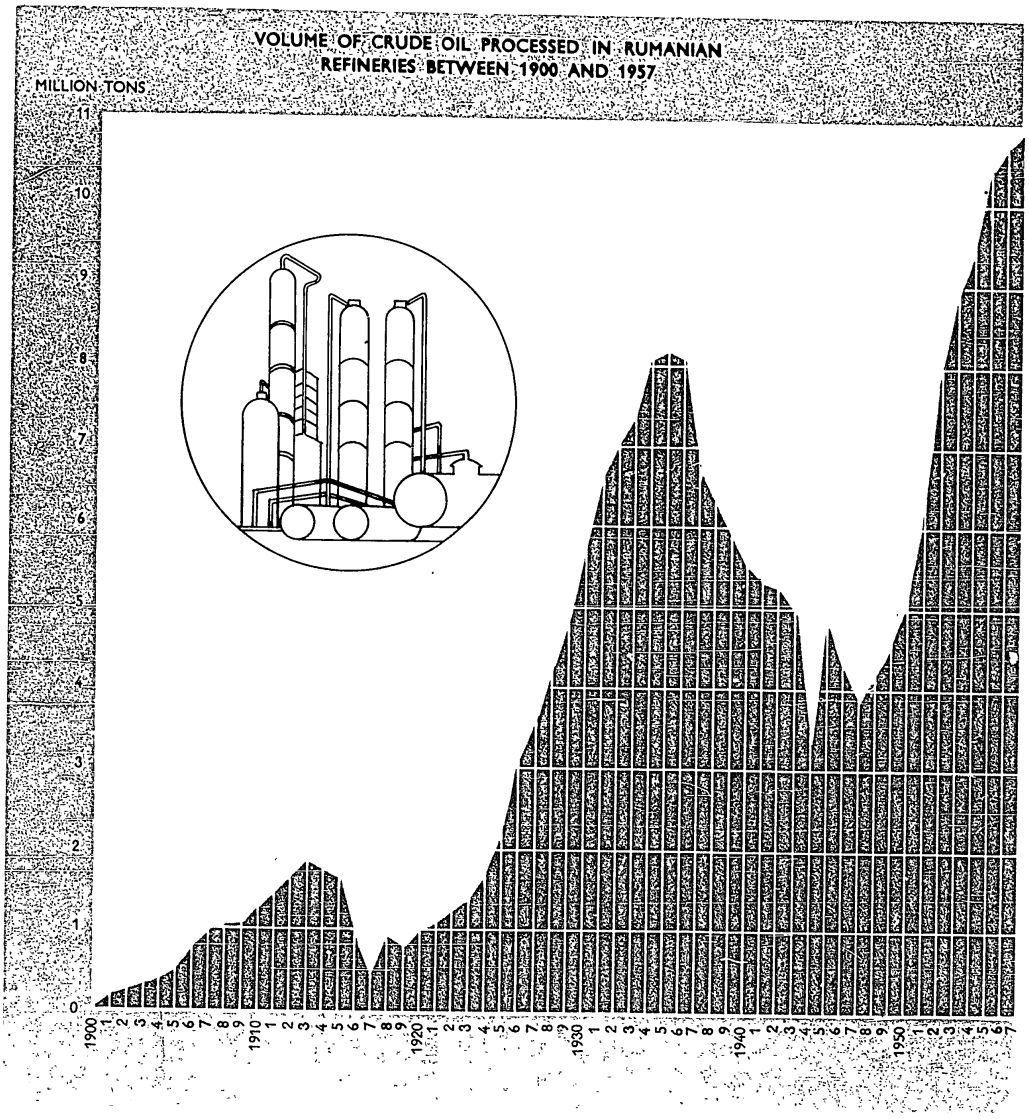
Dr. Lazăr Edeleanu

At about the same time a primitive flowing head was mounted on a well at Moreni. It consisted of two valves with two branches each, which guided the oil flowing at high pressure from the well to a wooden hut lined inside with sheet iron, where oil and gas were separated. A technical improvement was made to this method at a later date, when each of the two branches of the flowing head was connected to two or three cylindrical tanks filled with gravel, so as to provide a back-pressure of 2 or 3 atmospheres on the well head, which would reduce the velocity of the flow (gas and oil), as well as the quantity of sand associated to the mixture. Unfortunately the gravel tanks became very quickly clogged by sand and stopped working. These may be considered to have been the first attempts for controlling the production of wells and separating oil and gas.

The use of flow beans at the flowing head was tried for the first time in 1916. This experiment was carried out at a well in the Pleaşa (Moreni) oilfield, a four-branched flowing head being fitted to its mouth. A flow bean was placed in every branch. The quantities of sand thrown up by the well were, however, so great, that the flowing head device was soon worn away, valves and all. At about the same time a flowing choke made from a thick-walled 1 1/2" pipe was tested at a well in the Băicoi oilfield. The well was flowing 45 days and 30,000 tons of oil passed through the choke, but by then the device mounted on the well head was completely destroyed by erosion.

Concurrently with the increase of crude-oil output in the fields, the oil-processing industry continued its development at an even faster rate than oil production.

The increase of kerosene consumption for lighting purposes and the ever growing use of fuel oil in railway locomotives and steamships on the one hand and the invention of the internal combustion engine on the other, led to a considerable growth in the demand for oil products — a demand that could not be satisfied by the working capacity of the small refineries built in Rumania in the second half of the 19th century. In order to satisfy the growing demands for oil products at home and abroad, more and more refineries were built and by the end of 1914 they numbered 62.



In 1897 the biggest Rumanian oil refinery of that time was built at Cîmpina. It consisted of a battery of 16 continuous stills, with fire tubes, pre-heaters for residues and distillates, and was provided with dephlegmators. The processing capacity of this refinery was 1,200 tons per day. Distillation was effected by steam injection and the kerosene was refined. Some crude oils were processed for the production of lubricating oils and paraffin.

This refinery was enlarged in 1903 by the addition of a battery of 9 fifty-ton stills for the discontinual distillation of gasoline. To meet the needs of the refinery, a sulphuric acid factory, working on the contact principle, was built at Cîmpina in 1907.

From the point of view of planning and technical set-up the new refineries built between 1900 and 1914 were much superior to the small refineries erected prior to 1900. The crude-oil stills now had a capacity of up to 50 tons each and were provided with two tubular fire boxes, while distillation itself was done with superheated steam. New types of dephlegmators appeared at this time in great numbers. The whole quantity of gasoline obtained in these refineries was distilled by the heat recuperated from the pre-heaters for residues and distillates.

In 1908 Dr. Lazăr Edeleanu, a Rumanian scientist, worked out a method for the selective refining of kerosene with the aid of liquid sulphuric dioxide. Thanks to Dr. Edeleanu's invention Rumania obtained priority in the use of selective solvents for the refining of oil products.

Starting with kerosene, the method of selective refining with sulphur dioxide was extended to all other oil products. The method was continually improved, so that from the initial discontinual process the continuous method was worked out. The latter is at present also used for refining products derived from coal-tar resulting from the distillation of coal. Large sulphur dioxide refining plants are now successfully working all over the world.

Geologist Ludowic Mrazek

As a result of improvements introduced by the refineries, gasoline output increased from 6 to 13 per cent, while that of kerosene decreased from 68.5 to 29.9 per cent.

In 1900 gasoline consumption was quite insignificant compared to kerosene consumption, but by 1913 world consumption of gasoline reached 5,300,000 tons, Rumania's production during that year being 422,000 metric tons, or equal to 8 per cent of world consumption.

The processing capacity of the refineries increased rapidly, reaching 1,200,000 tons in 1900, 2,090,000 tons in 1908 and 4,152,000 tons in 1914.

During the period preceding Rumania's entry into the First World War, aromatic byproducts being needed for the production of explosives, a small plant for the pyrogenous treatment of oil fractions was built in Bucharest. Its output was sufficient to cover the internal needs of the moment.

In the early years of the 20th century the bulk of Rumania's crude-oil output was consumed at home. Exports of crude oil and oil products barely accounted for 25 per cent of produc-

tion. After 1910, however, the export of crude oil and oil products began to increase rapidly and in 1913 represented more than 57 per cent of the total output.

At first crude oil and oil products used to be exported to Western Europe only; when production reached a higher level, outlets were found in Egypt, Turkey and several other countries.

Steel pipelines were built for transporting the crude oil from the fields to the refineries. Their total length reached 1,600 kilometres in 1918 as compared with only 20 kilometres in 1900.

Railway tank cars were built in great numbers for the transport of oil products to export stations or large centres of consumption at home. From about 750 in 1903, their number increased to more than 4,200 in 1916.

Important progress was achieved in the building of storage tanks for crude oil and oil products. The total storage capacity of the Rumanian oil industry in 1918 was 386,333 cubic metres. 94 per cent of the tanks were made of steel and the rest of wood.

In 1906 the storage tanks and the loading station in the harbour of Constantza on the Black Sea were commissioned and in 1907 export stations for oil products were opened in the Danube ports of Giurgiu, Cernavoda and Brăila.

Geologist Gheorghe Murgoci

Simultaneously with the development of the oil industry, geological research was extended, with a view to discovering new oil deposits. The first Rumanian geologists to acquire international reputation were Grigore Ştefănescu, Grigore Cobălcescu, Mrazek and several others.

In his speech on the occasion of his election to the Rumanian Academy, Grigore Cobălcescu said:

"Oil exists in Rumania in oligocene, saliferous and pliocene formations, from the northern frontier of Moldavia right down to Oltenia.

"From a tectonical point of view, the geological formations are folded and form numerous anticlines which are split by deep faults in longitudinal and transversal directions. All folds of the oil-bearing zone run parallel to the Carpathian ridge, i.e., in the direction S.W.—N.E. in Wallachia and S.E.—N.W. in Moldavia. The oil is concentrated in anticlinal axes, where it is often accompanied by salt stocks, as well as saline and sulphureous springs containing iodines and bromides. There is no oil in the zones situated between the anticlines.

"In Moldavia the oil appears in miocene and oligocene formations, in Wallachia in oligocene and pliocene formations."

The studies made by Cobălcescu, Ştefănescu and other Rumanian geologists prior to 1900, led to the identification of rich oilfields in Rumania (at Colibaşi, Băicoi, Matiţa, Sărata Monteoru, Lucăceşti, Tazlăul Sărat-Zemeş, Solonţ, Teţcani, Sîrbi, Cîmpeni, etc.) thus clearing the road for work of great scientific and practical value in connection with Rumanian oil.

In 1903 the Commission for the Study of Oil Geology was set up. It was composed of the geologists G. Murgoci, S. Atanasiu, V. Anastasiu and W. Teisseyre. The commission's report, published as the result of studies extending over a number of years, presented for the first time an official inventory of the natural sources of hydrocarbons, an enumeration and a short technical and scientific description of all fields exploited at that time, as well as a general survey of the geological structure of oil-bearing regions, which showed the oil-bearing structures prospected up to that time.

In 1906 the Rumanian Institute of Geology was created, which carried out fruitful research in the field of hydrocarbons.

The work which was done, and the results of which were published by the Institute of Geology, was carried out with the participation of outstanding geologists, such as L. Mrazek, S. Atanasiu, Popovici-Hațeg, G. Murgoci, I. Popescu-Voiteşti, G. Botez, G. Macovei and some younger men, and referred to the stratigraphy and tectonics: (a) of the marginal region of the Eastern Carpathian flysch in the former counties of Neamț, Bacău and Putna, (b) of the Subcarpathian regions of Central and Southern Moldavia and the connections of the latter with the Moldavian plateau, (c) of the Southern Carpathian flysch zones; it also dealt with the geological structure: (a) of the paleogene, miocene and pliocene Subcarpathian regions in the former counties of Buzău, Prahova and Dîmbovița, and (b) of the Subcarpathian region and the pliocene zone in the Getic Depression (Oltenia).

In these publications an inventory is drawn up and a detailed description is given of all natural outcrops of hydrocarbons, together with descriptions of the geological structures to which they belong and of oilfields in exploitation at that time.

The inherent qualities of oil and particularly its increased use led to massive expropriation of the *moşneni* peasants in Rumania throughout the whole 19th century (and after the 1864 land reform of the smallholders), as soon as oil was discovered on their land. The seizure of their land was carried out by the boyars and landlords, by the rising bourgeoisie and by some of the kulaks in the villages situated in oil regions (many of whom later became oil manufacturers).

In 1867 the first oil company with Rumanian capital was founded under the name of "Rumanian Limited Company for the Exploitation of and Trade with Fuel Oil." Its founders were a group of landlords, bourgeois and politicians.

The rich Rumanian oilfields soon attracted the attention of foreign capital as well, whose owners considered them a good source of new profits.

In 1862 a French company carried out some drilling in the Mosoarele region, near Tîrgu Ocna.

In the same year a British firm, "Jackson, Brown & Co.," was formed with a capital of 4,000,000 francs which bought land all over the Prahova county and built a refinery at Brăila to which the crude oil was transported in barrels. There was also a Viennese company, "Suchard & Co.," which had obtained a concession at Colibaşi—Prahova.

The infiltration of foreign capital into the Rumanian oil industry was done with the direct connivance of the Rumanian bourgeoisie and the big landowners, as well as of the then leaders of the Rumanian state and particularly of the Hohenzollern dynasty.

In 1895 the first Mining Law was passed, facilitating the acquisition of oil-bearing land by foreign capital. This law established the principle that the owner of the land was *ipso facto*

the owner of its subsoil, free to sell it outright to anyone or to grant a concession for its exploitation, the state reserving no rights for itself, nor exercising any control.

State-owned oil-bearing land was divided into "perimetres" of no more than 40 hectares each, and concessions were granted for periods of 30 years, with a royalty of 4 per cent and an annual ground-rent of 20 lei per hectare.

In 1899 these provisions were amended: the perimetres were increased from 40 to 100 hectares and the royalties to 8—14 per cent. In 1900 the duration of the concessions was increased to 50 years.

The 1895 Mining Law threw the doors wide open for the entry of foreign capital. German, British, Dutch, and later American, French, Belgian and Italian capital came rushing in, and the proportion of Rumanian capital invested in the oil industry kept going down.

In 1900, only five years after the enactment of this law, the proportions of capital invested in the Rumanian oil industry were as follows:

German	60 per cent
Anglo-Dutch	30 per cent
Rumanian	10 per cent

Attracted by the rich oilfields and the favourable laws, the two big oil trusts "Standard Oil" and "Royal Dutch Shell" appeared on the scene.

In 1904 the American "Standard Oil" trust opened a branch under the name of "Romîno-Americana," with a capital of 2,500,000 lei. In 1914 this company controlled 18 per cent of the country's crude-oil output, 23 per cent of its oil-processing capacity and 6.19 per cent of the capital invested in the oil industry.

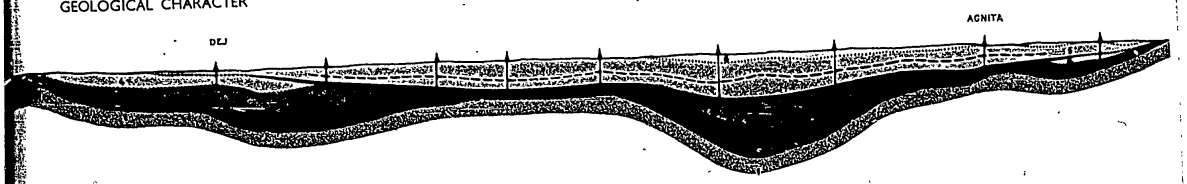
The Anglo-Dutch trust "Royal Dutch Shell" created a subsidiary in 1910, under the name of "Astra Romînă," with a capital of 29,400,000 lei; by 1914 it controlled 11.5 per cent of the capital invested in the oil industry, 25 per cent of the crude-oil output and 40 per cent of the processing capacity. Up to the outbreak of the First World War the distribution of invested capital underwent the following changes:

Origin of capital	1905		1914	
	In millions of lei	Per cent	In millions of lei	Per cent
British	—	—	63	16.15
Dutch	—	—	28	7.18
Anglo-Dutch	13.2	8 75	61	15.64
French	—	—	31	7.95
Belgian	—	—	16	4.10
Franco-Belgian	6.5	4.31	—	—
American	5	3.32	26	6.67
German	97	64.32	130	33.33
Italian	7.5	4.98	5	1.28
Rumanian	21.6	14.32	18	4.62
Other	—	—	12	3.08
Total	150.8	100	390	100

GEOLOGICAL CHARACTER

DEJ

AGNITA



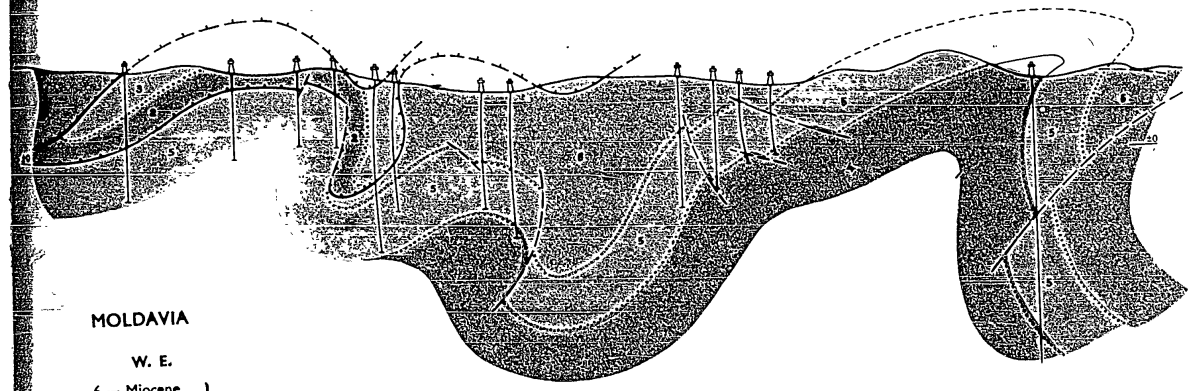
TRANSYLVANIAN DEPRESSION

N. S.

6 = Pliocene
5 = Sarmatian-Tortonian (salt)
4 = Aquitanian-Helvetian
3 = Paleogene
2 = Mezozoic + (Paleozoic ?)
1 = Crystalline basement

The scale of the heights is twice as large as that of the lengths

GEOLOGICAL CHARACTER

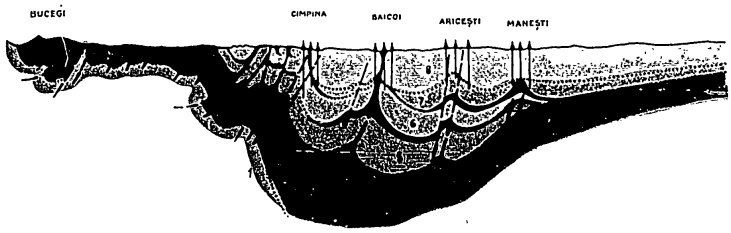


MOLDAVIA

W. E.

6 = Miocene
5 = Oligocene } Marginal zone
4 = Eocene
3 = Oligocene } Tazlău zone
2 = Eocene
1 = Eocene Tarcău zone

GEOLOGICAL CHARACTER



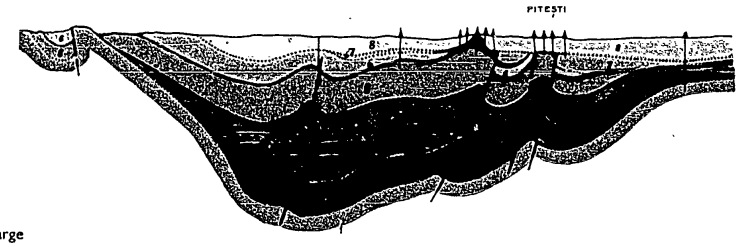
CENTRAL WALLACHIA

N. S.

8 = Pliocene
7 = Sarmatian-Tortonian (salt)
6 = Helvetian-Aquitanian (salt)
5 = Paleogene
4 = Cretaceous
3 = Jurasic
2 = Triassic-Paleozoic
1 = Crystalline basement

The scale of the heights is twice as large as that of the lengths

GEOLOGICAL CHARACTER



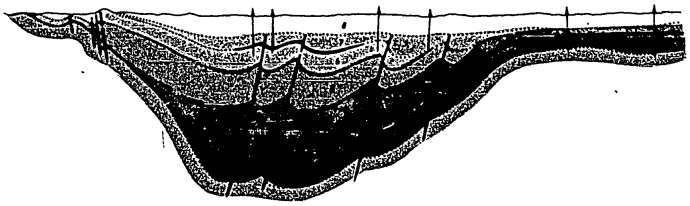
WEST WALLACHIA

N. S.

8 = Pliocene
7 = Sarmatian-Tortonian (salt)
6 = Helvetian-Aquitanian (salt)
5 = Paleogene
4 = Cretaceous
3 = Jurasic
2 = Triassic-Paleozoic
1 = Crystalline basement

The scale of the heights is twice as large as that of the lengths

GEOLOGICAL CHARACTER



CENTRAL OLTENIA

N. S.

8 = Pliocene
7 = Sarmatian-Tortonian (salt)
6 = Helvetian-Aquitanian
5 = Paleogene
4 = Cretaceous
3 = Jurasic
2 = Triassic-Paleozoic
1 = Crystalline basement

The scale of the heights is twice as large as that of the lengths

The foreign companies brought their own plant and machinery and came with their own technicians who were, in most cases, unfamiliar with geological conditions in Rumanian oilfields. For this reason many oil wells were completed in bad conditions and even whole oilfields suffered irreparable damage.

The training of Rumanian personnel, mostly only workers, was started after a considerable delay. It included drillers, drilling foremen and auxiliary personnel such as motor mechanics, fitters, electricians, etc. There were very few Rumanians on the medium and higher grade staffs, as it was the standing policy of foreign firms to bring such men from their own country. This policy was aided and abetted by the Rumanian governments of that period which did not open any special higher grade technical schools.

In 1904, of the 530 drilling foremen who worked in various parts of the country, more than 300 were foreigners.

Up to the end of the First World War there were only a few Rumanians in higher positions — engineers who had studied abroad, often men who had not specialised in oil.

In December 1904 a school for drilling foremen was opened at Cîmpina, but it was only in 1914 that a mining and oil section was created at the Bucharest School of Roads and Bridges.

Due to their keenness in learning drilling and extraction techniques, Rumanian technicians and engineers became competent oilfield managers in a short space of time and were worthy representatives of Rumanian science and technique, successfully drilling wells in regions where foreign technicians had failed.

Nevertheless up to the First World War the key positions in the oil companies continued to be held almost exclusively by foreign citizens, while the proportion of other staffs was as follows:

	Rumanians %	Foreign citizens %
Engineers	47	53
Technicians	70	30
Drilling foremen	84	16
Office employees	66	34

After the outbreak of the First World War (1914) and particularly after Rumania's entry into the war on August 15, 1916, the oil companies reduced their investments for drilling and extraction; this led to a continuous decrease in the oil output, which fell from 1,810,170 in 1914 to 898,994 tons in 1916. The fact that war was being waged on Rumanian territory also contributed to this situation.

When military operations forced the Rumanian troops to retreat temporarily to Moldavia, the Allied Powers asked the Rumanian government to destroy the wells, storage tanks, rolling stock and refineries, undertaking to compensate the Rumanian state for the losses incurred.

On these conditions and under the direct orders and supervision of British officers, Colonel Norton Griffiths and Colonel Thomson, the British Military Attaché in Rumania, about 1,500 wells were blocked and some 1,000 wells and shafts, as well as storage tanks holding more than 150,000 cubic metres of oil were set on fire. The plants and the storage tanks of the refineries

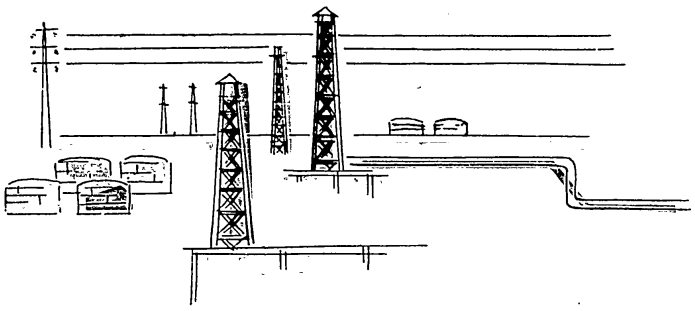
were also set on fire or blown up, so that more than 230,000 tons of crude oil, gasoline and kerosene were destroyed.

The majority of the Rumanian workers and technicians employed by the oil industry withdrew with the Rumanian armies to Moldavia, and contributed to the development of the oil industry in this region.

With the aid of rigs and materials brought to Moldavia they drilled new wells in the Moineşti, Zemeş and Solonţ fields, the output of Moldavian oil rising from 25,536 tons in 1915 to 57,389 tons in 1917. The small local refineries were repaired and put into working order, and at the same time two small refineries were built at Mărgineni—Bacău and at Socola—Jassy.

After the occupation of Wallachia, the German authorities created the "Erdölindustrie A. G., " an oil company with German capital, which was granted concessions of oil-bearing land belonging to the state, for a period of 50 years. In order to ensure regular fuel supplies to the army, the German military administration immediately started to put the damaged refineries into working order and to unblock the wells, at the same time drilling new ones. As a result of these measures oil output in the occupied territory rose to 917,921 tons in 1918.

By the separate peace treaty of May 7, 1918, concluded between Rumania and the Central Powers, the Rumanian state was obliged to cede 30,000 hectares of productive oil land for a period of 50 years, with an eventual extension to 90 years, to the new German company which had the exclusive right to oil exploitation in Rumania. The sale of oil products was to become the monopoly of a German-Austrian-Hungarian company. Following the defeat of Germany, this enslaving treaty was cancelled, but instead of the Rumanian people, the true owners of this wealth, drawing a benefit from it, the Rumanian oil industry fell into the hands of other foreign companies.



THE RUMANIAN OIL INDUSTRY AFTER THE FIRST WORLD WAR AND UP TO 1948

At the end of the First World War (1918), the Rumanian oil industry was in an extremely difficult situation, its output being only half of that of 1913, the processing capacity of the refineries was practically nil, and storage facilities were only a fifth of what they had been in 1914, while equipment was either deteriorated or incomplete.

The valuation of the losses suffered by the Rumanian oil industry was done by an appointed international commission, which arrived at an estimate of approximately 20 million pound sterling. Half of this represented losses suffered by the state through the destruction of crude-oil stocks, oil products, storage tanks, pumping stations, pipelines, etc., while the balance represented losses incurred by oil companies through the destruction of oilfields, refineries, drilling and extracting equipment, stocks of oil products, etc.

Although the destruction of the major part of the Rumanian oil industry had been carried out in accordance with the demand of the Allied governments, with an explicit undertaking on their part to reimburse at the end of the war the entire value of the damage caused, it was only after lengthy negotiations that the governments concerned agreed to pay a mere 4 million pound sterling, and even this sum was to be used as partial compensation of Rumanian war debts to the Allies.

The Rumanian state, however, was obliged to pay the oil companies the entire amount of 9,978,890 pound sterling, fixed as the value of their losses during the war.

An immediate consequence of the cessation of the state of war was the return to the former owners of all enterprises with French, British, Italian and American capital which had been confiscated by the German occupation authorities.

The San Remo Convention (1920) for the settlement of war damages that Rumania must pay to the Allies, established that the shares of oil companies with German capital should be divided between Rumania, Great Britain and France in the proportion of 51 per cent to Rumania and 24.5 per cent each to Great Britain and France.

The stipulations of the San Remo convention were not respected however, the bulk of the shares of the former German companies being taken over by British and French companies as the result of various financial and political manoeuvres. In the case of the "Steaua Romînă" Company the Rumanian group in the end received only one-fifth of this company's shares, and in the case of the "Concordia" and "Vega" only 2 per cent. These financial manoeuvres caused the Rumanian national economy losses estimated at 3,000 million lei.

Due to changes resulting from the distribution of the capital of former German companies, and to the founding of new enterprises, the situation in the Rumanian oil industry in 1921 was as follows:

Capital	Millions of lei	Per cent
British	377	16.85
Dutch	48	2.14
Anglo-Dutch	226	10.10
American	208	9.29
French	366	16.35
Belgian	187	8.36
Italian	11	0.49
Rumanian	800	35.75
Other	15	0.67

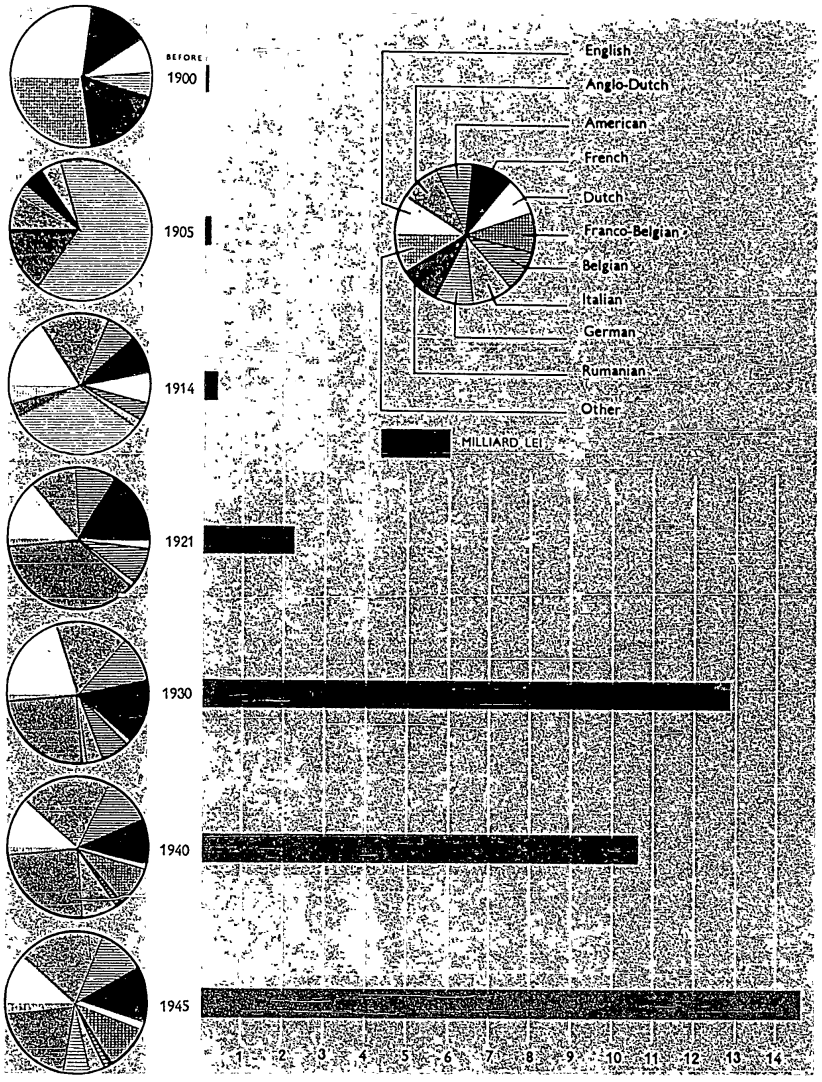
The Mining Law of 1895, under which the oil industry operated until 1924, facilitated an unbridled sacrifice of oil-bearing land that formed the state reserve. In 1924, 96 per cent of the 50,000 hectares under exploitation was privately-owned land, from which 1,208,000 tons of crude oil were extracted, representing 65 per cent of the total output of the country. The state-owned fields (1,900 ha), whose area was only 4 per cent of the total, produced 652,000 tons or 35 per cent of the total output of the country.

In 1924 a new Mining Law was passed which, in principle, provided that the whole wealth of the subsoil was state property, with the exception of "established" rights over oil-bearing land that was known as workable. Such "established rights" belonged in the majority of cases to foreign and Rumanian oil companies and to politicians of those times. The remainder of the subsoil which now became the property of the state could, by virtue of this law, be concessioned to oil companies on condition that 51 per cent of their capital was owned by Rumanian citizens.

The area now held on concession from the state reached 65 per cent of the total land exploited, and the extraction of oil increased considerably. The exploitation of state property was just as unscrupulous under the new law as it had been before.

In the fields leased by the state to the oil companies, the latter extracted in 1928 on the average more than 7,000 tons of oil per well, while on privately-owned land they extracted only 1,790 tons per well. Statistics show that in the same year 2,085 tons of oil were extracted from every hectare on land leased from the state, and only 651 tons per hectare on privately-owned land. Foreign oil trusts and their governments retaliated against the 1924 Mining Law by various ways and means, ranging from diplomacy to economic measures, which

CAPITAL INVESTED IN THE RUMANIAN OIL INDUSTRY
BETWEEN 1900 AND 1945



brought quick results in the form of far-reaching amendments to the law The 1924 Mining Law thus proved to be but a timid attempt on the part of the Rumanian governing circles to obtain a bigger share in the profits of the Rumanian oil industry.

The amendments introduced to the Mining Law in 1929 established equal treatment for Rumanian and foreign capital The result of the application of this amendment was a new and powerful offensive by foreign capital to take over Rumanian oil. In 1937 foreign companies, holding 74 per cent of the capital invested in the Rumanian oil industry, accounted for 86 per cent of the total oil output of the country In 1937 the Mining Law was again amended by introducing the principle of preferential treatment of companies with Rumanian capital

These amendments had not the slightest effect upon the unrestrained activities of the foreign companies, and "preferential treatment" only benefited the politicians of the time The losers under all the laws were the Rumanian working people, particularly those who worked in the oil industry

After 1918 the oil output steadily went up year by year, from 968,611 tons in 1918 to 4,836,974 tons in 1929, partly due to the enormous wealth of the new oilfields, but mostly because of their forced exploitation

The notorious 1929—1933 economic crisis had no influence upon the rising curve of production Although prices fell sharply and crude-oil production was considerably reduced all over the world, the Rumanian crude-oil output increased to 7,376,604 tons in 1933, as a result of the fantastic profits obtained by the companies even with the ridiculously low prices at which crude oil was being sold at that time

In order to maintain profits on their capital even with the prices offered at the time in the world markets, the big oil companies began to make huge cuts in their personnel, reducing their investments and particularly their exploratory drilling Therefore no new productive structures were discovered This can be seen from the fall in drilling figures 312,800 metres in 1929 compared with 124,400 metres in 1931

In order to justify the slowing down of their exploratory activity, the companies came out with the theory of the exhaustion of existing Rumanian oil deposits and the lack of new ones, even though many years before the Rumanian geologists Popescu-Voiteşti, Murgoci and Macovei had shown in their published works that considerable oil-bearing formations existed in regions considered unproductive by the oil companies, e g , some regions in Moldavia and around Tîrgu Jiu and Piteşti in Wallachia

After launching this theory about the exhaustion of Rumanian crude-oil reserves, the oil companies no longer replaced old oilfield and refinery equipment

This time too the companies' profits came off the workers' backs In order to pass through the crisis with the smallest possible risks and almost undiminished profits, foreign and Rumanian companies pushed the whole weight of the crisis upon the shoulders of the workers who were either discharged or worked reduced hours Wages were also reduced, or the men had to work longer hours without additional pay

Although Rumania's oil output amounted to 7,376,604 tons in 1933, i e , almost double that of 1929, it was obtained by 15,777 workers instead of 30,017, which was the 1929 figure In 1933 wages were 40 per cent lower than in 1929

The companies took ever more drastic measures to reduce output, to cut down costs and wages through the application of so-called curves of sacrifice, and through large-scale dismissals

However, things did not go the way the Rumanian bourgeoisie and landlords would have liked them to do. In 1933 the working class was no longer what it had been before the First World War. Under the leadership of the Communist Party of Rumania the working class passed to the counter-offensive in defence of its political and economic rights. In February 1933 the Rumanian oil workers, together with the Rumanian railwaymen, and led by the Communist Party of Rumania, wrote a glorious page in the history of the struggle of the Rumanian working class against exploitation and misery, for the liberty and independence of their country.

While exploratory drilling represented a bare 10 per cent of the total volume of drilling, productive drilling was intensified and increased from a total of 124,442 metres in 1931 to 385,318 metres in 1937. This resulted in an output of 8,703,497 tons in 1936, the highest figure ever reached before the Second World War. Owing to the failure to discover new productive structures, and to the intensive exploitation of the existing ones, production could not be maintained at this high level and kept falling steadily.

During the above-mentioned period drilling technique was greatly improved; the older systems of dry and hydraulic percussion drilling were abandoned and hydraulic rotary drilling came into general use. By this method numerous wells were drilled, some of them to a depth of more than 3,000 metres. Owing to the new method, drilling time was greatly reduced and instead of one to two years it now took only a few months to drill a well.

After the general introduction of rotary drilling (1928—1931), simplified casing was applied by using single strings of casing which resulted in a reduction of more than 40 per cent in casing consumption.

In 1927 electrical logging was used for the first time and soon became the general practice. It led to the solution of many geological problems in the Gura Ocniței, Boldești and Moreni fields, and this had a great influence upon the development of this region.

Mechanical coring was now only being used for the investigation of small portions of oil-bearing layers.

After 1928 the perforation of casing strings opposite oil-bearing formations was done with the aid of perforating devices invented by Rumanian engineers and technicians; some of these had an electrical, others a mechanical drive. The first accurate selective perforating equipment appeared in 1936.

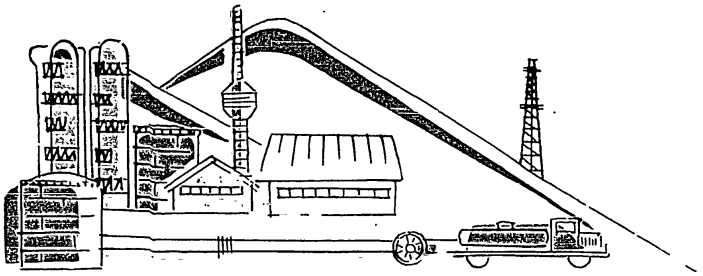
After 1926 crude-oil production technique was generally by natural flow controlled with the aid of flow beans and by the separation of gas in a separator, by artificial flowing (gaslift and airlift), as well as by deep pumping.

Bailing and swabbing were still used sometimes in wells with a low production.

Until 1933 the production of deep wells — after the period of natural flow was over — was done only by artificial flowing and only for comparatively short periods, as long as the lifting costs remained profitable from the economic point of view.

Many wells that could still have provided a good production were abandoned the moment their output no longer represented any interest from the point of view of profit.

Although deep pumping had been used for years in shallow wells, producing a non-paraffinous asphaltic oil, it was only in 1934 that it began to be extended to wells deeper than 1,000 metres and to paraffinous oil wells. That year pumping rigs and base equipment (pumps and separators) with a construction suitable for great depths were introduced and the problems connected with the fight against "surplus paraffin" in casings were solved.



In certain oilfields, where the lay of the land permitted it, group pumping was introduced by building central pumping stations that were connected with the wells by transmission lines.

Between 1916 and 1940 the number of productive wells increased from 1,045 to 2,377.

Although methods of extraction had been greatly improved and certain rational exploitation methods were introduced in a number of fields, the exploitation of the oil deposits continued, as a general rule, just as intensively and irrationally as before, leading to the premature depletion of the natural energy of the formations in many oilfields. The case of the Bucşani oilfield is a striking example. Work began here in 1934, with an output of 6,700 tons for that year, which increased to 2,180,000 tons in 1936, when it represented about a quarter of the total production of the country. Two years later the output was only 208,000 tons, which denoted the almost complete degradation of the oil strata after only three years' working.

Owing to the irrational exploitation of the oilfields and the depletion of their natural energy, large quantities of oil remained unextracted in the oil-bearing strata.

After the First World War the refineries were repaired rather slowly and the quantity of crude oil processed by them in 1921 was only 1,046,992 tons compared with 1,787,245 tons in 1913.

Following this date the processing capacity of the Rumanian refineries gradually increased, the refineries being enlarged and brought up to date, enabling them to handle 8,134,300 tons of crude oil in 1935. Cracking plants were built in 1930 and their capacity increased every year.

Although the capacity of the cracking plants was rather small in comparison with the need for the fullest utilisation of the crude oil, these plants were not kept fully employed, fuel oil being exported and processed in Western European refineries.

Two thermic reforming plants were built, having a total capacity of 270,000 tons p.a.

Gasoline with a high octane number, required for aviation motors, was obtained in small quantities and only by distillation from specially-selected crude oils.

Most refineries which produced lubricating oils maintained their old batteries of boilers for fractional distillation. Only the Braşov refinery was equipped for work with selective solvents.

Refined paraffin was produced in two plants, one of which was in the Cîmpina refinery and the other at Rîmnicu Sărat.

Some progress was made in building equipment for gathering cracking gas in the distilling and redistilling plants. The big refineries had introduced equipment for recovering gasoline in gas oil plants, as well as equipment for producing liquid gas.

In 1940 there existed 12 refineries in Rumania, whose daily processing capacity exceeded 1,500 tons each; only a single one belonged to a Rumanian company, the "Creditul Minier." Its processing capacity was about 6 per cent of the total; all the other refineries belonged to foreign oil companies.

The storage capacity increased to about 1,400,000 tons, — some 400,000 for crude oil, and the rest for oil products.

Crude oil was transported to loading stations in the ports by pipelines with a total length of approximately 2,400 km; there were 10,500 tank cars for the transport of crude oil by rail.

In the balance of Rumania's foreign trade exports of oil and oil products were rising to an ever higher place, going up from 1.66 per cent in 1913 to 52.8 per cent in 1934 and 40.6 per cent in 1937.

The percentage of capital of the various oil companies in Rumania on the eve of Rumania's entering the Second World War can be seen from the following table:

	Lei	Per cent
British	1,248,716,985	11.72
Anglo-Dutch	2,200,580,000	20.66
American	1,175,660,000	11.04
French	1,101,421,485	10.34
Dutch	31,255,000	0.29
Franco-Belgian	1,078,710,000	10.13
Belgian	46,725,000	0.44
Italian	373,613,000	3.50
German	582,184,000	5.46
Rumanian	2,719,742,210	25.54
Other	93,750,320	0.88
TOTAL	10,652.358,000	100

Following Rumania's entry into the orbit of Hitlerite Germany, Antonescu's fascist dictatorship was set up. Rumania was occupied by Hitlerite troops and ultimately pushed into the criminal aggression against the Soviet Union.

Under the royal dictatorship a special treaty had already been signed with Hitlerite Germany in 1940, the "Ölpakt," under which Rumania's oil output was placed at the disposal of the Hitlerite armies, in exchange for armament. Immediately after the proclamation of Antonescu's dictatorship the whole oil-bearing region was occupied by great numbers of German troops.

After the outbreak of the Second World War the Rumanian oil industry was almost completely monopolized by German capital. The Germans had full control of the oil industry because, on the one hand, they either took over or acquired control of the companies with Franco-Belgo-Rumanian and Anglo-Dutch capital and, on the other hand, they formed a new German company, the "Kontinentale Öl G.m.b.H.," which received concessions over vast areas in the former Dîmbovița and Prahova counties.

During the Second World War, between the years 1941 and 1943, Rumanian crude-oil production was maintained with small fluctuations round about the figure of 5,500,000 tons p.a. which

In 1940 there existed 12 refineries in Rumania, whose daily processing capacity exceeded 1,500 tons each; only a single one belonged to a Rumanian company, the "Creditul Minier." Its processing capacity was about 6 per cent of the total; all the other refineries belonged to foreign oil companies.

The storage capacity increased to about 1,400,000 tons, — some 400,000 for crude oil, and the rest for oil products.

Crude oil was transported to loading stations in the ports by pipelines with a total length of approximately 2,400 km; there were 10,500 tank cars for the transport of crude oil by rail.

In the balance of Rumania's foreign trade exports of oil and oil products were rising to an ever higher place, going up from 1.66 per cent in 1913 to 52.8 per cent in 1934 and 40.6 per cent in 1937.

The percentage of capital of the various oil companies in Rumania on the eve of Rumania's entering the Second World War can be seen from the following table:

	Lei	Per cent
British	1,248,716,985	11.72
Anglo-Dutch	2,200,580,000	20.66
American	1,175,660,000	11.04
French	1,101,421,485	10.34
Dutch	31,255,000	0.29
Franco-Belgian	1,078,710,000	10.13
Belgian	46,725,000	0.44
Italian	373,613,000	3.50
German	582,184,000	5.46
Rumanian	2,719,742,210	25.54
Other	93,750,320	0.88
TOTAL	10,652.358,000	100

Following Rumania's entry into the orbit of Hitlerite Germany, Antonescu's fascist dictatorship was set up. Rumania was occupied by Hitlerite troops and ultimately pushed into the criminal aggression against the Soviet Union.

Under the royal dictatorship a special treaty had already been signed with Hitlerite Germany in 1940, the "Ölpakt," under which Rumania's oil output was placed at the disposal of the Hitlerite armies, in exchange for armament. Immediately after the proclamation of Antonescu's dictatorship the whole oil-bearing region was occupied by great numbers of German troops.

After the outbreak of the Second World War the Rumanian oil industry was almost completely monopolized by German capital. The Germans had full control of the oil industry because, on the one hand, they either took over or acquired control of the companies with Franco-Belgo-Rumanian and Anglo-Dutch capital and, on the other hand, they formed a new German company, the "Kontinentale Öl G.m.b.H.," which received concessions over vast areas in the former Dîmbovița and Prahova counties.

During the Second World War, between the years 1941 and 1943, Rumanian crude-oil production was maintained with small fluctuations round about the figure of 5,500,000 tons p.a. which

represented about 63 per cent of the 1936 production. This output came exclusively from old oilfields and was produced only through extraction pushed to the utmost limits, as no other productive fields had been discovered, exploratory drilling being almost non-existent.

To satisfy the requirements of the Hitlerite army, efforts were made to obtain as many oil products as possible. The output of gas oil increased from 770,221 tons in 1939 to 897,650 tons in 1941 and the production of lubricating oils went up from 65,500 tons in 1938 to 103,700 tons in 1943.

All through the war Rumania supplied Hitlerite Germany with between 3 and 4 million tons of oil products each year. Based upon forced agreements, the prices were 20 per cent below world market prices and no taxes or dues whatever were paid by the Germans to the Rumanian state. When the Germans paid 2.85 lei per litre of gasoline and 2.41 lei for a litre of kerosene, the population of Rumania had to pay 14 lei for gasoline and 4 lei for kerosene.

Anglo-American air-raids, which began during the summer of 1943 and went on with increasing force in 1944, when the Soviet armies were approaching Rumania's border, caused heavy destructions and damage to refineries and storage tanks.

On August 23, 1944, the armed insurrection of the Rumanian patriotic forces led by the Rumanian Communist Party overthrew the fascist dictatorship of the Antonescu government and brought about the turning of arms against Hitlerite Germany.

The victory of the armed insurrection created conditions for the gradual conquest of state power by the mass of the people.

By the end of the Second World War the Rumanian oil industry was in an extremely bad position. In 1944 crude-oil production had fallen to the very low figure of 3,519,000 tons. The number of productive wells had decreased to 1,700; processing capacity of the refineries had been reduced by 85 per cent and storage capacity by 61 per cent. Physical depreciation of drilling and extracting equipment had reached an advanced stage. Apart from that, equipment consisted of many different types, most of which were obsolete.

The average daily yield of the wells was only 5.6 tons each and drilling had decreased by more than 50 per cent.

One might add that, although oil companies were, as a rule, using modern equipment and tools, there still existed 107 hand-worked shafts in 1944. These belonged to some small companies or to private people.

The oil companies that had been seized by the Germans during the war, were now taken over by the representatives of the former owners and oil trusts.

Dr. Petru Groza's government of large democratic concentration, formed on March 6, 1945, and supported by the broad masses of the people led by the Rumanian Communist Party, immediately started an intensive campaign for the reconstruction of the oil industry. The government granted large credits for this purpose to all oil companies, irrespective of the origin of their capital, so that they would repair and put the wells and refineries, damaged during the war, back into function, and repair and renew the deteriorated oilfield equipment.

The oil companies delayed or postponed the reconstruction of the Rumanian oil industry, alleging a shortage of equipment and materials. Nor did they make any attempt to start exploration drilling that would have led to the opening of new oilfields. They once more launched the old theory about the exhaustion of Rumanian oil-deposits, although there existed ample and precise indications about favourable prospects in many new regions.

The Rumanian Institute of Geology played an important part in the drive started by the Rumanian government for the earliest possible discovery of new oil-bearing structures that could be exploited and for the establishment of the existing industrial crude-oil reserves. The Institute expanded its research field by creating a geophysical prospecting service, for which special funds were allocated by the government.

Based on detailed studies and research into the lithology and stratigraphy of geological formations and on a more exact knowledge of the tectonics of oil-bearing structures, correct scientific schedules were drawn up regarding the placing of wells so as to ensure rational exploitation. Conditions were established for the preservation of gas in the oil layers and for the isolation of water; scientific and technical conditions were drawn up for the exploitation of oil at great depths in the lower pliocene strata and in the miocene strata of the Wallachian oil-bearing structures.

To facilitate the discovery of new workable geological structures, the geologists and geophysicists of the Institute of Geology explored wide areas in the mountainous and hilly zones of Moldavia and Wallachia. The valuable works of the geologists G. Botea, S. Atanasiu, Popescu-Voiteşti, G. Murgoci and Professor G. Macovei greatly assisted in the orientation of these discoveries.

The Rumanian Institute of Geology was further entrusted with the task of studying the geological formations which might contain oil in the Subcarpathian region of Northern Moldavia, in the Transylvanian Basin, in the Banat, in the Pannonia Depression and in the Maramureş. The results of these studies contributed to the success of subsequent prospecting for oil and gas.

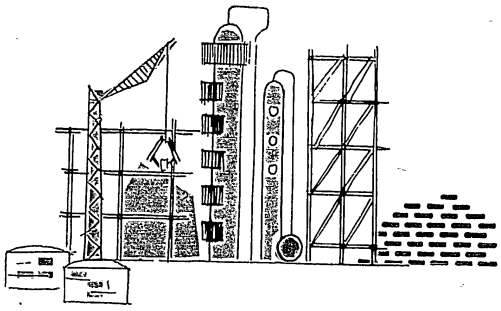
Great assistance was given by the Soviet Union in the action for rebuilding the oil industry. In accordance with the treaty of economic co-operation, signed in Moscow on May 8, 1945, providing for co-operation between the U.S.S.R. and Rumania in the reconstruction and raising of Rumania's productive capacities, the Soviet Union supplied the Rumanian oil industry with large quantities of equipment: up-to-date draw-works, pumps, geophysical instruments, logging equipment, drill-pipes, drilling rigs, cables, lorries, tractors, etc. Capitalist countries categorically refused to supply such oil equipment to Rumania.

In October 1945 a Rumanian-Soviet oil company was formed under the name of "Sovrompetrol," an economic unit of a new type, hitherto unknown to the Rumanian economy. The "Sovrompetrol" company was formed with the participation of the Rumanian and Soviet states and based upon the principle of absolute equality of both parties. Both parties made an equal contribution to the company and had equal rights in the management. The enterprise was incorporated in Rumania and subject to the laws of Rumania.

Founded at a time when the aftermath of war could be fully felt in the Rumanian oil industry, "Sovrompetrol" fought alongside the Rumanian people for the rebuilding and development of the Rumanian national economy. "Sovrompetrol" brought oilfield equipment and machinery, reference material and plans from the U.S.S.R.; it carried out intense work in developing drilling — particularly exploration drilling — and production, making great efforts to improve the processing of the crude oil in the refineries.

Apart from this the Soviet Union assisted the Rumanian oil industry from the very outset by sending engineers and technical staff who, together with Rumanian engineers and technicians, greatly contributed to the work of rebuilding the oil industry.

"Sovrompetrol" was a powerful mainstay in the struggle for the reconstruction of Rumania's economy.



THE RUMANIAN OIL INDUSTRY AFTER 1948

The proclamation of the Rumanian People's Republic on December 30, 1947, followed on June 11, 1948, by the nationalisation of the wealth of the subsoil, of industrial enterprises, banks, insurance companies, mining and transport, etc.; was the main factor in the total rebuilding and continuous development of the oil industry, as well as of the entire Rumanian economy, on its road to the construction of socialism. The oil industry, although reconstructed to a considerable extent, was still in a rather bad state at the time it was nationalised.

Nationalisation did away with dozens of oil companies which were fiercely competing with each other and exhausting the wealth of the subsoil, and cleared the way for centralized and harmonious management, and for planned organisation of production in powerful and well-equipped units. The nationalised oil companies were grouped in two state enterprises: "Petrolifera Muntenia," which co-ordinated the activities of oil enterprises in Wallachia and Oltenia, and "Petrolifera Moldova" which did the same in Moldavia. These state enterprises carried out the tasks assigned to them in the annual state plans for 1949 and 1950 regarding the reconstruction and development of the oil industry.

Rumanian-Soviet co-operation in the joint company perfectly reflected the content of the relations of a new type established between the two countries: full equality of rights, respect of mutual interests, mutual and fraternal aid in the furtherance of general economic progress.

In 1955, when the oil industry of the Rumanian People's Republic had definitely been placed on a solid basis, an agreement on advantageous terms was reached for transferring the Soviet share in the "Sovrompetrol" company to the Rumanian People's Republic.

The "Sovrompetrol" company put the bases for a rational exploitation of the oil-bearing formations and took energetic action in discovering and exploiting new oil-bearing regions.

The entire activity of the "Sovrompetrol" company was a school of technical progress. In order to obtain well-founded data with reference to the prospects of the oil-bearing formations, a trust of geological exploration was created, an enterprise for geological and geophysical prospecting, and a geological research laboratory. By centralizing and classifying the geological material, it became possible to draw up an inventory of all known oil-bearing structures, to reach an estimation of the prospects of new structural units and to calculate the existing crude-oil reserves of various kinds. The result was that exploratory work in new regions — and in the old ones as well — could be properly organised and directed.

The prospecting and exploratory activities were extended to all great structural units where chances of finding oil existed. Exploratory drilling was extended to more than 100 unexplored structures. It also led to an extension of areas that were already being exploited in known oil-bearing regions. 33 new productive structures were discovered, with 52 oil and gas-bearing horizons.

The discovery of new structures after nationalisation led to the appearance of new oil regions on the map of the Rumanian People's Republic. Such regions were situated in Western Wallachia (Pitești and Ploești regions), in Oltenia and in the Maramureș. The area of the Moldavian oil region was greatly extended.

In 1948 drilling activity was already greater than in 1938, and since 1951 it has been at least three times greater. There was a noticeable increase in exploratory drilling in particular, and it now amounts to more than 50 per cent of the total drilling operations.

In 1953 alone the total amount of exploratory drilling exceeded the exploratory drilling done in the 15 years preceding nationalisation.

A decisive part in reaching this position was played by the introduction and the extensive use of the most up-to-date methods of drilling technique.

The most important of these methods is turbine drilling, first applied in 1952.

In 1957 turbine drilling was being applied in more than 13 per cent of the total drilling, and in Moldavia this percentage increased to 85 per cent.

Since 1954 this method has been extended to the Maramureș region with its hard rock formations which resemble those of Moldavia, and to regions with soft formations, as well as to deep wells situated on the Rumanian plateau.

Turbine drilling lent itself without difficulty to directional drilling and was consequently introduced on a large scale in Moldavia for drilling cluster wells and for the drilling of twin wells. It also permitted wells to be drilled in places where the land formation was not very accessible, causing surface work, mounting and the transport of materials to be done under extremely difficult conditions. Directional drilling for deviated holes at angles of more than 45° from the vertical could be done from locations and positions where the lay of the land permitted it. In this way the development of the oil strata at Seninul Băicoi lying beneath the salt massif became possible, as well as of others which lay next to faults and could not be traversed by ordinary rotary drilling.

The reduction of costs in surface work obtained through cluster drilling and the drilling of twin wells, meant a 30 per cent economy in total drilling costs as compared with individual drilling.

In 1957, rotary drilling with water as drilling fluid was used in 33 per cent of the total amount of drilled metres. This technical method has made it possible to increase penetration rates four to five times, bringing the highest monthly speed per draw-works up to 7,621 metres. A 1,300 metre-deep well in the Pitești—Leordeni region was drilled in 5 days and 3 hours. In the same region average monthly drilling rates were 3,300 metres per draw-works.

Drilling with roller-bits has been greatly extended in the course of the last few years, particularly in the hard rocks of Moldavia and Maramureș. Research and planning institutes have designed new, improved types of roller-bits. The characteristic feature of these is the low washing of the rollers. The mechanical penetration rate is 2 to 3 times as high as it is with ordinary bits, and the advance has been increased by 54 per cent. More than 35 per cent of the total drilling is now being done with roller-bits.

Due to new drilling methods, the penetration rate and the advance of exploratory drilling have been increased by an average of 40 per cent all over the country.

For the survey of formations in cased and non-cased wells radioactive logging has been introduced on a large scale; control of various drilling operations, particularly of cementing is being carried out with the aid of radioactive isotopes.

The big increase in oil reserves as a consequence of intensified geological and drilling activities led to a rapid growth in the production of crude oil. In 1953 oil output had already exceeded the highest pre-war figure, and in 1957 it reached 11,180,290 tons. Crude-oil output per head of population increased from 422.7 kg in 1938 to 627.1 kg in 1957.

These remarkable results were to a great extent also due to the use of up-to-date and rational methods of oilfield exploitation and crude-oil production.

Since 1950 the exploitation of oil formations has been carried out only on the basis of exploitation plans drawn up by the Research Institute for Drilling and Extraction. These plans fix the boundaries of the oilfield, the rhythm and the organisation of drilling, the number of wells to be drilled, as well as the method of production and organisation of work in the oilfield. The plans for the exploitation of new oilfields provide for the maintenance of pressure in oil formations by injection of water, gas or both, according to the special characteristics of the oil formations.

One of the most serious consequences of the exploitation of oil-bearing layers in the past, was their premature depletion through the exhaustion of their natural energy, so that great quantities of oil remained in the strata, or that their recovery factor was exceedingly low.

To raise the recovery factor for old oil formations the method of secondary recovery is being applied today to an ever growing extent. It consists of washing the oil formations with water or with gas injected through injection wells.

At present 50 per cent of the crude-oil production in the Rumanian People's Republic is being extracted from the oil strata by means of water and gas injections.

In order to increase the flow of the oil towards the bore hole and to raise the receptivity of the injection wells, the method of hydraulic fracturing of the strata has been applied since 1955. About 300 fracturing operations are being executed each year.

Owing to these operations the daily output of the wells has increased two or three times. In some cases the whole character of exploitation has been changed, and instead of extraction by pumping, natural flowing can be applied again.

The 500 or more fracturing operations executed in Moldavia between 1955 and the end of 1957 have resulted in an additional output of about 550,000 tons of crude oil.

In order to increase the output of productive wells and the receptive capacity of the injection wells, a method of acidizing the strata has been introduced and thermo-chemical treatment has been applied.

Deep pumping with tubular rods in wells bringing up much sand is in current use, and so are vibrating separators and bottom flow beans in pumping wells with great gas quantities. Other methods include: the consolidation of non-consolidated sands in the strata; the damming of sudden sand flow with the aid of special filters (outside and inside the perforated casing), the forced pumping in wells containing water surpluses, etc.

In order to reduce consumption of materials at great depths, anti-corrosion protection is being applied by introducing inhibitors into the aggressive medium, with the result that the service-life of the pumps has increased up to 300 per cent. Cathodic protection is now used on pipelines carrying crude oil and oil products.

Keeping step with modernisation in drilling and producing, intensive work has been done in the oil-processing sector and now the whole output of crude oil is being processed inside the country.

During the period under review all the plant and equipment of the refineries damaged by air-raids have been rebuilt, repaired and put in working order. Many refineries were brought up to date and enlarged, so as to correspond to the present needs of production. Bottlenecks which existed in some plants have been eliminated and at the same time the processing capacity for the manufacture of refined products has been raised, considerably increasing their output. Facilities for making new products have also been created.

In order to increase processing capacity, to improve the quality of the products and to create the possibility for manufacturing new products, the No. 8 refinery at Dărmănești and the Teleajen lubricating oil block have been built; a big refinery is being built and equipped at Borzești which will form part of an extensive oil and chemical combine. This modern refinery will produce not only big quantities of various petroleum products, but in particular products of a superior quality, at the same time supplying the necessary raw material to synthetic rubber and synthetic fibre works that are now under construction.

The building of new refineries and the modernization of existing ones has already led to an improvement in the quality of the products. The octane number of gasoline has been raised, special fuels are being produced for tractors, spirits for jet-propelled aircraft, gas oils with high octane numbers and low freezing points, special lubricating oils with a D.D.90 viscosity index, oils for use with superheated steam, anti-freezing mixtures, special bitumens, white medicinal oils, transparent paraffin, natural pharmaceutic vaseline, demulsifiers, and in addition to all these a great many products that serve as raw material for the chemical and other industries.

Particular attention has been paid to the production of liquid gas for household use, its output having grown from 1,713 tons in 1938 (the equivalent of 131,000 containers) to 51,585 tons in 1957 (the equivalent for over 4,000,000 containers).

The export of oil products occupies an important place in the foreign trade of the Rumanian People's Republic and covers 22 countries in Europe, Asia and Africa.

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One of the new industrial branches born in Rumania during the years of the people's democratic rule is petro-chemistry. Apart from its use as fuel, oil has now become a first-class raw material for the chemical industry.

One of the most remarkable achievements of Rumanian petro-chemistry is the oxidization of paraffin, a method by which synthetic fatty acids required for the manufacture of soap can be obtained. Just as important is the manufacture of synthetic detergents, at present produced in two modern plants. One might also mention the successful manufacture of synthetic glycerine, the extraction of cyclohexane, benzene and xylene from gasoline, as well as the manufacture of ethylic alcohol from oil-well gas. Of great importance is the elaboration of the technological process for the manufacture of vinyl polychloride. The chemical treatment of liquid-oil products produces naphtenic acids required for the manufacture of synthetic detergents, as well as naphtenates which form the raw material for the paint and varnish industry.

In another petro-chemical unit cyclohexane used in the manufacture of relon synthetic fibres will be obtained by the distillation of certain gasoline fractions.

Work is proceeding for the definite elaboration and improvement of technological methods for the manufacture of synthetic rubber, synthetic fibres, plastics and chemical fertilizers.

Other important sectors of the petro-chemical industry will be put into operation within the next few years. Among these is a large synthetic rubber works, with a capacity of 50,000 tons p.a.; it will produce with half this capacity in 1960, using cracking gas as its raw material, producing the most modern types of synthetic rubber known till now. An acetone and methyl-ethyl-cetone factory is under construction. It will use as raw material certain fractions resulting from the distillation of crude oil.

It will not be long before cloth will be woven from wool or cotton fibres mixed with relon. Tests are being made with synthetic fibres made from ethylene xylonite, called "lanil." They are similar to wool fibres, but their resistance is twice or three times as great.

Owing to the great possibilities opening up for the Rumanian oil and petro-chemical industries, the country's economy and its population will have at their disposal numerous industrial products and consumer goods, furnished by the petro-chemical industry.

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One of the big problems facing the Rumanian oil industry was the manufacture of essential equipment.

Towards the beginning of the Second World War the extracting and processing oil industries had developed to a certain extent, but at that time practically no oilfield or refinery equipment was made in Rumania. All that was done consisted of repairs, the manufacture of certain spare parts and the making of some minor tools and fittings for producing and exploration wells. Extremely small quantities of a few types of equipment were produced in the "central workshops" of the "Concordia" oil company, including pumps, two or three steam-engines per year, valves, storage tanks and tools. In 1938 almost 99 per cent of the drilling and production rigs and all processing plants were of foreign manufacture: 80 per cent

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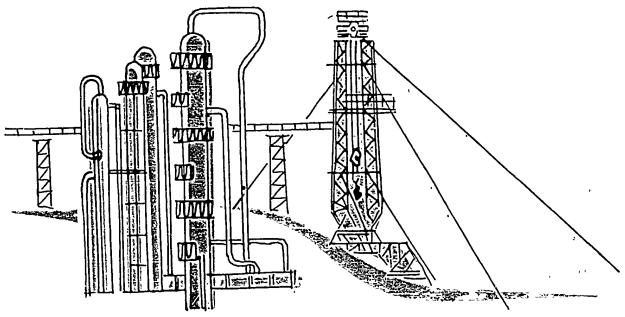
were of American make and the rest came from Great Britain, Germany or Holland. There were no more than 100 drilling rigs altogether, out of which 65 were steam-driven, 20 worked by electricity and 15 by Diesel engines.

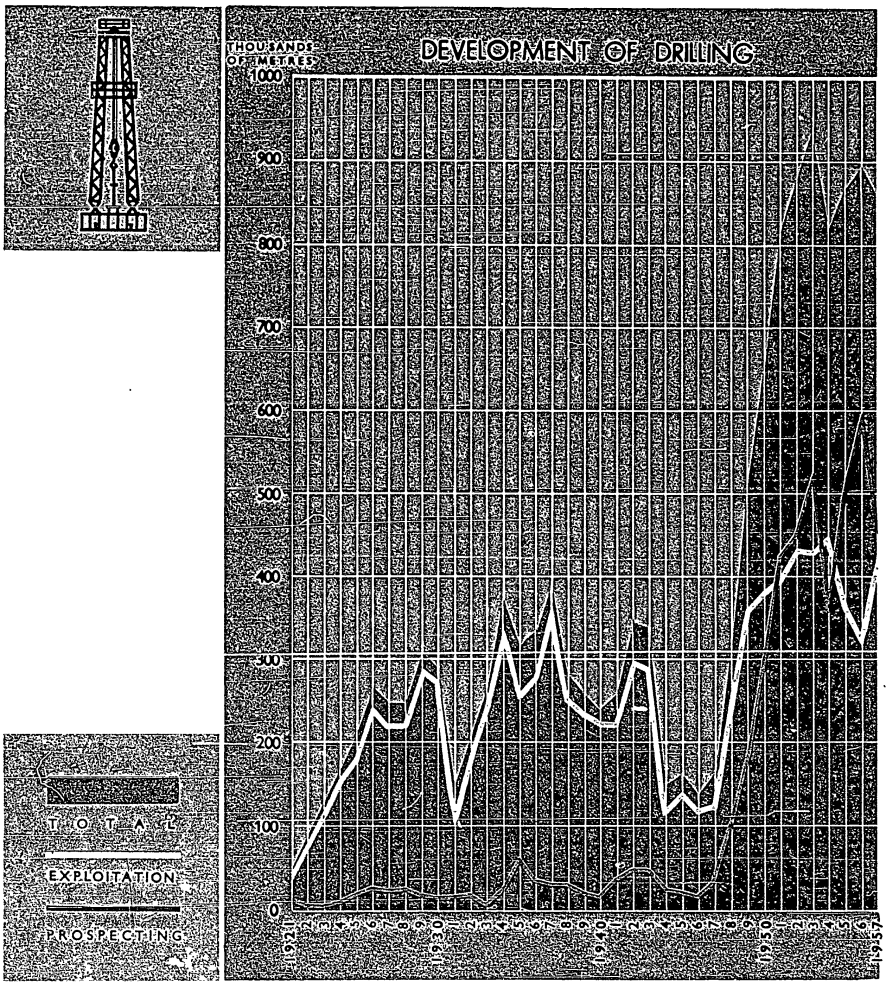
Apart from the fact that most drilling rigs were of low capacity, they consisted of different types and the majority were either worn out or obsolete.



When it became impossible to import goods from the West, owing to the war, the home manufacture of oilfield equipment was intensified to a certain extent. The "Reşiţa" works produced 3 or 4 draw-works a year, a small quantity of heavy forged drill-collars, sucker-rods and an exceedingly small number of tool-joints; "Concordia" increased the production of reduction gears for pumping units and the "Steaua Română" workshops at Cîmpina built a number of extraction pumps. A good deal of the equipment was brought from Germany, but in most cases as prototypes.

Apart from the equipment brought by the "Sovrompetrol" company, no other equipment came into the country between 1944 and 1948, but home manufacture was somewhat expanded, particularly in the "Reşiţa" works and the "Concordia" factory (now the "1 Mai" works, Ploeşti) which produced steam engines, transmission pumps, drilling draw-works, crown blocks, travelling blocks, rotary swivels, drill-collars, kelly stems, valves, tool-joints, oil pumps, flanges and fittings, drilling and fishing tools, storage tanks and some steel constructions for refineries. No complete drilling rigs were produced at that time.

It was after nationalisation that — for the first time in the history of the Rumanian People's Republic — the "1 Mai" works began to produce complete steam-driven drilling rigs for



depths of up to 2,500 metres and later rigs driven by Diesel engines for depths of up to 3,500 metres as well as transmission pumps, storage tanks, etc. The "23 August" works constructed the first 190 h.p. and then 450 h.p. Diesel engines for drilling rigs. Other Rumanian works, such as "Reşiţa," "Gh. Gheorghiu-Dej" of Tîrgovişte, "Mao-Tze-Dun" and "Republica," both in Bucharest, and others developed the production of drill-collars, tool-joints, steam-engines, sucker-rods, pumping units, roller-bits, drill-pipes and casing, tubing apparatus and plants for refineries.

These successes were also due to the generous assistance of the Soviet Union in placing documentary material at the disposal of the different works and factories, besides sending technicians and machines.

An outstanding success of the Rumanian oilfield equipment industry was the designing and bulding of the first heavy drilling installations 4 D and 5 D for depths of up to 3,500 metres, driven by 450 h.p. Diesel engines with pneumatically-controlled clutches, belt or chain transmissions and 500 to 800 h.p. slush pumps. The total nominal power of these installations was raised from the about 800 h.p. of the old drilling rigs in use, to 1,800—2,000 h.p. The latest type of the 4 LD drilling installations — for depths of up to 3,500 metres — is provided with an A-shaped folding steel derrick.

Concurrently with the development of the oilfield equipment industry, special plants for servicing and repairing oilfield equipment were being enlarged or built in the years of the first Five-Year Plan; some of these also make tools, spare parts and light equipment. Such plants exist at Ploeşti, Teleajen, Moreni, Poiana and Cîmpina. A special plant exists for servicing and repairing the numerous motor vehicles employed in the oil industry.

Owing to the achievements of the oilfield equipment industry it became possible to replace practically all the old drilling and production rigs. The present increased capacity of oilfield equipment works in Rumania ensures not only the satisfaction of all home requirements, but also leaves important quantities of oil equipment for export purposes.

Although the Rumanian oil industry can look back on a century-old tradition and is one of the basic branches of the national economy, up to 1948 it had no scientific research centre or planning institute which might have dealt with the various problems of the industry and with the scientific and technical problems connected with oil generally.

To ensure that drilling, extracting, processing and constructional work in the oil industry is carried out in accordance with up-to-date principles and with the highest technical and economic efficiency, research and planning institutes were founded following nationalisation, with the scope of serving the various sectors of the industry: oil geology, drilling, extraction, processing and the chemical treatment of crude oil, as well as the manufacture of oilfield equipment.

Since 1951 a number of scientific institutions were founded for such purposes: the Scientific Research Laboratory in Cîmpina which later became the Research Institute for Drilling and Extracting Oil and Gas; the Research Laboratory for the Technology of Processing, which subsequently merged with the Petro-chemical Institute for problems connected with the processing and chemical treatment of crude oil; the Planning Institute for Oilfields; the Refinery Planning Institute and the Oilfield Equipment Planning Institute.

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These successes were also due to the generous assistance of the Soviet Union in placing documentary material at the disposal of the different works and factories, besides sending technicians and machines.

An outstanding success of the Rumanian oilfield equipment industry was the designing and bulding of the first heavy drilling installations 4 D and 5 D for depths of up to 3,500 metres, driven by 450 h.p. Diesel engines with pneumatically-controlled clutches, belt or chain transmissions and 500 to 800 h.p. slush pumps. The total nominal power of these installations was raised from the about 800 h.p. of the old drilling rigs in use, to 1,800—2,000 h.p. The latest type of the 4 LD drilling installations — for depths of up to 3,500 metres — is provided with an A-shaped folding steel derrick.

Concurrently with the development of the oilfield equipment industry, special plants for servicing and repairing oilfield equipment were being enlarged or built in the years of the first Five-Year Plan; some of these also make tools, spare parts and light equipment. Such plants exist at Ploeşti, Teleajen, Moreni, Poiana and Cîmpina. A special plant exists for servicing and repairing the numerous motor vehicles employed in the oil industry.

Owing to the achievements of the oilfield equipment industry it became possible to replace practically all the old drilling and production rigs. The present increased capacity of oilfield equipment works in Rumania ensures not only the satisfaction of all home requirements, but also leaves important quantities of oil equipment for export purposes.

Although the Rumanian oil industry can look back on a century-old tradition and is one of the basic branches of the national economy, up to 1948 it had no scientific research centre or planning institute which might have dealt with the various problems of the industry and with the scientific and technical problems connected with oil generally.

To ensure that drilling, extracting, processing and constructional work in the oil industry is carried out in accordance with up-to-date principles and with the highest technical and economic efficiency, research and planning institutes were founded following nationalisation, with the scope of serving the various sectors of the industry: oil geology, drilling, extraction, processing and the chemical treatment of crude oil, as well as the manufacture of oilfield equipment.

Since 1951 a number of scientific institutions were founded for such purposes: the Scientific Research Laboratory in Cîmpina which later became the Research Institute for Drilling and Extracting Oil and Gas; the Research Laboratory for the Technology of Processing, which subsequently merged with the Petro-chemical Institute for problems connected with the processing and chemical treatment of crude oil; the Planning Institute for Oilfields; the Refinery Planning Institute and the Oilfield Equipment Planning Institute.

Hundreds of engineers and technicians who had been in the oil and chemical industries for many years are now working in these institutes. Their knowledge makes a valuable contribution to the solution of problems concerning the oil and petro-chemical industries.

Among the important works executed on the basis of the research work and plans of these institutes are the following: the rational exploitation of oil formations, the construction of oil and gas main pipelines, drilling installations for depths of up to 2,500 and 3,500 metres, the triplex pump, the 800 h.p. pump, equipment for deep pumping, equipment for well servicing, equipment for the electrical desalination of crude oil, the extension of No. 7 and No. 8 refineries, the plans for the Borzeşti refinery, low-pressure polyethylenes, the oxidization of paraffin for the production of fatty acids, the purifying of naphthenic acids, multifunctional adhesives for lubricating oils, anti-freezing mixtures, the production of tractor oils, the manufacture of cetone and methyl-cetone, the extraction of cyclohexane and the manufacture of cyclohexanon, new technological methods for aromatizing gasolines, etc.

Apart from research and planning work, the above institutes, closely connected with the production branches, also give technical assistance required for the introduction of the most up-to-date methods.

Oil engineers, geologists and chemists frequently publish technical and scientific works on problems which arise in the three main sectors: drilling, extraction and processing. These contributions, together with technical literature from abroad, form the basis of the technical documentation which plays an important part in the development of the oil industry of the Rumanian People's Republic.

Prior to 1948, technical and scientific literature in connection with the oil industry was published in Rumania to a very limited extent. In recent years the quantity of technical and scientific publications has grown enormously, the necessary technical and financial conditions being created for the publication of a vast technical and scientific material in the shape of original works and translations. For this purpose various state enterprises were founded, such as the Technical Publishing House, the Institute for Technical Documentation, the Publishing House of the Central Trade Union Council and the Publishing House for Scientific Literature.

In the Ministry for Petroleum and Chemical Industries itself there exists a Technical Documentation Centre, with branches in the more important industrial centres. It receives and distributes all periodical publications and technical books dealing with oil and chemistry which appear in the Rumanian People's Republic and abroad.

A technical magazine, "Petrol şi Gaze" (Oil and Gas), is published monthly, containing studies and articles on the main problems of the oil industry, written by Rumanian oil engineers; it also contains the latest technical information.

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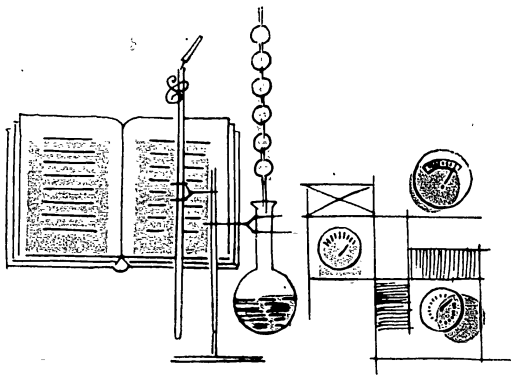
In order to ensure the rapid development of the oil industry on the basis of the most advanced working methods, it was necessary to train new technical personnel and to continually raise the professional qualifications of the existing staff.

The training and qualification of personnel was mainly done in two ways: in training schools for men taken from the enterprises, who continued to receive their full pay, and at courses for raising professional qualifications, held at the place of work.



From 1949 until now more than 75,000 workers and members of the technical and administrative staff were trained at qualification courses at the place of work. In vocational schools for adults 3,000 skilled workmen were trained between 1952 and 1956.

Professional schools for apprentices were opened, with a curriculum of 2 or 3 years; more than 5,000 apprentices have been trained in them. The pupils of such schools get free board and lodging, clothes, books and utensils. After finishing school they are immediately found a job. Until 1955 medium technical personnel were trained in 4-year technical schools. In 1956 the medium schools were transformed into technical schools for foremen. Since 1950 more than 2,700 technicians have passed through these schools.

The higher-grade staffs required by the oil industry are trained in an university-grade institute founded in 1948 and now bearing the name of the "Institute of Petroleum, Gas and Geology." Up to the present 1,146 engineers have graduated from it. 114 students from 18 foreign countries have also graduated from the Institute.

Numerous technicians and engineers in the Rumanian oil industry were sent abroad for specialization. On the other hand a great number of highly-qualified Rumanian engineers, technicians and workers have given technical assistance to many countries whose oil industry is less highly developed.

As a result of the steady improvement of the professional standard of the workers and technicians and of the encouragement given by the state to their creative initiative, the drive for inventions, innovations and rationalization has enormously increased, and this has been of great benefit to the oil industry.

The introduction of technical and organisational improvements and rationalization in the form of inventions and innovations, to which workers, technicians and engineers in the oil industry have greatly contributed, led to a continuous rise in labour productivity and to substantial reductions of cost prices.

Funds are allotted for manufacturing and testing prototypes of inventions till they can be definitely adopted and applied on an industrial scale.

During the 1951—1957 period 9,200 inventions and innovations have been applied in the oil industry, producing in the first year of application economies estimated at 270 million lei, for which the innovators have been awarded corresponding bonuses. Five groups of engineers, technicians and workers have been awarded State Prizes for outstanding achievements in the development of the oil industry.

The material situation of the personnel employed in the oil industry has considerably improved in the last ten years. Apart from money wages paid on the basis of a system that takes into consideration the degree of professional qualification, the wage earners enjoy the advantages of a state system of social insurance and of state grants for social and cultural purposes. Taken together these represent the "social salary," which means a considerable contribution in raising the living standard.

In the 1948—1957 period the volume of social and cultural building and building for public health purposes has grown very considerably in the oil industry. Between 1951 and 1957 more than 1,700 dwelling houses, numerous canteens, etc., were erected, representing a total value of 367 million lei. Dwelling houses alone account for about 300 million lei. The rest is represented by 79 Halls and Clubs, 212 canteens and buffets, 77 health centres, 189 baths, 7 night sanatoria and 25 rest houses

The total amount of long-term credits granted by the state to employees in the oil industry for the building of private houses exceeds 23 million lei.

The old settlements of Lucăcești and Onești have been transformed into towns, the majority of their inhabitants being oil workers.

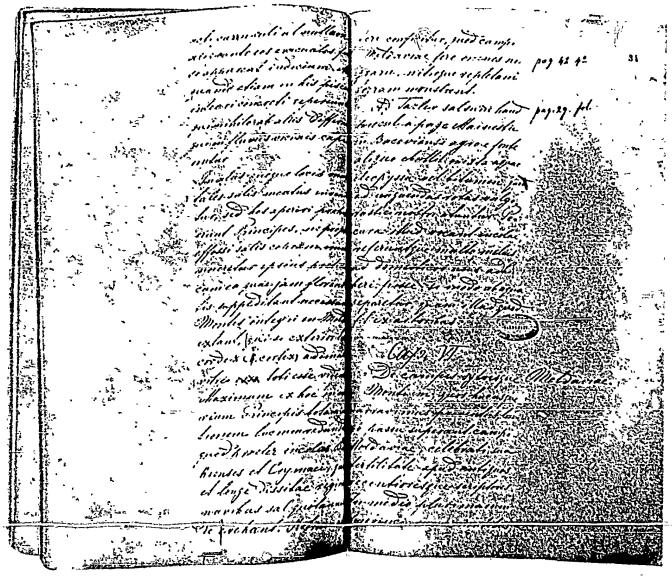
For the protection of the oil workers' health a special health-service network has been created in addition to the general state health service.

In 1956, some 21,000 oil and chemical workers and 3,500 oil and chemical workers' children were sent to spas and health resorts, to rest houses and holiday camps at the expense of the state insurance system. In 1957 the number rose to over 27,000.

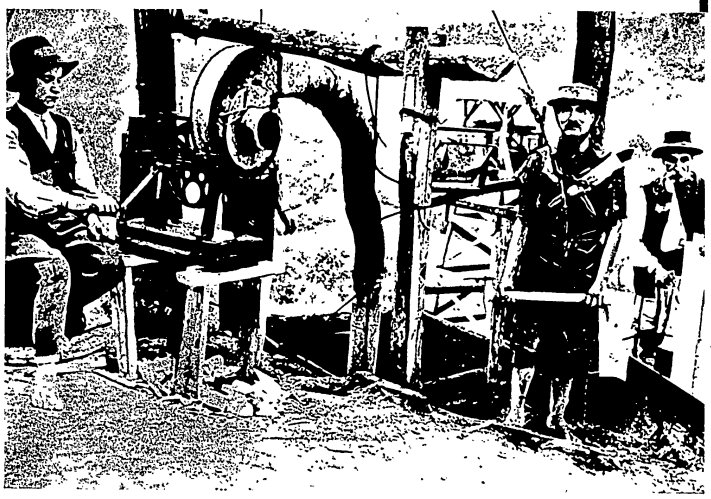
Between 1949 and 1957 the state allocated more than 300,000,000 lei for materials and work connected with labour safety and protection in the oil industry.

The hundredth anniversary of the Rumanian oil industry coincided with the tenth anniversary of the proclamation of the Rumanian People's Republic.

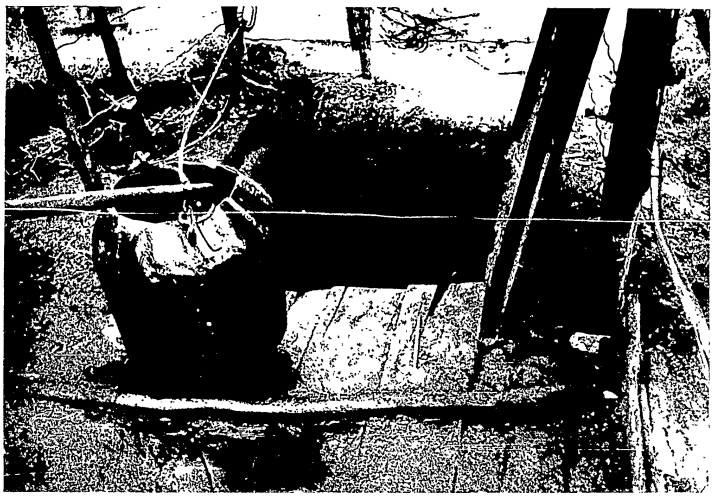
Rumania has always been known as one of the main oil-producing countries of the world, but the highest level of output and technical achievement was reached in the years of the people's democratic regime. 150,000,000 tons of crude oil were extracted in the 90 years before nationalisation and 93,000,000 tons in the 10 years following nationalisation, the latter figure representing almost 40 per cent of the total output of the country in the course of 100 years. The achievements of the Rumanian oil industry are something that all oil workers are proud of — all those who have their heart and soul in an industry which uses the wealth of Rumania's subsoil for the people's benefit.



Page from the original manuscript copy (belonging to the Rumanian Academy) of the book *Descriptio Moldaviae* by Dimitrie Cantemir. The last paragraph of Chapter V, *De montibus et mineris Moldaviae*, testifies to the existence of crude-oil pits in the Tazlău Valley, describes them and shows the uses given to the liquid extracted from the earth



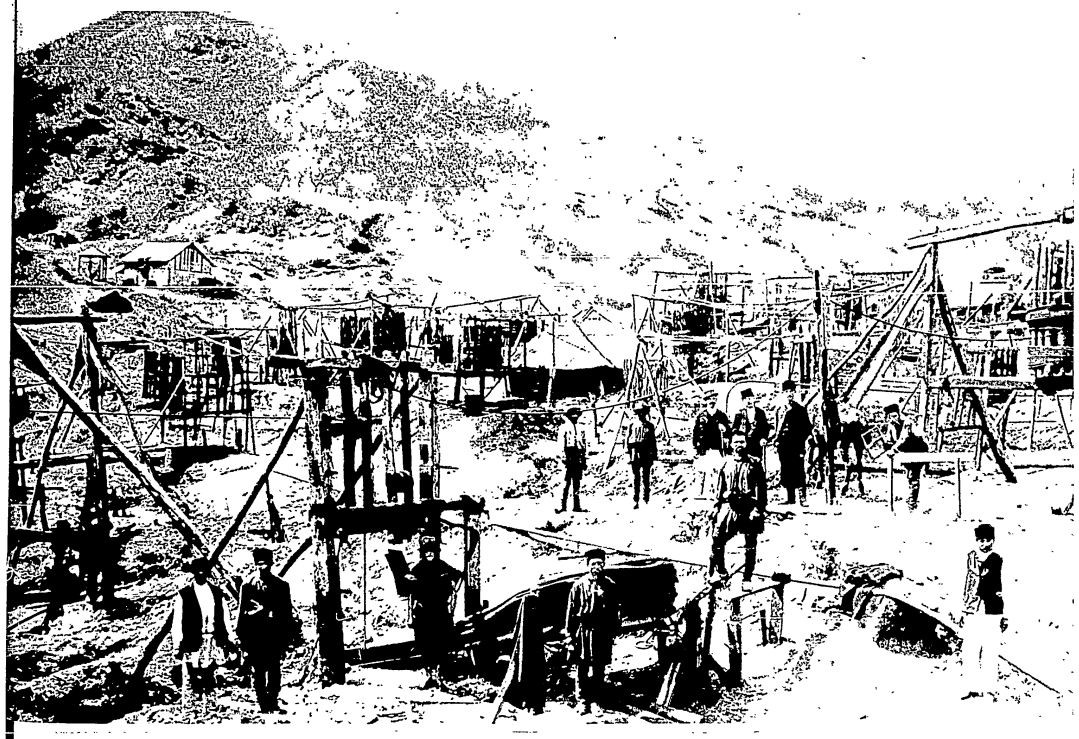
Oil well in the Cimpina oilfield in 1896. Picture shows the hand-driven fan for ventilating the shaft, and the digger ready to go down

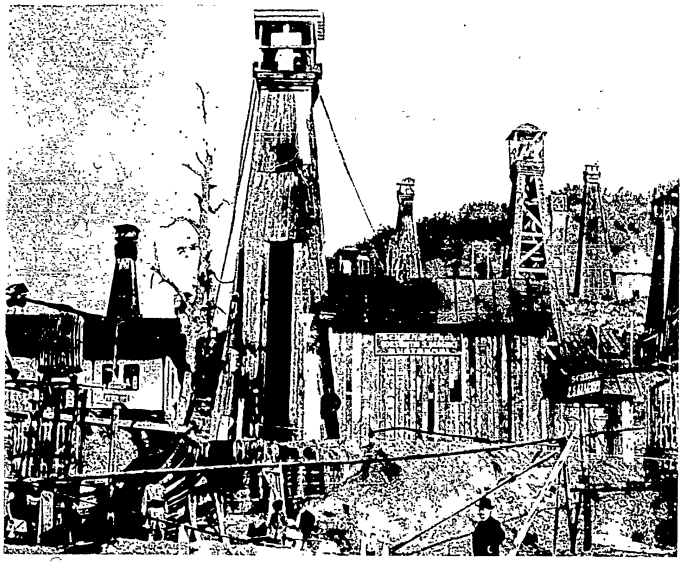


A well mouth lined with *tambre* (cofferdams) in the Bustenari oilfield (1857). Crude oil was lifted by means of a metal bucket of 50 litres capacity

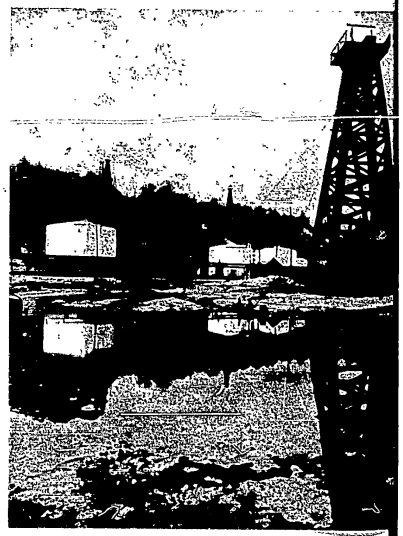
View of a street in Bucharest lighted by kerosene lamps (1858).

Partial view of the Glodeni oilfield in the year 1886 showing hand- or horse-drawn *hecnas* (hoists) for digging or extraction. Note the system of ventilating the pit by means of bellows

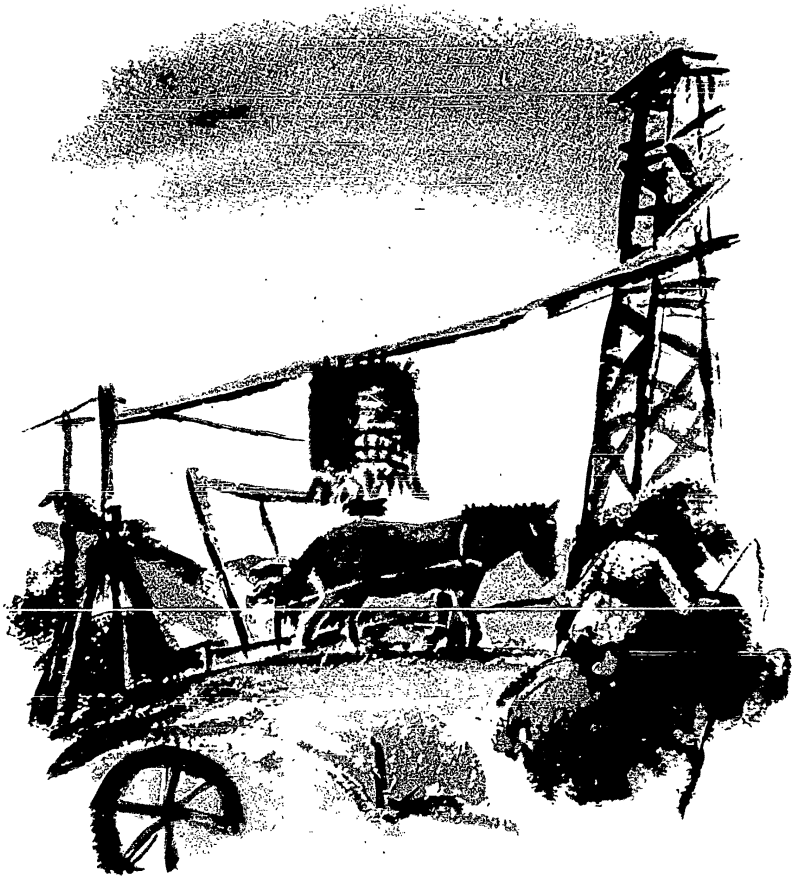




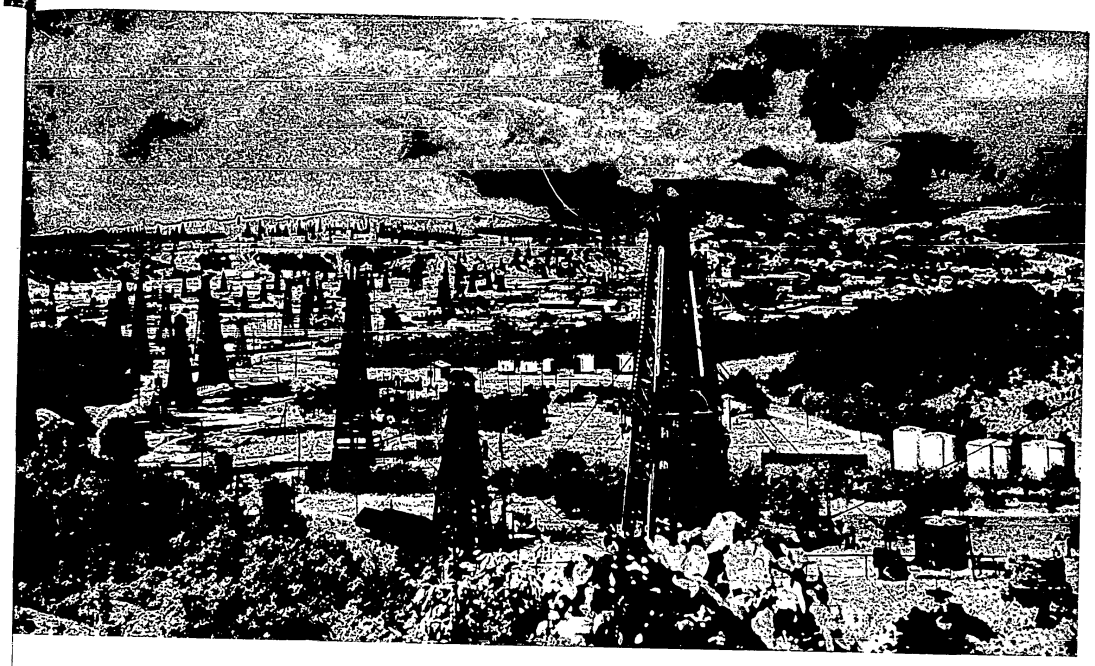
Aspects of the Buştenarı oilfield between 1905 and 1910, when the first Canadian drilling rig made its appearance. Beside the drilling rig, walls producing by *hecnas* may still be seen



View of the Cîmpina oilfield



Old type of horse-drawn production hoist, called "hecna".

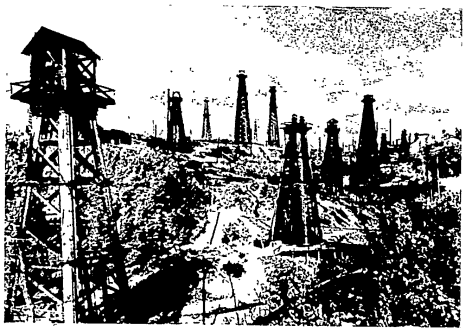


Moreni oilfield in which the old Canadian and Alianţa drilling rigs are intermingled with the new hydraulic rotary drilling rigs

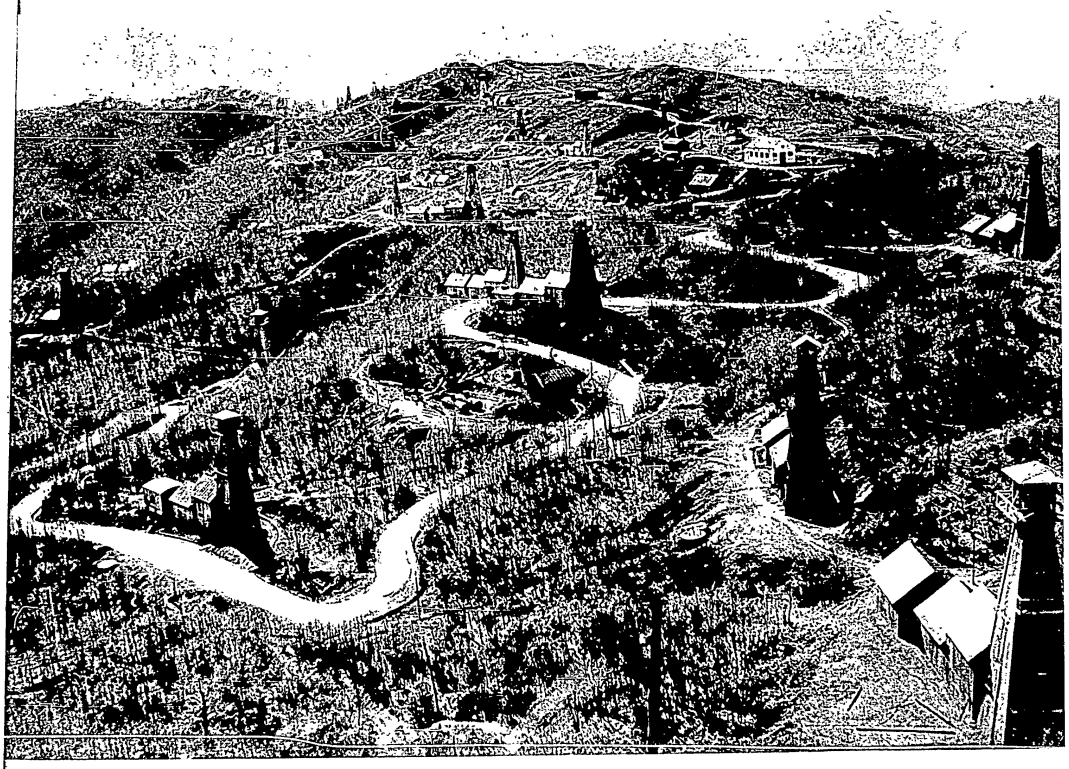
The Runcu oilfield. Wells drilled between the years 1910 and 1915 with Canadian rigs

Cimpina. Gachita oilfield. A gusher well

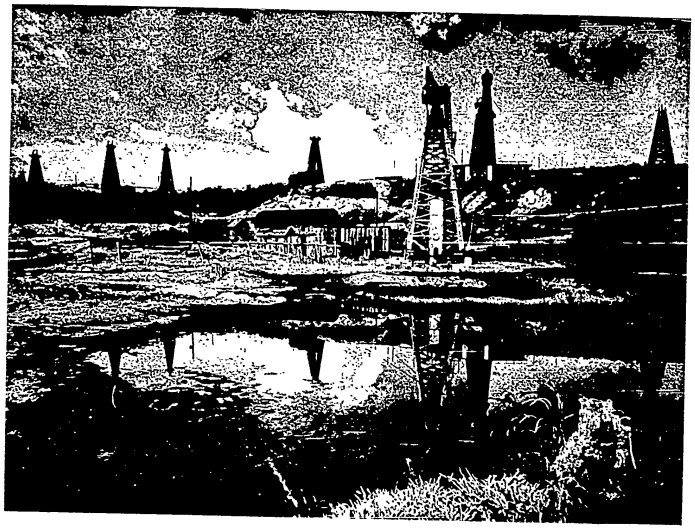
Part of the old Gura Ocnitei oilfield



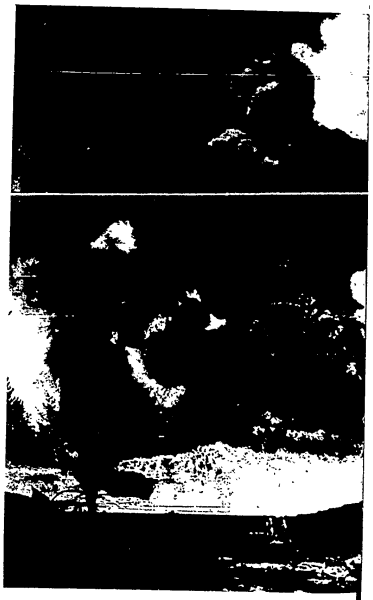
Moreni wells in the old oilfield drilled with Canadian and Alianta rigs



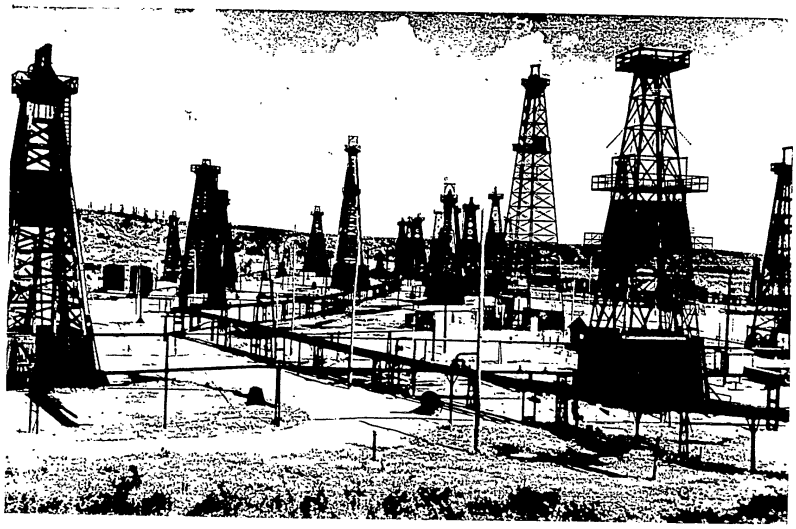
General view of the Arbănaşi oilfield between 1905 and 1915. The wells drilled with Canadian rigs were operated by bailing



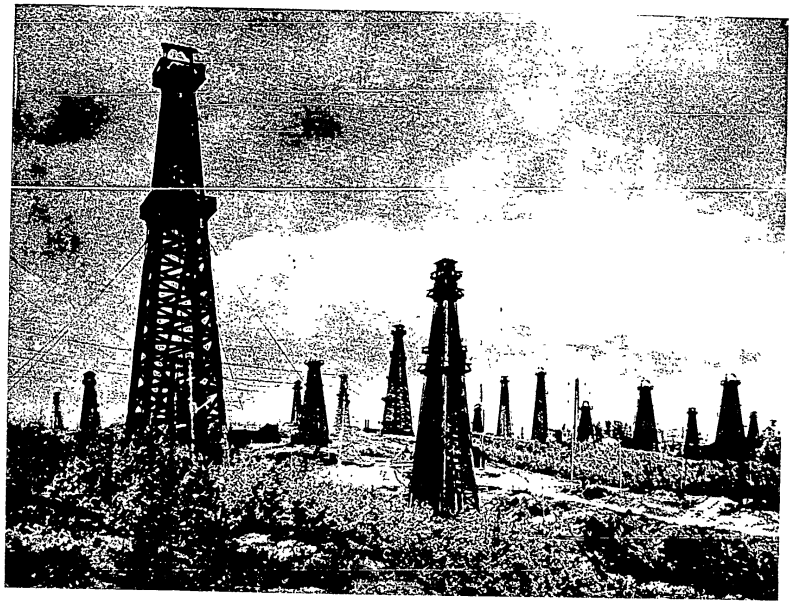
Ochiuri. Merişoi. An old oilfield



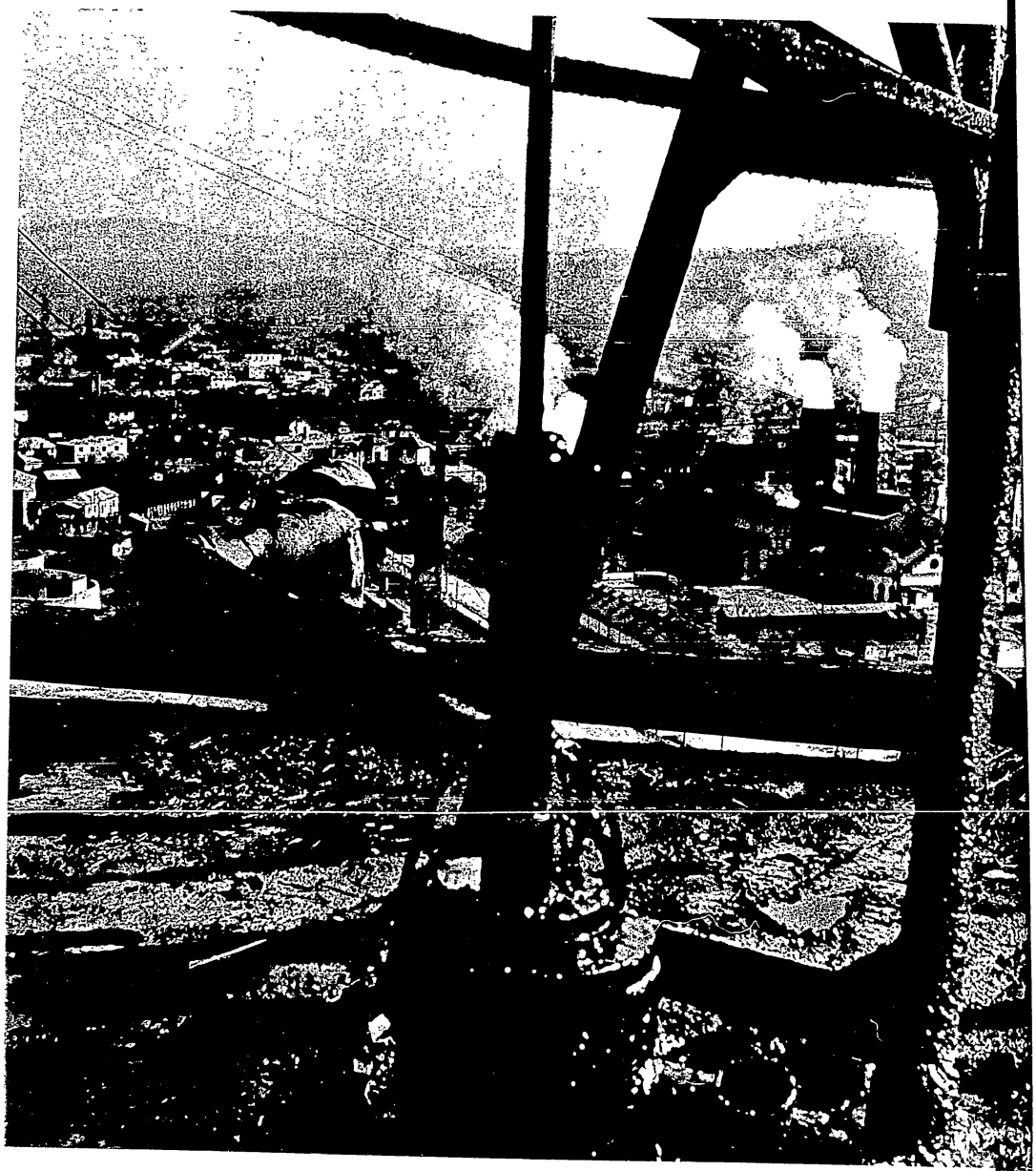
Cimpina oilfield (1920) A well on fire



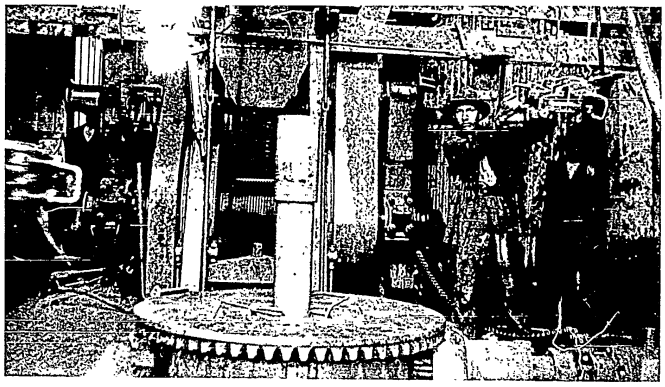
Ţuicani oilfield. Old wells (Canadian and Alianţa types) and new well drilled with rotary outfit



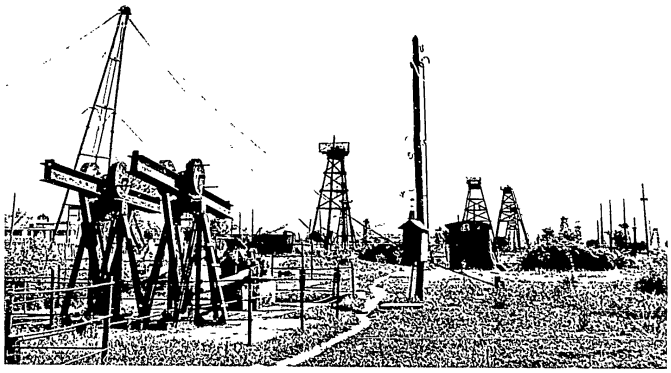
View of the Săeni oilfield



First rotary drilling outfit (1930)



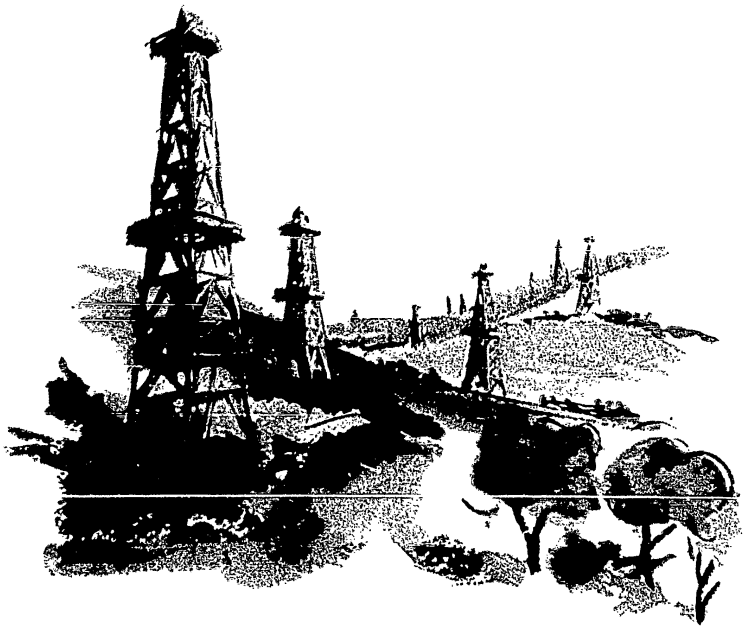
Cîmpina oilfield. Old wells. Deep pumping from a central power station



Individual Canadian pumping equipment with wooden walking beam Gura Ocniţei oilfield

Moreni (1927) General view

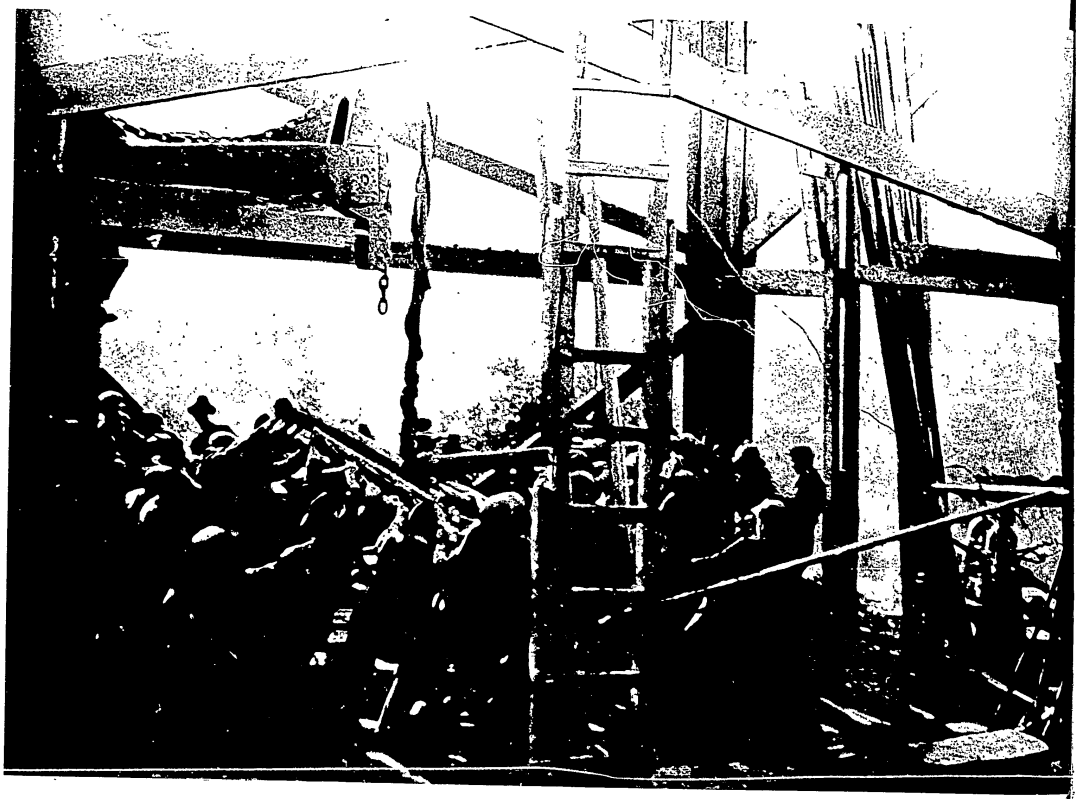
Moreni. Well No. 160, Romino-Americana, which caught fire in 1929 and burned for 3 years



View of an oilfield.

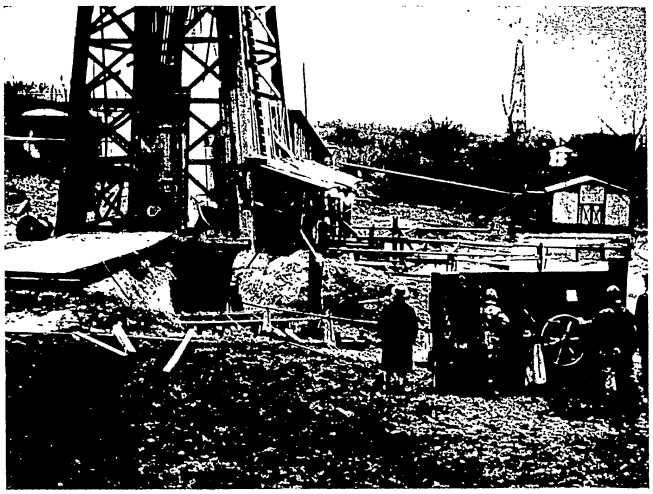
Wells in the Ocnița oilfield

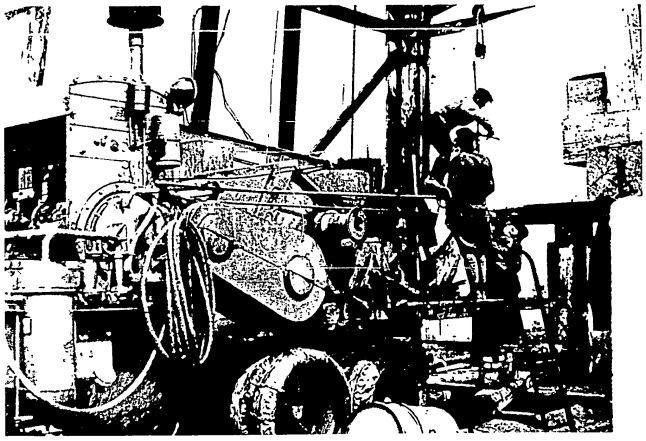
Wells in the Ocnita oilfield



Fishing job on well — about 1920

Boldeşti oilfield. Long-distance killing operation carried out from behind a shield (1930—1935)

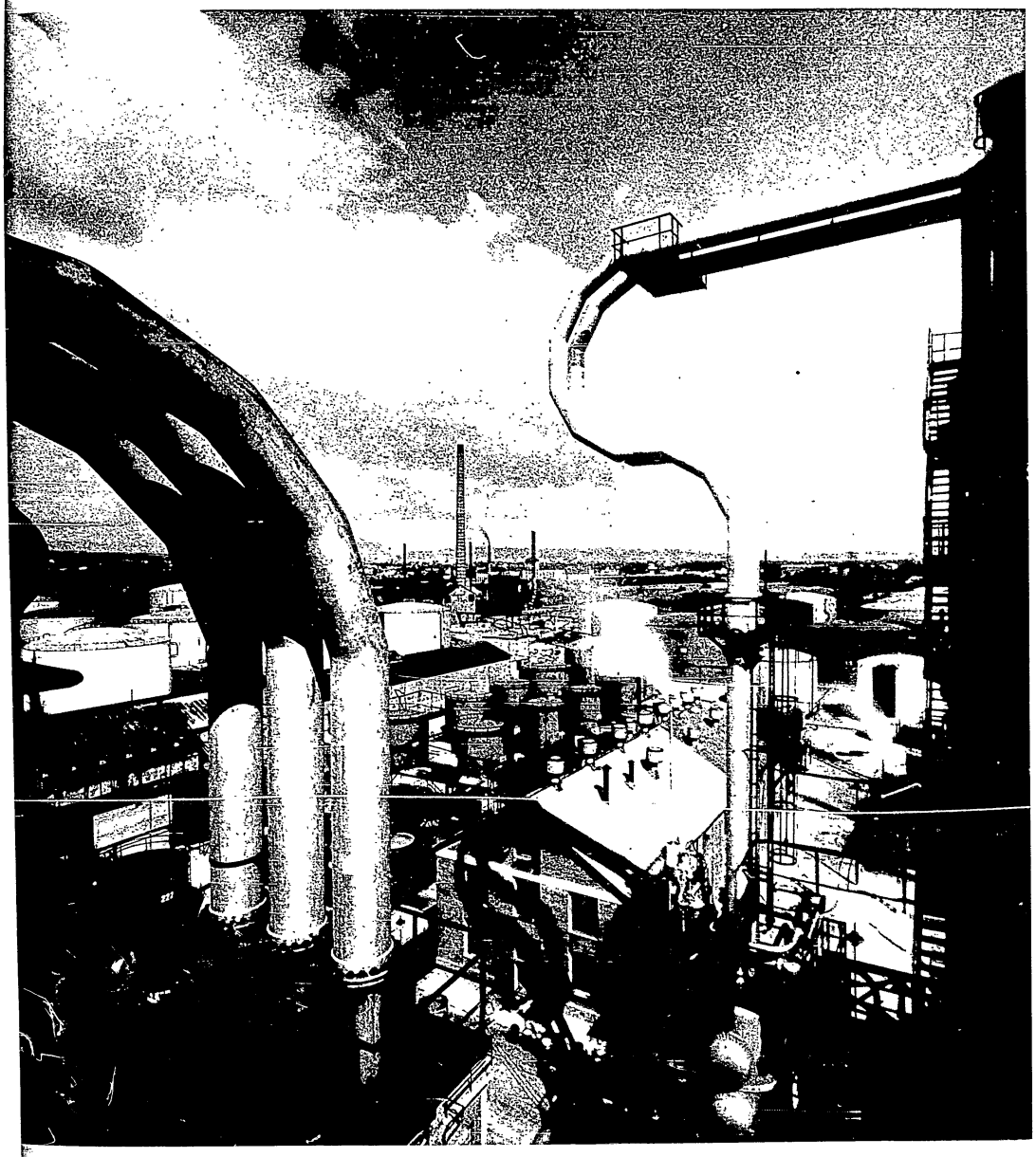


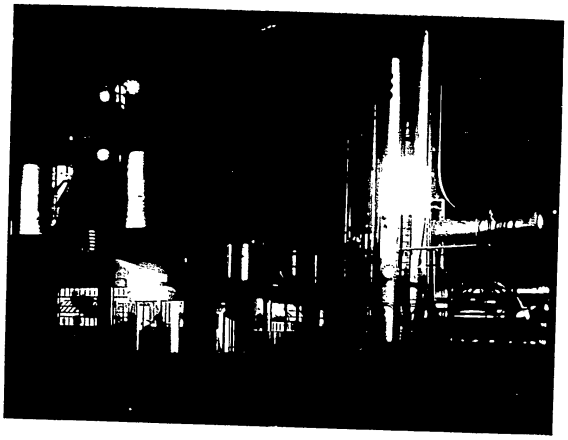


Portable hoist pulling the plunger of a deep oil pump

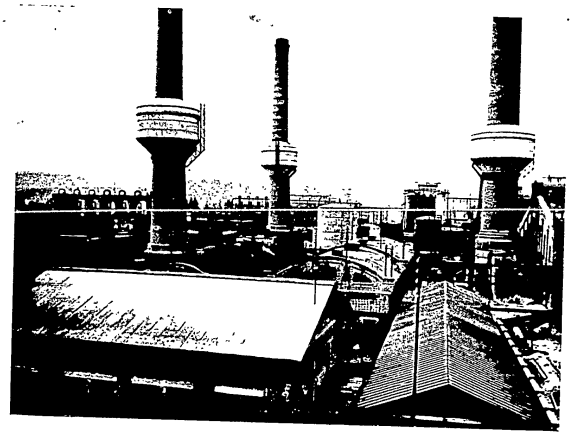
Morent. Turcani oilfield. Rotary-drilled wells

General view of Brazi refinery

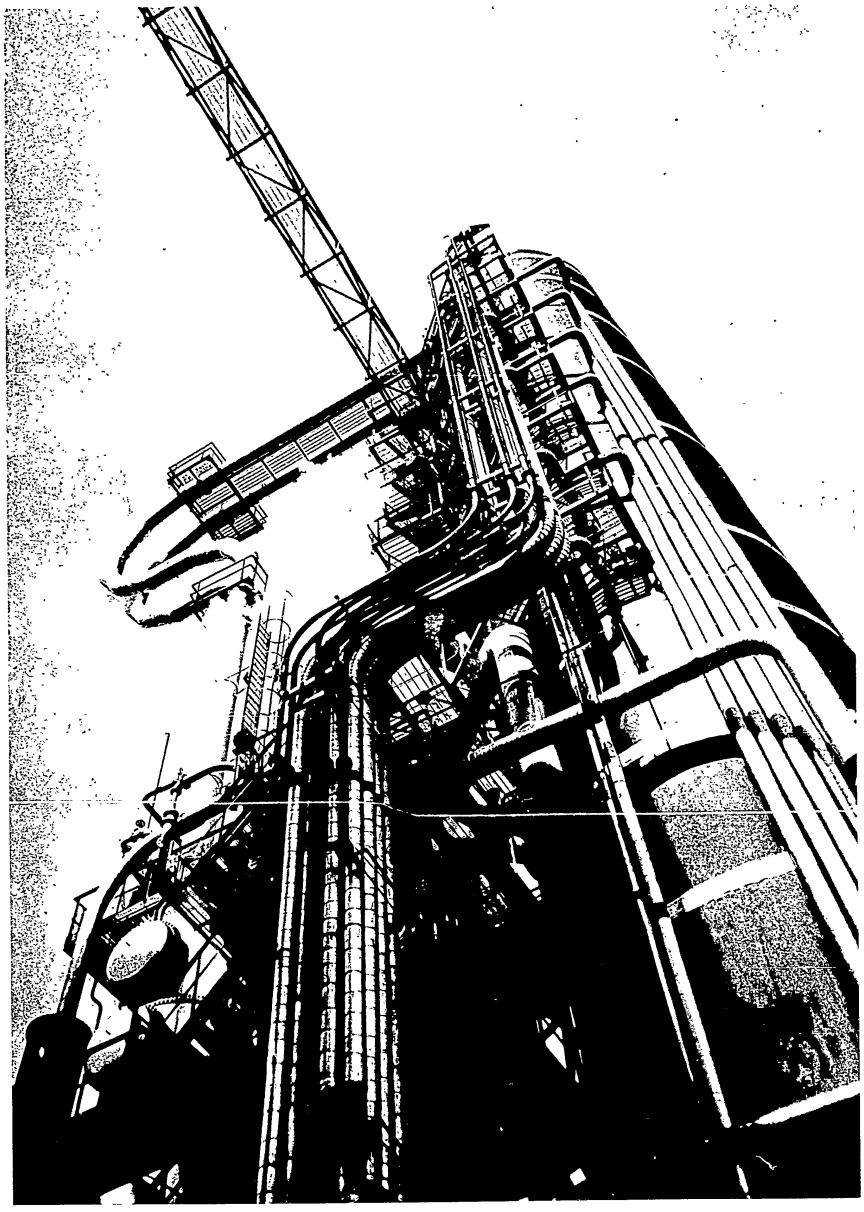




Brazi refinery at night



General view of the Cimpina refinery in 1940. The first big refinery built in Rumania



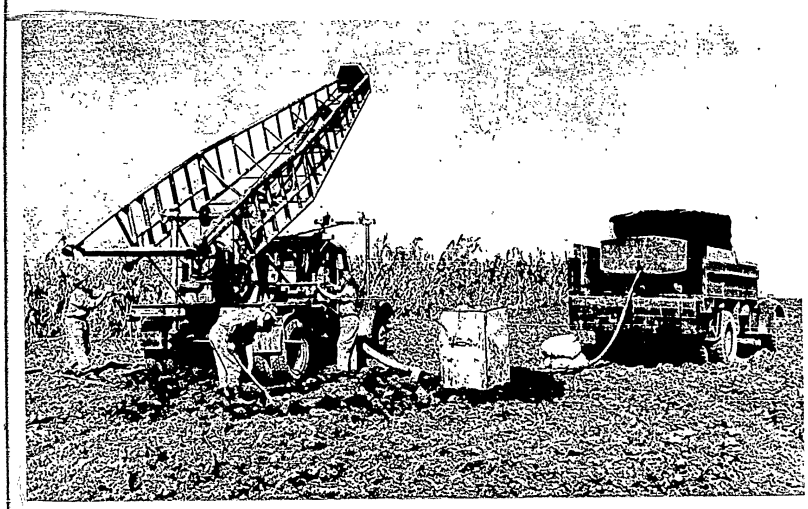
Vacuum fractionating column

Brazi refinery View of the storage tanks

No 1 Ploesti refinery. Part of the atmospheric distillation and vacuum equipment

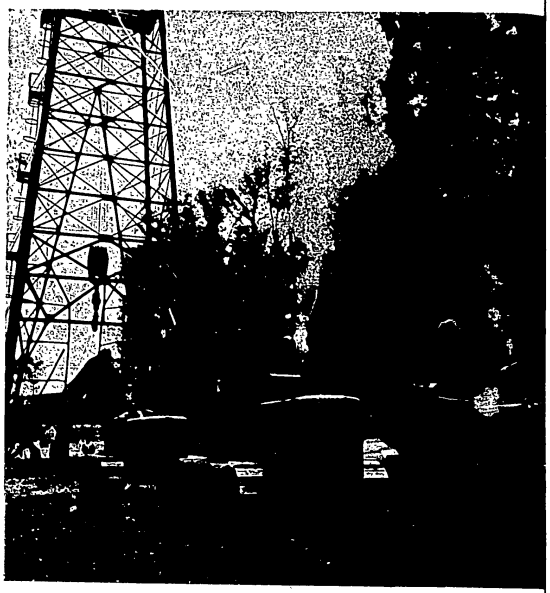
Geophysical explorations carried out by a flying crew

Mounting a group of geophones for geophysical exploration



Exploration drilling in the Bărăgan plain

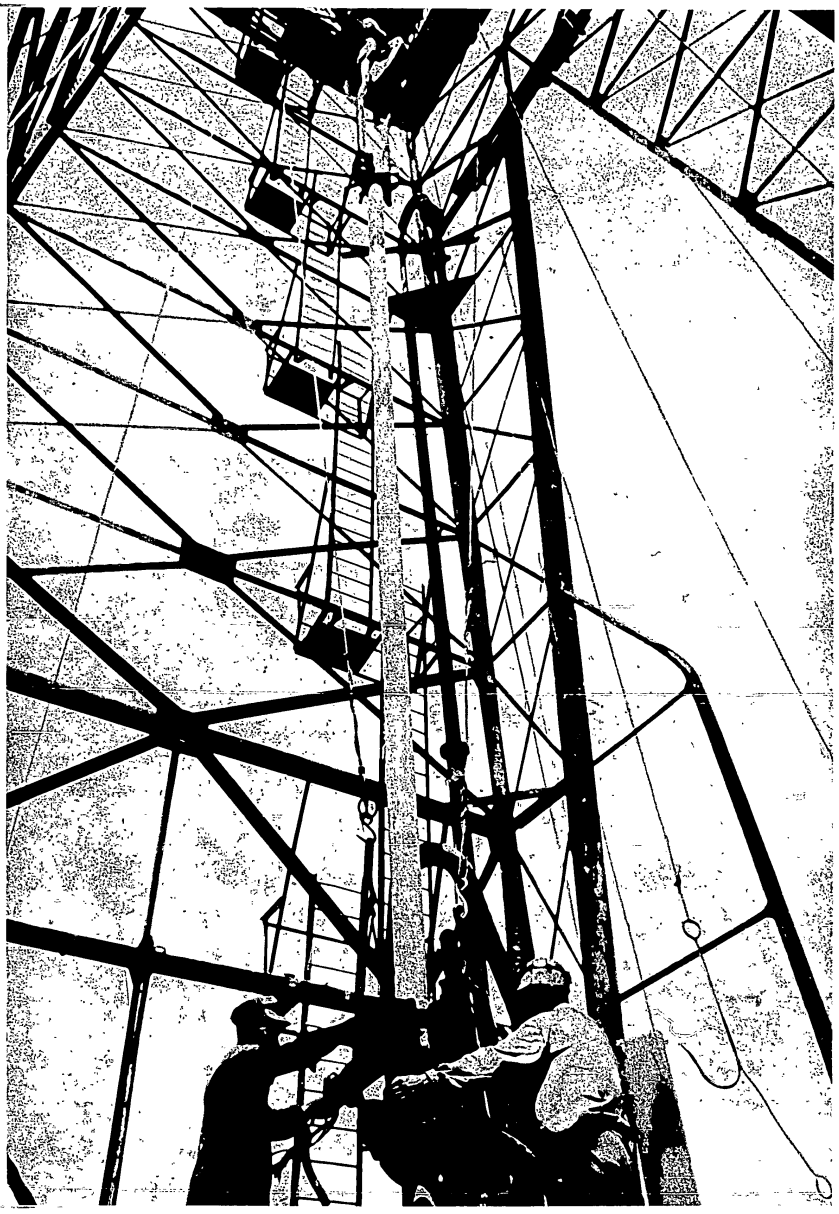
Mounting a metal derrick

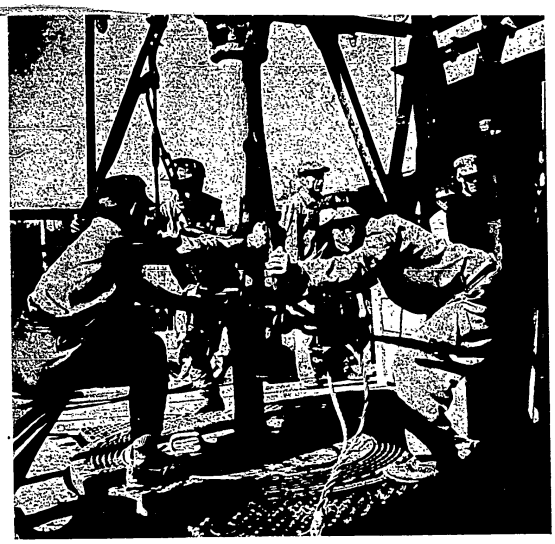


Sliding a metal derrick from one location to another without dismantling

Pulling drill-pipe

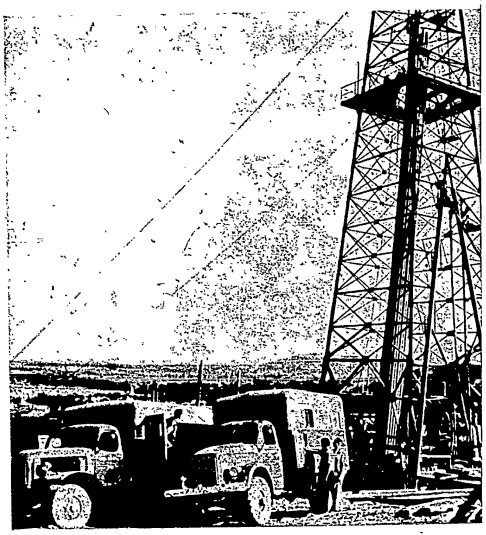
Pulling drill-pipes on a well in the Prahova Valley



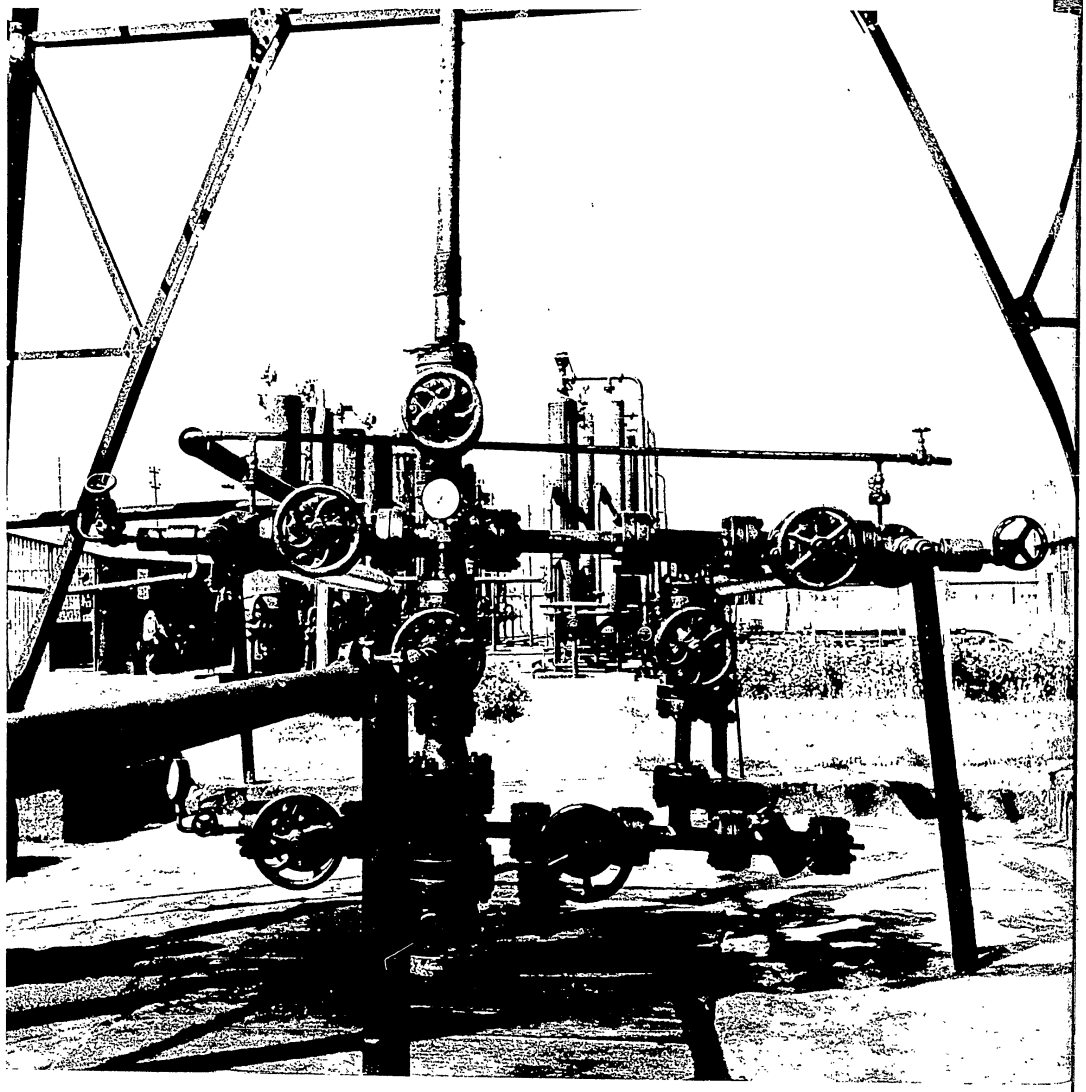


Screwing drill-pipe stands

Radio-active logging at a completed well

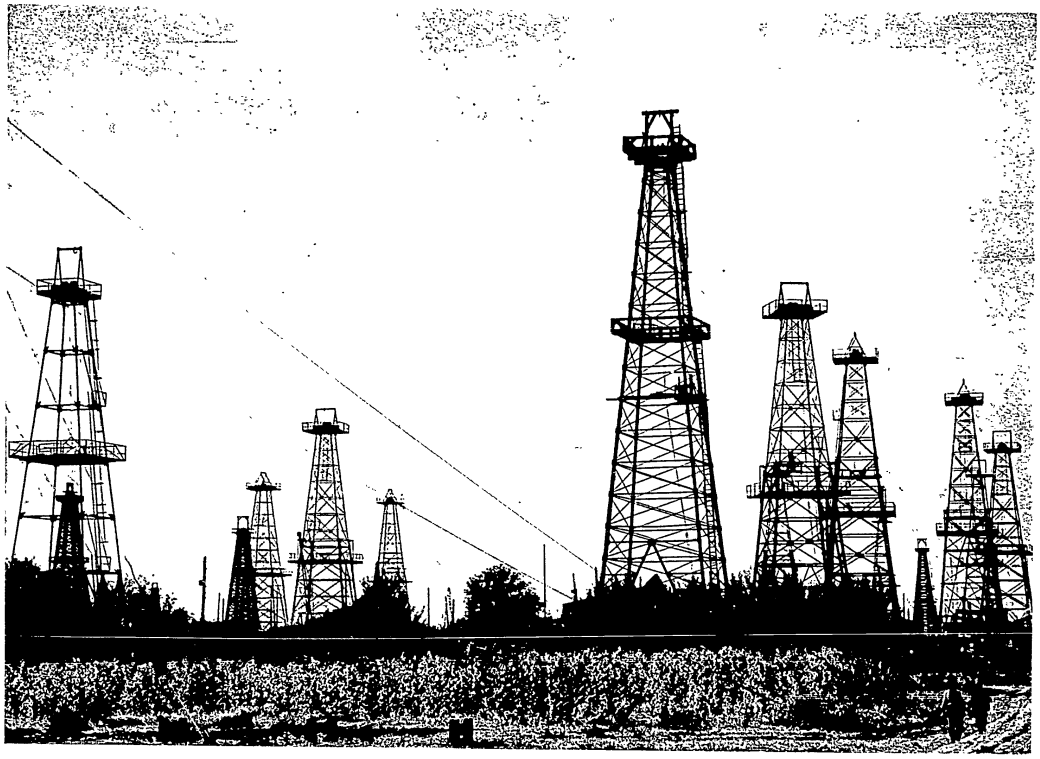


Drilling crew hanging the swivel and kelly to the hook

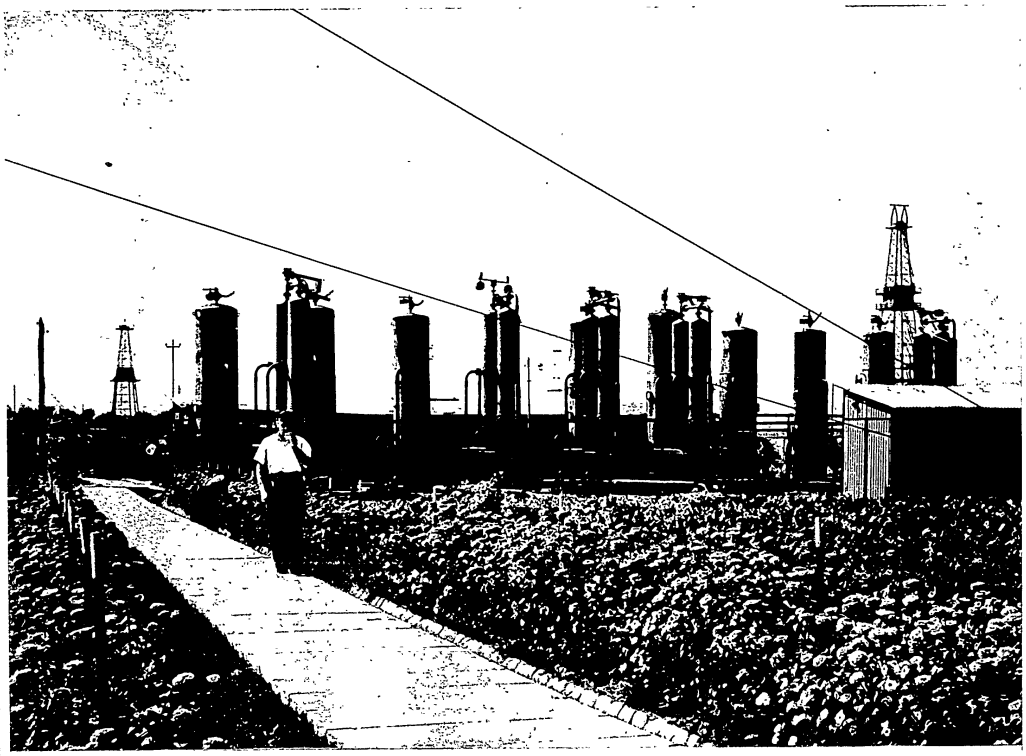


High pressure casing-head installed at a deep flowing well

Inside view of a steel derrick



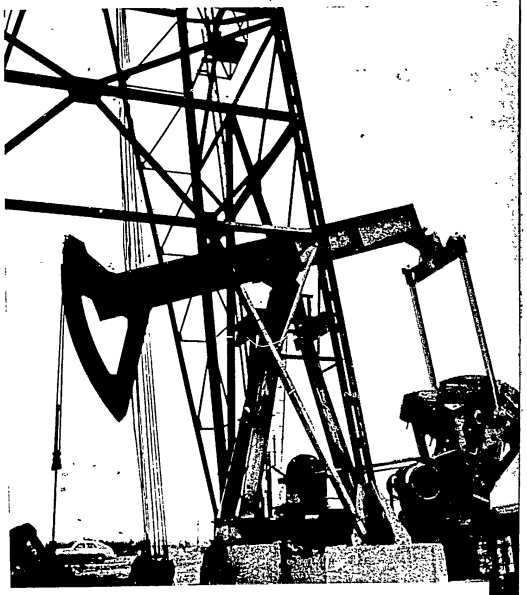
Partial view of a new oilfield near Tirgoviște



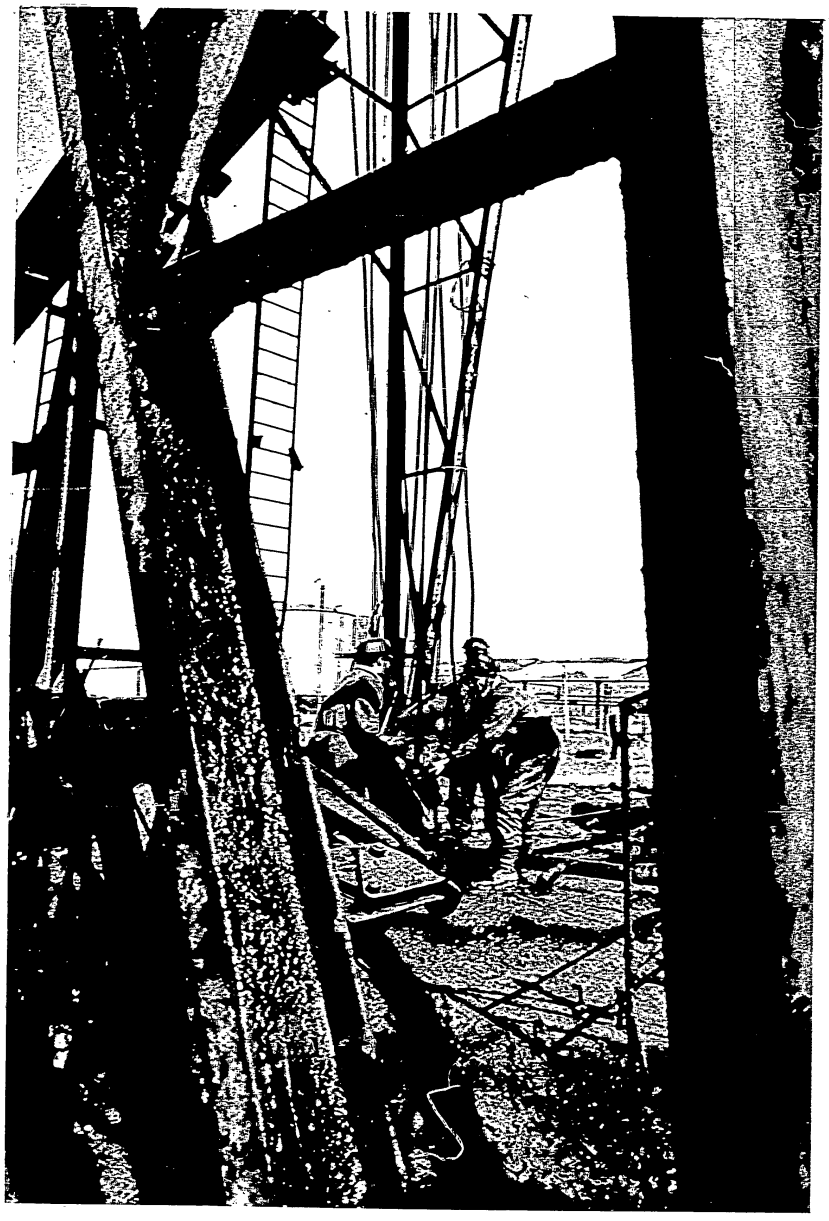
High and low pressure separators in a producing oilfield

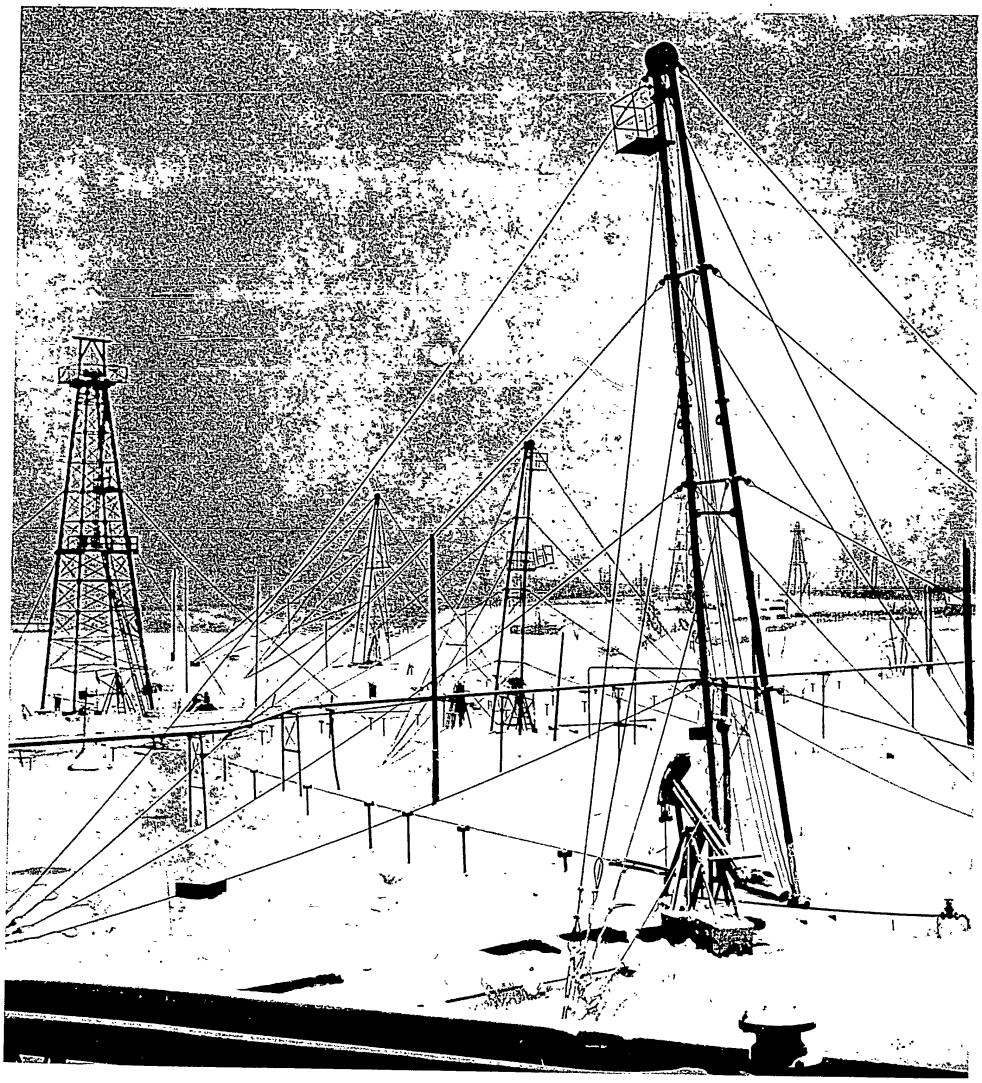
Running in pumping rods into a well

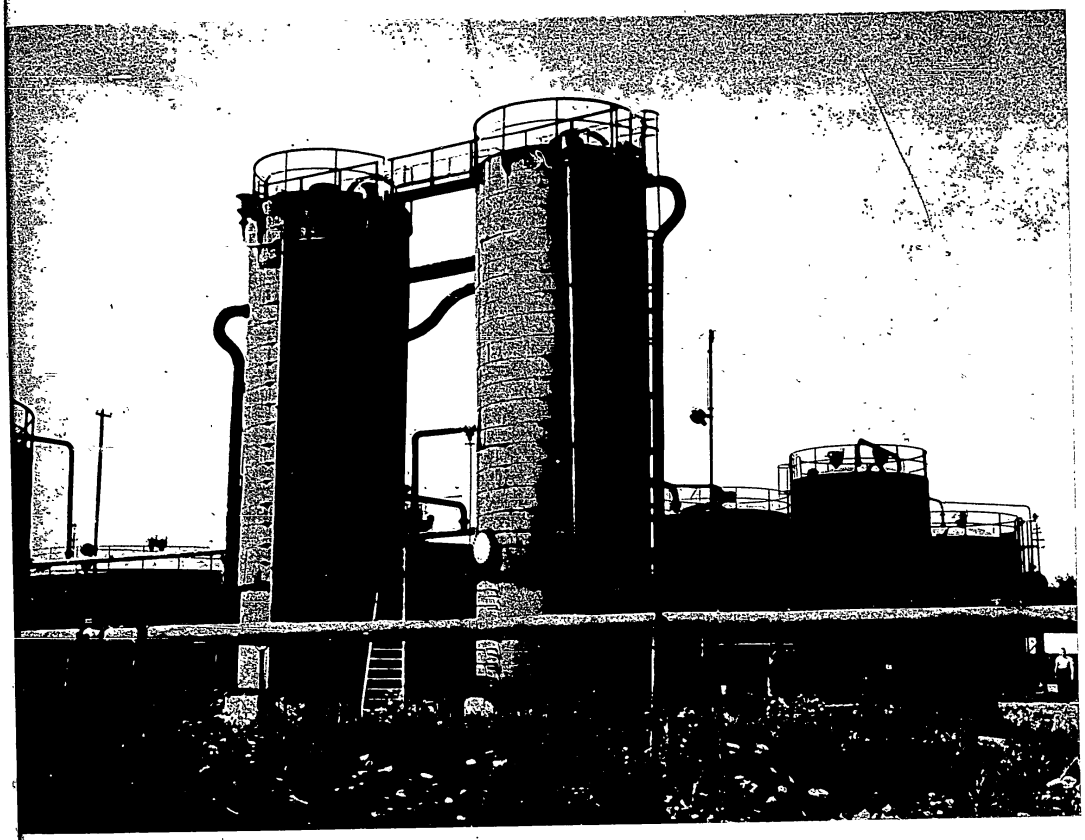
Portable hoist pulling an oil pump on a deep well



Electrically-driven 12-ton individual pumping unit

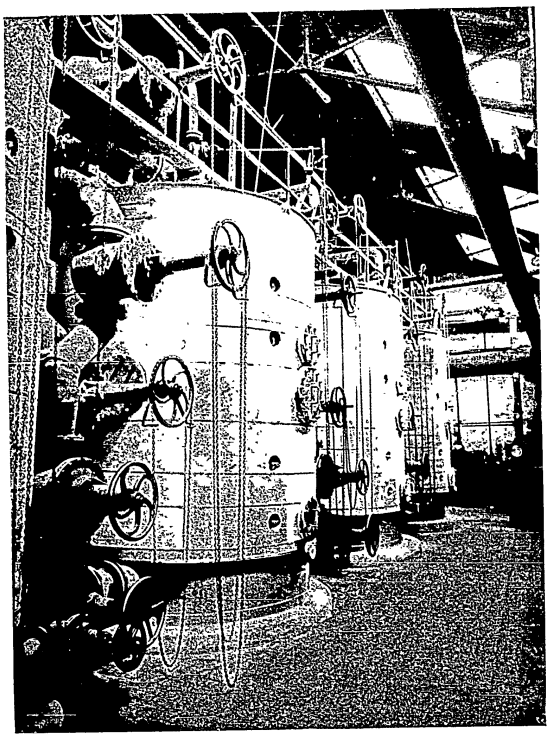




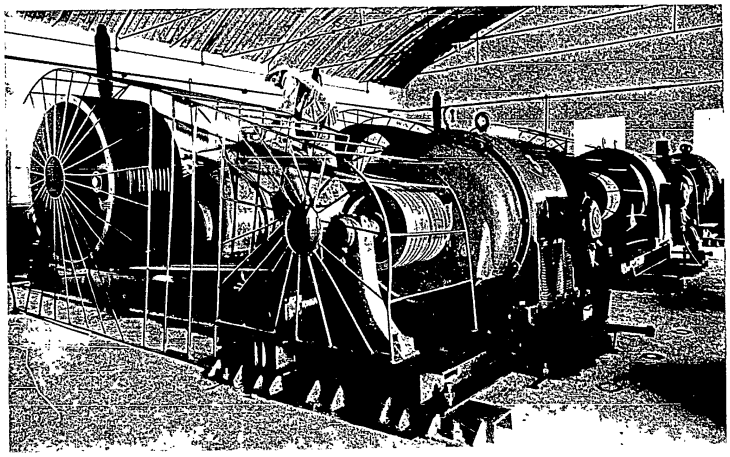


An electrical desalination plant invented by C. Nicodimescu

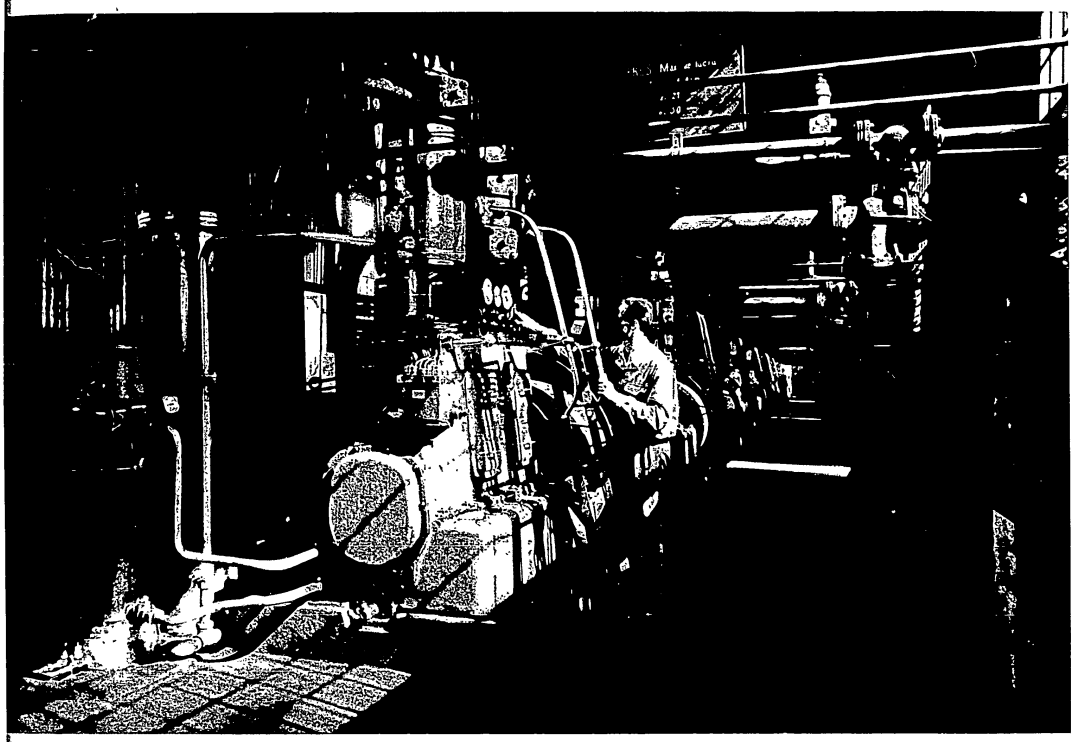
Moreni. Group of old pumping wells equipped with masts, derricks and jacks, hooked to a central pumping power



Gasoline plant absorbers. Partial view

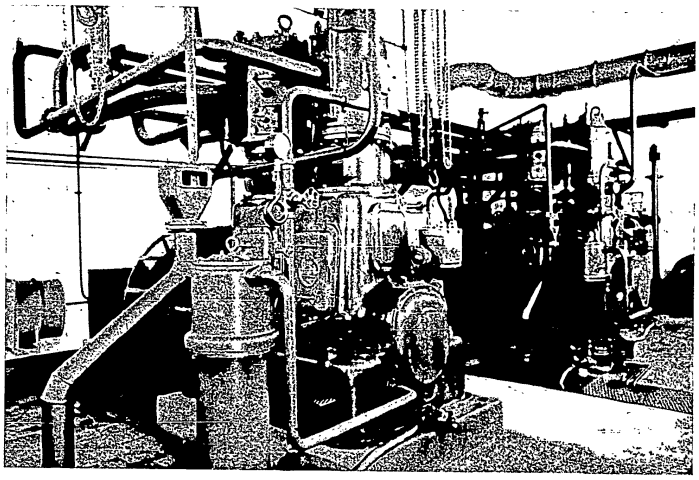


Electrically-driven water station pump



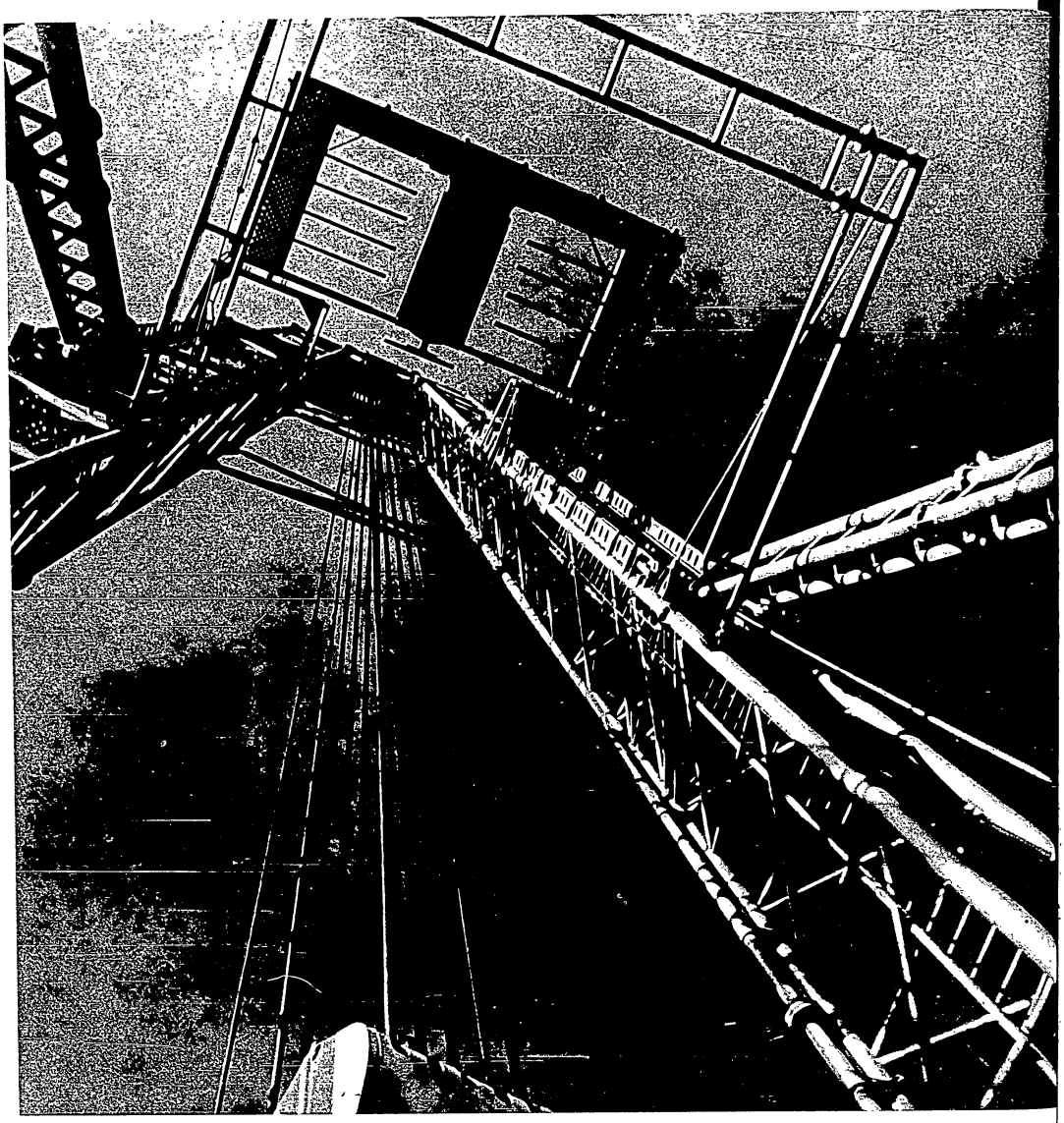
Compressor station with vertical engines

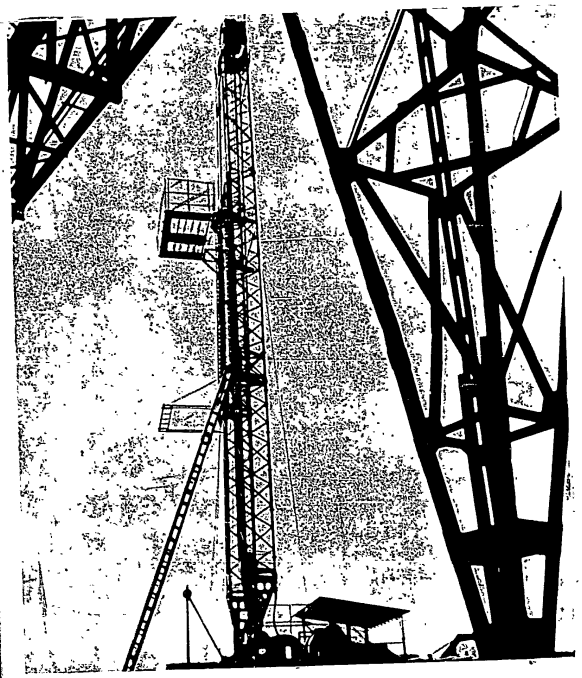
Electrically-driven compressor station

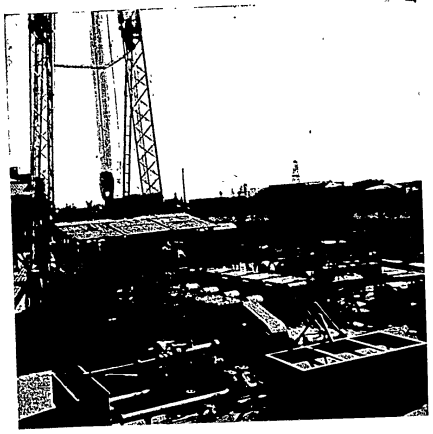


Electrically-driven vertical compressors

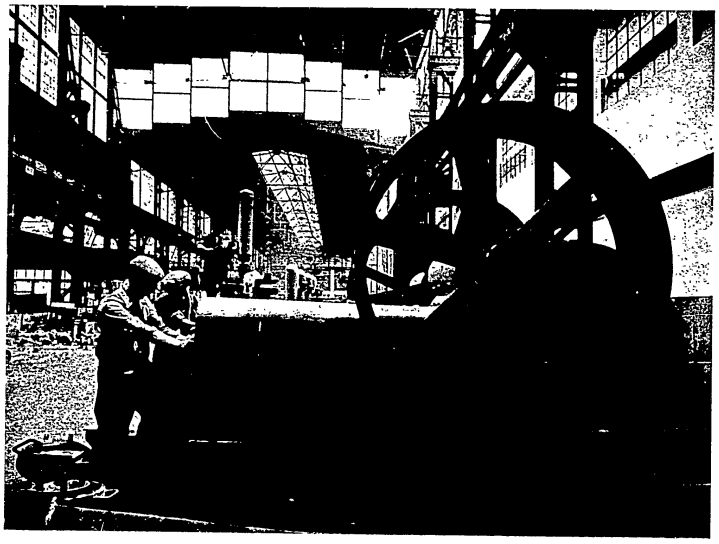
Workshop in the Tirgoviște oilfield equipment factory



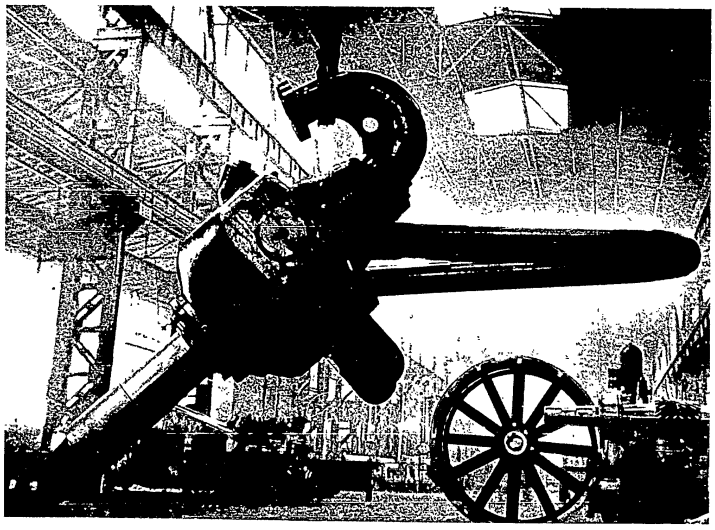




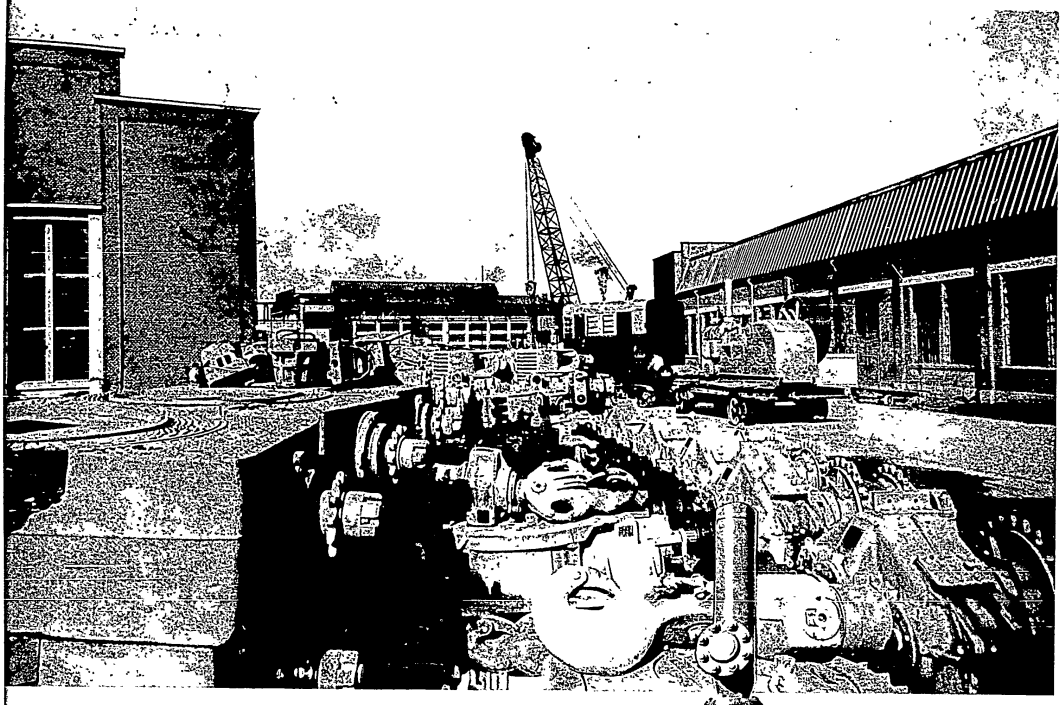
In 1956, the "1 Mai" oil-equipment works at Ploeşti started to produce a new type of drilling rig called the 4 LD. Features: a folding derrick which can be mounted in 5 minutes and dismantled in less than a minute by an automatic device, four 450 h.p. Diesel engines, drilling capacity to 13,500 ft. Pictures show three different views of the new drilling equipment

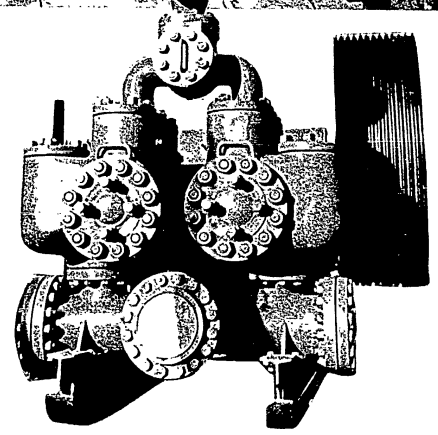


In the assembling workshop of the "1 Mai" works at Ploești. A group of slush pumps being mounted



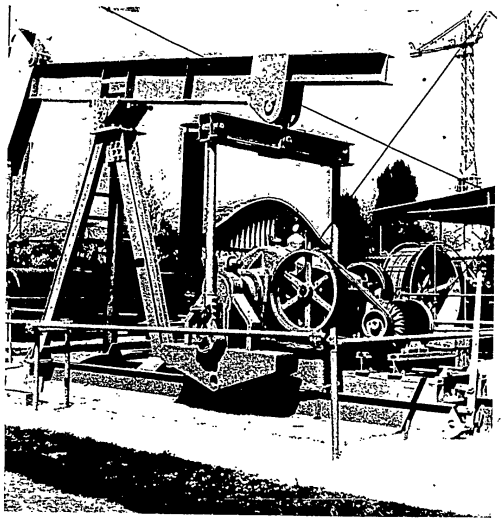
300-ton swivel ready for shipping



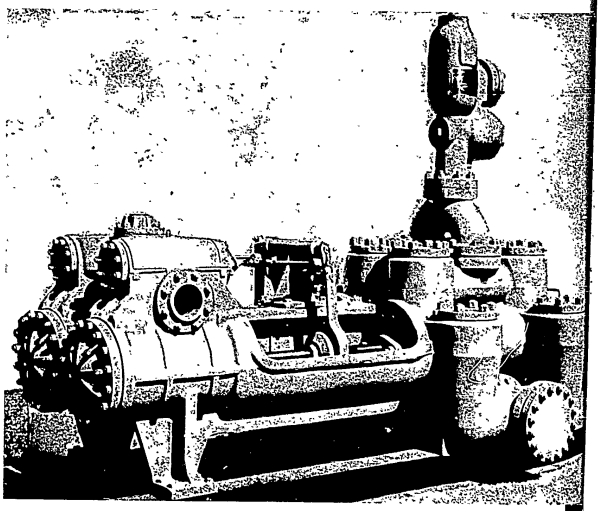


Since they have been set up, Rumanian oil-equipment factories produced a wide range of equipments, whose quality has also been appreciated abroad in the numerous countries to which these products have been exported. Photo shows view of the Ploești "1 Mai" works: equipment ready for shipping

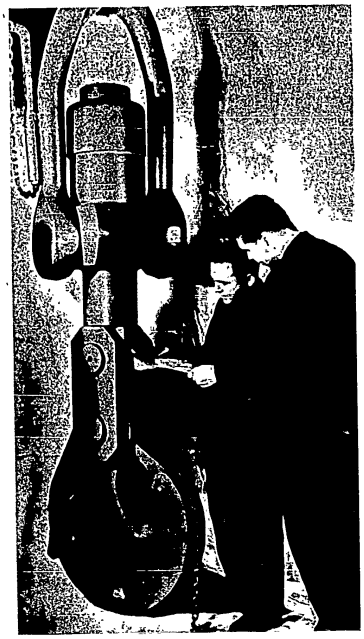
Some of the products of Rumanian factories, ready for export



Light pumping unit

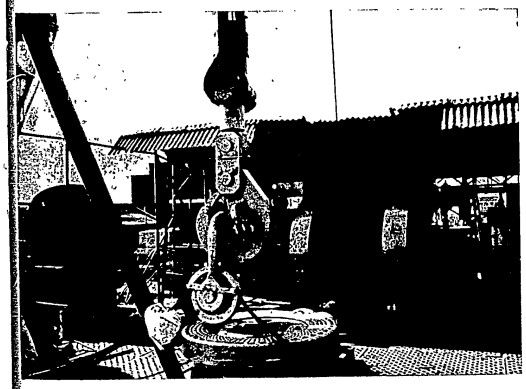


Duplex steam-driven slush pump

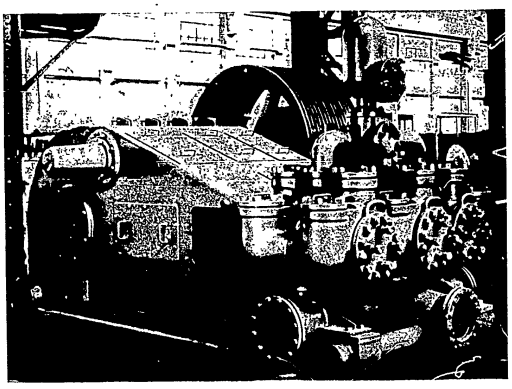


150-ton hook

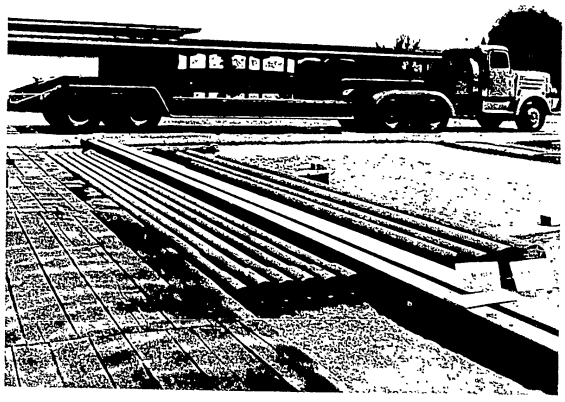
Details of the 4 LD drilling rig (hook, rotary table, draw-works and switch-board)



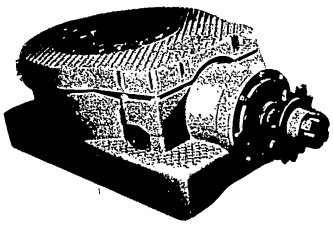
Triplex slush pump



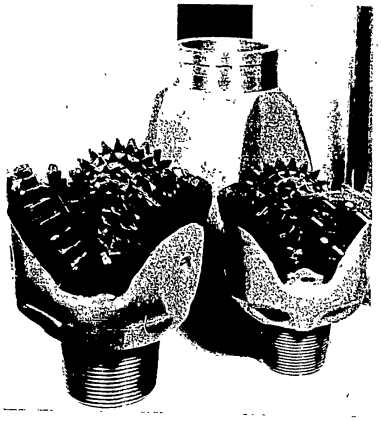
View of a tubular good station. Drill-pipe racks

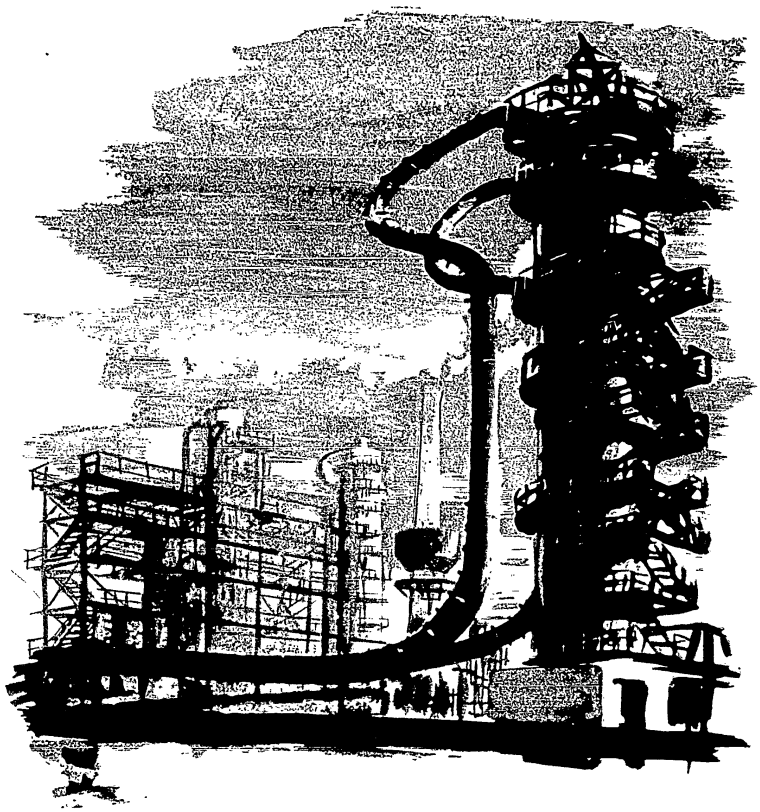


Three-cone roller bits

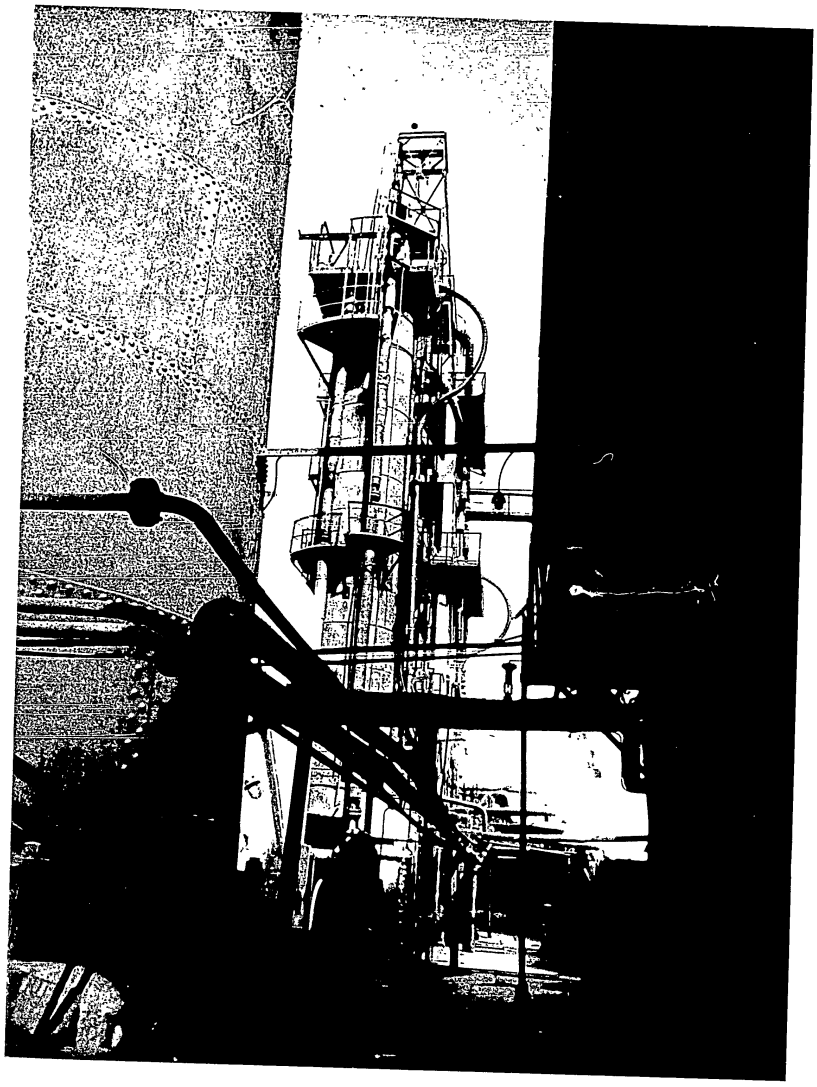


Rotary table



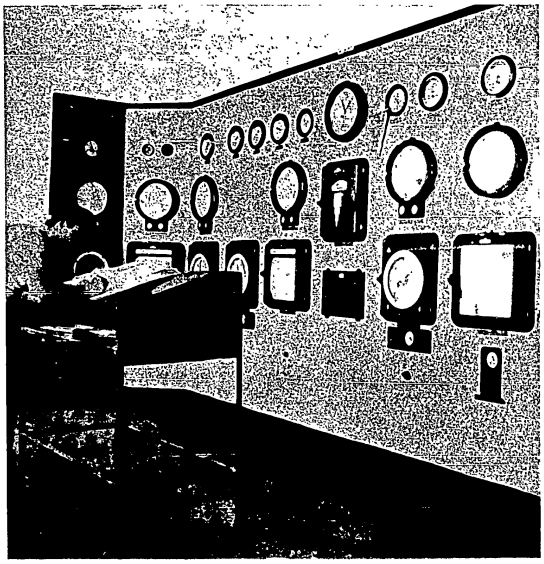


View of a refinery



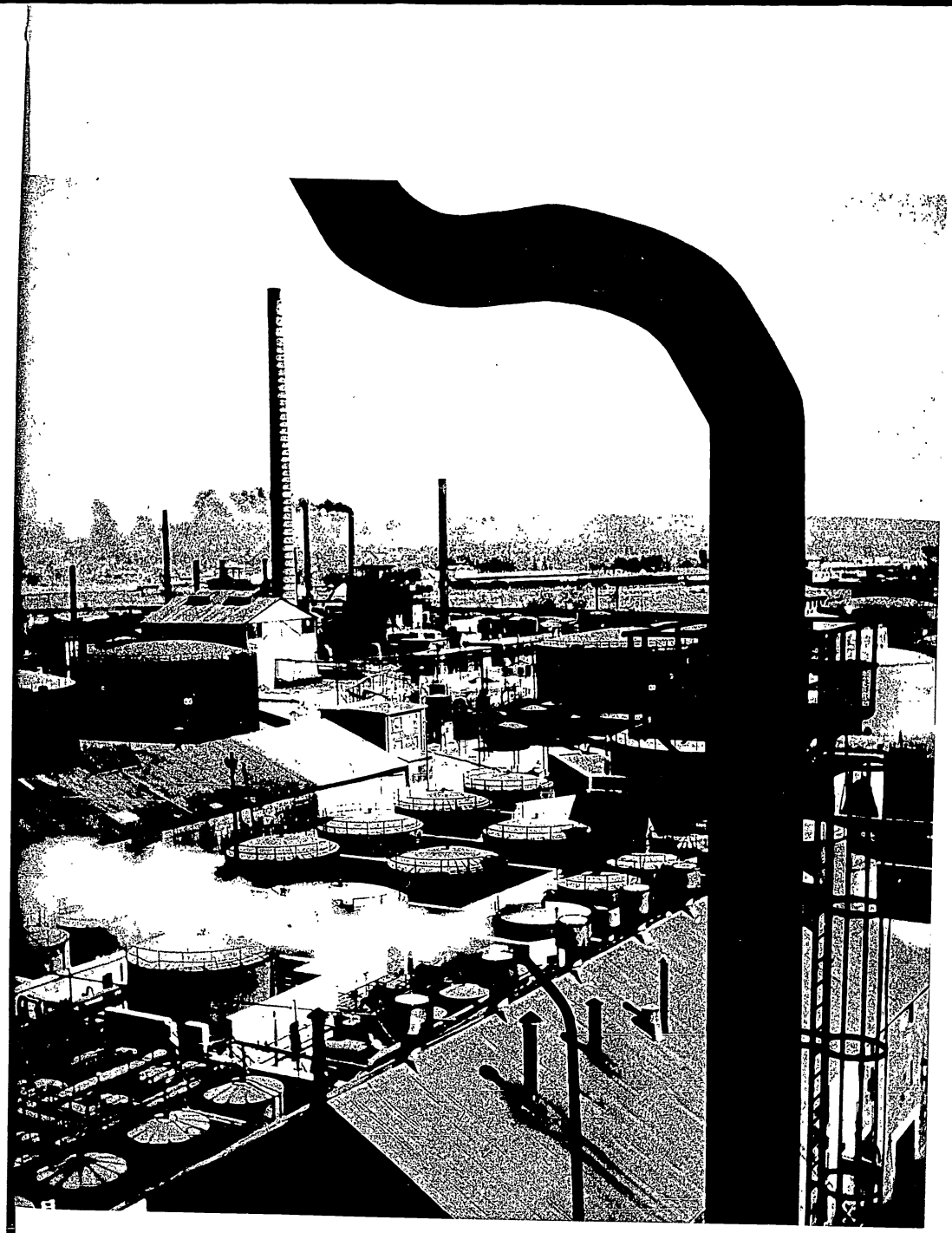
Aspects inside a refinery

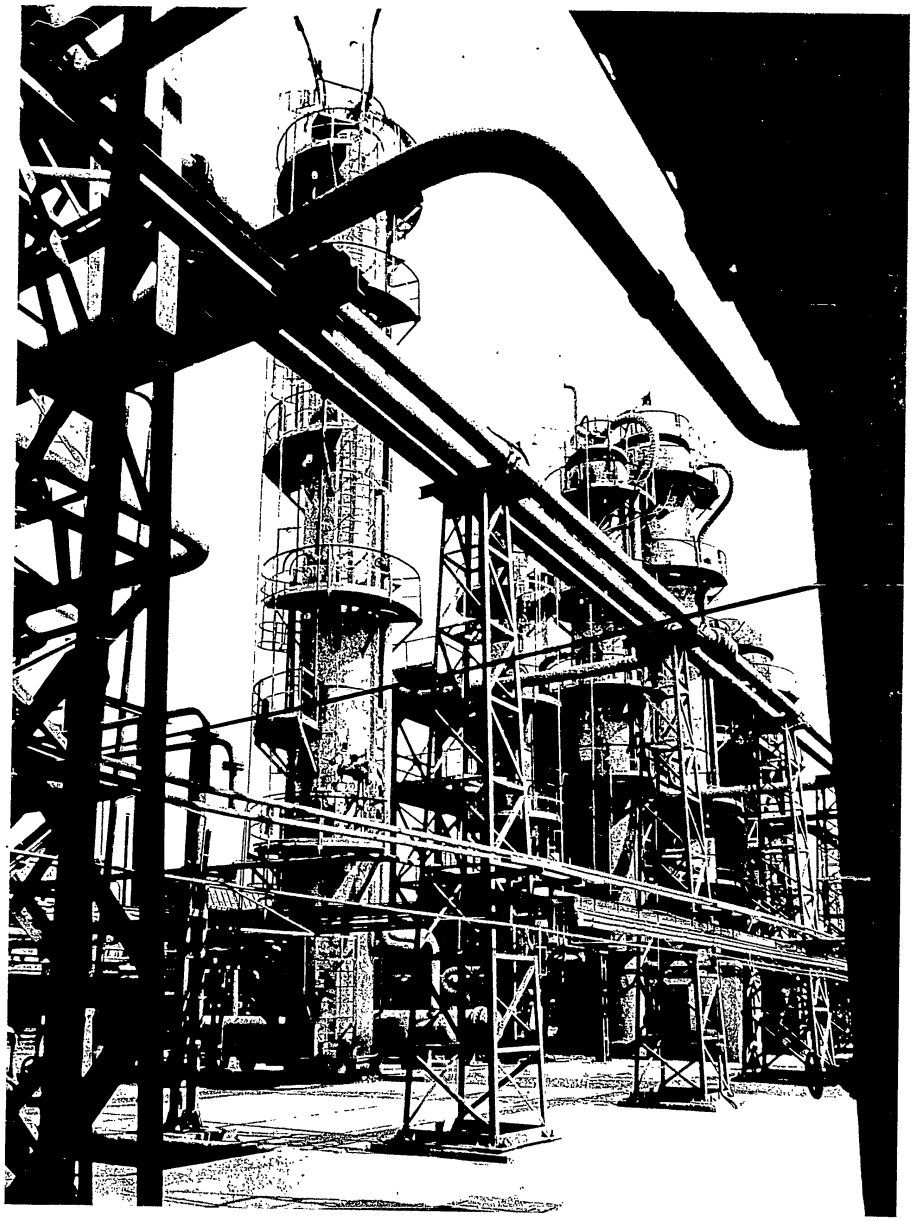
Kerosene-neutralizing equipment at No. 8 refinery in Moldavia



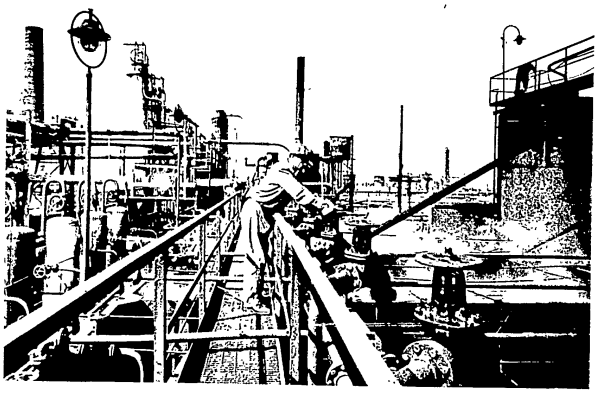
Switch-board in a refinery for measuring and checking instruments

Storage tank-farm in a Ploești



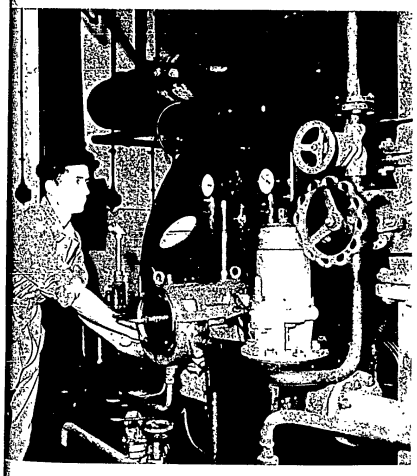


View of modern distillation equipment at No. 10 refinery — a big new Moldavian plant

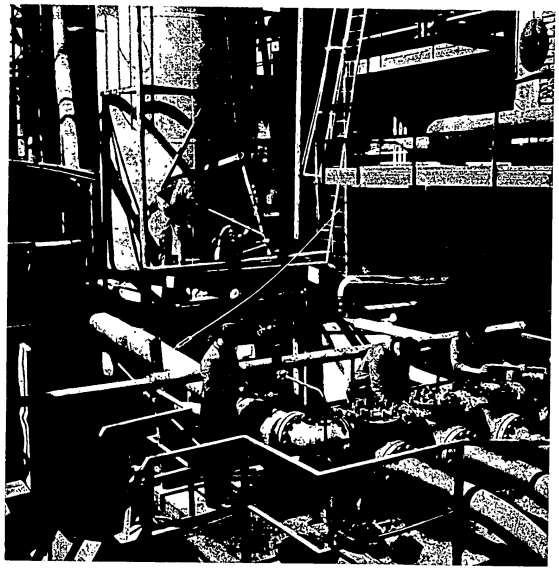


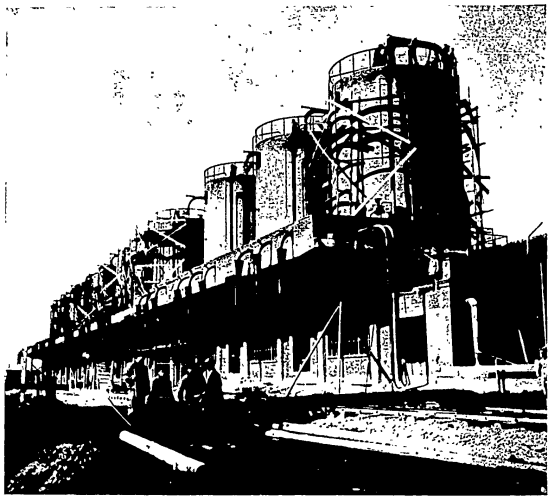
No 1 Ploești refinery Checking the instruments on a distribution manifold

Manifolds and pipelines leading to the storage tanks of a refinery

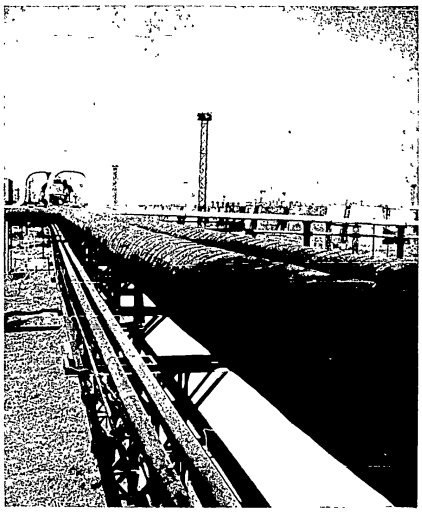


Control of crude-oil flow rate into the furnace



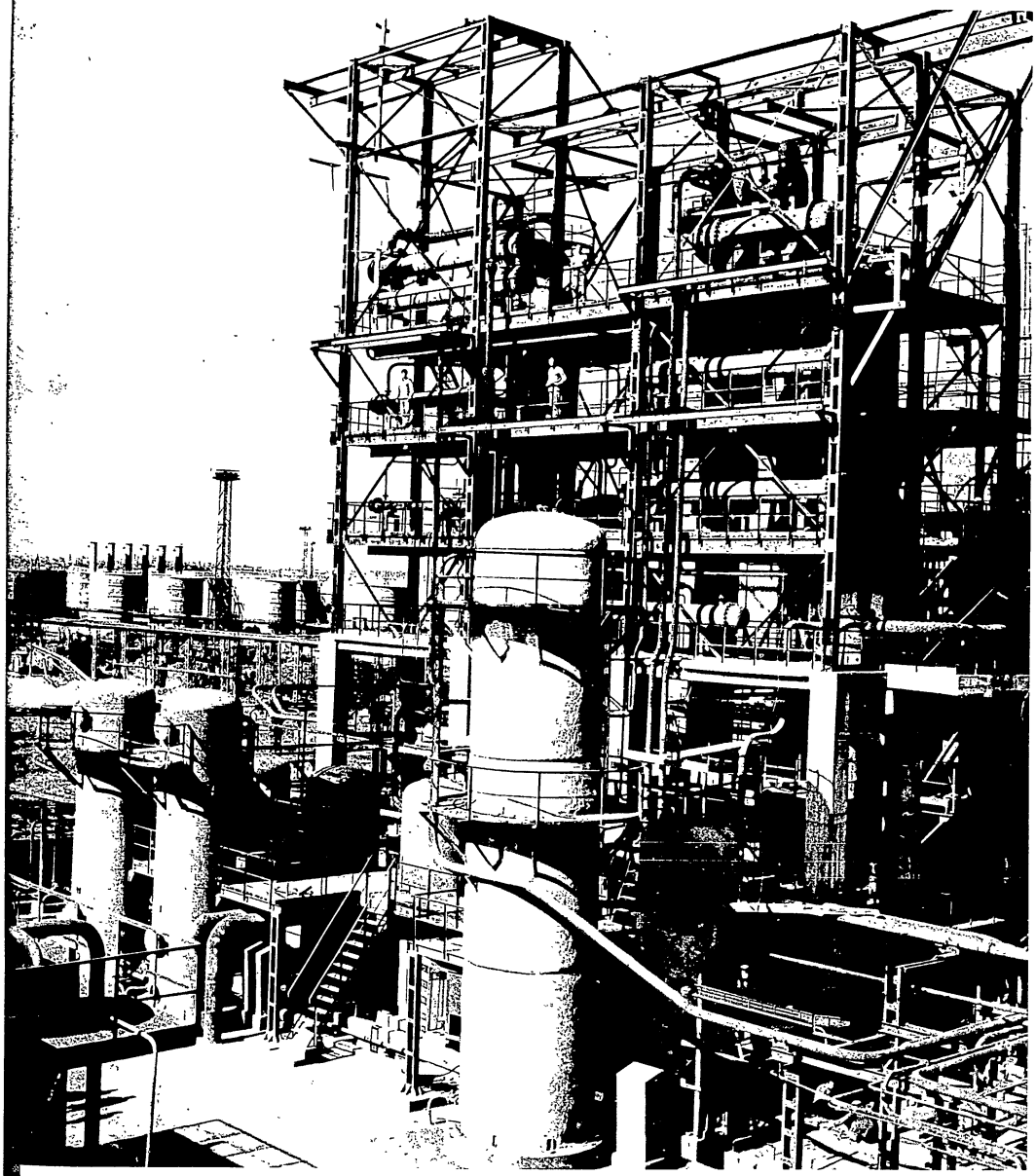


Building a new and up-to-date bitumen plant at an oil refinery near Ploești

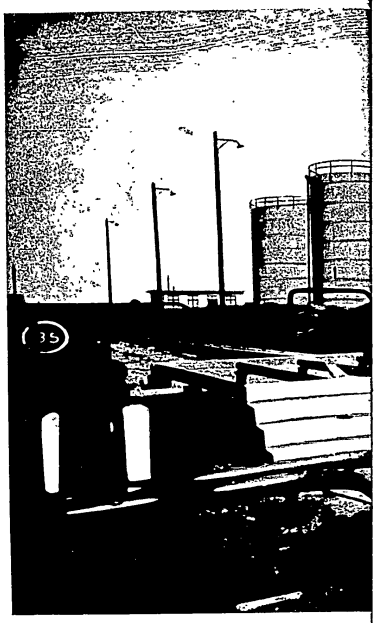


Pipelines inside a refinery

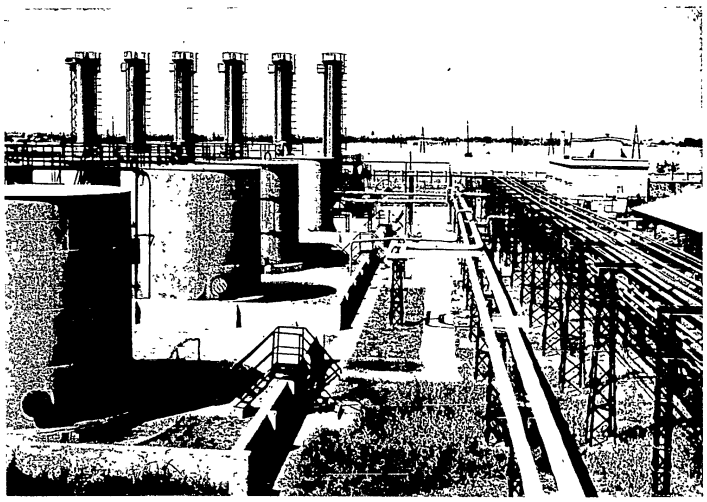
Partial view of the furfurol equipment in a newly-built oil refinery

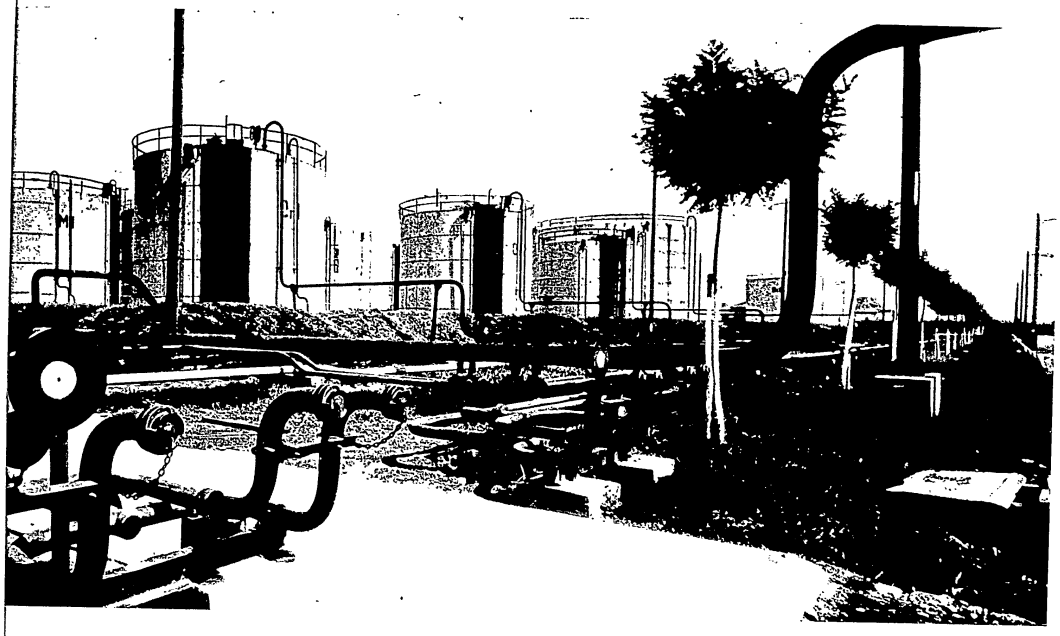


Storage tank-farm in a refinery

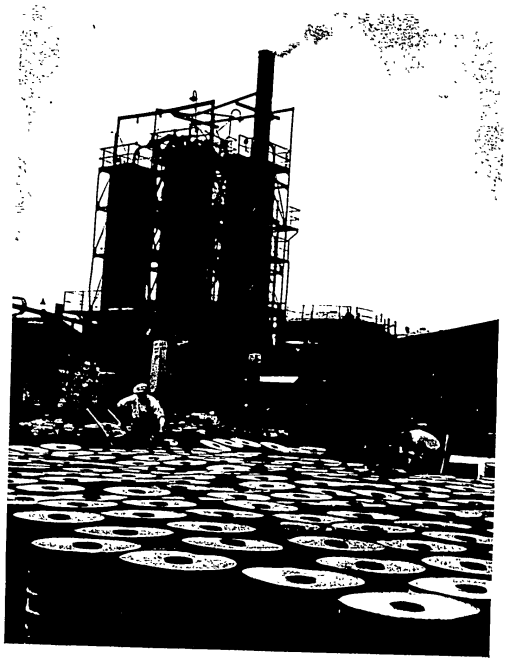


Pipelines and tank-farm in an oil refinery near Ploeşti



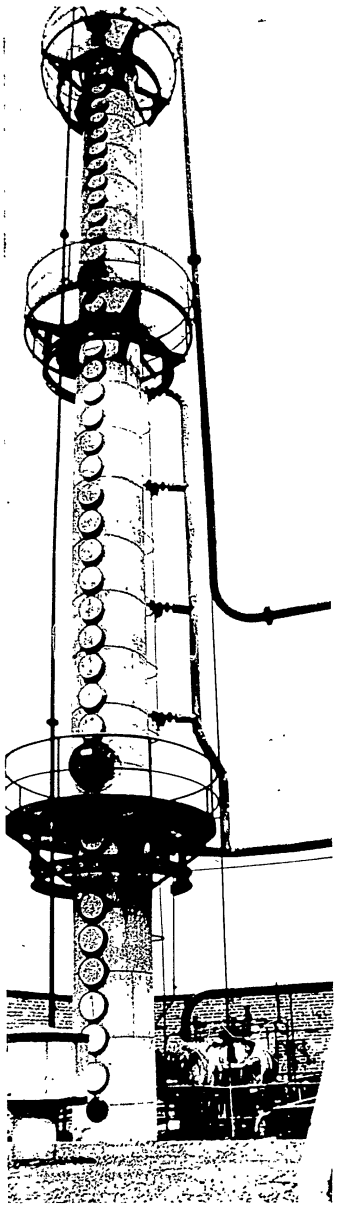


Pumping station inside a refinery for handling the products

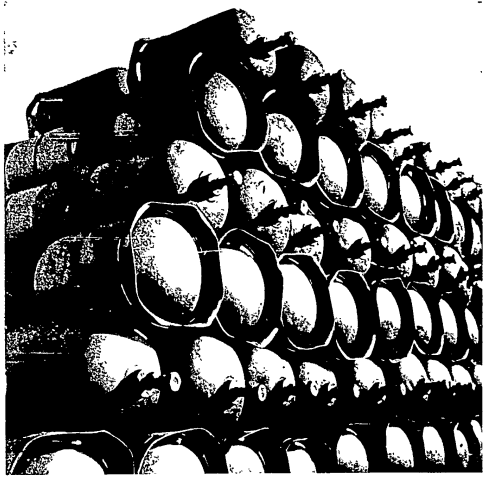


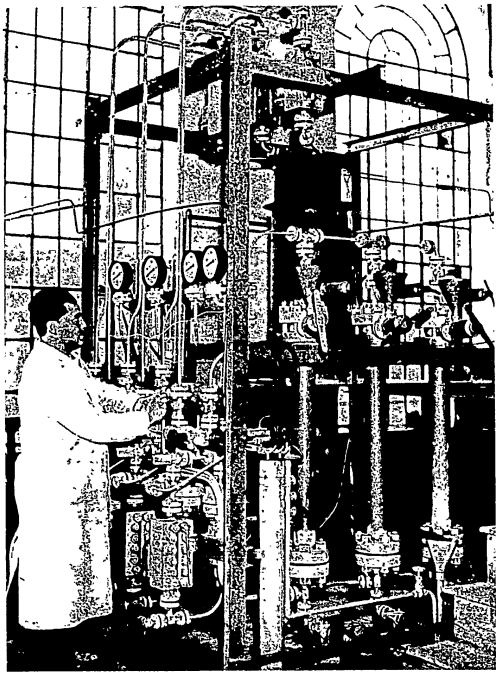
Pitch-producing and loading equipment in a refinery

Filling station for liquified gas containers at Bucharest main storage tank farm



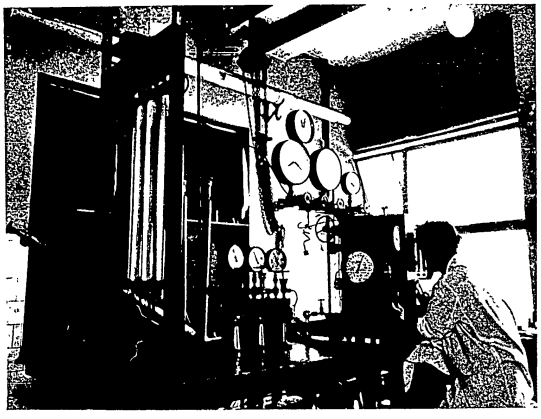
Fractionating tower for liquid gases



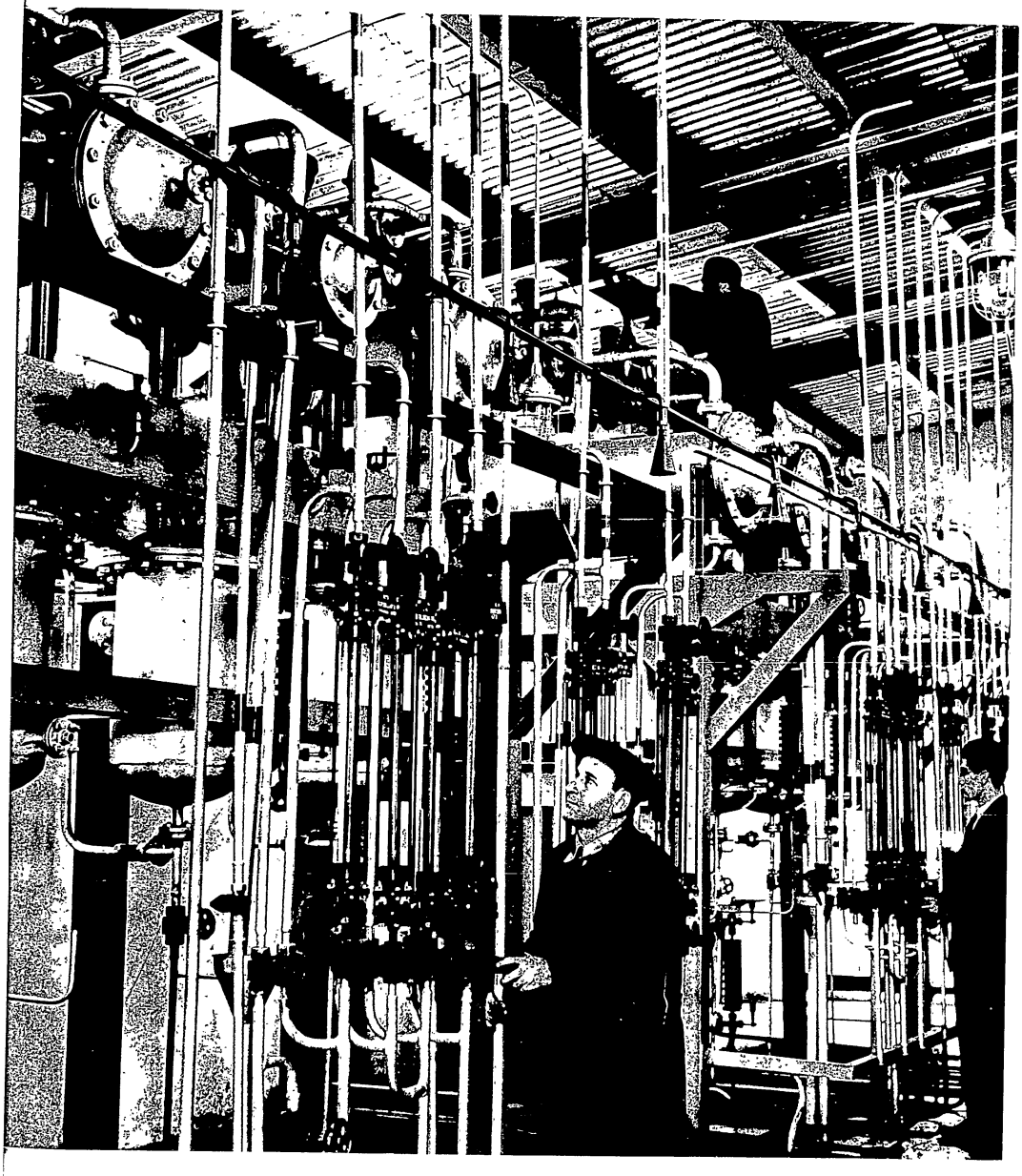


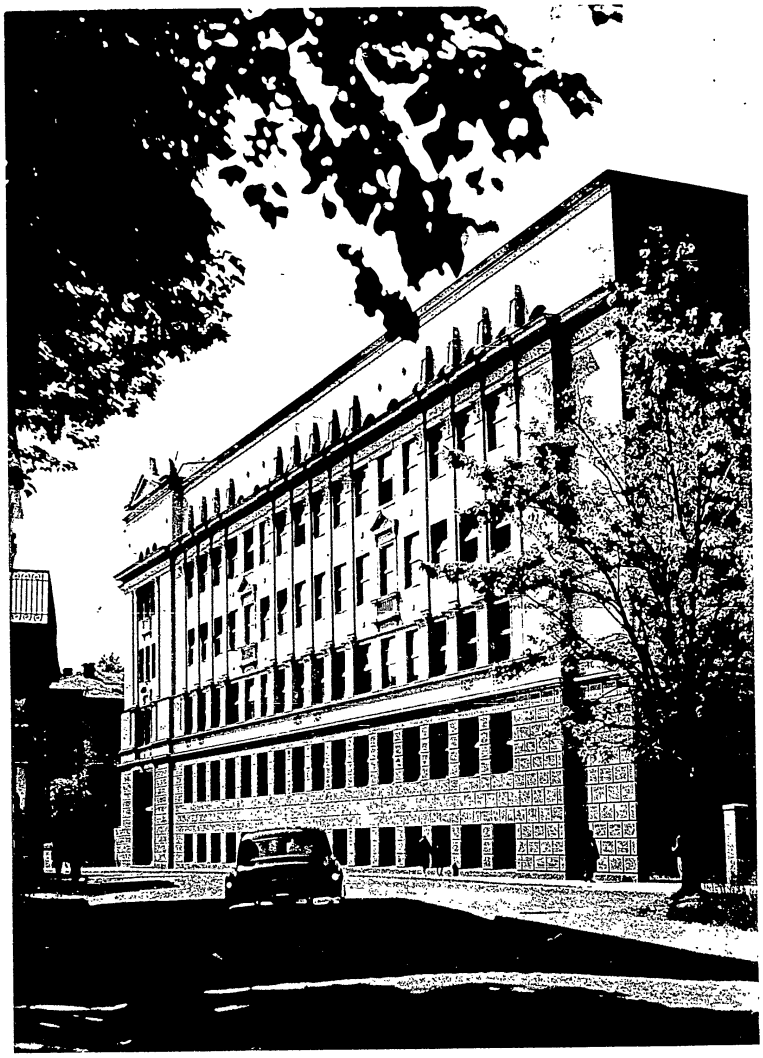
A laboratory at the Ploeşti Petro-Chemical Institute. Checking the apparatus on a pilote station

← →



A laboratory of the Cimpina Institute for Drilling and Extraction Research. Gauge for measuring the bottom pressure

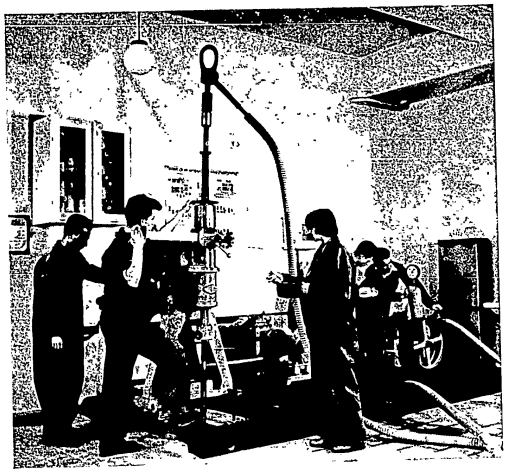




The Bucharest Petroleum, Gas and Geological Institute. Here future petroleum engineers and geologists are trained

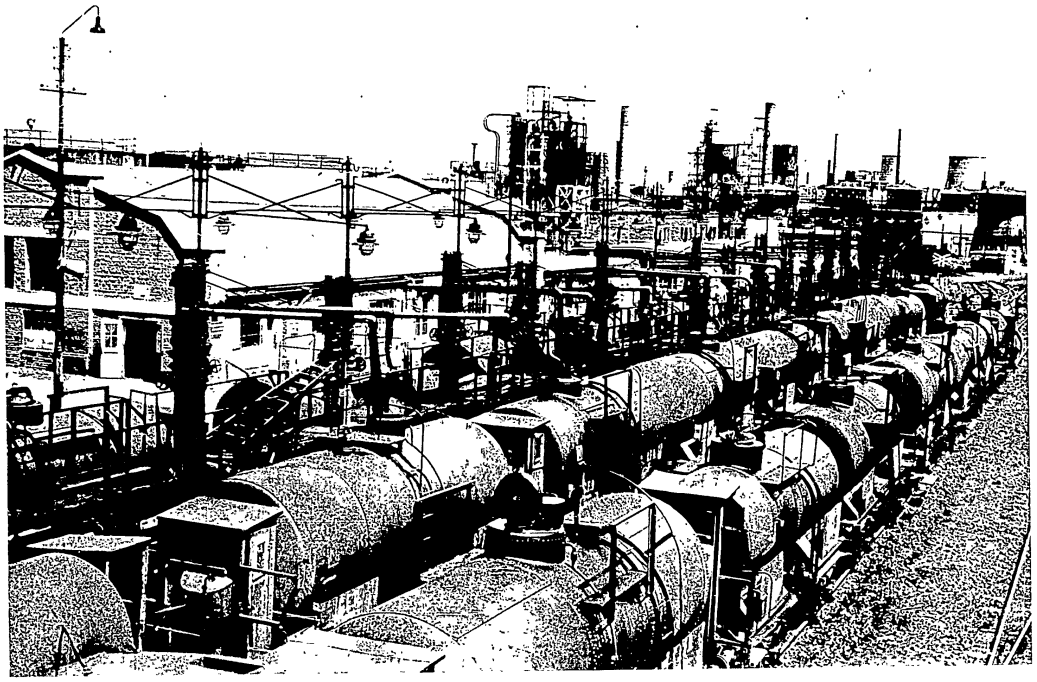
Students during their practical course studying the construction and working principles of the roller-bit

Students receiving the first practical notions about drilling wells and handling bits, in the laboratory for drilling technique

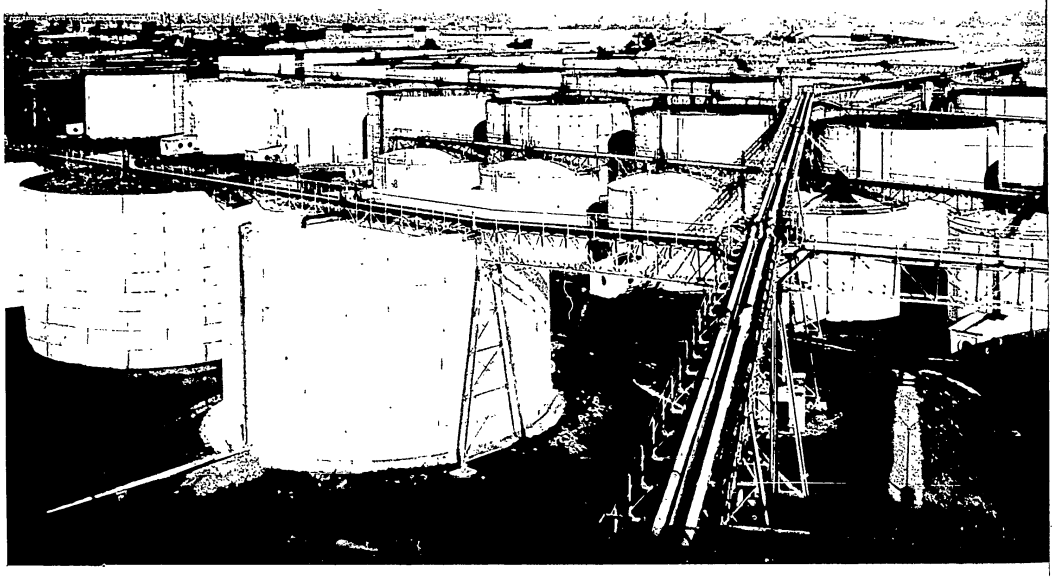


Students at work in one of the Institute's laboratories for crude-oil technology

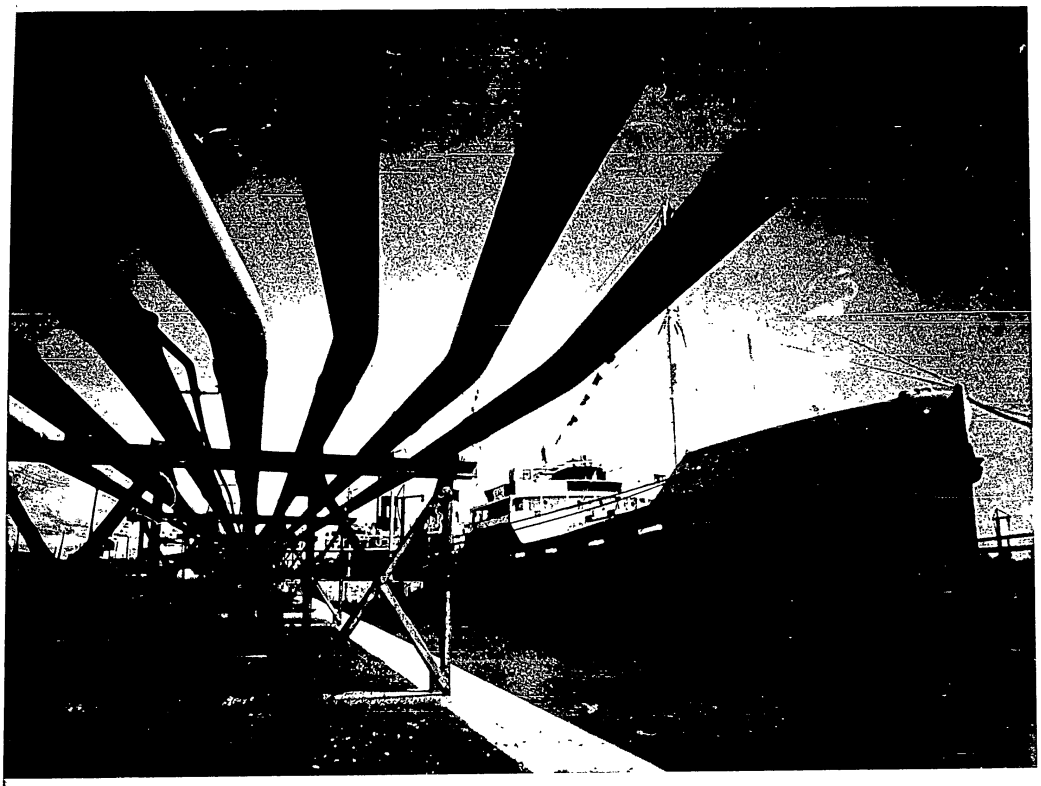
Bucharest Head Office for the distribution of petroleum products



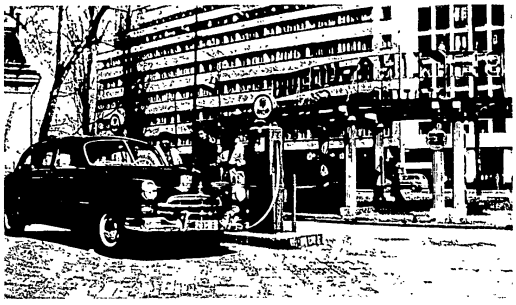
An oil tank-car filling station at a refinery

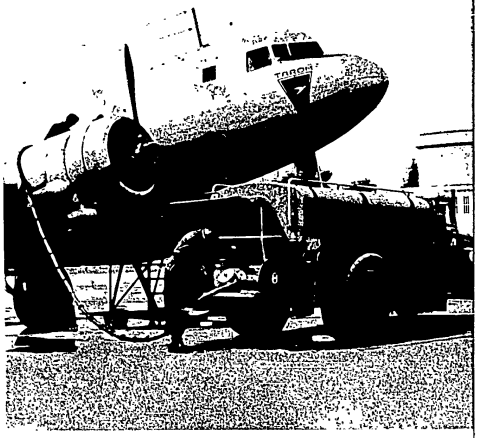


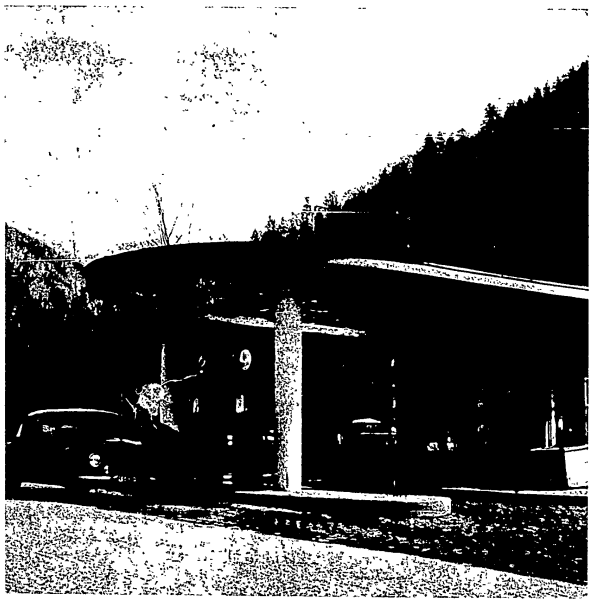
The port of Constantza is the principal gateway for the export of Rumanian petroleum products. Photo of the port's storage tank farm



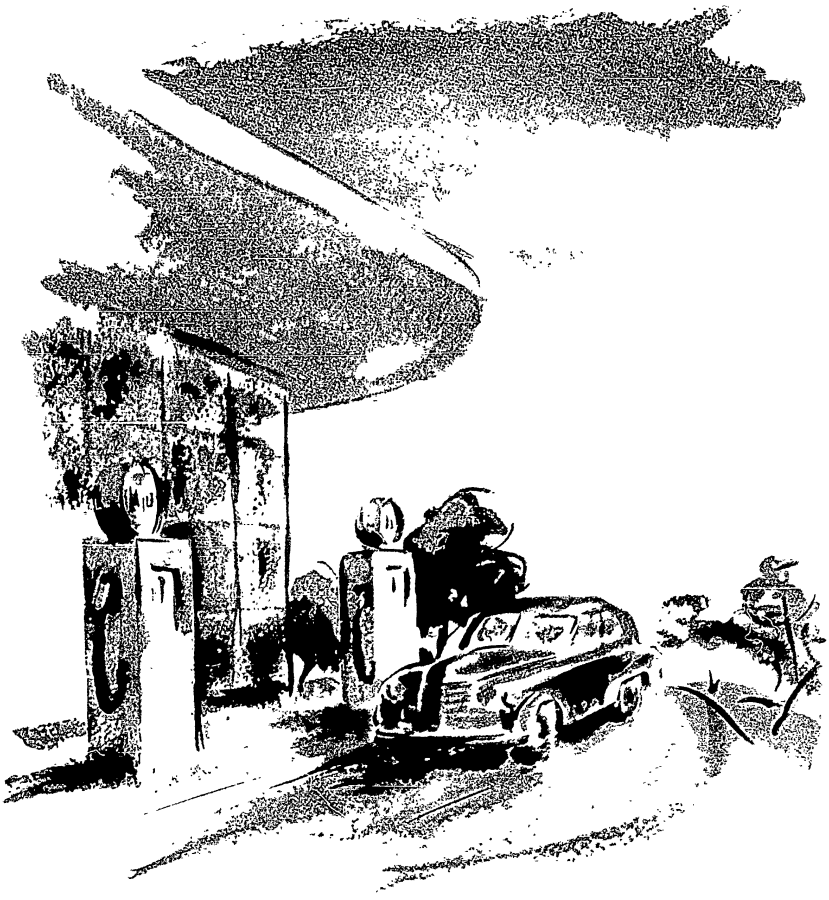
Network of pipelines conveying petroleum products to the oil tankers which ship them all over the world





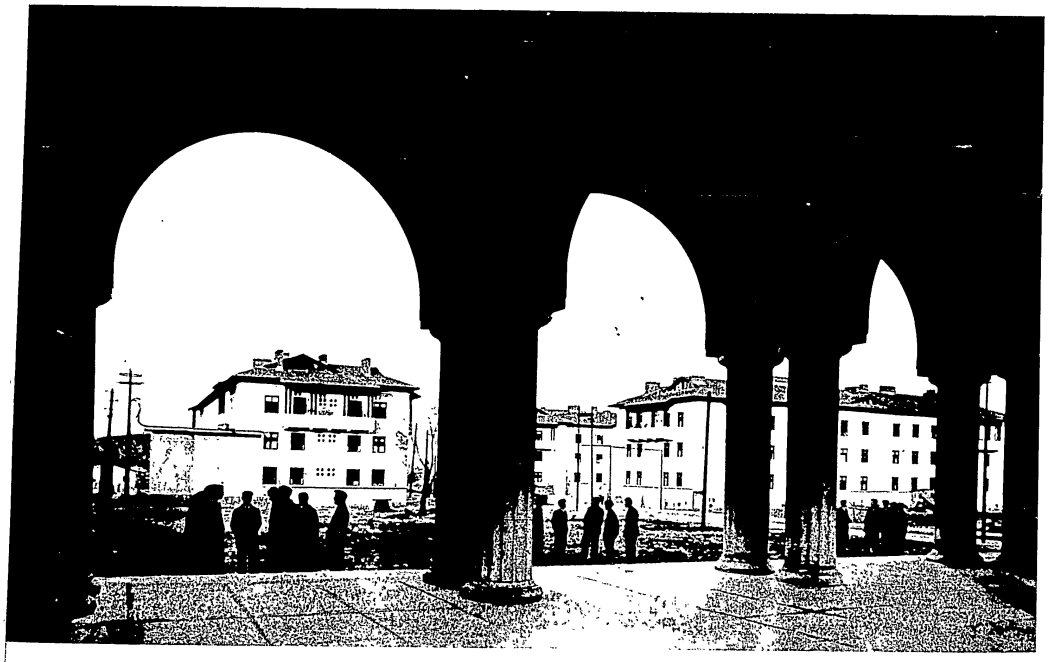


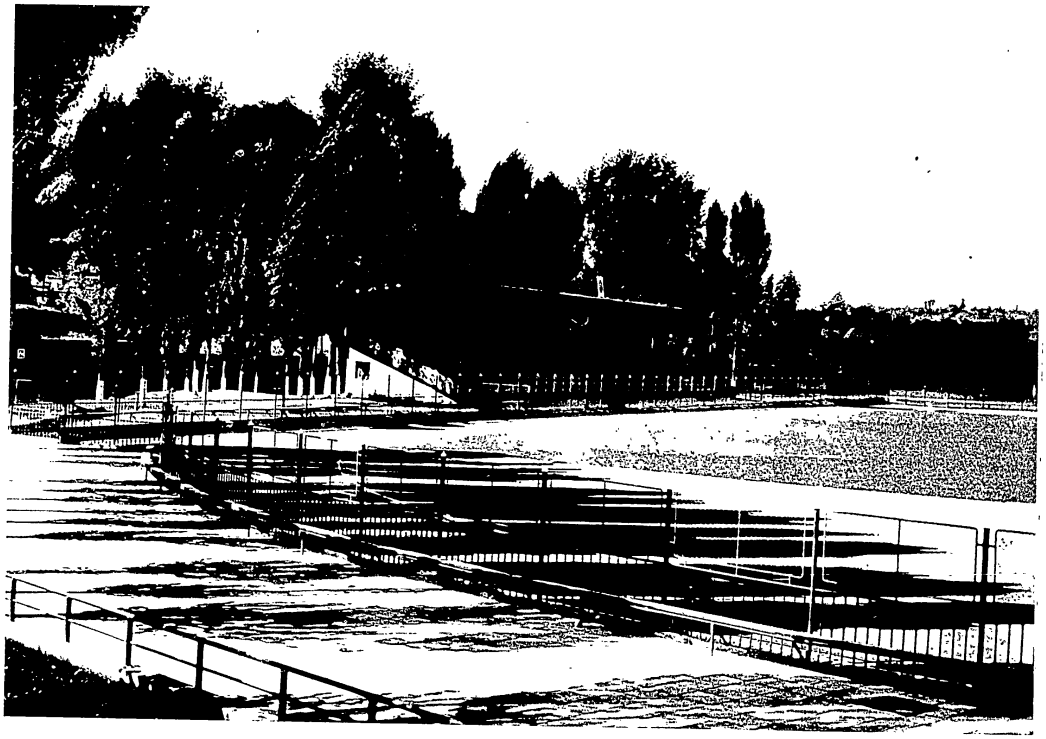
The distribution of petroleum products in towns and on highways is ensured by filling stations stocked with the entire range of petroleum products



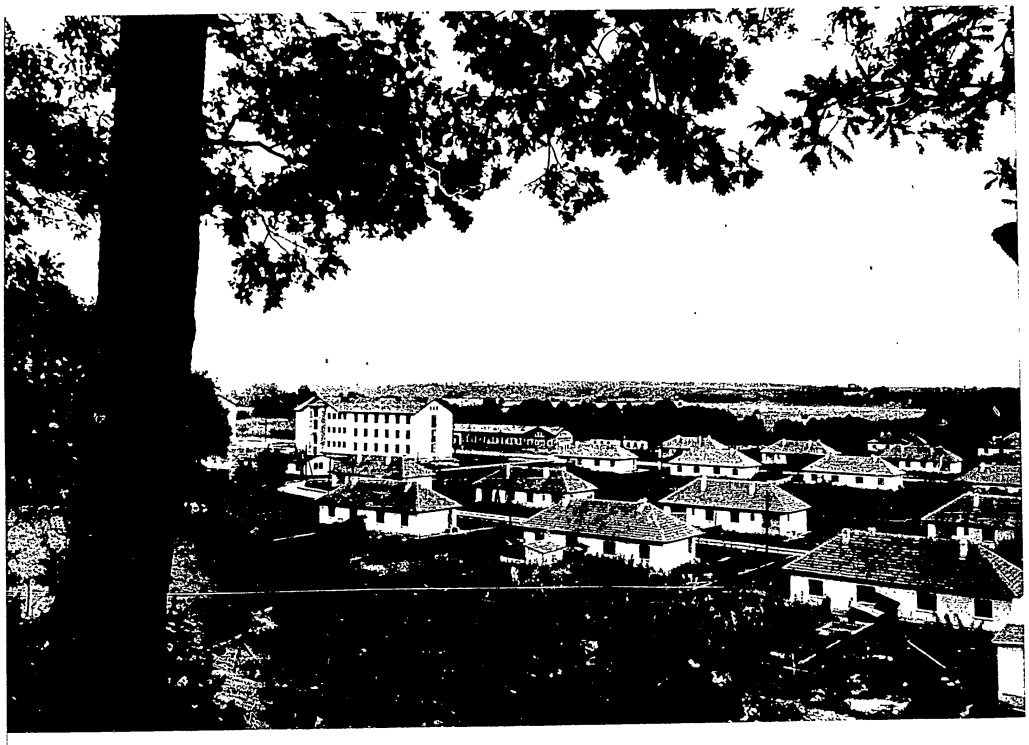
Filling station.

At Lucăcești new and comfortable buildings for oilfield workers have been built on the sites of the old houses

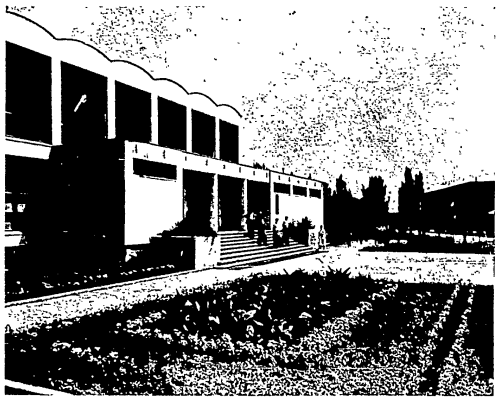




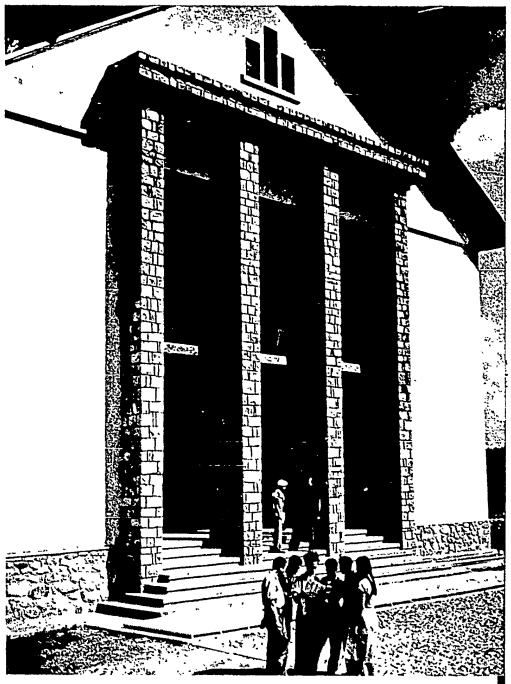
The Prahova Valley oil men are very keen footballers Their team "Petrolul" Ploeşti is one of the best in the country. Our photo shows the Cimpina Stadium



Little towns like these, inhabited by oil workers, have sprung up as result of the extension of the oilfields in the Pitești region

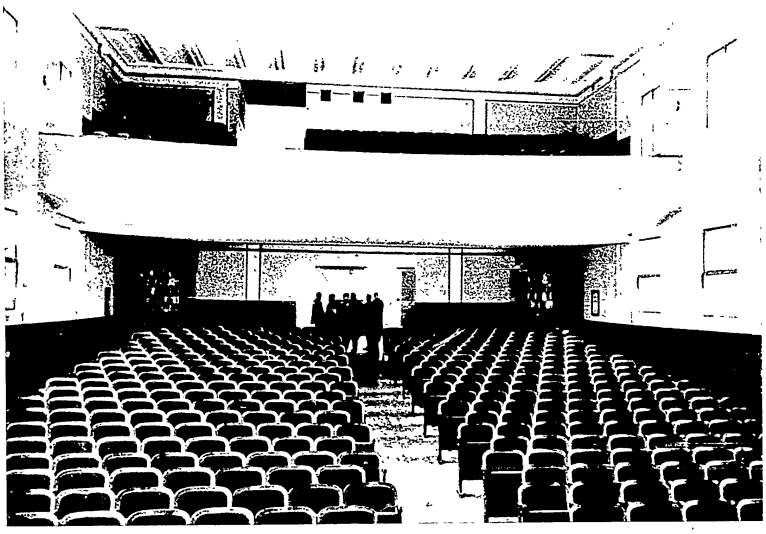


The canteen of the "1 Mai" works, Ploești



A worker's club in Moinești district

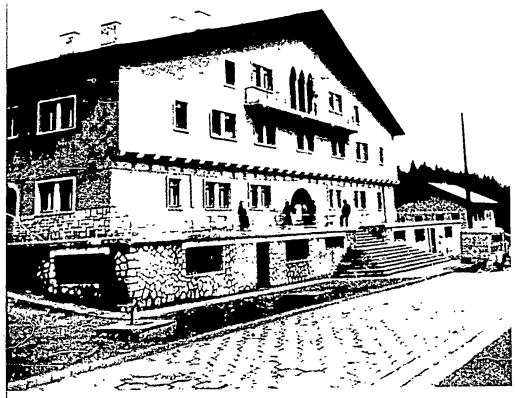
Workers at the Ploești No. 1 refinery have an up-to-date well-equipped club



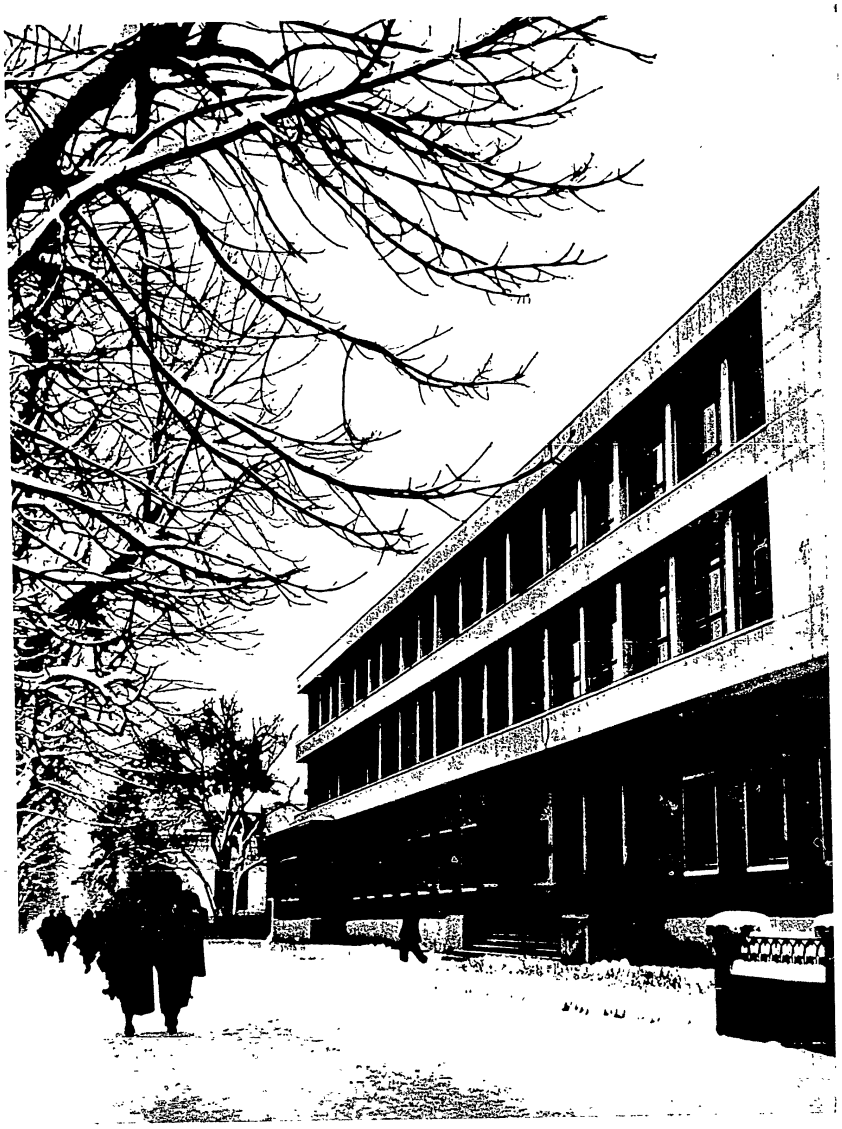
The new club of the Lucăcești oil workers has a spacious festival hall

Oil workers' children at the Cimpina "8 Martie" day-nursery on their usual after-breakfast stroll in the park

One of the operating theatres at Lucăceşti hospital



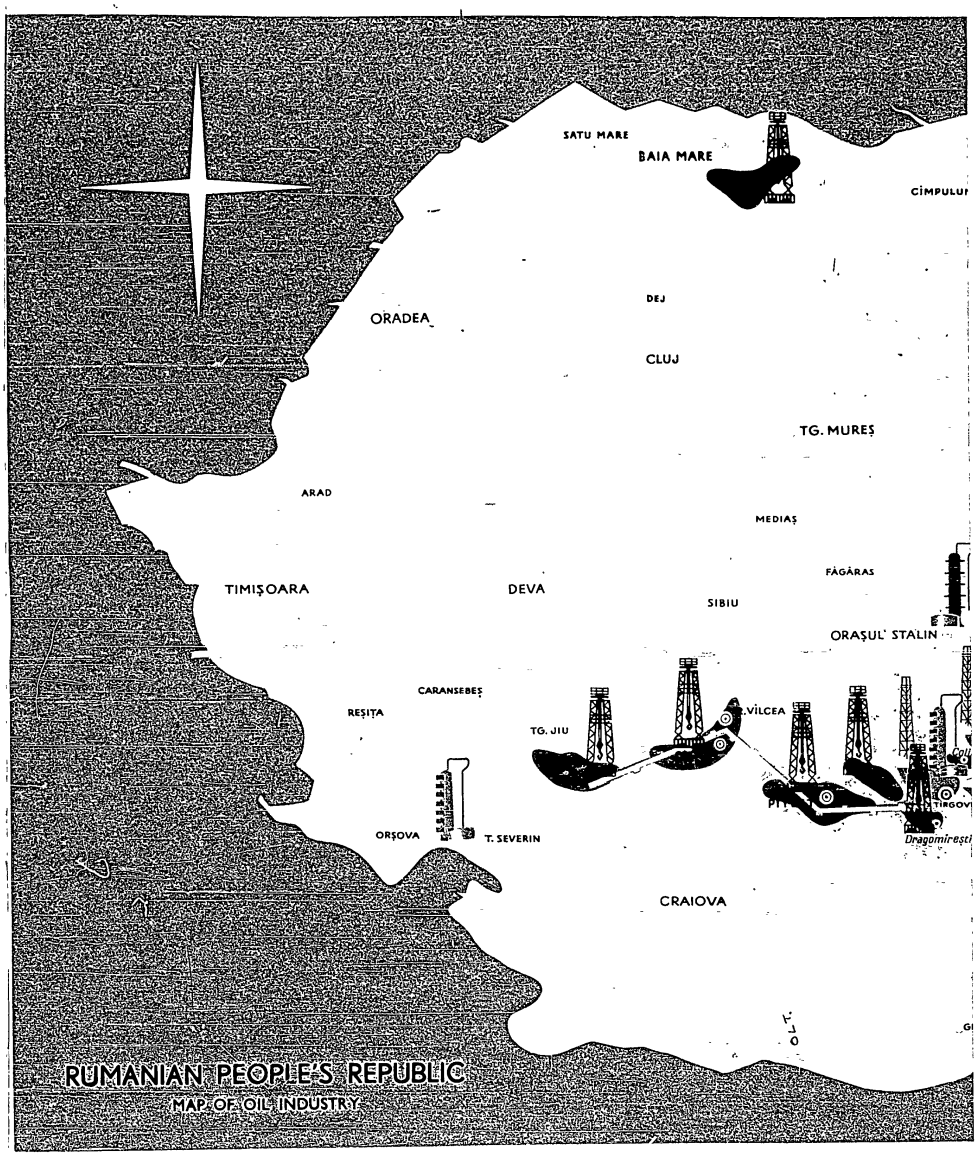
Moineşti. The new hospital building

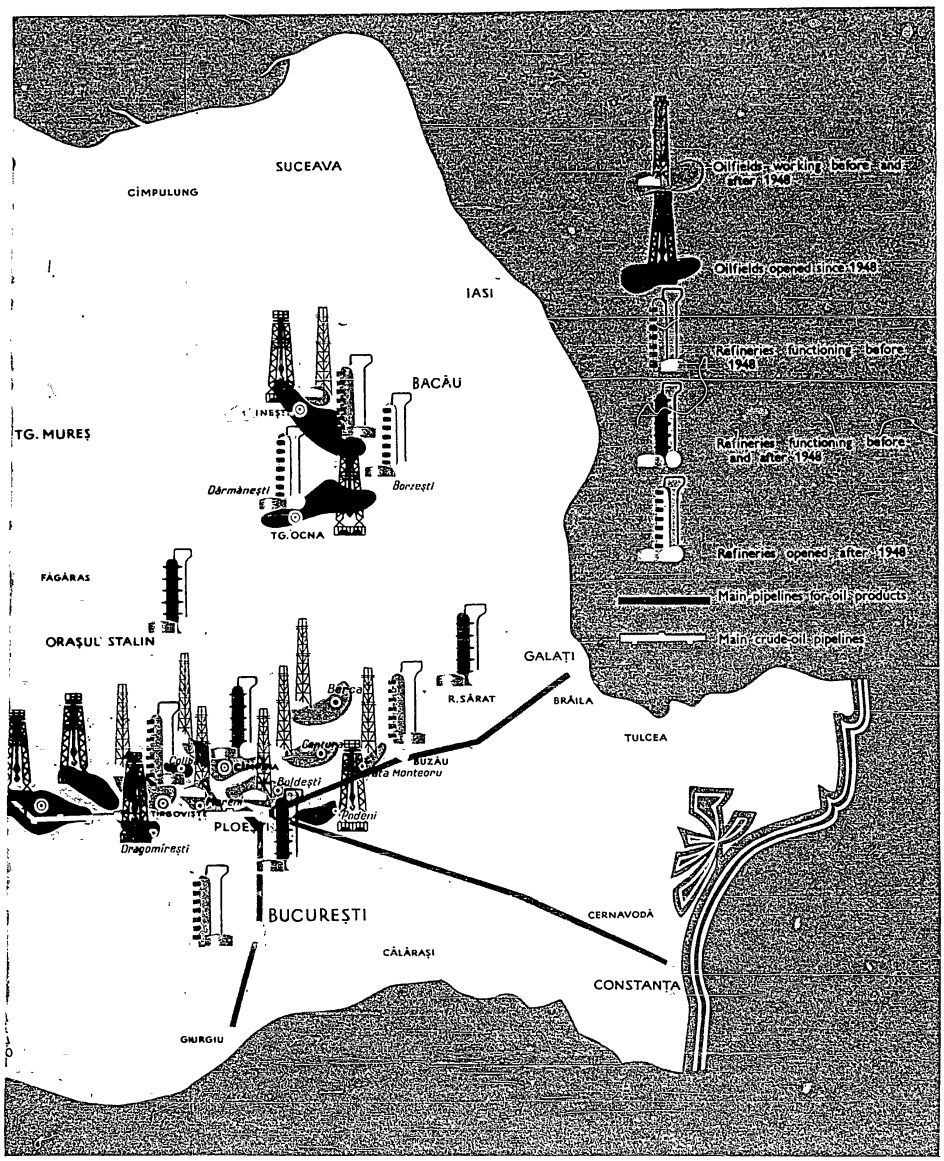


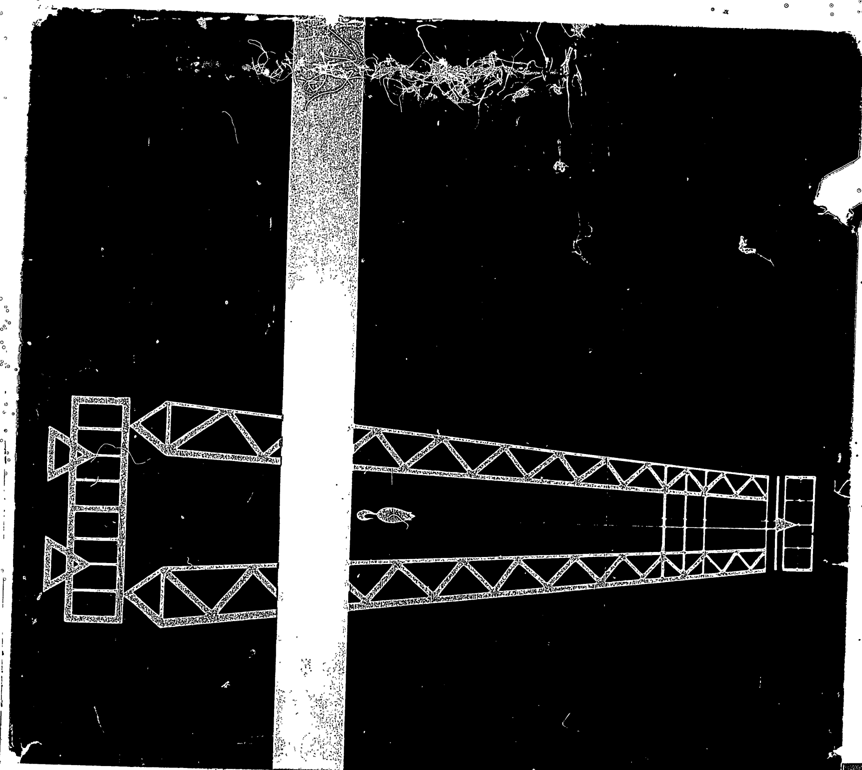
The Ploesti Oil-Petroleum Chemistry professional school

Those working in the oil industry spend their annual holiday at the bathing resorts on the Black Sea coast ..

. . or in the mountain villas of the Ministry of the Petroleum and Chemical Industries and of the productive trusts







End of Job

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