PIPELINE EDITION

ANCHORAGE DAILY NEWS

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Dedication Set Tomorrow for Big Military Pipeline

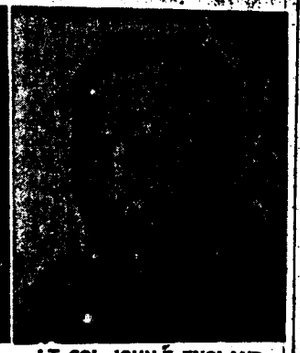
Military Officials Who Guided Big Project

COL. CARL Y. FARRELL
District Engineer

BRIG. GEN. LOUIS H. FOOTE
Division Engineer

LT. GEN. J. H. ATKINSON
Commander in Chief, Alaska

BRIG. GEN. D. R. TULLEY
Asst. Chief, Engineers



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Resident Engineer

TELEPHONE-TELEGRAPH GRID NEEDED FOR LINE CONTROL

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These pumping stations are the heart of the Arctic artery which supplies jet and aviation, diesel and automotive fuels to interior Alaskan military bases.

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ALASKA'S GOVERNOR, TOP LEADERS IN MILITARY, CORPS OF ENGINEERS AT CEREMONY

The $40,000,000 Haines-to-Fairbanks pipeline, representing two years of engineering work, will be turned over to the U. S. Army, Alaska, in a formal ceremony at Haines tomorrow afternoon.

Regarded as the most spectacular project under defense construction program in Alaska, the big military fuel line will supply jet and diesel fuels and aviation and automotive gases to military installations in the central interior of the Territory.

Governor B. Frank Heintzleman and other territorial officials are expected to attend along with representatives of the Canadian government which cooperated in the construction of the two-year project.

Highlights of the ceremony will be the acceptance speech by Lt. Gen. J. H. Atkinson, commander in chief of the Alaskan Command, who will head a large party of high ranking military representatives.

With Col. Carl Y. Farrell, Alaska district Engineer, presiding, the program will start at 1:30 o'clock when the welcoming address is given by Maj. Gen. James F. Collins, commanding general of the U. S. Army, Alaska. The guests of honor will be introduced by Brig. Gen. Louis H. Foote, division engineer, North Pacific division, and thereafter Brig. Gen. D. H. Tully, assistant chief of engineers for military construction, U. S. Army, will accept the pipeline from the contractor. Brig. Gen. Hugh Mackintosh, commanding general of the Columbus General Depot in Ohio, will then speak as representative of the Quartermaster Corps, which will operate the gas and oil pipe[illegible]tions had progressed to a point [illegible]re on-schedule completion of project was imminent.

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Three major pumping stations furnish impetus for the fuel moving through the line and two smaller standby stations are available for emergency pumping. Major tank farms are included in the system for fuel storage required in controlling the flow of multiple fuels.

Work on the big pipeline project got under way in December 1953 with clearing crews working along the right-of-way despite severe winter conditions. In April 1954, pipeline spreads started welding together the 40-foot lengths of steel pipe across Alaska and Canada and construction crews began building the pumping stations and tank farms.

LONG SHIFTS

With construction time in the north limited to six months spanning the summer, work was at a feverish pitch as crews put in long shifts under rugged conditions to take full advantage of daylight hours and keep the job on schedule.

When the winter of 1954 closed in discontinuing all work on the project, the 626 miles of pipeline was practically complete and work on the tank farms and pumping

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Control of the oil products to be pumped through the new pipeline required that all pump stations and take-offs along the route be in continuous and instantaneous communication with each other.

TELETYPE NETWORK

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This system provides for dialing each individual station by any other station in the network or by dialing all stations at once. A separate pressurized room was provided for communication equipment at each POL installation to eliminate any danger of sparks from the electric equipment causing any danger of explosion.

To provide this network of communications, required that the first pump station at Haines be linked with POL installatons near mile 48 on the Haines cutoff highway, Canyon creek and Destruction bay in the Yukon territory, Tok junction, Fort Creely (Big Delta), and Eielson and Ladd fields in Alaska.

The link connecting Haines with the mile 48 installation was accomplished by an armored, subterranean telephone cable in the trench with the pipe itself.

This work was accomplished by a contract awarded by the Corps of Engineers at a cost of approximately one-half million dollars. The ACS provided the engineering, technical specifications, and installation supervision required to effect this link and made acceptance tests when the cable installation was completed.

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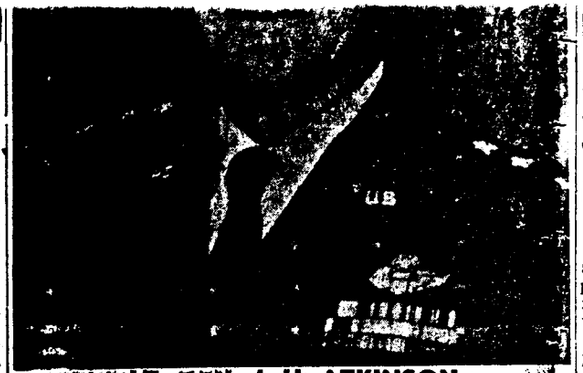
This communication system will be operated by USARAL (U. S. Army, Alaska), and will be maintained by the ACSS except for the portion of the system between Haines junction and the Alaska-Yukon border, which will be maintained by the Canadian Northwest Communication System.

In addition to the half million dollar contract for the Haines-Mile 48 cable negotiated by the Corps of Engineers, approximately three-quarters million was expended to procure equipment and complete the construction of the modern communication facility.



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Yukon Construction company of Anchorage sub-contracted the clearing and grading necessary for the 626-mile long pipeline. Starting at Ladd Air Base, on the outskirts of Fairbanks in December 1953 shortly after the big pipeline project was placed under contract, clearing crews and their big dozers began slashing out a roadway for the pipeliners to follow.

With three hours of sunlight the crews worked all available hours and made good footage despite the time and temperature handicaps of the sub-arctic winter. On the first of January more crews were added at Tok Junction and at the Alaska-Yukon border. During these mid-winter months each crew averaged one mile a day despite extremely low temperatures and 10 to 20 foot snows.

In February, temperatures ranged from 15 below to 30 below for 15 consecutive days. During this period one crew was able to keep going. Their dozers were covered with tarps during their operation to direct the heat from the engine to the operator's cab. At night, when the sub-zero temperatures plunged, dozers were completely wrapped in tarps and gasoline lanterns were placed under the equipment to provide heated motors which could be started the next morning.

Despite the extreme low temperatures equipment held up and operated without serious breakage and other than some chipping of metal track shoes.

The pipeline right-of-way was cleared to a width of 50 feet with a 30-foot wide strip graded in the center along which the pipeline was laid. Merchantable timber cut and piled for salvage while brush was windrowed along the edge of the right-of-way.

The long clearing operation was completed in October 1954.

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PLANNING NEEDED

Construction of the pump stations in the Haines-Fairbanks system required careful planning. Attention had to be given to the availability of materials at the site in time to allow work in logical sequence.

Materials and equipment needed to build these complex installations were literally collected from all parts of the United States and Canada and routing shipping and expediting had to be closel integrated with the field work. If any item were behind schedule, where possible, the field work was replanned to permit concentration on other phases of the project which could be brought along more quickly

Sub-surface conditions for the building foundations varied greatly at the pump stations. The best conditions existed at station 3, near Tok Junction, where a silty top soil 2 feet thick overlays a granular deposit of sand and gravel. The buildings have isolated spread footings beneath columns connected by grade beams.

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HAVE PROTECTION

All underground utility piping installed at the stations is protected against freezing by insulated coverings or electric heating wires.

At station three, utility piping condensate, air sewage, and fire protection water is installed in shop fabricated utilidors up to 48 inches in diameter. These utilidors are made from corrugated metal, lined inside with fiberglass insulation and coated on the outside with enamel. The utilidors are buried as deep as 15 feet, to provide adequate drainage.

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NEW METHOD

The Haines-Fairbanks pipeline introduces a new method to the military fuel system for Alaska combining a 626-mile long pipeline with a protected water route from the States.

Tankers now move up the Inside Passage, a maize of continental islands which dot the west coast of Canada and southeastern Alaska, to unload their cargoes at the pipeline's deep-water terminal dock on Lutak inlet. From Haines the fuel is pumped northwest through the line, a course along the Haines and Alcan highways through the towering passes of the Chilkat mountains, across permafrost and tundra, around lakes and glaciers, creeks, swamps and rivers to Fairbanks.

Previously military fuel was moved into Alaska by rail from the ports of Seward, Whittier and Anchorage following transport by tanker and barge across the storm-swept and open Gulf of Alaska.

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Portable pumping equipment moved northward out of Haines as sections of the mainline pipe were tested at pressures ranging from 1500 to 1900 pounds per square inch—greater pressures than the pipeline would ever undergo when in operation. Nearly 170 miles of water was pumped into the pipeline at Haines for the purpose of the tests.

PUMPS NOT USED

Pumps in the pipeline's five stations were not used in these tests but received their break-in runs pumping the diesel fuel which followed the water into the line.

The final test of the entire pipeline was the one-month operation of the system by the contractors.

The Haines-Fairbanks pipeline system was designed and constructed under the supervision of the Alaska District, U. S. Army Corps of Engineers. Actual construction was by private contractors: Williams Brothers of Tulsa, Oklahoma; McLaughlin Co. of Great Falls, Montana; and Marwell Construction Co., Ltd. of Vancouver, British Columbia.

BIG FUEL PIPELINE SPANS FRINGES OF TWO MIGHTY NATIONS

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The next link to the installations in Canadian territory was achieved by integrating the new communications requirement into the existing ACS and Canadian facilities which were rehabilitated and augmented to provide the additional services required. This included the rehabilitation of the White Pass-Yukon Railroad open wire line and the addition of a second crossarm to the ALCAN line north of Whitehorse, Yukon territory.

CROSSARM ADDED

A contract was negotiated with the Northwest Communications System of the Canadian Department of Transportation to add a second crossarm to the Canadian section of the ALCAN line and also construct the additional facilities required to reach the pump stations near Canyon creek and Destruction bay in Canadian territory. Addition of the second crossarm to the American section of the ALCAN line between the Alaska-Yukon territory border and Northway was accomplished by line construction crews of the 505th Signal Company (Cons) attached to the ACS.

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Structural steel for the buildings was fabricated in Vancouver for the three stations in Canada and in Seattle for the wharf and the two stations in Alaska. The steel was coded and numbered and shipped to the site and erected on anchor bolts previously set in the concrete. On this structural frame, steel wall and roof panels, prefabricated in the east were placed to close-in the buildings. The panels provide two inches of fiberglass insulation on the walls and three inches of firtex insulation on the roof. Roofs are finished with a durable layer of tar and gravel. With double windows the buildings should provide efficient operation even in the coldest weather.

MATERIAL EXCAVATED

Roads throughout the station areas have all the frost-susceptible materials excavated from the subgrade and are back filled with coarse gravel. A six-inch layer of screened gravel top dressing is spread and compacted to provide a smooth wearing surface.

All debris was removed in clearing station and tank farm sites, following construction, station areas were landscaped. A six foot wire mesh fence encloses each station.

An attractive paint job on all the buildings, housing, outside piping, and tanks completes and sets off quality of the installation.

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BIG FUEL PIPELINE SPANS FRINGES OF TWO MIGHTY NATIONS

CONQUERING CANADIAN WILDERNESS — Across the rugged wilds of Northern British Columbia, Canada, the vast pipeline which will feed vital fuels to Alaskan military bases, slashes through forests and over snow-wrapped mountains. Inspecting progress of the pipeline are representatives of Canadian and American governments, and the contractors building the $29,000,000 pipeline. Left to right: Looking over some of the heavy machinery is Brigadier H. W. Love, commander of the Canadian army highway system. Heads down, watching their muddy footing, are Col. Carl Y. Farrell, Alaska district engineer, U. S. Army Corps of Engineers; B. E. Barnes of Williams Bros. Construction Co.; Hugh Martin of Marwell Construction Co., Vancouver, B. C.; Col. L. H. Foote, North Pacific division engineer, and Lt. Col. John E. England, resident engineer in charge of the pipeline, U. S. Army Corps of Engineers. The pipeline which extend from the port of Haines in Southeastern Alaska, to Fairbanks, far n the interior, crosses 284 miles of British Columbia and Yukon Territory and is popularly called, for Alaska and Canada, the A.CANGO.

(Offical photo, Corps of Engineers, U. S. Army)

PIPELINE CROSSES MANY RIVERS

THE MIGHTY "ALCANGO"—The $40,000,000 pipeline, the "ALCANGO," carrying jet and aviation, automotive and diesel fuels to supply military bases in interior Alaska, will be dedicated at Haines, Alaska, tomorrow. Stretching 626 miles from the southeastern port of Haines to Fairbanks, the pipeline crosses 280 miles of northwest Canada. The steel fuel artery crosses rugged Alaskan country—over mountain passes, crossing stream and tumultous rivers, around glaciers and lakes, over tundra, swamps and permafrost. It was built in record time against terrific obstacles of terrain, Arctic winter, and time. (U. S. Army Photo)

Fuel Flowing Through Completed 626-Mile, $40 Million ALCANGO Pipeline

Quicker, Safer Transport Route Constructed Within Two Years

Fuel is flowing through 626 miles of steel pipeline connecting the port city of Haines with Fairbanks in the sub-arctic interior of Alaska.

Construction of the $40,000,000 military multiple fuel line — the ALCANGO—is finished.

It has been tested and is in full operation—performing as it was designed—pumping jet and diesel fuels, aviation and automotive gases northward to Alaskan military installations.

The American and Canadian pipeline and construction crews who did the job have returned to their homes or to other construction work. Administrative offices of Williams Brothers, McLaughlin & Marwell, the contractors, and the supervising Corps of Engineers project office, have moved to Anchorage where records and reports will finalized.

According to the office of the Alaska district, Corps of Engineers, at Anchorage, work on the project was brought to a successful conclusion when contractors finished their one-month operational test of the pipeline.

Formal turn-over and dedication of the line will take place tomorrow at Haines, with territorial and military officials in attendance.

QUICKER, SAFER ROUTE

Completion of the Haines-Fairbanks pipeline introduces a new method for getting fuel to the military in Alaska.

Haines, the small port city in southeastern Alaska, is terminal for the pipeline. Tankers now dock here following voyage from the United States through scenic and protected Inside Passage, the maize of continental islands which parallel the west coast of Canada and southeastern Alaska.

Formerly tankers and fuel barges plied the open Gulf of Alaska, subject to violent storms and possible submarine attack, to dock at the ports of Seward, Whittier and Anchorage, with cargo fuels then moved inland by railroad.

The new system for supplying fuel to defenses in Alaska combines a protected water route from the States with a pipeline to the interior of the territory for quicker, more regulated and economical fuel transport. Savings resulting from the use of the pipeline will repay the cost of its construction in a relatively short time.

From Haines the pipeline climbs the heights of the Chilkat Mountains [illegible] gradual [illegible] stations is located at Haines, another 48 miles up the Haines highway to boost the flow of fuel over the Chilkats and the third is near Tok Junction for the final 200 mile push into Fairbanks.

In addition there are two smaller stations located along the Canadian portion of the line—standby facilities for emergency pumping. Major tank farms for fuel storage to control the flow of multiple fuels are located at the Haines and Tok stations.

The Haines-Fairbanks pipeline is a multiple products line which permits different fuels to follow each other. Careful design and operating procedure prevent the fuels from mixing.

RACE WITH TIME

Work on the lengthy eight-inch project got underway in December 1953 shortly after the defense construction contract was awarded to the low-bidding combine of American-Canadian contracting firms. Clearing crews went at the 626-miles of pipeline right-of-way despite the severity of winter in central Alaska and northwestern Canada.

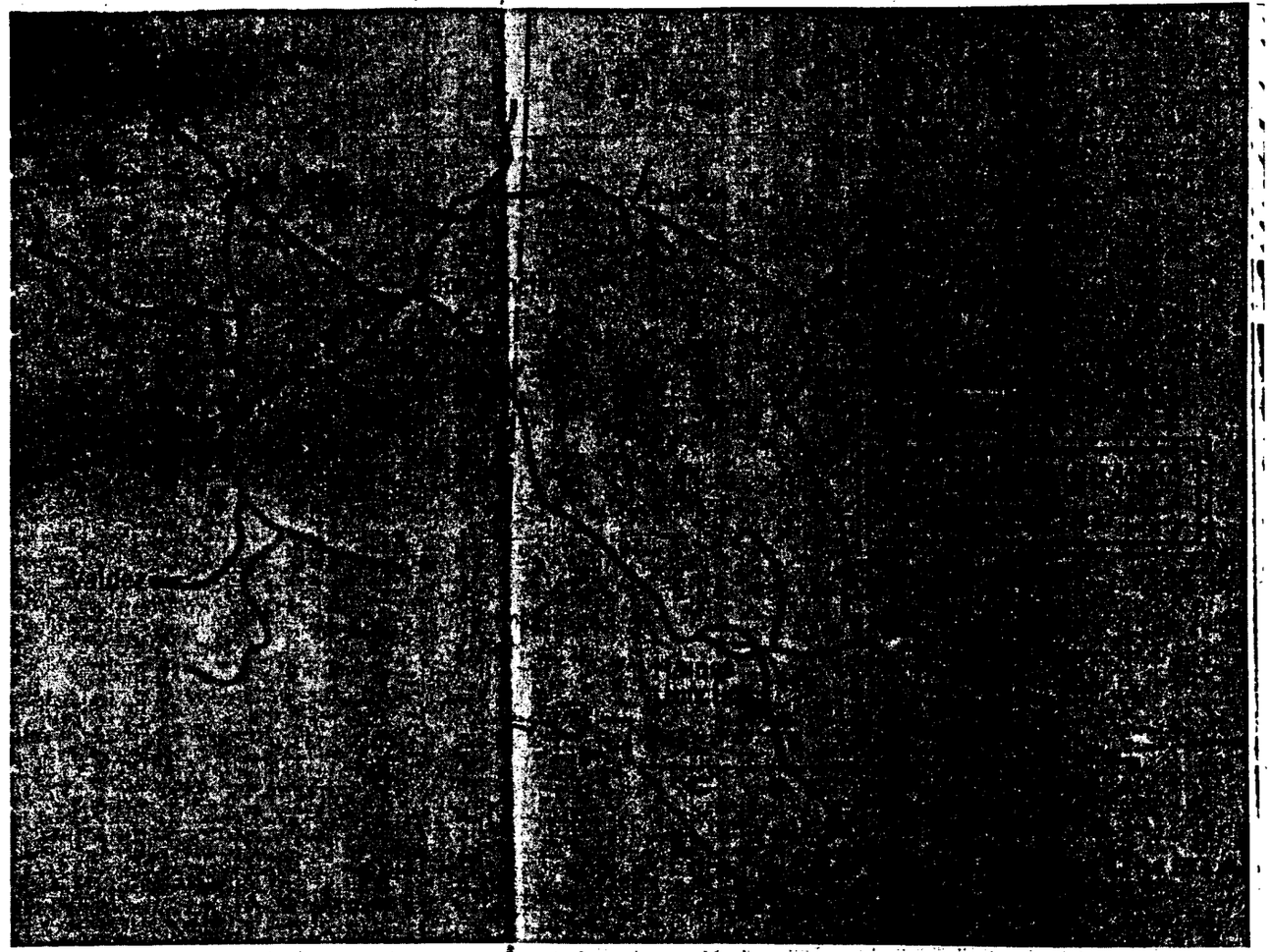
In April 1954 pipeline crews began welding together the 40-foot lengths of steel pipe across Alaska and Canada and construction crews went to work building the pumping stations and tank farms which dot the course of the line.

Throughthe summer and into the fall the project was the scene of feverish activity as crews worked long hours to take full advantage of the short construction season in the northland and keep the job on schedule.

When winter closed in the 626 miles of pipeline were practically complete—the 100 foot crossing of the Slim's river needed solid ice for its tie-in. Work on the pumping stations and tank farms had progressed to a point where on-schedule completion of the project was assured.

Crews returned before spring to begin the final phase of construction. By July the pipeline was ready for testing and the pumping stations and tank farms were nearing completion.

Pipeline tests began in June at Haines. Water was the testing agent,a safety precaution since use of oil in high pressure testing posed fire dangers. About 170 miles of water was pumped into the line at Haines and push-



FUEL FOR FREEDOM PATH—Passing over territory of two nations, the United States and Canada, the 626-mile Haines-to-Fairbanks ALCANGO pipeline will carry fuels to military units in Alaska. Tankers will unload at Haines after traveling through the Inside Passage. A variety of petroleum products can be pumped through the eight-inch pipeline, with special checks preventing mixture.

line's five stations were not used in these hydrostatic tests but got their break-in runs in pumping diesel fuel which followed the water in the line.

One-month operation of the pipeline by the contractors was the final test on the project—getting underway in mid-August the same day the pressure testing was completed at the Fairbanks end.

CONSTRUCTION FINISHED

When the operational tests began [illegible] and had been replaced by those who were skilled in recognizing and eliminating pipeline "bugs". The outward confusion of construction with thundering noise of equipment and its sweating and cursing was over and outward calm descended along the 626-mile pipeline front as operators moved quietly and watchfully through the operation of the tank farms and pumping stations looking for flaws.

Now the project has moved [illegible]

Pipeline Construction Involved Problems of Locations, Design

Location and design of the ALCANGO pipeline involved many problems before construction

The terminus for the pipeline was fixed at Fairbanks, but a seaport terminal had to be selected. The selection of Haines proved most practical since its location a Whitehorse refinery. The Canol system was comprised of 2, 3, and 4-inch lines and fell far short of supplying the modern military fuel needs in Alaska. However, operational records provided valuable data utilized in the design of the ALCANGO project.

a more economical or practical method of construction or operation could be incorporated.

Such changes were made for stream crossings to provide large savings in construction and maintenance costs.

The original plan was in the [illegible]

Joint Venture Built Largest Single Project

The contract for the Haines-Fairbanks mainline pipeline, the largest single project ever undertaken in Alaska, was awarded Oct. 29, 1953, on a joint venture bid of $29,001,287.50.

Williams Brothers company of Tulsa sponsored and formed the join venture with McLaughlin, Inc., of Great Falls, Mont., and Marwell Construction company, Ltd., of Vancouver, B. C., as its partners.

The invitation to bid was issued on Sept. 15 and bids had to be submitted by Oct 14, slightly less than one month's time. Main alternates provided for completion by either Dec. 1, 1954, or Sept. 1, 1955. During the night of Oct. 13 and the early morning of Oct. 14, the final venture bid for completion by the 1955 date was assembled and submitted.

Although the job was advertised extensively and it was open to the the United States and Canada, only three groups submitted bid estimates for the entire job. No other wished to assume the risks involved. In addition to the Williams Brothers-McLaughlin-Marwell bbid of $29,001,287.50, there was a bid of $31,812,739.25 and another of $38,784,597.35.

The sucessful joint venture bid was $378,603.23 or 1.32 per cent higher than the government estimate of $28,622,684.

The contract was signed Nov. 10, by each of the co-venturers and by then Col. Louis E. Foote, representing corps of engineers.

able behavior of the streams the crossings were revised where possible. Channel changes by the unpredictable, meandering streams with a continual deepening of stream beds could cause expensive breaks in the pipeline and loss of petroleum products.

The ALCANGO was relocated at major river crossings to utilize existing bridges. Bridge crossings were substituted at the Donjek, White, Robertson, Johnson, Big Gerstle, Salcha, and the Tanana No. 1 and No. 2 rivers. Where the pipeline is buried beneath major streams burial is nine feet below stream beds. Minor stream beds required seven foot burial. Where the pipeline crosses small creeks ra[illegible]

ports of Seward, Whittier and Anchorage, with cargo fuels then moved inland by railroad.

The new system for supplying fuel to defenses in Alaska combines a protected water route from the States with a pipeline to the interior of the territory for quicker, more regulated and economical fuel transport. Savings resulting from the use of the pipeline will repay the cost of its construction in a relatively short time.

From Haines the pipeline climbs the heights of the Chilkat Mountains and then begins its gradual descent northwest following the Haines and Alcan highways and passing through 280 miles of northwestern Canada on its route to Fairbanks.

Three major pumping stations furnish impetus for the fuel moving through the line. One of the

...and tank farms had progressed to a point where on-schedule completion of the project was assured.

Crews returned before spring to begin the final phase of construction. By July the pipeline was ready for testing and the pumping stations and tank farms were nearing completion.

Pipeline tests began in June at Haines. Water was the testing agent, a safety precaution since use of oil in high pressure testing posed fire dangers. About 170 miles of water was pumped into the line at Haines and pushed northward as testing moved along the pipeline.

Portable pumping equipment was used for testing the pipeline with sections fo the pipeline literally squeezed at pressures ranging from 1500 to 1900 pounds per square inch. Pumps in the pipeline's five stations were not used in these hydrostatic tests but got their break-in runs in pumping diesel fuel which followed the water in the line.

One-month operation of the pipeline by the contractors was the final test on the project—getting underway in mid-August the same day the pressure testing was completed at the Fairbanks end.

CONSTRUCTION FINISHED

When the operational tests began construction had come to an end. The pipeline operating staff moved in to give the big Alaska fuel artery a complete shake-down run.

The welders, cat-skinners, sheet metal workers, carpenters and other craftsmen who put the pipeline together were gone and had been replaced by those who were skilled in recognizing and eliminating pipeline "bugs". The outward confusion of construction with thundering noise of equipment and its sweating and cursing was over and outward calm descended along the 626-mile pipeline front as operators moved quietly and watchfully through the operation of the tank farms and pumping stations looking for flaws.

Now the project has moved through this testing phase and is into full operation—an artery into Alaska with a throbbing diesel heartbeat feeding fuels for the mechanics of defense here in the northwestern perimeter of Democracy.

military units in Alaska. Tankers will unload at Haines after traveling through the

Pipeline Construction Involved Problems of Locations, Design

Location and design of the ALCANGO pipeline involved many problems before construction

The terminus for the pipeline was fixed at Fairbanks, but a seaport terminal had to be selected. The selection of Haines proved most practical since its location combined a deep icefree port at the head of the Inside Passage with a natural route for the pipeline following the Haines and Alcan highways northward.

In 1950 Ryall Engineering of Little Rock, Ark., conducted the preliminary survey for the route of the line under a sub-contract with Fluor corporation, a California architect-eningeering firm assisting the corps of engineers in designing the new pipeline system.

Reconnaissance along the proposed route was conducted to study flash flood conditions and other problems for construction in the field. Research was conducted into the construction and operational records of the Canol pipeline system to gain solutions to the problems of pipelining in the far north.

The Canol pipeline was constructed in World War II to furnish fuel products between Whitehorse and Fairbanks. A connecting line from Skagway brought tanker deliver fuel to Whitehorse and another pipeline link ran north to Norman Wells to bring crude to a Whitehorse refinery. The Canol system was comprised of 2, 3, and 4-inch lines and fell far short of supplying the modern military fuel needs in Alaska. However, operational records provided valuable data utilized in the design of the ALCANGO project.

As design data was accumulated original plans were changed where a more economical or practical method of construction or operation could be incorporated.

Such changes were made for stream crossings to provide large savings in construction and maintenance costs.

The original plan was in the burial of the pipeline under all streams. However, due to the variwith the continual deepening of stream beds could cause expensive breaks in the pipeline and loss of petroleum products.

The ALCANGO was relocated at major river crossings to utilize existing bridges. Bridge crossings were substituted at the Donjek, White, Robertson, Johnson, Big Gerstle, Salcha, and the Tanana No. 1 and No. 2 rivers. Where the pipeline is buried beneath major streams burial is nine feet below stream beds. Minor stream beds required seven foot burial. Where the pipeline crosses small creeks, ravines, gulleys and wash areas it is supported overhead out of reach of flood stages.

Two Contractor 'Spreads' Sped Work

A unit of measure to pipeline contractors is the "spread." It is a term to measure men, money, equipment, as well as a geographical measurement since a spread in the field can be strung out over an extensive length of the pipeline right-of-way.

These definitions were all applicable to the pipeliners who connected the 626-miles of steel piping between Haines and Fairbanks.

Two spreads were utilized by Williams Brothers, the pipeline contractor, one starting out of Fairbanks to cover the Alaskan portion of the line and the other from the Alaska-Yukon border to join the pipeline through the 285 miles of northwestern Canada.

SEPARATE ENTITY

Each was a separate entity comprised roughly of 140 men to a crew and equipped with everything necessary to working and living with their job. The entire operation was portable from the welding machines mounted on tractors to the trailer-type living quarters, mess halls, and offices. Camps leap-frogged across the northland moving along the Alaska highway to set-up ahead of the advancing spreads and when passed moved only to move again when apssed once more.

Spreads began pipeline welding on April 17 at Fairbanks and found attached and thawed the permafrost soil to leave a quagmire churned by equipment. Standard equipment for the pipe-liners was hip boots for the crews and were continually encountering sections of the right of way where it was necessary to work in knee and hip deep floods. Occasionally equipment became bogged down or even sink from sight and have to be fished for and towed out.

'TOTAL' DAYLIGHT

As the spreads moved steadily southeast into the summer months long daylight hours provided the pipeliners with almost 24 hours of continual daylight. Crews were placed on 12-hour shifts. Working seven days each week became a chore for the terrain through which they were passing was still rugged. The arduous work, too much for some of the men had to be replaced as they quit their jobs under the strain and returned to the States.

But, pipelining is noted as a rugged business and these men were pipeliners with combined worldwide experience. The Alaskan pipeline was admittedly a bit tougher but they were used to tough going—working against the clock—and they hung on as men do when facing a challenge.

They wanted the pipeline completed the first year—they had only six months to do it in for their time schedule was bordered by severe sub-arctic winters. In the face of Arctic experience saying that if couldn't be done, they did it with few days to spare.

STRINGING CREWS

The pipeline spread was headed by the stringing crew with a side-boom equipped tractor unloading the pipe carrying trucks and swinging the pipe lengths into position along the right-of-way. The bending crew followed, bending the pipe to conform with the profile of the ground. By using a tractor with a single bending shoe, up to 400 joints of pipe a day could be traversed, making all the necessary bends.

The pipe gang followed along with welding machines mounted on tractors. Before the pipe was welded, end bevels were checked, remade if necessary and cleaned. Machines for the stringer bend and hot pass welds were carried on separate tractors which could usually get over the ground without difficulty. Welders following with pass and completing the four beads required to complete each welded joint. In sections of the right-of-way which would not permit the passage of equipment, the pipe was made up in long lengths adjacent to these swamps an dmarshes and pushed across from solid ground.

The welding specifications for the project were rigid. The defects permitted in the welds were conserdibaly less than regular specifications permit and strict visual and X-ray inspections carried out and enforced the specifications to the limit.

Color, Excitement Mirrored in Report

The excitement of constructing a giant project with unknown problems in a race with time and the weather is reflected in the Williams Brothers history of the pipeline. An inkling is shown by an exerpt on just one phase:

"In Canada, the delay in obtaining welders and the necessity for careful welding of the Brittish pipe slowed the anticipated progress during the summer months. To compensate, a double crew of welders was formed in late August and the tail end crew setting the valves and making the many river, slide area and road crossings found in this section of the line, was jumped from Burwash at the north end to Kluane Lake south to the Haines Cut-off road just behind the pipe gang. From here, a final drive was launched to cross the Chilkat pass before snow flew

"As September passed in a blaze of autumn color, the race grew tense and the size of the bets increased. Nights became frosty and the mountains on both sides of the line took on fresh snow, but a group of swamps on the high pla-

across.

"Rock was unexpectedly encountered in three stream crossings further delaying the work and then the Canadian government asked for additional valves installed at all samon streams.

"With the arrival of October, it looked impossible to cross the pass in 1954, but each day broke clear, the sun just being lower on the horizon.

"To everyone's surprise, the crisp days of Indian summer continued for two weeks more and during this time the race was won.

On Oct. 14, the line was laid tested and tied in at the Alaskan border beond the pass.

"The afternoon the snow started falling.

"During the next few days, a column of trucks and equipment moved north to Haines Junction through a silent and shadowless world of gently falling snow which made be twisting road almost invisible. But the trip was accomplished neventfully and within a week after the men left these des-

Contractor Oldest 'Pipeliner'

Williams Brothers, which did the actual Haines-Fairbanks pipeline construction as part of a joint venture, was the first specialized large builder in the pipeline field and everything the company does now is related to pipelines.

It has built more than 40,000 miles of pipelines and related structures, constructing them recently at a rate of approximately 2,000 miles a year.

It maintains equipment with a replacement value of $10,000,000 in order to carrry out its work on four continents: North and South America, Africa and Asia.

Since 1940, the company annually has performed construction work with an installed value exceeding $50,000,000.

To carry out its many functions, Williams Brothers maintains a permanent staff which has headquarters at Tulsa, Okla., of approximately 500 supervisors and administrators, and, in a normal year, employs an average of 8,000 to 10,000 men on its crews for varying periods. Personnel files on hundreds of capable workers have been developed over the years, and are kept current in order to permit prompt staffing of projects. Many "pipeliners" have received their first training with the company.

STARTED IN 1908

The firm got its start in 1908 when David R. and S. Miller Williams, Jr., who had gone to Fort Smith, Ark., with a contractor, got him to accept a note for a concrete mixer and a set of tools when the bond issue for a municipal paving project failed to pass. The brothers confined themselves to concrete and masonery structures, gradually broadening to the construction of buildings.

However, there soon was a booming demand by the British and French for United States oil because of outbreak of World War I. Under the impetus of the industrys sudden requirements for quickly-expanded facilities, the brothers were diverted to the building of a pipeline in 1915. With that first venture, the company began concentrating almost exclusively on pipelines.

Besides the two brothers, particular distinction in the firm was earned by Guy S. Connors, who became general manager of the company's operation and the acknowledged top 'spread boss' of the entire pipeline industry, and Cecil A. Stanfield, who was in charge of all administrative matters.

A younger generation of Williams Brothers, John, Charles and David, began coming into the organization just prior to World War II and now heads the active management of the organization. The older group, now constituting the separate company of Williams, Connors and Stanfield, serves as consultants. Both have a common purpose: to make certain that high standards are maintained and leadership is preserved so that "WILLIAMS BROTHERS" continues to be synonomous with "pipelines."

HANDLES ALL PHASES

The company is the only international general contractor which confines itself to pipelines, including crude oil, petroleum products, gas and water.

There is no phase of pipeline planning, design, construction, operation or related structures and services which the company does not perform, including management on a fixed-fee basis.

Beyond basic services, the engineering department is often called upon to assume the comprehensive responsibility for "turnkey" projects, in which they carry out every phase of a job from its inception, including purchasing, shipping, testing, placing the facility into operation, and hiring and training local staff. Most of the projects of this type have been executed abroad, where special problems have existed for the client.

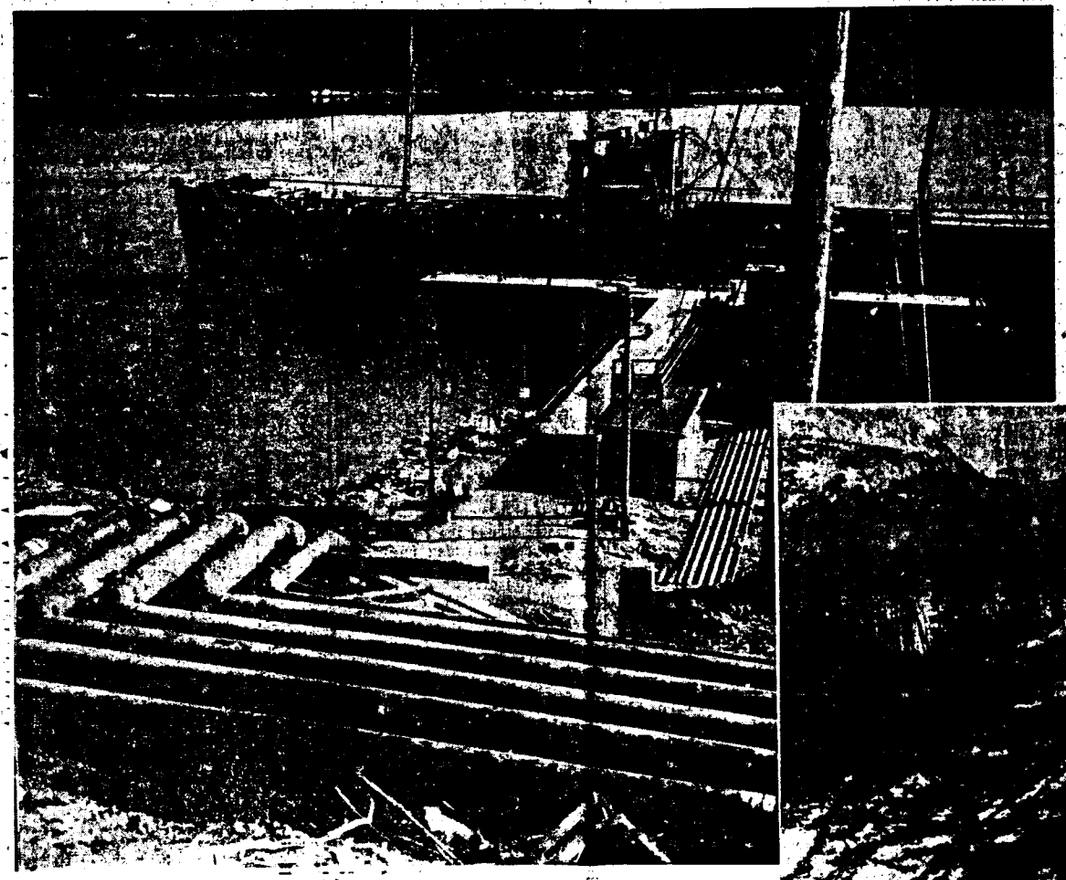
Among its famous jobs have been the famous "Big Inch" and "Little Big Inch" built during World War II; the Trans-Arabian Pipeline system; the Portland-Montreal, the Great Lakes and the Southeastern Lines; the Plantation Pipeline system; the difficult Uue-Amuy line in Venezuela; and other extensive projects in the United States, Canada, Mexico, Panama, Colombia, Bolivia, Chile, Brazil the Hashemite Kingdom of Jordan, Syrian, Lebanon, the Belgian Congo and the Gold Coast.

FUEL LINE REQUIRES PROTECTION

UP AND OVER—This stream bed, now dry, will be a raging torrent in the spring thaws. The heavy steel pipeline had to be bent

OINT VENTURE

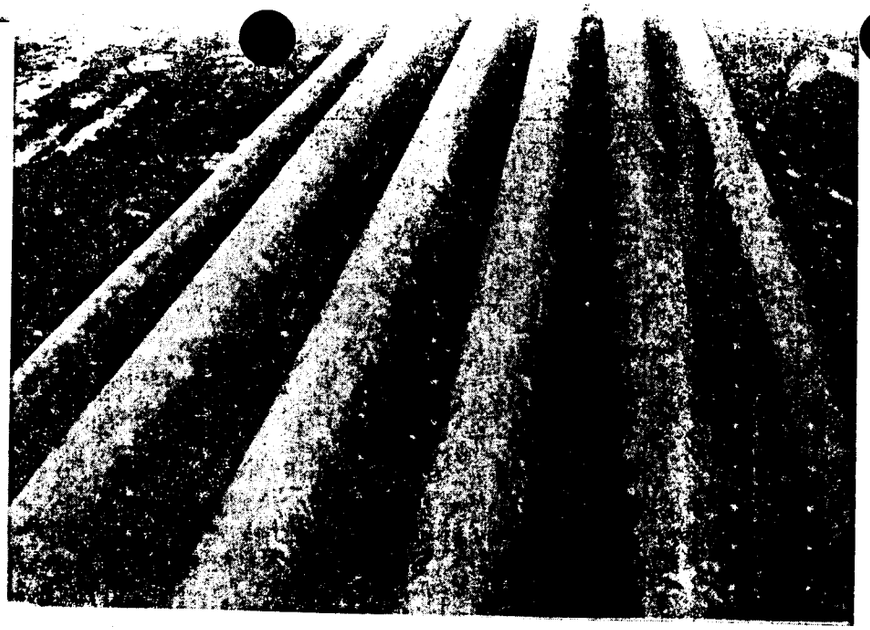
WILLIAMS BROTHERS — McLAUGHLIN — MARWELL



Symphony in Pipe...

Haines - Fairbanks Pipeline
Dedication of the Alcango

Wednesday Afernoon, the Twelfth of October, 1955, at 1:30 P. M., Haines, Alaska



OINT VENTURE Is Completed

626 MILES . . . $40,000,000.00 . . .

This multi-purpose pipeline is now supplying the Far North interior military bases with vital petroleum products. The pipeline extends from the port of Haines to Fairbanks, Alaska.

A SUCCESS STORY:

Overcoming obstacles such as weather, rugged country, snow and ice, perma frost, glaciers and time . . . all led to the successful completion of another major step in Alaska's progress. This pipeline was built under the supervision of the Alaska District Corps of Engineers. The construction was an international Joint-Venture: Built by Williams Brothers, of Tulsa, Oklahoma; McLaughlin, Inc., of Great Falls, Montana; Marwell Construction Company, Ltd., of Vancouver, B. C.

Col. Carl Y. Farrell Commends Personnel Who Built Haines-Fairbanks Line

PRAISE GOES TO OFFICIALS, EMPLOYES OF TWO NATIONS

Highest commendation for the "excellent cooperation, tireless effort and fine skill" of the personnel who built the $40,000,000 ALCANGO Haines-Fairbanks pipeline which will be dedicated tomorrow was voiced today by Col. Carl Y. Farrell, Alaska, district engineer.

His praise extended to the officials of two nations, the United States and Canada—to the contractors and their fast moving crews—and to the men and women of the ALCANGO Residency of the Alaska District Corps of Engineers.

"The friendship and cooperation of all the personnel is the thing which made the actual completion of the pipeline possible in record time against record obstacles," Col. Farrell said.

"Special thanks are given to the commander of the Northwest Highway System and his staff; to the officials of the customs and immigration service, and to the officials of the Yukon territorial tesies and diplomatic assistance in government for their many courcoordinating the work."

THANKS CANADA

Col. Farrell expressed deep appreciation to A. C. L. Adams, former special commissioner for the pipeline, department of northern affairs and national resources of Canada, "for his wholehearted and energetic cooperation and his very successful efforts in paving the way for both the district engineer personnel and the contractors' personnel in their dealings with the various departments of the Canadian government involved."

Of his own staff who manned the ALCANGO residency and the Haines project office, Col Farrell commented:

"We picked the best people to do a big tough job. They have done it—and well."

He especially commended Lt. Col. John E. England, ALCANGO Resident Engineer, who "rode the pipeline day and night and directed the whole job for the Alaska district Corps of Engineers, earning the loyalty of his own personnel and the respect and affection of all with whom he dealt."

KEY PERSONNEL LISTED

Some of the key residency and contractor personnel who helped push through t[illegible]ous 626-mile pipeline ar[illegible]

Lt. Col. [illegible], resident engineer, a[illegible] ames Biddison, as-

civil; H. A. Sherman and D. Dedes, office engineers; Joe Dukes, welding; Alice Burnson, drafting; Dick Moore, W. Hickinson, J. Von Gillern, survey; Mel Blevins, R. Fisher, engineering aides; Ethel Smock, administration; Jay Shearer, property; Boris Johnson, mail and records; Midge Cliss, clerk-steno; Binks Siefert, automotive maintenance.

Area engineers for the corps of engineers were J. L. McNamara, William Lennon, Jack Spangler; assistant area engineers, Dave Nease, C. B. Russell, Jack Stege; inspectors G. T. White, C. F. Fenn, Harrry Knutson. L. J. Drake, Fred Burns, James Wilson, George Kraft, Dick Shock, Thomas T. Rockwell, L. A. Roby, Charles Bicknell, Weaver Rushing, Mel Blevins and Dick Campbell.

IN DISTRICT OFFICE

In the district office in Anchorage the Alaska General Projects branch, working on the pipeline were Capt. James Trimble, Robert Prescott, Charles Campbell, Gus Steinwandel, Dick Huson and Leo Kelly.

Among the contracting personnel were A. M. Garber, resident manager for the joint-venture contractors, Williams Bros., McLaughlin-Marwell—R. H. Kerr, comptroller; B. E. Barnes, vice president of Williams Bros.; Hugh Martin of Marwell Construction Co.; Ben Hasha, project engineer; Paul Cote, technical engineer; H. L. "Red" Davis, Alaskan spread superintendent; Ed Hubach, Canadian spread superintendent; G. R. Hamilton, trenching. Superintendents included Clyde Gregory, Jack Engleking, Red Smith, Harold Brady and Ray Crain.

Engineers included Red Williams, "Southern" Comfort, Al Ross, Larry Parker, Roy Bartlett and Ray McGuire. Foreman, Dick Woodring, Spence Lambert and Red Stokes.

Welders were Chambers, Jensen, Burgess, Swift, Beale, Sydlowski, Hamlin, Barber, McDougall, Melmard Smith, Lambert, Dunham, Hill, Peasley, Lyster, Roberts and Eby. Safety engineers were Don Edwards, L. White, Doc Kellam and

Construction Difficulties Whipped on New Pipeline

"The Haines-Fairbanks pipeline is probably the best tested pipeline ever constructed." This testimonial for the new military fuel artery into interior Alaska was given by a pipeliner with years of world-wide experience.

And his classification is probably right for Corps of Engineers specifications were exacting. They had to be because the pipeline had to be right; there could be no failures as the pipeline forms the principal supply for the fuel which powers the military defense machinery of the interior. Variable conditions under which it would be operated to fulfill this mission required a pipeline that would operate despite temperature variations of 170 degrees from a high of 91 degrees above to a low of 83 below.

Testing started immediately with the construction of the pipeline and didn't cease until after the job was completed.

Visual and radiographic inspections was given welding on the pipeline. Two visual inspectors were part of the pipeline gang on each spread inspecting the important hot pass weld and then reinspecting the welded joints when the completing filler welds had been added.

X-RAY USED

Bringing up the rear of the pipeline gangs were teams of radiographic inspectors equipped with portable X-ray cameras selecting welded joints at a 20 per cent random sample.

Photographic plates were developed on the job in portable darkrooms and negatives were checked and double checked by Corps of Engineer inspectors looking for welding flaws.

As sections of the pipeline were completed and tied into the line a wire brush pig was passed through first to clean the line and was followed by a sizing pig. Air pressure of 185 pounds per square inch was maintained for 24 hours between gate valves which were set at 25 mile intervals.

The pipeline was subjected to exhaustive pressure testing which began late in June at Haines. Water was used in these tests in preference to oil as a precautionary measure since the use of oil in high pressure testing involved certain fire dangers. Nearly 170 miles of water was pumped into the line at Haines and pushed northward as the tests moved up the line.

SEPARATE PUMPS

Portable pumping equipment used in these tests was hooked into the pipeline at varying intervals to bring pressures within the line up to from 1500 to 1900 pounds per square inch—well above any pressures which would be exerted on the line during its operation. Pumps in the pipeline's five pumping stations were not used in these hydrostatic tests but received their break-in runs pumping the diesel fuel which followed the water into the line.

A one-month operational test by the pipeline's builders was the final and most exhaustive test given the project. These tests began in mid-August on the same day that the hydrostatic tests of the pipeline was completed at the Fairbanks end. During the operational tests, the pipeline was in full operation pumping fuels northward to Fairbanks.

During this period minor flaws were detected by the experienced crew of operators and corrections were made.

Now, completely tested, the pipeline is in full operation.

Pipeline Construction Crews Had Trailer Living Quarters

Construction crews "lived on wheels" in building the Haines-Fairbanks pipeline.

Two mobile camps were used in Alaska and one in Canada. On the Alaskan section, sleeping quarters were provided by Spartan trailers On Canadian sections they were from Trailer Co., Ltd. These were originally used by Comstock-Midwestern on the Trans-Mountain Oil Pipe Line Co. job and were purchased by Williams Bros. and refitted.

Kitchens, mess halls, offices, parts warehouses and showers were either on trailers or were skid mounted for easy moving.

Catering was contracted to Canus Services, Inc., Seattle, and its subsidiary, Canus Services, Ltd., Vancouver, B. C. Fresh fruits and vegetables were provided in abundance in a country where market gardens are virtually unknown. The catering company served breakfast at five each morning, diner at 7:30 p.m. and packed a lunch for the men to take out to the job.

Each camp was set up so that it might be moved in one overnight trip. Camp sites were located at 50 to 70-mile intervals and were used until crew[illegible]d bypassed them about [illegible] miles. Each camp was a v[illegible] ci' complete with its own water s tem and diesel electric genera-

Ingenious Methods Used for 'Burial' of One-Fourth of Line

The Haines to Fairbanks pipeline is primarily a surface-laid pipeline system, stretching exposed across mile after mile of northern wilderness. But one-quarter of the total length of the line had to be "buried".

In the method used for burial is a prime example of how the contracting industry has consistently come up with new methods to whip construction difficulties in the far-north.

At the northern end of the line pipe burial was required for the first 100 miles out of Fairbanks to pass under military maneuver areas, a section almost completely comprised of permafrost.

At the southern end of the line a 45-mile long section out of Haines needed burial where the pipeline passes northward through heavily timbered and mountainous country. Here burial was necessary as a protection against rockslides, snow slides and falling trees.

Despite the sub-surface ice condition at the northern end of the line, a ditching machine was used to gouge out the trench. Experienced construction men familiar

during a 12-hour shift. During the height of the construction season when daylight became a perpeual condition in the north, the ditching operation was placed on a 24-hour day basis. The ditcher moved constantly around the clock, from early Monday morning until late Saturday night with the operation closing down over Sunday for the overhaul and repair of equipment.

The difficult ditching operation through the permafrost was hard on the tough steel teeth of the digging buckets and they had to be replaced after each 12-hour shift.

Ditching the 45-mile stretch out of Haines was somewhat less arduous since the permafrost problem was not present. However considerable amount of this ditching was through rock which required drilling and blasting.

In other locations where the pipe passes through settled areas the line is buried to prevent restriction of traffic. Where the pipe [illegible] minor rivers and streams [illegible] was also required for some of the stream crossings.

Lt. Col. England, resident engineer, and James Biddison, assistant resident engineer.

In the Resident Engineer's office: A. L. Soliss, office management engineer, Foster Harrington, structural; Capt. William Martin, mechanical; Herb Dodderage and Bob Shary, electrical; Hugh Tyker, Eby. Safety engineers were Don Edwards, L. White, Doc Kellam and Don Bakke.

Canus Service, the commissary company, had Fred Thomlinson and Jack Walker and their crews.

Oaks Construction Co which handled the Alaskan clearing, moved fast along the 50-foot right-of-way through wilderness under Carl Oaks, W. Butcher, R. Crawford, Tope, Slim McMahon and Beale. On the Canadian 200 miles of clearing, Omack Co. slashed through under Charles Ash, H. Balfour, and Cliff Thompson. For General Enterprise of Whitehorse, Y. T., working on hand clearing were Harry Frome, Smokey Stout and M. McIsaacs.

"Some of these crews moved so fast we couldn't even get their first names,' Col. England commented.

Supply A Big Problem On Project

While any sizeable construction project in Alaska has problems of supply, the $40,000,000 Haines to Fairbanks pipeline had appalling problems for every phase of its construction.

Every bit of materials from the first 40-foot length of cast steel pipe placed on the ground at Fairbanks to the last spray of paint on the tanks at Haines had to be procured from distant supply centers and then transported to the job. Skilled pipeline welders had to be recruited and brought to the north. Fixed and mobile camps had to be provided across the 626-mile long project.

Successful completion of the project required time. The hard-going, fast-moving pipeline operation required supplies, parts and repairs facilities within a few miles of every construction facility. This necessary mobile support was furnished in trailer camps complete with housing, messing, administrative and repair facilities.

The airplane plays an important part in pipeline operations and the contractor's two aircraft—a twin-engine Beechcraft and a DC3—moved personnel and parts from point to point.

Communications between spread vehicles and field and main offices were handled by two-way radio equipment. A radio equipped ambulance was a part of each spread and during the daily operation was located at what appeared to be the most hazardous spot.

Pipe for the pipeline came from both American and British mills. English made pipe was shipped from Scotland while American made pipe along with other materials and equipment was transported from Pennsylvania mills down the Mississippi out of New Orleans, through the Panama canal and up the inside Passage to Alaskan ports.

Unloading, hauling and stockpiling of pipe was performed by the Alaska Transport Co., and the contractor's crew handled the stringing.

complete with its own water system and diesel electric generating units.

Where work necessitated the use of smaller trailer camps they were set up as side camps and in some instances commercial lodging facilities along the Alaska highway were utilized to provide quarters for smaller crews operating away from the established camp.

Pure water was plentiful at every camp site, and it was usually possible to draw the supply directly from the nearest river.

Fixed camps consisted of dormitory-type bunkhouses and were located at the sites for all five pumping stations. Each bunkhouse had its own hot and cold water, showers, indoor plumbing, laundry facilities and modern messhall.

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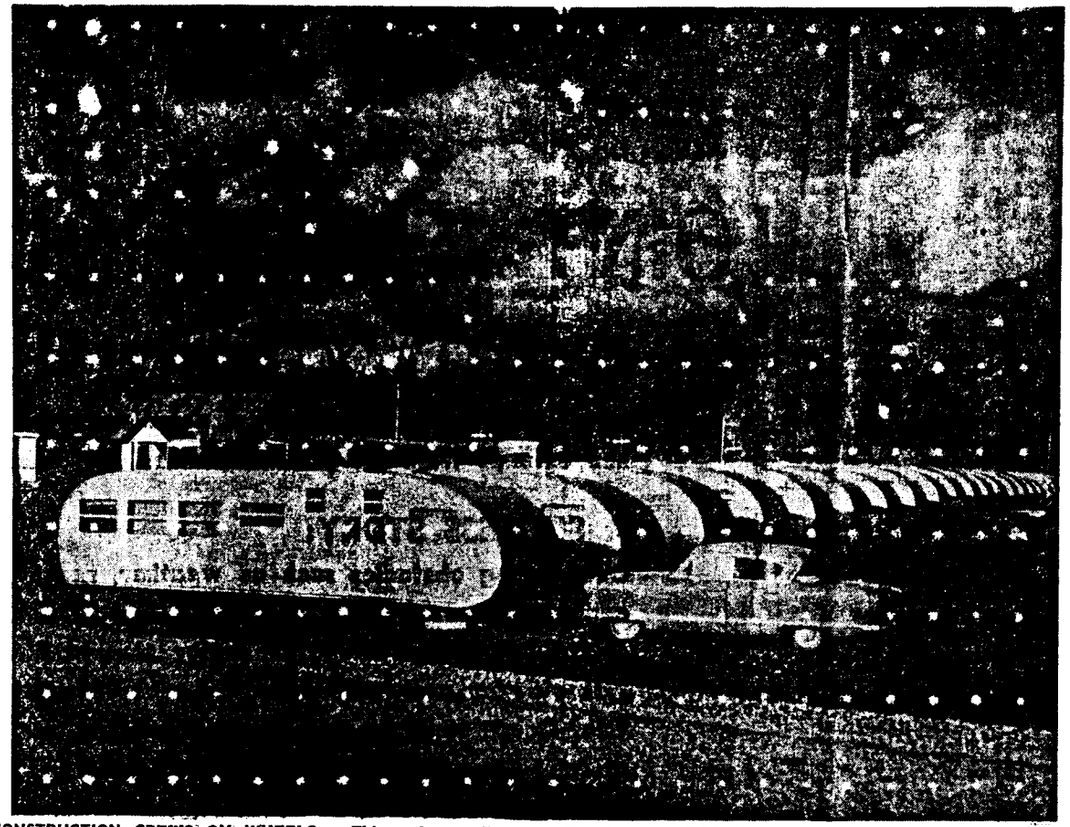
'TRAVELING CAMPS' BIG BOON TO PIPELINE PROGRESS



CONSTRUCTION CREWS ON WHEELS — This modern trailer camp, with rolling commissary, mess halls and living quarters, moved right along with the progress of construction on the 626-mile Haines to Fairbanks pipeline. This temporary base is on Mosquito lake near Haines.

(U. S. Army Photo)

line, a ditching machine was used to gouge out the trench. Experienced construction men familiar with building in the north argued that such a machine could not do the job. "You can't dig through solid frost," they held, "and a ditcher is nothing more than a mechanical digger."

But the pipeline contractors had studied the permafrost condition and came up with an idea. They equipped their ditching machine with a smaller digging wheel and added buckets. Thus a 12-ft. diameter wheel replaced the conventional 18-ft wheel; the smaller wheel together with its 14 buckets provided the ditcher with a continuous digging cycle reducing jarring action and wear on the machine despite the difficult ice material through which it excavated.

Ditching was a slow moving operation averaging only one mile was also required for some of the stream crossings.

Through the permafrost country the ditcher was given added pull through the heavy gumbo and against the tough icy soil by a towing tractor. Other equipment in the ditching operation consisted of a side-boom tractor to lower the pipe into the ditch with a backhoe for backfilling over the trenched pipe.

The ditching operation was followed by a tie-in gang installing road crossings, connecting the mainline pipe with the pumping stations, and installing the many gate valves and check valves in the line.

The Army will spend about $4,000,000 on the new Federal Employees Group Life Insurance program in fiscal 1955.

Almost Insurmountable Pipeline Diffculties Solved by Modern Engineering Know - How

QM Corps To Supervise Big Pipeline

Dedication of the Haines-Fairbanks pipeline tomorrow will mark the formal transfer of the completed project to the army. Personnel of the quartermaster corps thereafter will supervise the $40,000,000 pipeline with its five pumping stations and multiplicity of valves and gauges.

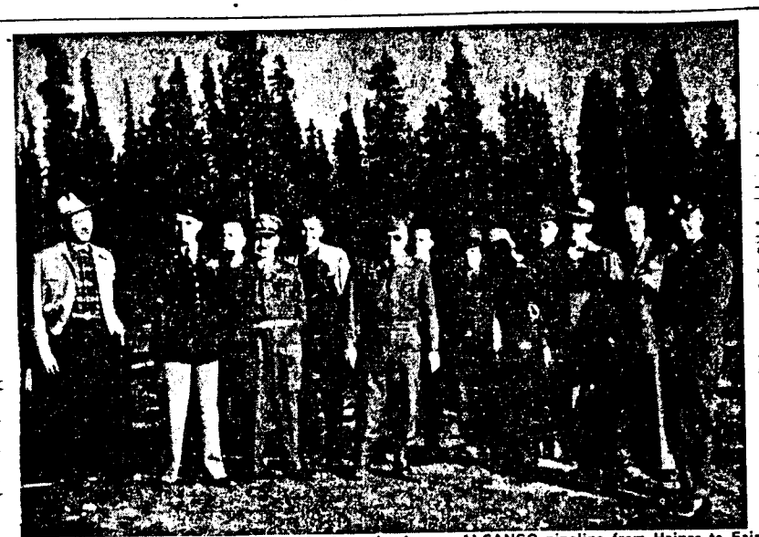
Included among the 81 civilian quartermaster personnel who will operate the pipeline will be pumping station operators, laboratory technicians, pipeline specialists and administrative workers.

Ninety per cent of the various fuels passing through the pipeline will be for delivery to the air force. This percentage will be increased in the event of war. Delivery capacity of the line is 16,000 barrels a day or 400,000 gallons with aviation and automobile fuels flowing at a faster rate than the heavier diesel fuels. The tremendous volume capabilities of the line would be virtually impossible to maintain by rail shipments, especially on a wartime basis.

Two quality-control test points will be maintained, one at Haines and operated by USARAL quartermaster personnel and the other at the Alaska General Depot manned by depot personnel.

The fuels must be constantly tested for detection of foreign materials, water and the possible mixing of products. Octant and volability tests are also continuous. All the fuels which pass through the pipeline are designed to flow to minus 60 degrees Fahrenheit.

Construction of the pipeline was by international agreement between the United States and Canada and its construction was an international effort in other respects. Marwell Construction — one of prime contractors—is a Canadian firm; much of the materials and equipmen used to build the pipeline came from Canadian sources; many of the construction men who worked on the project were Canadians; and, three of the pipeline's five pumping stations are located in Canada.



INSPECT HISTORY-MAKING PIPELINE—Over the famous ALCANGO pipeline from Haines to Fairbanks, Alaska, an inspection party from the Army Corps of Engineers and the contractors who built the 621-mile long line, checked progress. Left to right: B. E. Barnes, project manager and vice president of Williams Bros., one of the contractors in the three-way combine of Williams Bros.-McLaughlin-Marwell, who have the contract; Col. Carl Y. Farrell, Alaskan district engineer; Warren George, Alaska district engineering division chief; Brigadier H. W. Love, commander of the Canadian Army Highway System;—284 miles of the pipeline cross British Columbia and Yukon Territory—Hugh Martin of Marwell Construction Co.; Lt. Col. John E. England, resident engineer for the ALCANGO project; Roy Staggs, foreman for Isotope Products, handling the radiographic welding inspection of the long pipeline; James L. McNamara, zone engineer; Fred W. Burns, inspector, and W. Jay Sherer, property supply superintendent for the Alaska district engineers; F. S. Brown, North Pacific division engineer division chief; A. C. L. Adams, special commissioner on the pipeline for Canada; and Col. Louis H. Foote, North Pacific division engineer, Corps of Engineers, U. S. Army.

(Official photo, Corps of Engineers, U. S. Army)

Wharf, Tanks and Pumps Vital To Success of New Pipe System

Tankers and barges carrying multi-purpose fuels for military bases in interior Alaska dock at Haines terminal in southeastern Alaska on deep, protected and ice-free Lutak inlet, and moor to a T-head steel and concrete wharf.

This new wharf, built as part of the $40,000,000 Haines-Fairbanks "ALCANGO" pipeline, has 11,000 lineal feet of steel piling, driven to solid rock, capped by a concrete deck.

From the dock several lines run to the manifold transfer building in the tank farm. Electrically driven pumps in the transfer building force the fuels into the main pump house for immediate flow into the main line pipe or up to the tanks for storage in the tank farm.

Nine 30,000, two 5,000, and one 1,000 barrel tanks comprise the tank farm. Fire protection is provided by an automatic fire foam distributing system with its separate foam piping and two foam-making chambers at each tank.

PUMP CAPACITY

In the main pump house at the Haines terminal, three 335 horsepower 6-cylinder engines, driving through gear reducers turn quintuplex power pumps. With pumps turning at 120 rpm each of the three pumps can discharge 330 gallons per minute at 12000 p.s.i. The radiators for the engines are located in a separate building and mounted with individual cooling fans and circulating pumps. Heat from the radiators is vented through louvered walls to the outside.

The 1200-pound discharge pressure will carry the fluid 48 miles to station 2 in British Columbia which is at an elevation of 1,390 feet. Here three 335-h.p. six-cylinder engines drive four-stage centrifugal pumps through high speed increasers.

The discharge pressure at Station 2 is 1,450 pounds per square inch. A heavy walled pipe was laid for four miles upstream from the station to withstand this increased pressure. In the nine miles north of Station 2 the pipeline elevation is increased 2,400 feet to its mad[illegible]

Along its 626-mile route from Haines to Fairbanks, the ALCANGO pipeline passes over and under the major and minor streams of the north noted for treacherous and meandering courses. There are gullies, deep ravines and wash areas along this route that remain dry and dormant through most of the year only to become packed with twisting, writhing violence that comes when mountain run-offs of rain and melting snows use any and every available course in their seasoned rushes to the lower levels.

The pipeline crosses many gullies and streams supported by H-frame bents a maximum of 50 feet apart. There are several suspension crossing with spans up to 200 feet. Wide rivers were crossed by supporting the pipe on A-frames welded to the vertical members of the steel highway bridges. Special designs were necessary to prevent over stressing of the pipe from expansion and construction in straight sections of pipe on these bridges up to 2000 feet long.

OUTSTANDING SPAN

Perhaps the most outstanding crossing along the pipeline was over Slim's River, a glacier-fed swift-water stream which empties into Kluane Lake in the Canadian Yukon.

In original pipeline planning, the pipeline was to be across the Kluane. This would have been the deepest water crossing ever attempted in pipeline history. The Kluane is 291 feet deep and would require an eight-mile underwater crossing.

When the construction project was offered for bids contractors were permitted to bid on an alternate route around the lake. This would avoid the tricky crossing but added 5½ miles to the total length of the line. This alternative received the lower bids and the crossing was discarded in favor of the land route skirting the lake. Another problem was present in that the route around the lake necessitated the crossing of Slim's River, 1000-ft. wide and packed with roaring twisting white water.

RIVER HIGH

When pipeline operations reached the Kluane lake area in July of 1954 the mountain fed tributaries were at their peak carrying the heavy runoffs from the rain and melting snows and ice high in them ountains. Of necessity the Slim's River was by-passed and the pipeliners continued southward toward Haines.

The pipeline was all but completed in that first season with the pipeline spreads setting pipe laying records by welding together 626 miles of 8-inch steel line from Fairbanks to Haines in less than six months. When winter closed in one link remsined to be made—the Slim's river crossing.

Rather than attempt such a crossing during that season at the risk of the lives of crewmen, the pipeliners chose to wait for the winter and a freeze-over of the stream which would provide safe passage of the crew members and their equipment.

CROSSING IN APRIL

The crossing began in early April with piles being driven for the H-frame bridging of the stream bed. The steel pipe pilings were driven to 55-foot penetrations in the stream bottom to provide framing that would stand up against the powerful stream. The pile-driving through the thick layers of ice and the underlying frozen stream bed was a time-consuming operation that required three weeks to complete.

Once the H-frames were in place across the stream, crews had to move fast to snake the pipeline through the brackets to keep ahead of the rapidly disintegrating ice in the river. Crew members and sideboom cats tugged and wrestled the steel line over the crossing in a two-day operation slowed by frequent breakthroughs as the top layers of ice gave way under the weight. However, the underlying ice layers held and the pipeline was slogged across.

With the crossing accomplished, the 1000 foot length of pipe was welded into the mainline piping the final link in the 626-mile long military fuel line and a spectacular wind-up for a spectacular piece of construction in the north.

Mud A Major Problem for Line Builders

Of all the major problems confronting the pipeliners in their dash across the north country to build the ALCANG[illegible]ne from Haines to Fairbank[illegible] was the [illegible]ing.

five pumping stations are located in Canada.

pump house for immediate flow

turn quintuplex power pumps. With pumps turning at 120 rpm each of the three pumps can discharge 330 gallons per minute at

The discharge pressure at Station 2 is 1,450 pounds per square inch. A heavy walled pipe was laid for four miles upstream from the station to withstand this increased pressure. In the nine miles north of Station 2 the pipeline elevation is increased 2,400 feet to its maximum elevation of 3,700 feet through Chilkat pass.

Two identical pumping stations, 2A and 2B, are located in the interior Yukon plateau approximately 100 and 200 miles northwest of Station 2. These smaller stations will only be used to bring the pipeline to a maximum pumping capacity. During normal operation, the small standby stations will not be used since Station 2 can pump through to Station 3, at Tok Junction some 400 miles north.

At Station 3, there are three quintuplex pumps similar to those at the Haines terminal. In addition there are two smaller triplex pumps, powered by diesel engines, tied into the 3-in. Canol line to pump through the Canol line which also terminates in Fairbanks. The pipeline's second tank farm is also located at Station 3 with nine 30,000-barrel storage tanks and four smaller capacity tanks.

At each station there is a scraper trap which will permit the pipeline scraper to be removed from the line at the suction side of the station piping and inserted in the line at the pressure side of the pumps. The effect of rust in the pipeline will be minimized by a rust-preventing sodium nitrate solution which can be injected into the line at each station.

CLEAN FUEL

A comprehensive system of water separators, filters and strainers will continuously remove water and dirt in the line to keep the delivered product clean. An excess of water in the line would be serious with the advent of winter weather, as a sudden drop in temperature would freeze a deposit of water and possibly block or damage the system.

Housing is provided at each station for the operating and maintenance crew of the pipeline. Accomodations consist of modern attractively designed six and eight family quarters for married personnel and dormitories for single employees.

The larger stations—one, two three—are heated by boilers supplying steam at 15 p.s.i. Stations 2A and 2B have additional oil-fired hot-air furnaces in each of the buildings. Electric power at all stations is furnished by diesel generators.

Because of the remote locations of the installations there is adequate equipment available to provide standby units for such items as pump engines, boilers and generators.

Line Builders

Of all the major problems confronting the pipeliners in their dash across the north country to build the ALCANGO pipeline from Haines to Fairbanks, mud was the most imposing.

The summer of 1954 was usually wet, and permafrost—the northland's construction bogey—teamed with the rains to turn the right-of-way into an alleyway of gumbo.

Left in its natural state, tundra is an insulator for permafrost against the summer sun. In clearing operations the tundra was left intact where possible, but the churning tracks of clearing tractors and other equipment which followed tore out the mossy insulation and the underlying frozen soil thawed quickly.

The pipeline gangs encountered pipeline right-of-way ranging from easy going to the virtually impossible and seldom found moderation between. In muskeg and thawed permafrost areas, the track vehicle sometimes sank up to the hoods to become immobile as tracks failed to gain toe-hold on the icy bottom. On occasion a cat would drop out of sight and a thoroughly drenched skinner would scramble to high ground. Extra tractors were kept busy towing floundering equipment.

While a considerable amount of the right-of-way was flooded, normally these areas were not more than two or three feet deep. Thus equipment was able to function but personnel frequently worked in waist-deep icy water.

Some flooded areas had to be bypassed to be welded in by one of the follow-up gangs when the area dried. In other stretches the pipe was welded into sections and pushed across the flooded area and tied in.

Here concrete river weights were used to anchor the pipe with a negative buoyance of 25 pounds per foot. Weights were cast as needed using a portable concrete mixer and woden forms.

Pipeliners compared the conditions in Alaska to those found in pipelining through swamps of coastal Louisiana with the frozen soil of the north posing extra difficulty.

Pipe for the Canadian section of the pipeline, 285 miles long, was purchased from Stewart and Lloyds of Great Britain. The remainder of the seamless steel pipe was purchased from American mills Shipped to the ports of Haines and Valdez, the pipe was hauled by truck to the pipeline right-of-way. In four months 42,000 tons of pipe was moved to the site requring some 10,000,000 ton-miles of hauling.

(A)

U. S. Army Photo

WILLIAMS BROTHERS CONSTRUCTORS ENGINEERS

Williams Brothers Company is proud of the part that it played in building the $40,000,000 Haines-Fairbanks pipeline . . . The successful conclusion to this project was brought about by the cooperation of our Joint Venture partners McLaughlin, Inc., of Great Falls, Montana, and Marwell Construction Co., Ltd., of Vancouver, B.C.

Williams Brothers wishes at this time to salute the Alaska District Corps

Williams Brothers wishes at this time to salute the Alaska District Corps of Engineers for their patient help and assistance, the men and Unions who were an integral part of the success of the operation, and the Canadian Northwest Highway System and Department of Northern Affairs.

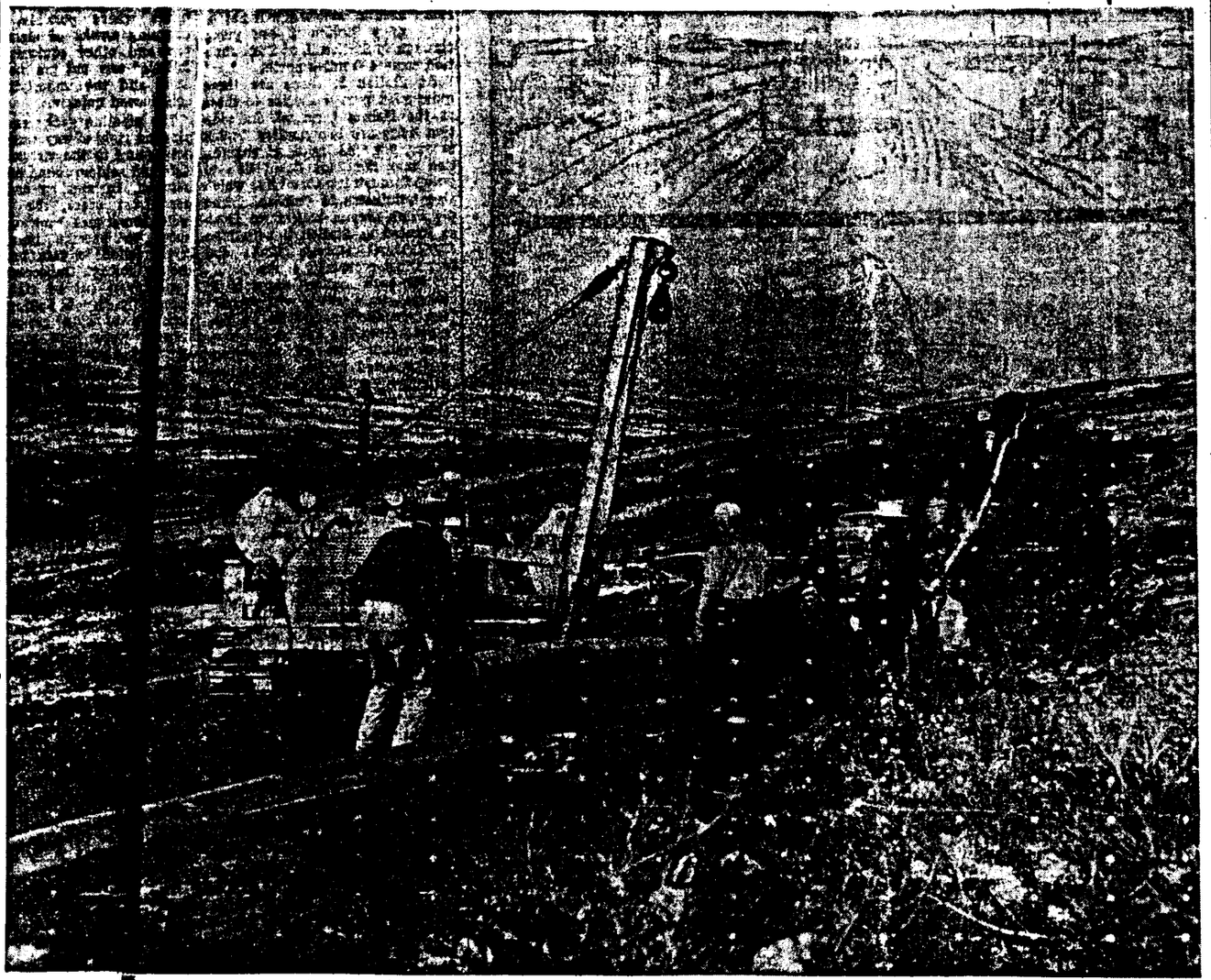
To the people of Alaska, Williams wishes to thank you for your consideration and assistance which helped to bring the Haines-Fairbanks pipeline to early completion.

(B) Bucky McDonald Photo

(A) HIGHWAY ROUTE—Most of the route of the 626-mile Haines to Fairbanks POL pipeline follows interior highways. Here the pipe is being laid along the Haines Cut-off to join the Alcan into Fairbanks.

(B) TYPICAL TERRAIN picture of the pipeline right of way.

(C) A view approximately 65 miles Haines Road.



(C) Bucky McDonald Photo

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Haines - Fairbanks Pipeline

Anchorage, Daily News 11 Oct 55

lars In Construction

and weapons—adapted to Alaska's problems of widely different weather and terrain, vast distances, and transportation of men, supplies and heavy equipment by land, sea, and sometimes accessible only by air.

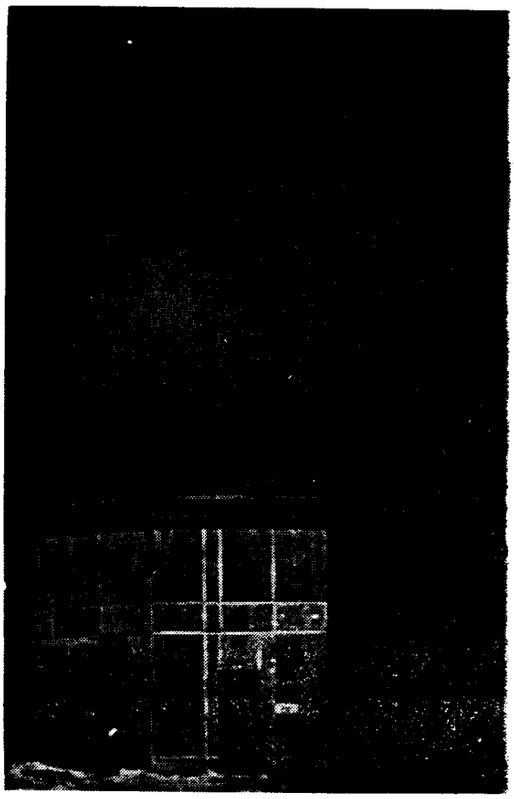
To meet these problems constant studies and experiments are carried on in the Corps of Engineers Research and Development Laboratories in the States and in the field in the Alaska District. From these come ideas, designs, inventions, methods, models and completed construction winning international attention.

You think of Alaska as a frontier. It is. It's a challenge where engineers of imagination, vision, ability, stamina and daring are needed to translate foresighted dreams into efficient accomplishment. The future of the Alaska District seems as far-reaching as Alaska's role in the world-wide picture.

FUEL FOR MILITARY BASES—The famous "ALCANGO" pipeline carries jet, diesel and motor fuels from the southeastern Alaska Port of Haines, to Fairbanks in the central interior. More than one-third crosses Canada's British Columbia and Yukon Territory. Contractors on the $40,000,000 pipeline were the joint venturers of Williams Bros., Tulsa, Okla., McLaughlin Co., Great Falls, Mont., and Marwell, Ltd., Vancouver, B.C. Through cooperation of Canadian and the U.S. authorities, pipe for the Canadian stretch was manufactured and shipped by British firms; for the Alaska route by American contractors. Work started simultaneously at Haines and Fairbanks terminals. This photo is Tok Junction, interior Alaska. The vital pipeline was completed on schedule against severest Alaskan obstacles, through mountain passes, around glaciers, spanning rivers and flooded streams, over tundra, swamps and permafrost. Completed by the Alaska District, Corps of Engineers, it now is operated by the U.S. Army Quartermaster Corps.

FREEZING THE ARCTIC—In Arctic and sub-Arctic regions in Alaska where earth is eternally frozen, Alaska District Engineers apply new methods to combat "permafrost." Where the earth slips and slides as warmth penetrates a few inches, a serious construction problem is to keep structures from tilting or collapsing as building heat thaws the permafrost. Corps of Engineer laboratories worked out the system of deep-freeze with refrigeration coils keeping the ground at constant temperature. Giant drills bore deep holes for piling in which firm foundations can be laid. Here a young scientist-engineer checks the refrigeration gauge.

"BIG BUBBLES" GUARD ALASKA—Popping out of the snow and ice of far north Alaska are these Arctic radar towers located near the DEW Line (Distant Early Warning) and AC&W (Aircraft Control and Warning) installations. The sides are prefab steel. The top a plastic bubble heated to melt snow and ice. Inside a revolving radar antenna operates automatically. The "puff balls" are built for the U.S. Air Force under supervision of the Alaska District.



DEW LINE—Extending the fence of the Distant Early Warning radar system along the 1,000-mile Aleutian Island Chain six DEW Line stations were slated for construction during summer 1957 under the Corps of Engineers, Alaska District. The $25,000,000 "Operation Stretchout" extends in a great arc of islands toward Kamchatka betweeen the Bering Sea and the Pacific Ocean. Project headquarters are at Cold Bay.

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