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NEW ENGLAND DIVISION
BOSTON, MASSACHUSETTS

FOR

OFFICE OF THE CHIEF OF ENGINEERS
AIRFIELDS BRANCH
ENGINEERING DIVISION
MILITARY CONSTRUCTION

DECEMBER 1983

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BY SUBJECTS

AARON, HENRY

- (1) "Frost Heave in Highways", Public Roads, Periodical, Vol. 15, No. 1, March 1934, 10-25, B.S.L.

Soil profiles in which frost heave has been observed; and subgrade, base and drainage designs which have been used to prevent frost heave are discussed and illustrated.

- (2) also WATKINS, W. I.

"Soil Profile and Subgrade Survey, The", Public Roads, Vol. 12, No. 7, Sept. 1931, 51-64.

A study of the relationship between frost boils and soil structures and the soil profile.

ABOLIN, R. I.

- (1) "Permanently Frozen Ground and Ground Ice", Zapiski Chita Sect. of Amer. Branch of Russian, Vol. IX, 1913, Russian.

ACADEMY OF SCIENCES, USSR

- (1) "Theoretical Basis of the Thermic Method of Prospecting", Inst. of Theoretical Geophysics, Acad. of Sci., Moscow, USSR, Russian.

Domes buried at a depth of 500-600 in., were found by means of thermic prospecting. Rocks of different structure and chemical composition can be located by this method of prospecting.

- (2) "Mineral Water of the Frozen Zone of the Lithosphere", Trudy Komm. Perm., Vol. VI, 1938, 63-78, Acad. of Sci., Moscow, USSR Russian with Eng. Summary; also Fr. & German.

- (3) "Observations of Water Freezing", Trudy Kom. po Izuch. Vech. Merzloty (Proc. Comm. on Permafrost), Vol. 6, 1938, 167-171 409-411, Acad. of Sci., Moscow, USSR, Russian with summary in English.

- (4) "Symposium of Instructions and Program-Indications for the Study of Frozen Ground & Permanently Frozen Ground", 1938, 272pp, Acad. of Sci., Moscow-Leningrad, USSR, Russian.

- (5) "Physical-Mechanical Properties of Snow & Their Utilization in the Construction of an Airfield in the Southern Part of the Region of Permanently Frozen Ground", 1945, Acad. of Sci., Moscow, USSR, Russian, DLC.

ADAMS and WILLIAMSON

- (1) "Temperature Gradient", Physical Review, Vol. 14, 1919, 99pp.

AFANASIEV, A. D.

- (1) "Mechanization of Snow Removal Operations on a New Technological Basis", The Physico-Mechanical Properties of Snow & Their Application in the Construction of Airfields and Roads, 1945, Acad. of Sci., Moscow, USSR, Russian, Transl. by DN avail. in SPDO-S.

RESTRICTED.

This is an article on the removal of snow from airfields. It describes the requirements of the machines and equipment and gives the considerations on which snow removal is based. It

AFANASIEV, A. D. (cont'd.)

describes the use of the rotary plow, the snow scraper, the disc-type snow remover and gives technical characteristics and data on the performance of various types of snow removal machinery.

ALASKA DEPARTMENT OF HEALTH

- (1) "Sanitation Needs in Alaska", A Proposed Program of Research in Environmental Sanitation in Alaska, 1949, Avail. in SPDO-P.

This article was written by Harold A. Whittaker, Special Consultant, USPHS for the Alaska Dept. of Health. It presents a review of the problems discovered and outlines suggested research studies which are essential for their solution.

Table of contents:

1. Foreward. 2. Sanitation Activities in the Alaska Dept. of Health. 3. Sanitary Conditions in Alaska. 4. Special Problems of Sanitation in the Permafrost Area. 5. Information on Prevalence of Enteric Infections in Alaska. 6. Proposed Studies for Investigation and Research in Arctic Sanitation. 7. Arctic Health Institute.

ALENISKY, V. V.

- (1) "Field Experiments on the Freezing of Ground", Leningrad Inst. of Constr., 1933, 52pp, Leningrad, Moscow, Russian.

- (2) "Regarding Reasons for Deformations of Structures Under the Conditions of Permanently Frozen Ground", Construction Industry, Vol. 16, No. 3, 1938, 39-40, Russian, DLO.

Anadyr buildings all showed tilt to the North and East. Soole or soole-like fill was not properly maintained. It was allowed to crumble in the summer and was patched up in the winter.

ALEKSEYEV, V. V.

- (1) "Experimental Investigation of Monometric Transmitter", Trudy of the Geol. Inst., Vol. IX, 1939, 349-363, Acad. of Sci., Moscow, USSR, Russian.

ALGREN, A. B., BLACKSHAW, J. L., & ROWLEY, F. B.

- (1) "Surface Conductance as Affected by Air Velocity, Temperature, and Character of Surface", ASHVE transactions, Vol. 36, 1930, 429.

- (2) "Overall Heat Transmission Coefficients Obtained by Tests and by Calculation", Amer. Soc. of Heat. & Vent. Engineers.

ALLEN, HAROLD and JOHNSON, A. W.

- (1) "Results of Tests to Determine the Expansive Properties of Soils, The", Proc. Highway Res. Board, Vol. 16, 1936, 220-233.

Condensed report of a comprehensive study of the swelling characteristics of five Kansas soils. Includes data on volume change on repeated freezing and thawing on soil.

- (2) ALLEN, HAROLD only

"Report of Committee on Warping of Concrete Pavements" Proc. Highway Research Board, Vol. 25, 1945, 199-250, Highway Research Board, avail. in SPDO-P.

(2) ALLEN, HAROLD only (cont'd.)

A description of concrete pavement details and their relation to distortion of pavement (high joints) due to frost action; artificially produced high joints; joint drains; oil and tar treated subgrades; selected low volume change base courses and maintenance of joints as related to frost action and high joints.

AMERICAN GEOLOGICAL SOCIETY OF NEW YORK

(1) "Mounds of Arctic America", Geographic Review, Vol. 28.

(2) "Ground Ice Mounds in Tundra", Geographic Review, Vol. 32.

AMERICAN INSTITUTE OF PHYSICS

(1) "Temperature - Its Measurement and Control in Science and Industry", 1941, 1362pp, Reinhold Publishing Corp., New York, N. Y., SPDO-P.

This portion of this book relating to "Meteorology - Soil Temperatures - Instruments" covers such subjects as:

1. Testing of Thermocouple Materials
2. Temperature Measurements
3. Use of a Zone Box
4. The Accuracy Attainable with Copper-Constantan Thermocouples

AMERICAN SOCIETY OF PHOTOGRAMMETRY

(1) "Manual of Photogrammetry", Book, 1944, 819pp, SPDO-P.

This book discusses the following subjects: Principles of Surveying; Photogrammetric Optics; Cameras; Photographic Mission; Materials and Laboratory Technique; Geometric Characteristics; Stereoscopy; Interpretation; Radial Plotting Methods; Photographic Mosaics; Stereoscopic Mapping Methods; Analytical Computations; Mapping from Oblique Photographs; Field Inspection and Completion; and Training and Application. Includes numerous photographs, maps and drawings.

AMERICAN SOCIETY FOR TESTING MATERIALS

(1) "Procedures for Testing Soils", 1944, SPDO-P.

This publication brings together in convenient form various methods of testing soils now in current use. Included are 13 methods adopted as Standard or Tentative Standard by the American Society for Testing Materials, and 36 suggested methods of test for soil and soil mixtures. The suggested methods have no official status in the Society; they represent available test procedures that have been used with some degree of success for the determinations in question and are presented in this publication only as information. The soil test procedures fall into 5 categories each pertaining to a particular type of soil testing as follows: Part I - Indicator Tests on Soils; Part II - Compaction and Consolidation Tests on Soils; Part III - Strength Tests on Soils; Part IV - Tests for Soil-Cement; and Part V - Tests for Soil Bituminous Mixtures.

AMERICAN SOCIETY FOR TESTING MATERIALS (cont'd.)

- (2) "Symposium on Thermal Insulating Materials", Columbus Regional Meeting - A.S.T.M., 3-8-39, 123pp, A.S.T.M., Philadelphia, SPDO-P.

1. Introduction.
2. Factors Influencing the Thermal Conductivity of Non-metallic Materials.
3. A Discussion on Test Methods for Determining Physical Properties of Thermal Insulations.
4. One Consumers Problem in Selecting Heat Insulation.
5. The Effect of Solar Radiation on the Heat Transmission Through Walls.

ANANIAN, A. A.

- (1) "Electric Conductivity of Frozen Ground", Russian.
- (2) "On the Problem of the Reaction of a Direct Electric Current Upon the Ground", In: Izvestiya Akad. Nauk SSSR, Seriya Fiziko-Matematicheskie Nauki, vyp. 1, 1942, 86-97, Acad. of Sciences, Moscow, USSR, Russian, DLC.

ANDERSON, A. B. C. and FLETCHER, J. E.

- (1) "Soil Moisture Conditions and Phenomena in Frozen Soils", Trans. American Geophysical Union, Part II, 23rd Annual Meeting, Nov. 1942, 355-371, Nat. Res. Com. of the Nat. Acad. of Sci., Washington, D. C., BSL & SPDO-P.

A theoretical discussion of experimental methods of measuring the temperature at which soil moisture freezes; interrelations among the thermodynamic variables of state under different conditions of freezing soil moisture; generalized treatment of the effect of pressure on the freezing point, and its application to relatively moist soils - generalized Clausius - Clapeyron equation; and movement of soil moisture in relation to freezing phenomena in soils. Bibliography.

ANDERSON, H. W.

- (1) "Soil Freezing and Thawing as Related to Some Vegetation, Climatic, and Soil Variables", Journal of Forestry, Vol. 45, No. 2, Feb. 1947, 94-101.

ANDERSON, J. G.

- (1) "Solifluction, A Component of Subaerial Denudation", The Journal of Geology, Vol. 14, No. 2, Feb.-Mar. 1906, 91-112, The Univ. of Chicago Press, 5750 Ellis Ave., Chicago.

Description of an climatic features which cause the slow moving of soil from higher to lower ground by solifluction (derived from solum - "soil" and fluere - "to flow") in the subglacial climate of the Falkland Islands, the Rocky Mts., Spitzbergen and Scandinavia.

ANDERSON, M. S., DUTILLY, A., and FEUSTEL, I. G.

- (1) "Properties of Soils from North American Arctic Regions", Soil Science, Vol. 48, No. 3, Sept. 1939, 183-200.

This paper includes the chemical and mechanical analyses, mineralogical composition and organic content determinations of soil samples collected at 15 widely scattered locations from Churchill north to the 76th parallel. A detailed description of 37 samples is given, including the geological classification of parent rocks, vegetation types, groundwater conditions and soil acidity. The influence of mechanical weathering forces, especially freezing, thawing and wind action, predominate in arctic regions. Normal soil-forming processes of eluviation and illuviation are greatly retarded under the frigid climatic conditions. Reference is made to a shallow, clayey, alluvial soil found in a polygonic formation near Ft. Burwell, N.W.T. The authors state "the process of polygon formation is presumably directly related to a flooding or saturation of the soil with water followed by evaporation and resultant contraction of the material - a factor of particular importance relative to shrinkage behavior of this soil would seem to be the ratio silica to total bases". A bibliography of 20 references is included.

ANDRIANOV, P. I.

- (1) "Coefficients of Expansion of Soils at Freezing", Sovet, Izuchen Proizvod Sil, Kom. Izuchen Vechnoi Merzloty (Soviet Productive Force Study, Committee for the Study of Permanently Frozen Ground), Fase 1, 1936, 7-24; Acad. of Science, Moscow, USSR.
- (2) "Temperatures of Freezing of the Soils, The", Sovet Izuchen Proizvod Sil, Kom. Izuchen Vechnoi Merzloty (Committee for the Study of Permanently Frozen Ground), 1936, 25-54, Russian with Eng. summary, NN.
- (3) "Bound Water in Grounds and Soils", Trudy of the Inst. of Permafrostology, Vol. 3, 1946, 5-138, Acad. of Sci., Moscow, USSR, Russian, NSTef.

ANDRIENKO, N. I.

- (1) "Foundation and Construction on Permanently Frozen Ground", Information Bulletin, No. 11 (31), 1938, Russian.
- (2) "Building Foundations on Permanently Frozen Ground", Stroitel'naya Promyshlennost', No. 8, 1940, Moscow, USSR, Russian, DLG.

ANGSTROM, A. and PETRI, E.

- (1) "New Ground Thermometer and Some Observations on the Ground Temperature in the Vicinity of Stockholm", Teknisk Tidskrift, Vol. 58, 6-9-28, 237-241, Swedish.

ANTONOV, V. I. and ZHORNITSKY, E. L.

- (1) "Experiment of Rapid Construction in Yakutia", Glavsevmorput, 1941, 4Opp, Moscow-Leningrad USSR, Russian.

ANDERIEV, G. I.

- (1) "Swamps of the Kola Peninsula", Geographical Institute Report of the Soil - Botanical Party - Northern Scientific - Industrial Expedition, 1922, USSR, Russian.

ARCHIBALD, RAYMOND

- (1) "Peace River Bridge Builders Win Hard Race", Engineering News Record, Vol. 131, No. 6, 8-5-43, 4-5.

Describes the location of the bridge and problems encountered during construction. Includes several photos.

ARCTIC, DESERT & TROPIC BRANCH, AAF TACTICAL CENTER

- (1) "Handbook of Alaska", Informat'l Bulletin No. 18, April 1945, Hqts. AAF, SPDO-P.

General description of Alaska including topography, drainage, inhabitants, travel, climate, vegetation, animals, birds and fish. To be used in conjunction with the Pocket Guide to Alaska, prepared by the Special Service Division, ASF, the Arctic Manual (TM 1-240).

ARCTIC INSTITUTE OF NORTH AMERICA

- (1) "Project 'Snow Cornice' ", Preliminary Report, 1948, 85pp, SPDO-S.

This report comprises a compilation of preliminary statements which result from 1948 research of the Project "Snow Cornice". It outlines the basic objectives of the project. The area of operations embraced is the drainage basin of the Seward and Malaspina Glaciers on the International Boundary. It is in both Alaska and the Yukon Territory. Personnel employed represent both U.S. and Canada. Studies being made cover the following fields:

1. Glaciological and geological studies.
2. Seismic operations.
3. Sonic soundings.
4. Meteorology.
5. Botany.

- (2) "Permafrost Study at Norman Wells, NWT", Journal of the Arctic Inst. of North America, Vol. No. 1, 1948, p.69, AUL.

A study is being conducted by R. A. Hemstock in conjunction with the general construction program of the Imperial Oil Co. It was found that metal piles freeze in almost immediately after being driven. Permafrost was discovered at a depth of 140 feet in some abandoned wells.

ARMCO CULVERT MANUFACTURER'S ASSOCIATION

- (1) "Handbook of Culvert and Drainage Practice", 1937, 41,67,111, 305-8, & 331, R. R. Donnelly & Sons, Chicago.

Pressure due to frost action, transverse forces and frost action, depth of footings, frost heaves and frost boils, heaving track, and theory of frost heaving.

ARNDT, W. J.

- (1) "Temperature Changes and Duration of High and Low Temperatures in a Concrete Pavement", Proc. Highway Research Board, Vol. 23, 1943, 273-9.

Includes data on soil temperatures under concrete pavements for the period 1936-1941.

ARNOLD, F. P.

- (1) "Frost Breaks in Macadam Roads Due to Inadequate Drainage", Engineering News-Record, Vol. 79, #20, 11-5-17, 933.

Results of a field study of 96 bituminous macadam failed areas in Wyoming County, N. Y. The drainage conditions causing failure due to frost action and suggested remedial measures are described.

ARONOV, S. N.

- (1) "On the Depth of Burial of Water Mains", Vodosnabzhenie Sanit Tekhnika, No. 10-11, 1940, 74-77.

ASK, REYNOLD E.

- (1) "Fundamentals of Photogrammetric Engineering", Engineering News-Record, Vol. 133, No. 24, 12-14-44, 84-89.

This article considers topographic mapping including the use of various types of plotting equipment and methods such as the stereocomparagraph, the KEX plotter, the Brock process and the multiplex equipment; and military mapping including the Tri-Metrogon method, the continuous-strip camera, and night photography.

ATKINSON, E. B. AND BAY, C. E.

- (1) "Some Factors Affecting Frost-penetration", Trans. Amer. Geophysical Union, 1940, 935-951.

BAER, K. E.

- (1) "On the Ground Ice, or Frozen Soil of Siberia", Royal Geog. Soc. London, Journal, Vol. 8, 1838, 210-213.

BAILEY, CASAGRANDE, L.; TREUMPER, J. O.; STOKSTAD, O. L.; MORTON, J. O.; and WILLIS, EDW. A.

- (1) "Prevention of Detrimental Frost Heave", Proc. of Hwy. Res. Board - 18th Meeting, Part II, 1938, 356-365, BSL & AHL.

This is a symposium in which the various authors discuss different aspects of the problem of frost heaving.

BAIRD, P. D.

- (1) "Report on Visit to Alaska of Lt. Col. P. D. Baird", Canadian Arctic Research Group, AUL & EL.

This report includes an account of observations made at the Permafrost Test Area at Fairbanks, and at Point Barrow.

BARANOV, I. Y.

- (1) "Methods of Charting the Permafrost", Trudy of the Committee on Permafrost, Vol. 6, 1938, 107-125, Russian with sum. in Eng., DLC, Eng. Abstr. by Stef. avail. in SPDO-P, AUL, EL.

Article discusses various methods of mapping permafrost. These maps are made on scales of 1:5,000 to 1:500. It points out that for const. work, detailed maps showing configuration of surface of

BARANOV, I. Y. (cont'd)

seasonal and permafrozen ground, water bearing thawed ground, mechanical properties, thermal regime of the ground, degree of moisture, suitability of site, etc. should be made. There is also a discussion of climate, geol. struct. hydrogeology and vegetation. The author points out that drilling and test pits are necessary to obtain much of the desired information.

BARBER, E. S. and HOGENTOGLER, C. A.

- (1) "Trend of Soil Testing, The", Proc. 18th Annual Meeting, Part II, Dec. 1938, 9-34, Highway Research Board, SPDO-P.

The article is a resume of soil test methods and the significance of test data. Subjects discussed include the following: dominant colloidal phenomena; apparent volume of soil fractions; effect of film moisture on stability of the soil, effect of electrolytes; internal forces retain high density of soil; stability of soil determined by test; the consolidation test and its applications; shear tests; compaction tests; and indicator tests.

BARKSDALE, WM. L. and BLACK, ROBERT F.

- (1) "Permafrost Program Progress Report No. 5, Terrain and Permafrost, Umiat Area, Alaska", Sept. 1948, Geol. Survey - Mil. Geol. Section, SPDO-P.

This report describes briefly the topography, drainage, climate, vegetation, geology, permafrost and hydrology in the Umiat area of northern Alaska. Two terrain units, the floodplain of the Colville River and the bedrock hills of the Arctic Plateaus, are discussed in relation to material, vegetation, permafrost, and construction considerations. Areas of coarse-grained material, favorable for airfield construction, are scattered widely and their extent is limited. The permafrost conditions as described in this report are probably similar to those of other areas in the Arctic Plateaus of northern Alaska. Report includes maps of the Umiat area, aerial photograph of Umiat area, mean monthly maximum and minimum temperatures at Umiat, Umiat No. 1, test hole temperature log, and photographs of the area.

- (2) "Oriented Lakes of Northern Alaska," Journal of Geology, 1947, U. S. Geological Survey, Washington, D. C., DGS.

BARNES, L. C.

- (1) "Permafrost: A Challenge to Engineers", Military Engineer, Vol. 38, No. 243, Jan. 1946, 9-11, SPDO-P, AUL and EL.

This article gives a brief discussion on permafrost regions, thermal regime, as well as discussion of the permafrost project assigned to the St. Paul District by the Corps of Engineers, D.A.; discusses briefly the investigations and tests, project objectives, and includes several photographs of natural soil and ice formations.

BAVER, L. D.

- (1) "Soil Temperature", Soil Physics, Book, Chap. VIII, 1940, 370 pp total (153-155 & 275-289).

Discussion of effect of freezing and thawing on soil aggregation; relation of soil color to temperature; thermal properties of soils (specific heat, thermal conductivity, heat capacity, thermal diffusivity); theory of heat flow; soil factors affecting heat conductance; and daily and seasonal changes in soil temperature. Bibl. general discussion regarding soil temperature.

BAZHENOV, I. K., and NAGORSKY, M. P.

- (1) "Cambrian and Proterozoic of Eastern Sayan in the Area of Krasnoyarsk City", West Siberian Geol. Treat, Vestnik, Vol. 5, 1936, Russian

- (2) "Geology of the Krasnoyarsk Region", Materials on Geology of the Krasnoyarsk Area, Vol. 1, 1937, Russian, DIC.

BEDMAN, G. B. and DAY, P. R.

- (1) "Thermoelectric Method of Determining the Freezing Points of Soils", Proc. Soil Sci. Soc. of America, Vol. 2, 1937, 65-71.

The authors state objections to the commonly used method of determining freezing points of soils by means of the Beckman thermometer and describe equipment for thermoelectric measurement of freezing points. Experimental data on the effect of precooling temperatures on the freezing point and data on freezing point depression-moisture content relationships are given.

BEKKER, M. G. and LEGGET, ROBERT F.

- (1) "Fundamentals of Soil Action Under Vehicles", Tech. Memor. #6, Tech. Memor. #8, Nov. 1946, June 1947, SPDO-P.

This paper presents a mathematical analysis of the stability of a model representing wheel or track of a moving vehicle. The proposed method of determining a trafficability curve is based on accepted theories of Soil Mechanics and represents a continuation of the work described in Technical Memo No. 6. A cohesionless medium and the stability of a single wheel or a single track shoe with or without grouser is along considered. The proposed method, however, is general in scope and may be easily extended over cohesive soils and several wheels and shoes. No abstr. available for Part I of Tech. Memor. #6 although it is believed the contents are similar.

BELCHER, D. J.

- (1) "Engineering Significance of Soil Patterns", Proceedings, 23rd Annual Meeting, Highway Res. Board, 1943, 569, SPDO-P.

The term soil pattern is used in the comprehensive sense that includes not only the color pattern of soils but the numerous other factors recorded in an aerial photograph that are influenced by the soil. When properly evaluated, they indicate the engineering properties of the soil. A number of extensive soil areas are described in detail and test data showing their uniformity are presented. Photographs of these areas are included to illustrate their respective patterns.

- (2) "Development of Engineering Soil Maps, The", Engineering Bulletin, Vol. 27, No. 2, March 1943, 86-92, Purdue University, SPDO-P.

Engineering soil maps are made to indicate areas in which similar engineering soil problems can be expected. They are a source of information concerning soil types and drainage for planning highway and other construction projects.

- (3) "Identifying Land Forms and Soils By Aerial Photographs", Proc. Thirtieth Annual Road School, Extension Series No. 56, Jan. 1944, 133, Purdue University, Lafayette, Indiana, SPDO-P.

BELCHER, D. J., (cont'd)

Information on the engineering characteristics of soils can be obtained from aerial photographs providing a background of knowledge concerning the area being studied is available. The landform is the key to the type of parent material and the parent is the key to the general physical properties of the soil. Factors observed in analysis of aerial photographs include relief, drainage pattern, erosion, color pattern, vegetative cover, and land use. Bibliography.

- (4) "Report No. 4 on Aerial Photographic Reconnaissance Investigation", 12-1-45, Purdue U. Eng. Exp. Sta., SPDO-P.

A Permafrost study in the territory of Alaska conducted for the St. Paul District Office, US Engineer Department. A report on field exploration of areas containing both permafrost and unfrozen ground and the study of observable details found on aerial photographs of these areas. The areas investigated were Northway, Tanacross, Big Delta, Galena, and Nome, Alaska.

- (5) also Gregg, Jenkins, and Woods

"Origin, Distribution, and Airphoto Identification of U. S. Soils with Spec. Ref. to Airport and Highway Engineering, The", Tech. Development Report #52, May 1946, 202 pp and 63 plates, U. S. Dept. of Commerce CAA, Washington, D. C., SPDO-P.

Jenkins is of the CAA, the other three are from Purdue University. This report also contains an appendix B dated 1946. A comprehensive report describing the various soil and material deposits in the U. S. accompanied by a map showing their distribution; and application of the data to airport development.

- (6) also GREGG, L. E. and WOODS, K. B.

"Formation, Distribution, and Engineering Characteristics of Soils, The", Engineering Bulletin (Research Series #87), Engr. Res. Bull. No. 10, Jan. 1943, 125-132, Purdue University, Lafayette, Indiana, SPDO-P.

Discussion of frost action and its relation to nature of glacial drift; pedologic soil series, soil structure and to damage occurring during the frost melting period. Bibliography of 214 published works.

- (7) "Subgrade Soil Temperatures", Proceedings, Purdue Conference on Soil Mechanics and Its Applications, Symposium on Frost Action, 2-6 Sep. 1940, 474-482, Purdue University, Lafayette, Ind.

Data on and discussion of influence of air temperatures, propagation of temperatures, temperature and frost penetration in soils.

BELOTELKIN, K. T.

- (1) "Soil-Freezing and Forest-Cover", Transactions, American Geophysical Union, Pt. 1, 1941, 173-5.

Depth of and time of soil freezing and rapidity of thawing as related to type of forest cover, effect of snow cover, forest litter, natural internal soil drainage and soil texture on frost penetration.

BELYAYEV, P. M. and STCHEPOCHKIN, V. N.

- (1) "Experiments on Shatterability Strength of Frozen Grounds", Vol. 103, 1931, Inst. Eng. Means of Communication, Russian.

BELOKRYLOV, I. D.

- (1) "Permanently Frozen Ground and Railway Construction", Permanently Frozen Ground and Railway Transport, No. 8, 1931, 11-52, Moscow, USSR, Russian.

BENKELMAN, A. C. and BURTON, V. R.

- (1) "Relation of Certain Frost Phenomena to the Subgrade, The", Proc. 10th Annual Meeting Highway Res. Board, Vol. 10, Part 1, 1930, 259-275.

See Engineering News Record "Highway Progress and Investig." which is a staff review of "The Relation of Certain Frost Phenomena".

- (2) "Frost Action in Silt Soils Defined by Field and Cold-room Studies", Eng. News-Record, Feb. 12, 1931, 266-270, AHL.
Soil types are shown on the map. Construction features involved in grade design, methods of drainage, subgrade treatment. Soil expert to visit the job from time to time during the course of grading. "Subgrade treatment and drainage measures previously recommended are reviewed and checked and any changes deemed necessary from the information disclosed by the detailed study are ordered and made. Silt pockets, wet clay areas, saturated sand layers over clay and areas affected by seepage are carefully mapped and appropriate measures are taken to eliminate or to reduce ground swelling.

- (3) "Studies of Frost Heaves in Michigan", Roads and Streets, Vol. 71, No. 7, July 1931, 272-276, BSL.

A condensed version of papers by Burton and Benkelman, Proceedings, Highway Res. Board, Vol. 10, pp 259-275, 1930 and Benkelman and Olmstead, Proceedings, Highway Res. Board, Vol. 11, Pt. 1, pp 152-165, 1931. Also similar to paper by Benkelman presented at the 17th Annual Conference on Highway Engineering at the University of Michigan, Feb. 19, 1931.

- (4) also OLMSTEAD, F. R.

"A New Theory of Frost Heaving", Proc. 18th Meeting, also Proc. 11th Meeting, Part III and Vol. II, Part I, 1938 and 1931, 366-370, Highway Research Board, BSL, SPDO-P.

A new hypothesis on the mechanics of frost heaving based upon a fluctuating frost line. Discussion by A. Casagrande, W. I. Watkins, and S. Taber.

- (5) also OLMSTEAD, F. R.

"Cooperative Project on Structural Design of Non-Rigid Pavements", Proc. Highway Research Board, Vol. 26, 1946, 13-25, SPDO-P.

Progress report, including data on relationship between weather conditions, moisture content, density and maximum V-L (vertical-lateral pressure in triaxial test) for subgrade soil samples taken under the base course.

BENKELMAN, A. C. (cont'd)

(6) also BURTON, V. R.

"Relation of Certain Frost Phenomena to the Subgrade, The",
Eng. News Record, Vol. 105, No. 25, Dec. 18, 1930, 978-981.

A staff review of the above article which in its entirety is found in Proc. of Hwy. Research Board - Vol. 10, pp 259-275.

BENNET, E. F.

(1) "Frost Action in Soils", Proceedings of the Purdue Conference on Soils Mechanics and Its Application, July 1940 or 2-6 Sept. 1940, 471-473, Purdue University, Lafayette, Ind. SPDO-P.

Discussion on frost heave around culverts, drainage and the use of the soil survey for locating frost susceptible soils and soil conditions.

BEREZANTSEV, V. G.

(1) "Stability of Frozen Ground Under Foundations", Frozen Ground, Vol 2, No. 1, 1947, 48-54, Academy of Sciences, Moscow, USSR, Russian, DIC.

BEREZKIN, N.

(1) "A Route from the Village Olak, Okhotsk District of Maritime Province, to Seimchan on Kolyma River and from the latter to Yakutsk Across the Oimekon-Barochansk "Nasleg, Bayagantaisk Ulus of Yakutsk District", Izv. I.R.G.O., Vol. 51, 1915, 217-236, Russian.

BERG, L. S.

(1) "Dostizheniya sovetskoy geografii (1917-1947)", (Achievements of Soviet Geography (1917-1947)), 1948, 48, Len. Publ. House, Leningrad, USSR, Russian.

Includes Arctic exploration, advances made in study of permanently frozen soil, glaciology, and meteorology.

BERGGREN, W. P.

(1) "Prediction of Temperature Distribution in Frozen Soils", Transactions, American Geophysical Union, Part 3, 1943, 71-77.

Theoretical analysis of temperature distribution in frozen soils. Included are: analysis of an idealized system, solution of examples, and special adaptations of the analysis.

BERTRAM, COLIN

- (1) "Technique of Polar Travel, The", 1939, 125pp, W. Heffer & Sons, Ltd., Cambridge, England.

BERTRAM, G. E., BOYD, EUSTIS, FOSTER, HANSEN, JERVIS, McFADDEN, PRINGLE, PORTER, MIDDLEBROOKS, GRIFFITH, REDUS, TURNBULL

- (1) "Development of DBR Flexible Pavement Design Method for Airfields - A Symposium", Proc. Amer. Soc. Civ. Engineers, Vol. 75, Jan. 1949, 4-104, SPDO-P (abstr.).

This is a collection of 11 papers on the application of the CBR test to airport flexible pavements. The papers indicate in general that the CBR penetration tests and design curves yield very reliable results but that a satisfactory method of preparing laboratory samples has yet to be developed.

BESKOW, GUNNAR

- (1) "Soil Freezing and Frost Heaving with Special Application to Roads and Railroads", 26th Year Book, The Swedish Geological Society, Series C, No. 375, Nov 3, 1935, Technological Institute, Northwestern U., Evanston, Ill, Swedish, Trans. by Osterberg, available in BSL, SPDO-P.

Dr. Gunnar Beskow has devoted most of his life to the study of frost action of soils. This publication is a summary of his studies of the subject up to 1935 and is perhaps the only complete treatise on frost action. It contains a historical introduction and discussions of the structure of frozen soil, the process of soil freezing, heaving caused by the freezing of water in the soil or suction of water to the frost line, capillarity, permeability, groundwater, ground temperatures, and calculation of frost depth in soils.

- (2) "Prevention of Detrimental Frost Heave in Sweden", Proc. 18th Meeting, Part II, 1938, 366-370, BSL and AHL.

A classification of heave and frost boil characteristics based on type of pavement and a description of measures used to prevent damage by frost. Preventive measures described are the use of insulation and deep drainage. The depth of drains necessary to prevent detrimental frost action; the basis for selecting type of treatment; the use of additives; testing methods; and criteria for susceptibility of soils to frost heaving are discussed. A summary of Swedish experiences. Problems are essentially the same as those reported for this country.

- (3) "Scandinavian Soil Frost Research of the Past Decade", Proc. of the 27th An. Meeting (also Abstr. - Applied Mech. Review, Vol. 2, No. 9, Sept. 1949, p. 214), 1947, 372-381, Highway Research Board, Abstr. in SPDO-P.

Fundamental research work, dealing with conditions and mechanics of frost heave and frost boils and with methods for preventing and counteracting them (base exchange, isolation, deep drainage, etc.) was completed prior to 1935. A formula was written giving frostheave speed as a function of load pressure, groundwater depth, and fundamental soil

BESKOW, GUNNAR (Cont'd)

properties; capillarity, permeability, etc. In the past decade (1937-1946) the principal advance in this field has been the result of the comprehensive Norwegian investigation on frost depth as a function of temperature conditions and material properties. The paper describes this work and contemporary Swedish research in frost action. The effect of soil stabilizing chemicals on frost action is reported.

BEZRUK, V. M.

- (1) "On the Question of Thermal Treatment of Grounds", Pochve-vedenie (Soil Science), No. 8, 1940, 125-134.

BILIBIN, U. A.

- (1) "Active and Passive Permafrost, The", Izvestia of the Geographical Society, Vol. 69, No. 3, 1937, 409-411, Moscow-Leningrad, Russian, Russ. avail in DLC. Eng. abs. by Stef. avail. in SPDO-P and AUL EL.

This is a short article which discusses the origin of permafrost. The author cites two opposing theories. Permafrost is a product of the climate of some distant epoch and at the present time is gradually and constantly degrading; or permafrost is the direct result of present day climate. The author does not fully accept either point of view yet finds enough justification for each. He discusses the various phases of permafrost in so far as it occurs in Russia.

BIRKENGOF, A. L.

- (1) "Some Observations on the Forest Cover and Permafrost", Trudy of the Commission for the Study of Permafrost, Vol. III, 1934, 41-57, incl., Leningrad, Russian, DLC. Eng. abst. by Stef. avail. in SPDO-P and at EL and AUL.

This article is based on the author's observations on permafrost conditions in the basin of the Indighirka River. He points out that the daurian larch is the dominant tree and, north of 67° latitude, the only tree. In the southern part of the basin, birches, poplars, and aspens are found in addition to the daurian larch. The author discusses his theories as to the lack of reforestation in the tundra and other factors concerning vegetation in permafrost areas. The author concludes his observations by a description of a "sunken lake" described as the result of the thawing of fossil ice.

- (2) "Permanently Frozen Ground and Forests", Permanently Frozen Ground and Forests, 1938, 233-244, Acad. Science, Moscow, USSR, Russian, DLC.
- (3) "The Southern Border of Permafrost in the Lake Region of the Lower Amur River", Trudy of the Committee on Permafrost. Vol. IX, 1940, 39-56, Moscow, Russian, Microfilm in SPDO-P, Engl. abstr. by Stef. in SPDO-P.

This article deals with that portion of the lower Amur River region which is located between the Amur and Amgun

BIRKENGOF, A. L. (cont'd)

rivers, west of the Bureja mountains, usually known as the lake region of the Amur River. Describes the geological characteristics and history of the region. One of the typical characteristics of the region is the presence of permafrost islands and the southern border of the permafrost region. However, the information on the presence of permafrost, up to the time of this investigation, is very scant.

BLACK, ROBERT F.

- (1) "Permafrost Program - Progress Report No. 2 - Permafrost Investigation at Point Spencer, Alaska," 1946, U. S. Geological Survey, SPDO-P.

Report on an investigation of the regional geologic aspects of permafrost as related to military engineering problems, particularly in regard to selection of airfield sites, so that ultimately criteria can be established for the accurate forecast of the problems and conditions which will be encountered in permafrost areas of possible military interest that are inaccessible to ground reconnaissance. The immediate aim of the investigation at Point Spencer was to determine the geologic and permafrost conditions with special emphasis on groundwater.

- (2) also WAHRHAFTIG, CLYDE

"Preliminary Geologic Investigation of Railroad Track Difficulties in the Nenana River Gorge, Alaska", Military Geology Section, Dept. of the Interior, Jan. 1948, U. S. Geological Survey, Washington, D. C.

On 19 Oct. 1947, immediately after several earthquakes, the Alaska Railroad track at Mile 351.4 in the Nenana River Gorge, Alaska, began to settle at the rate of about 4 ft. a day. The authors visited the area 31 Oct. after the rate of settling had diminished to a few inches a day and made a geologic reconnaissance of other troubled areas along the railroad in that area. The geologic formations and troubled areas are sketched on the map accompanying this report but no attempt was made to survey areas accurately. Includes discussion of the geologic history of the area, engineering aspects of the geologic formations, summary of the causes of the track difficulties, general recommendations for control of the track difficulties, and discussion of some of the troubled areas.

- (3) "Terrain and Permafrost in the Barrow Area, Alaska", U. S. Geological Survey, Washington D. C.

Investigation in progress. No report available.

- (4) "Polygonal Ground and Related Permafrost Phenomena of Northern Alaska", U. S. Geological Survey, Washington, D. C.

Investigation in progress. No report available.

BOBKOV, N. B.

- (1) "Engineering-Geologic Investigations in Connection with the Planning of Various Engineering Constructions", Gos. Geologo-Razved. Izd-Vo, 1932, O.N.T.I. - N.K.T.P., Moscow-Leningrad USSR.

BOCH, S. G.

- (1) "On the Occurrence of Permanently Frozen Ground in Northern Ural", Priroda, No. 5, 1938, 80-84, Russian.

BOGDANOFF, F. M.

- (1) "On the Question of the Degradation of Perpetually Frozen Soil", Prob. Soviet Geology, also Nauch. Labrb of Min. Vol. 3, / and Ref. II, Heft 4, 1934/and 1935, 232-234/539, Russian.

This article discusses evidence of past frost action in coal and caves in present temperate belt with remains of polar animals.

BOGDANOV, N. B.

- (1) "Permanently Frozen Ground and Construction on It," Spec. Commission Investigating the railroads in Russia, St. Petersburg, fasc. 82, 1912, St. Petersburg, USSR, Russian.

BOGDANOVICH, K. I.

- (1) "Geology and Economic Deposits of Irkutsk Province", Geol. Invest. and Prospect. Along the Siberian Railroad, fasc. 2, 1896.

- (2) "Sketches of the Chukotsky Peninsula", 1901, Pettersburg, USSR, Russian.

BOGOSLOVSKY, N. N., CHEKOTILLA, A. M., DEMENTIEV, A. I., KACHURIN, S. P., LAPKIN, O. I., SALTNIKOV, N. I. and TSYTOVICH, N. A.

- (1) "Shallow Foundations of Buildings with a Few Stories", Dept. of Foundation Placement for Buildings, w/few stories in conj. w/season freez. of the ground; 1946, 16-42, Acad. of Sci., Moscow-Leningrad, USSR, Russian, DLC and NN. Abstr. by Stef. avail. in SPDO-P, at AUL & EL.

The author discusses the possibility of building small buildings of more than two stories with the basements or cellars on almost any ground since they can easily withstand small, uneven settlement. He points out that in these cases it may be possible to avoid expensive and deep foundations. He states that the nature of the frozen ground, the nature of ground swelling, and the extent of swelling of various types of ground are factors which must be considered. The author states that the phenomenon of migration of moisture in the ground is of more importance than the freezing of the water in the pores of the ground. He lists twelve basic principles of foundation construction.

BONCHKOVSKY, V. F., AND BONCHKOVSKY, U. V.

- (1) "Study of the Applicability of the Seismic Method for the Determination of the Upper Surface of Permafrost, The", Trudy of the Commission on Permafrost, Vol. 5, 1937, 131-162, Moscow, Russian, DLC, Eng. abstr. by Stef. avail. SPDO-P, AUL & EL.

This is a rather detailed discussion of methods and equipment used in the application of the seismic method for determination of the upper surface of permafrost. The author states that the seismic method is very dependable for determining depths of the upper surface of permafrost where the permafrost is near the surface. He also discusses other factors of the seismic method. A bibliography of two titles is given.

BONNARD, D., and STUCKY, A.

- (1) "Theory of Formation of Frozen Lenses in Soils; Application of Theory to Study of Soil Freezing in Subgrades of Several Swiss Highways", Bul. - Technique de la Suisse Romande, Vol. 64 No. 7, Mar. 26, 1938, 85-92.

BORISEVICH, E. S. and OGIEVICH, I. B.

- (1) "Contact Sagging Meters", Seismologicheskii Inst., Acad. of Sci., Moscow, USSR, Russian.

BORISSYAK, A. A.

- (1) "Geologic Sketch of Siberia", 1923.

BOUYOUKOS, G. J.

- (1) "An Investigation of Soil Temperatures and Some of the Factors Influencing It", Mich. Ag. College, Exp. Sta., Technical Bul. No. 17, Feb. 1913, 196 pp, Mich. Agricultural College, East Lansing, Michigan, SPDO-P.

The results of heat conductivity experiments on natural soils (gravel, sand, loam, clay and peat), and the effect of snow cover on soil temperatures, also given are data on the freezing point of solutions in sand (NaCl , KCl , K_2CO_3 , KNO_3 , CaCl_2 and $(\text{NH}_4)_2\text{CO}_3$) and on the effect of the following admixtures on the rate of rising and lowering of temperatures; NH_4Cl , NaNO_3 , CaCl_2 , K_2HPO_4 , K_2CO_3 and K_2SO_4 .

- (2) "Effect of Temperature on Movement of Water Vapor and Capillary Moisture in Soils", Journal of Agricultural Research, Vol. 5, No. 4, Oct. 25, 1915, 141-172.

Test apparatus, test methods, experimental data and theory of movement of moisture from warm soil to cold soil at various initial moisture contents. Includes data on both vapor movement and capillary movement of moisture and relation of temperature to surface tension and viscosity of water.

BOUYOUCOS, G. J. (cont'd)

(3) also McCOOL, M. M.

"Freezing Point Method as a New Means of Measuring the Concentration of the Soil Solution Directly in the Soil, The", Mich. Ag. College, Exp. Sta., Tech. Bul. No. 24, Dec. 1915, 44 pp. Mich. Agricultural College, East Lansing, Michigan, SPDO-P.

A correlation exists between the concentration of the soil solution and the freezing point of the soil. Further discussion is given in Technical Bul. 31, 1916 by the same author.

(4) "Soil Temperature", Mich. Ag. College, Exp. Sta., Tech. Bulletin No. 26, Jan. 1916, 133 pp, Mich. Agricultural College, East Lansing, Michigan, SPDO-P.

The author reviews his previous work (Tech. Bul. No. 17, 1913) on specific heat and conductivity tests and presents voluminous soil temperature data taken during 1913, 1914 and 1915. He also discusses the effect of meteorological elements on the soil temperature; daily and monthly maximum and minimum temperature, the monthly amplitude, and the degree of amplitude for different depths and the law it follows.

(5) also McCOOL, M. M.

"Freezing Point Lowering of Soils", Technical Bulletin #31, 31st Ann. Rpt. of Exper. Sta. Mich. Ag. College, 1917, 558-605, Mich. Agricultural College, East Lansing, Michigan.

(6) "Classification and Measurement of Different Forms of Water in the Soil by Means of the Dilatometer Method", Mich. Ag. College Exp. Sta. Tech. Bulletin, No. 36, Sept. 1917, 48 pp, Mich. Agricultural College, East Lansing, Michigan, SPDO-P.

The author discusses the principle of the dilatometer method, and its use in determining the relative amounts of free, capillary, absorbed, and combined water; describes the apparatus (dilatometer) and procedure used; and presents experimental data giving the percent unfreezable water at various temperatures for different soils. He also presents data showing volume change, temperature, relationships; the effect of salts on the amount of freezable water, and the relationship between texture and unfreezable water.

(7) "A New Classification of Soil Moisture", Soil Science, Vol. II, No. 1, Jan. 1921, 33-47.

The author on the basis of past researches (listed in this bibliography) classifies soil water into groups on the basis of its freezing point. The author proposes a new classification of soils based on the principle of the freezing of water.

Gravitational

Free	- freezes 1st time at supercooling of	-1.50C
(	Capillary - adsorbed	-4.00C
Unfree	(minus the free water)	-7.80C
(	Combined - (Water of solid solution)	does not freeze
(	(water of hydration)	at all

BOUYOUKOS, G. J. (cont'd)

(8) also McCOOL, M. M.

"A Study of the Causes of Frost Occurrence in Muck Soils", Soil Science, Vol. 14, No. 5, Nov. 1922, p. 383.

The authors present air and soil temperature data and discuss the effect of soil color; differences in temperature of air at various elevations above ground; differences in specific heat by volume of soil; and differences in head conductivity of soils on the occurrence of frost in muck soils.

(9) "Movement of Soils Moisture from Small to the Large Capillaries of the Soil Upon Freezing", Journal of Agricultural Research, Vol. 24, No. 5, May 5, 1923, 427-431, SPDO-P.

The author presents data showing the effect of alternate freezing, thawing, stirring and standing on the freezing point depression of soils. From the data, he arrives at a hypothesis on the movement of moisture from the small to the large capillaries. When a soil short of saturation is frozen, the force of crystallization tends to draw the moisture from the small capillaries and from around the small particles as thick films into the larger capillaries. When the soil is wet or saturated under proper conditions moisture freezes at the surface of the soil and forms capillary ice columns or thin needle-like crystals. The force of crystallization draws the water from below, which freezes at the lower end of the column and pushes the entire column upward.

(10) also McCOOL, M. M.

"Correct Explanation for the Heaving of Soils, Plants and Pavements, The", Journal Am. Soc. of Agronomy, Vol 20, No. 5, May 1928, 480-491.

Three different types of heaving are described and an explanation of the causes of frost heaving is given. The formation of ice crystals and the movement of soil moisture associated with crystal formation are discussed.

(11) "A New Electrical Resistance Thermometer for Soils", Soil Science, (Also Highway Research Abstracts, No. 141, May 1947) Vol 63, No. 4, April 1947, 291-298.

Description of two new types of liquid electrical resistance thermometers for measuring soil temperature under field conditions.

(12) also MICK, A. H.

"Improvements in the Plaster of Paris Absorption Block Electrical Resistance Method for Measuring Soil Moisture Under Field Conditions", Soil Science, (Also Highway Research Abstracts, Vol. 17, No. 8, Sept. 1947), Vol 63, No. 6, June 1947, 455-465.

Description and fundamental principles of the Plaster of Paris block, its limitations and its advantages in determining soil moisture and the freezing point of soils.

BOUYOUCOS, G. J. (cont'd)

(13) also MICK, A. H.

"An Electrical Resistance Method for the Continuous Measurement of Soil Moisture Under Field Conditions", Mich. Agr. Exp. Sta. Tech. Bull. Tech. Bull. 172, April 1940.

(14) "Nylon Electrical Resistance Unit for Making Continuous Measurement of Soil Moisture in the Field", Hwy. Res. Abstr. or (Soil Science, Vol. 67 #4, Apr. 1949, p 319-330, Hwy Res. Abstr. Vol. 19 #7, July 1949), Vol. 18, #10, Nov. 1948, 6-7, Hwy Res Board, SPDO-P.

Contents as found in "Soil Science"

1. Principle of the Nylon unit.
2. Resistance Measuring instruments
3. Calibration
4. Performance Characteristics
5. Moisture Curves of Various Types of Soil
6. Comparison between Nylon and Fiber-glass Units
7. Effect of Salts
8. Effect of Temperature
9. Directions for Use
- 10 Summary and Conclusions.

(15) "Degree of Temperature to which Soils Can Be Cooled Without Freezing", Journal of Agricultural Research, Vol. 20, No. 4, 15 Nov. 1920, 267-269.

The results of experimental studies to determine the limit of supercooling which soils can resist without freezing.

BRATTSEV, L. A.

(1) "Sinking of Shafts in Permanently Frozen Ground in Vorkuta Coal Basin", Russian.

BRETH, H., ENDELL, K. AND LOOS, W.

(1) "Report on Original Experimental Studies of Relation Between Freezing of Soils and its Physical Prop: Condition of Soil Colloids, Water Capacity, Etc.", Forschungs arbeiten aus dem Strassenwesen, Bull. No. 16, 1939, 655 pp, German.

BRIDGMAN, P. W.

(1) "Effect of Pressure on the Freezing Point of Water", Smithsonian Phys. Tables, Vol. 71, 1921, 200 pp.

Table showing the "Effect of Pressure on the Freezing Point of Water".

BROADWELL, J. A.

(1) "How CAA Engineers Meet Construction Problems North of the Arctic Circle", Pacific Builder and Engineer, Vol. 51, No. 4, April 1945, 55-56, SPDO-P.

An article on the construction of landing strips and radio navigational aides at Kotzebue and Shungnak, which described transportation, labor, weather conditions, and utilities.

BROOKS, A. H.

- (1) "The Kougarak Region", U. S. Geological Survey Bulletin, 328, 1908, 294-328, USGS, Washington, D. C.

Area includes Bendeleben Mountains on southeast, a low basin to the northwest of the mountains, and to the north the dissected upland. Bedrock is primarily schist and a crystalline limestone. Alluvium, widely scattered, consists of (1) gravels, sands and clay, underlying modern deposits in valleys; (2) the bench gravels; and (3) the present stream gravels. Brief discussion of geologic history including a sequence of geologic events that lead to present erosional features is set forth. Author then discusses in some detail the various gold placers, including description of deposits; i. e., benches and valley fillings.

- (2) "Antimony Deposits of Alaska", Bull. 649, 1916, U. S. Geol. Survey, Washington, D. C.

BROWN, A. W. A. and HALLIDAY, W. E. D.

- (1) "Distribution of Some Important Forest Trees in Canada, The", Ecology, Vol. 24, No. 3, 1943, 353-373, Domin. Forest Service, Ottawa, Canada.

This paper presents maps showing the distribution of 20 forest trees in Canada, not only the boundaries of their range but also by contours showing population intensity (of the particular species) within this range. Methods and techniques employed in this survey are discussed in detail. Canadian forests are divided into four major biotas: (1) mixed eastern (2) western mountainous; (3) boreal or northern; and (4) coastal. Of special interest is the boreal forest which is centered in the Yukon valley. Individual species discussed include white spruce, black spruce, tamarack, aspen, balsam poplar, paper birch, lodgepole pine, and alpine fir. (With the exception of the last two species, all of these trees are common in the permafrost zone of Alaska). Some plant geographers say that both lodgepole pine and alpine fir occur near the Alaska-Canada boundary line and possibly extend into Alaska proper in the vicinity of the Alaska range. Special emphasis is placed on the effect on plant distribution produced by the major glaciations. The northern limits of various tree species correspond strikingly with the July isotherm. Other factors contributing to tree distribution include occasional references to soil and moisture conditions, seeding habits of the particular species, and the effect of forest fires and logging operations. Bibliography of 25 papers is included.

BRYAN, KIRK

- (1) "Permanently Frozen Ground", The Military Engineer, Vol. 38, April 1946, 168, A.U.L.,

A letter to editor containing comments on article "Permafrost: A Challenge to Engineers" by Col. Lynn C. Barnes. The author here proposes a new set of terms to be used in lieu of the present terminology about permafrost.

BRYAN, KIRK (cont'd)

- (2) "Study of Permanently Frozen Ground and Intensive Frost Action, The", The Military Engineer, Vol. XL, No. 273, July 1948, 304-308, SPDO-P & AUL.

Cryopedology is suggested as a suitable name for the sub-science concerned with the study, both theoretical and practical, of intensive frost-action and permanently frozen ground. Sixteen other terms are also introduced and defined. Of these the important ones are pergelisol, permanently frozen ground, and mollisol, the overlying seasonally thawed ground in which intensive frost-action occurs. Comments on the suitability of Professor Bryan's terminology follow the main article. Some of the terms suggested and their definitions are:

1. Congelifract - a fragment of soil broken off by frost action.
2. Congeliturbate - rubble created by frost action.
3. Pergelisol - permanently frozen soil.
4. Mollisol - active layer.
5. Tabetisol - unfrozen ground.
6. Tjalele - permafrost.

BUDEL, JULIUS

- (1) "Examination of Ice-free Arctic Land Areas With Special Reference to Morphological and Climatic Variations, and the Process of Solifluction Which Characterizes These Areas, as Affected by Climate", Erdkunde, BD. 2, Lfg. 1/3, 1948, 22-53, German.

BUETOW, W. C.

- (1) "Causes and Control of Damaging Frost Action in Shoulders and Sub-grades", Proc. of 8th Annual Asphalt Paving Conference", Proc. of 8th Annual Asphalt Paving Conference, 8th An. Rpt. 1929, 146-151, The Asphalt Association.

General description of the action of frost boils and methods used in their eradication.

BUKREEV, P. A.

- (1) "Waterproofing and Drainage of Defense and Non-Defense Constructions", Strojizdat Narkomstroja", 1943, 3-124, Russian, DIC & DGS. Eng. abst. by Stef. and part trans. by U. of Minn. avail SPDO-P. Abstr. avail. at EL & AUL.

Chapters translated are the following:

1. Characteristics and Origin of Ground Water
2. Drainage Operations
3. Pumping Operations
4. Special Measures for Preventing the Inflow of Water
5. Measures of Waterproofing Against Groundwater
6. Waterproofing Barriers for Unstable and Water-Bearing Soils.

This book contains a description of the construction and methods of work most frequently used to protect construction work, completely or partly built in the ground, from surface and ground waters. He discusses the properties of subterranean

BUKREEV, P. A. (cont'd)

waters and their origin; drainage works; methods of preventing the inflow of water into the construction work; methods of waterproofing; and special provisions against capillary action. A bibliography of 51 titles is included.

BULGAKOV, A. I.

- (1) "Industrial Construction Under the Conditions of Constant Soil Congelation in the Anadyr District", Bulletin Far East Branch, No. 12, 1935, 81-91, Acad. of Science, Moscow, USSR, Russian, DIC.

In this article, the author recommends insulating layers of pumice below the foundations.

BURICE, M. F.

- (1) "Soil Temperature in the Matanuska Valley of Alaska", Transactions, American Geophysical Union, Part 1, 1943, 151.
Relates to temperature above freezing and for depths of 0-2-4-8 inches.

BUSH, JAMES D.

- (1) "Definite Project Report for Ladd Field, Fairbanks, Alaska", Jan. 15, 1941, U.S.E.O. Ladd Field, Fairbanks, Alaska, SPDO-P.
This report covers the location and description of the project such as the land, soil, weather and buildings along with progress and sequence of the work, wage scales, plans and specs., construction data and estimated cost.

BYDIN, F. I.

- (1) "Struggling with Ice Break-ups on the Svir River" Edition of Svirstroi, 1933, 158pp, Russian.
- (2) "Investigations in the Methodology of Forecasting the Ice-regime" Trans. Inst. Hydrotech. Vol. 15, 1935, 185-203, Russian.
- (3) "Thermal and Ice-regime of Some Rivers in USSR and the Conditions of Foreseeing the Same", Bull. Ass. International Hydrol. Sci. No. 23, 1937, 245-273.

BYERS, H. G. and SMITH, W. O.

- (1) "Thermal Conductivity of Dry Soils of Certain of the Great Soil Groups, The", Proc. Soil Science Society of America, Vol. 3, 1938, 13-19.
The thermal conductivity of dry soils and its relation to volume weight and porosity; and the conductivity of different soils of the various great soil groups. An equation is developed by means of which thermal conductivity can be computed.

BYKOV, G. E.

- (1) "On the Question of Climates During the Quaternary Period of the Far East and On the History of Permanently Frozen Grounds:" Comptes Rendus de l'Academie des sciences d l'URSS, Vol. 20, No. 5, 1938, 387-390, English.

BYKOV, G.E. (cont'd)

This article discusses pollen preserved on terraces of the Amur River. The highest shows cold flora. The Intermediate shows a sub-tropical flora. The lowest shows a temperate flora. It states that permafrost "was not distinctive of the entire Quaternary period." No one claims that permafrost has been stable through the entire Quaternary. Fluctuations are generally recognized.

BYKOV, N. I.

- (1) "Experimental Work of the Permafrost Station", Construction Industry, Vol. 15, No. 7-8-11, 1937, 24-28, Russian.

This article discusses ideal construction of house floors for the permafrost areas. An air tight, draft-proof condition is essential according to the author.

- (2) "Permanently Frozen Ground and the Building of Igarka", Industrializatsiya Sovetskogo Vostoka, Vol. 2a, 1934, Centr. Bu. of Krayevedeniya, Moscow, USSR, Russian.

CAKO, B. H.

- (1) "Certain Data on Permanently Frozen Ground in (downstream) Yenisei", Problems of the Arctic, No. 1, 62-79. Russian.

CALCIUM CHLORIDE ASSOCIATION NEWS

- (1) "Calcium Chloride Treated Roads Guard Against Spring Breakup", Calcium Chloride Association News, Vol. 10, No. 3, June 1944, pp. 3-5.

Summary of experiences in six counties in Minnesota on the effectiveness of calcium chloride introduced in holes in the subgrade in preventing spring breakup.

- (2) "Preventing Detrimental Frost Heaving (By Treatment of Eruption Areas with Calcium Chloride)", Information Sheet, Brief No. F-61, Revised February 1945, SPDO-P.

This pamphlet discusses correction and prevention methods, early subsoil treatments, CaCl_2 admix in bases. CaCl_2 maintained surfaces. Includes several photos.

CALLENDAR, H. L.

- (1) "Preliminary Results of Observations of Soil Temp. with Electrical Resistance Thermometers Made at the McDonald Physics Bldg. McGill University, Montreal", Transactions, Royal Society of Canada, Second Ser., Vol. 1, Sec. 3, May 1895, 63-84.

Description of electrical resistance thermometers and procedure used in observing temp. of soil to depth of 9 ft. Results presented graphically show iso-thermal diagram for winter months, diurnal variations in air and in soil temp. at various depths, variation of temp. with depth on various dates, and integrated curves of sunshine. Presented also is a method of computing thermal diffusivity from graphical temperature data.

- (2) also McLEOD, C. H.
"Observations of Soil Temperatures with Electrical Resistance Thermometers", Proc. and Transactions Royal Society of Canada, Vol. 2, Sec. 3, May 1896, 109-126.

CALLENDAR, H. L. (cont'd)

A continuation of the May 1895 report by the Senior Author giving more complete data on soil temp. The data are presented in form of an isothermal diagram, March 1895 to April 1896 and curves showing variation in temp. w/depth. A table of thermal diffusivity values are given for various seasons of the year for various depths.

CAMERON, F. K. and GALLAGHER, F. E.

- (1) "Moisture Content and Physical Conditions of Soils", U. S. Dept. of Agric. Bureau of Soils, Bul. #50, 1908, Dept. of Agric., Washington, D. C.

CANADIAN NATIONAL RAILWAYS

- (1) "Perpetually Frozen Subsoil in Northern Canada", 29 March 1940, Office of Chief Engineer, Can. Nat. Ryys., Western Region, Winnipeg, Manitoba, AUL & DES.

This compilation contains the following articles, each filed under its own author in Permafrost Bibliography.

1. Hill, R.M.M. - Memo re Perpetually Frozen Subsoil Observations in the Vicinity of the Hudson Bay Railway.
2. Thompson, W.A. - Soil Temperatures at Winnipeg, Manitoba
3. Harrington, E. L. - Soil Temperatures at Saskatchewan
4. Nat. Res. Comm. of Can-Soil Temperatures in Canada - Observ. of Soil Temperatures.
5. Nikiforoff, C. - The Perpetually Frozen Subsoil of Siberia.

CAPPS, S. R.

- (1) "Rock Glaciers in Alaska", Jour. Geol., Vol. 18, 1910, 359-375.

- (2) "The Chisana-White River District, Alaska", U. S. Geological Survey Bulletin, 630, 1916, U.S.G.S., Washington, D. C.
Describes general geology and geography of this region with several illustrations and maps.

- (3) "The Kantishna Region, Alaska", U. S. Geological Survey Bulletin, 687, 1919, U.S.G.S., Washington, D. C.

This bulletin covers an area bounded by the Alaska Range on the south, the Tanana River on the north, the Nenana River on the east, and the lower Kantishna River on the west; the area lies between the Village of Nenana and Mt. McKinley. Field work was done in 1916. The geography and geology of this area was undertaken in 1916 because the Alaska Railroad was being built adjacent to this area, and it was anticipated that mining activity would be greatly increased. Coal as well as gold, silver and antimony were found.

- (4) "Glaciation in Alaska", U. S. Geological Survey Professional Paper, 170-A, 1931, U.S.G.S., Washington, D. C.

A discussion of mainly pleistocene glaciation in Alaska.

CARPS, STEPHEN R. (cont'd)

- (5) "Geology of the Alaska Railroad Region", U. S. Geological Survey Bulletin, 907, 1940, U.S.G.S., Washington, D. C.
Describes geology and geography of an area 140 miles wide and 450 miles long from north to south reaching from Gulf of Alaska northward into Yukon Basin. Includes illustrations and maps.

CARPENTER, MARTIN R.

- (1) "Building Ice Skating Rinks", Refrigerating Engineering, Vol. 21, May 1931, 334.

This article discusses various design and operating factors including cooling loads for winter and summer.

CARTER, D.

- (1) "Defrosting the Frozen North, Report on Institute of Eternally Frozen Soil", Science Digest, Vol. 17, May 19, 1945, 4-8, Science Digest, Inc., Chicago 11, Ill., DLC, AUL, & SPDO-P.

Taken from TORONTO STAR WEEKLY:

A general statement on Russian experience, presumably as a result of an interview with Prof. V. Obruchev, member of the Rus. Ac. of Sci. and Director of the Inst. of Etern. Fr. Soil. Suvgin's theory of defrosting the northland is mentioned. In accordance with this theory, and as a result of experience, agriculture has been extended. It has been found however, that soil should not be thawed beyond a depth of 2 feet, in order to conserve ground moisture. Permafrost stations have been established at Igarka, Yakutsky, Anadyr, and Vorkuta.

CASAGRANDE, L.

- (1) "Discussion on Frost Heaving", Highway Research Board, Proc. of 11th Annual Meeting, Vol. 11, Part 1, 1931 or 1932, 168-172, Lord Baltimore Press, Baltimore, Md., BSL.

This is a discussion on paper "A New Theory of Frost Heave" by Bankelman and Olmstead. A discussion on the main points of differences between the Bankelman-Olmstead and Taber theories of the mechanics of frost heaving.

- (2)* "Prevention of Detrimental Frost Heave", Proc. Highway Research Board, Vol. 18, Part 2, 1938, 356-365,

A symposium reviewing the theory of frost action; measures in use in New Hampshire, Washington, Michigan and Germany for preventing detrimental frost action; and suggestions for new research.

- (3) "Effects of Frost in Soil", Permanent International Asscn. of Road Congresses, 1st and 2nd sec. combined, 8th Congress The Hague, 6th question, 1938, 10-11.

Brief summary concerning the limiting grain size between frost susceptible and nonfrost-susceptible soils.

*CASAGRANDE, L., MORTON, J.O., STOKSTAD, O.L., & TREMPER, B.

CASAGRANDE, L. (cont'd)

- (4) "Experimental Road Sections: The Drainage of Foundations", Strasse, 1938, 5 (16), 529. Road Abstracts (also Road Abstracts, Vol. 5, No. 5, abst. 273, pp. 73-74, Aug. 1938) Vol. 6, No. 1, abst. 280, 145-39, p. 5.

A discussion of the effectiveness of drainage on frost action on experimental road sections in Baden, Germany.

- (5) "What Has Frost Damage of Last Winter Taught Us", Road Abstracts (also Hwy. Research Abstracts, No. 86, January 1942), Vol. 8, No. 11, abst. #343, 10-14-41, p. 133.

Description of the effects of exceptional hard winter of 1939-40 on German highways. A review of criteria on effectiveness of frost prevention for average winters, effect of grain size, granular bases, drainage, necessity for dwelling concrete pavements and others.

- (6) "Lessons from Frost Damage to Roads", Roads and Bridges (Canada), Vol. 80, No. 2, Feb. 1942, p. 100, AHL.

An abstract of Casagrande, L. "What Has the Frost Damage of Last Winter Taught Us" Strasse 1940, pp 193-201, July 9/10. A summary of an article describing German experience in 1939-40 with frost damage to roads.

- (7) "Ice Pressure Determinations in Clay Soils", Eng. News Record (Magazine), Vol. 115, No. 4, July 25, 1935, 127.

The above paper was given by Casagrande at the 1935 meeting of the Soc. for the Prom. of Eng. Educ. The staff review gives data and shows graphically the unit pressures (in a consolid. test) required to reduce the soil moisture contents to the values obtained during ice segregation in freezing tests.

CEDERSTROM, D. J., and PEWE, TROY L.

- (1) "Preliminary Report on Permafrost and Ground Water Investigations in the Fairbanks Area, Alaska (a)", U. S. Geological Survey, 1947, Washington, D. C., DGS.

CHEKOTILLO, A. M.

- (1) "Icings and Countermeasures", 1940, 5-131, Inst. of Permafrostology, Moscow, Russian, Eng. abst. by Stef. & U. of Minn. avail; in SPDO-P, AUL & EL.

This book represents an attempt to collect and systematize existing material on the question of measures of combating the phenomenon called by the Russian "Naled" (plural Naledi). The book is divided into the following chapters: Process of formation of the "Naled" and the phenomenon caused by it; The value of water pressure in naled; The snow cover as a factor in the formation and activity of naled; The effect of naled on engineering construction; History of development of measures against naled, where the author summarizes the methods up to 1928; Modern methods of combating naled. A bibliography of 20 titles is included.

CHEKOTILLO, A. M. (cont'd)

- (2) "Gigantic Naledi or Icings of Northeastern Siberia", Nauka i Zluzn, No. 1, 1945, 26-29, Moscow, Russian, DLC, Engl. abst. by Stef. avail. in SPDO-P, AUL & EL.

The author describes the peculiar arctic phenomenon known in Russian literature as "naled" and throughout Siberia by the Yakut term "taryn" and called "icing" in English literature. River "naleds" are formed as a result of the freezing of the shores and the increase of the thickness of ice covering. The water under the ice seeks an outlet and once having broken through, it spreads along the surface and freezes. A similar process takes place during the formation of ground "naleds". In spite of the abundance of water in the summer in rivers and lakes in Siberia, the problem of water supply in the winter is difficult. A study is being made to determine the possibility of using the underground water supply of the naleds to provide a dependable water supply for mining and other purposes.

- (3) "Use of Snow, Ice, and Frozen Ground for Construction Purposes, The", Izd. Institut. Merzlotovedenie, 1945, 2-62, Academy of Sciences, Moscow-Leningrad USSR, Russian, DLC, Eng. abst. by Stef. avail. in SPDO-P, AUL, EL & DGL.

This article is intended to familiarize engineering circles with the technique of construction which utilizes snow, ice and frozen ground. The various methods of using snow and ice in frozen ground for construction purposes is discussed in detail. A bibliography of 76 titles is included.

- (4) "The Underground Storage Places in the Permafrozen Ground", Priroda, Vol. 11, 1946, 27-32, Russian, D.L.C., Eng. trans. at SPDO-P, A.U.L., E.L.

Annot: The author discusses the use of the huge reserve of cold stored in permafrost areas in Russia and methods of constructing, operating, and maintaining such underground storage places. The advantages and disadvantages of the various types of soils to be encountered are briefly mentioned. Some of the important factors discussed are the insulation, materials, ventilation, temperatures, depth, dimensions, etc. Geographical references as to location of various cold storage places is given and the author lists other uses for these subsurface rooms besides food storage. A bibliography of 12 titles is included.

- (5) "Measures Against Naledi (Icings)", Priroda, No. 1, 1946, 20-28, Russian, DLC. Engl. abst. by Stef. avail. in SPDO-P, AUL & EL.

This article discusses various measures to prevent icing. These include drainage, seasonal or permanently frozen belts, Temporary or permanent obstructions, changing of the water course, enlargement of excavated areas, and the change of construction location. The application of various items to prevent icing is discussed in detail. A bibliography of 21 titles is given.

CHEKOTILLO, A. M. (cont'd)

- (6) "Five Years of Construction and Use of Ice Storage Houses", 1946, 3-79, Obruchev Inst. of Permafrostology, Leningrad, Russian, DLC. Eng. abstr. by Stef. avail. in SPDO-P, AUL & EL & DGS.

This brochure summarizes the experience gained through the construction and utilization of ice storage houses in the U.S.S.R. The author discusses the method of construction of ice houses, dimensions, site selection, etc. He also points out the defects in the original plans and details of construction for new types. Repairing and winter cooling of the storage houses are also discussed. Facts and figures on the preservation of various types of vegetables is included. A bibliography of 9 titles is given.

- (7) also Obruchev, V. A.
"In Memory of M. I. Sumgin", Trudy, Permafrost Institute, Vol. 6, 1944, 3-7, Russian, DLC.

- (8) also Geniev, N. N.; and Sumgin, M. I.
"Water Supply of Railroads in the Areas of Permafrost", 1939, 251 pp., State RR Trans. Pr. Off. Moscow, USSR, Russian, Partial translation by H. Shantz in SPDO-P.

The following are the titles of the various sections translated:

1. Thermo-dynamics in a Water Distribution System
2. Turning on of water in Water Distribution System
3. Installation of Pipelines During the Winter
4. Heat Flow at the Contact Between a Liquid and a Solid.

- (9) "Utilization of Snow, Ice and Frozen Ground in Fortifications", Utilization of Snow, Ice and Frozen Ground in Fortifications, 1943, Military Publication of the National Commissaries of Defense, USSR, Russian, Microfilm in SPDO-P.

- (10) also Efimov, A. I.; Kachurin, S. P.; Sukhodolsky, E. I., and Tolstoy, A. P.
"Instructions for Taking into Consideration Peculiarities of Frozen Ground During the Exploration, Planning, and Construction of Airfields in the Southern Part of the Permanently Frozen Ground in the USSR," 1946, Acad. of Sci., Moscow, USSR, Russian, DLC.

- (11) "Solving the Problem of "Naleds" (Surface Ice Formation) in Permafrost Regions", Engineering News Record, Vol. 137, Nov. 28, 1946, 724-727, AUL.

This article divides the "naledi" into 2 classifications: Control of naleds, formed by surface water, and Control of naleds formed by river water. The methods of prevention are discussed and compared.

CHERNGSHOFF, M. J.

- (1) "Piping of Water in Areas of Permanently Frozen Ground", Journal Industrial Construction, No. 10, 1928.

CHERNYSHOFF, M. J. (cont'd)

- (2) "Water Services in Regions with Perpetually Frozen Ground", 1933, Vladivostok, SPDO-P.

This article describes water service installations in Russia at the stations of the Transbaikal Railway in permafrost regions. Calculations of heat loss are given.

- (3) "Search for Underground Water in Perpetually Frozen Areas", Journal Am. Water Works Assoc., No. 5, Vol. 27, 1935, 581-593.

CHERSKY, I. D.

- (1) "On Post-Tertiary Deposits Siberia", Trudy St.P. Soc. of Naturalists, Vol. 18, 1887, Russian.

- (2) "Geological Investigation on the Siberian Stage Route from Baikal Lake to the Eastern Slope of the Ural Range", Sup. No. 2, Zapiski Acad. Sci. St. P., Vol. 59, 1888, Russian.

CHIRIKHIN, U. D.

- (1) "Permafrost in the Basin of Indighirka River, The", Trudy of the Committee for Study of Permafrost, Vol. III, 1934, 21-39, Leningrad, USSR, Russian, DIC. Engl. abstr. by Stef. avail. in SPDO-P, AUL & EL.

This article is based partly on the results of an investigation by the Academy of Sciences in 1929-30. It discusses in detail the naleds and icings in the Indighirka River. The author points out that the amount feed water from moisture from the thawed horizon above the permafrost depends on (1) amount of water in the ground which depends on the amount of precipitation prior to freezing, and (2) temp. of air at start of freezing, and (3) amount of first snow.

CHIRVINSKII, P. N.

- (1) "Snow, as an Indicator of Relief", Izvestia Gos. Geograficheskogo Ob-va, Vol. 72xyp.6, 1940, 855-856, Russian, DIC, DGS.

This paper has to do with photography in snow covered regions.

CHRISTIANI and NIELSEN

- (1) "Cell Concrete", Circular 22, 12-1-26.

Part I deals with cell concrete, its properties and application. Part II deals with the normal manufacture of cell concrete and how it is cast and treated. Both parts I and II are illustrated with drawings and tables which assist greatly in the preparation of cell concrete.

- (2) "Dist. Heating Systems in Denmark with Cell Concrete Insulation" Jan. 1937, Christiani & Nielsen.

This bulletin discusses the matter of insulating heat plants using cell concrete as a material for insulation. Most of the plants used as illustrations are located in Denmark.

CHRISTIANI and NIELSEN (cont'd)

- (3) "Cell Concrete on Floors", 3-8-40, Copenhagen.

This bulletin discusses the construction of cell concrete as insulation material and an underlay for flooring. Construction details are set forth and illustrated with photos and drawings.

CIVIL ENGINEERING

- (1) "Studies Determine Proper Construction Procedures in Permafrost Areas", Civil Engineering, Vol. 17, July 1947, 387-389, AUL, SPDO-P.

The article contains a brief report of the work done by the St. Paul District at Ladd Field, Purdue University, and the University of Minnesota.

CLARK, A. C.

- (1) "Alaska Highway - Effect of Climate and Soils on Design", Western Construction News (also Civil Engineering, Vol. 13, No. 5, May 1943), Vol. 18, March 1943, 105-109, EL, on microfilm at AUL.

This paper explains the unusual soil and climatic conditions that were encountered during construction of the pioneer road for the Alaska Highway and their effect on design. It discusses the difficulties encountered in construction on permanently frozen ground or ice close to the surface immediately under a heavy insulating layer of moss or grasses; on layers of ice and frozen soil occurring at depths of 3 feet or more; and where an ice condition known as "glaciating" exists (icing).

CLARK, K. A.

- (1) "Some Examples of Frost Boils Occurring on Alberta Highways" The Canadian Engineer, Vol. 69, No. 11, 9-10-35, 7-10, BSL.

A discussion of the physics of frost heaving; the conditions under which heaving does not occur; the relation of soil classification type to heaving; and a description of frost boil occurrence with illustrations of soil profiles in which frost boils occur.

CLAY SEWER PIPE ASSOCIATION, INC.

- (1) "Clay Pipe Engineering Manual", 1946, 129-130, The Clay Sewer Pipe Assn. Inc., Columbus, Ohio.

The use of subsurface drains to prevent damaging frost heave.

COLEMAN, A. P.

- (1) "Ice Ages Recent and Ancient"

The largest tree now growing in Spitzbergen is a willow which scarcely rises three inches above the ground. The arctic regions have enjoyed genial periods and some parts of the tropics have suffered Arctic cold showing that in the past there have been very important variations of climate. "Seams of excellent coal.....and great fossil leaves belonging to trees of a warm climate in beds of cenozoic age are found in Spitzbergen."

COLLIER, A. J.

- (1) "Gold Placers of the Seward Peninsula", Bulletin, No. 328, 1908 40-110, Geological Survey, Washington, D. C.

General introduction to area and history of exploration presented. General outline of physiographic features discussed, i.e., shoreline, mountainous regions and drainage characteristics. Good report although primarily of a reconnaissance nature. Fairly complete geologic map included.

COMPRESSED AIR MAGAZINE

- (1) "Army Engineer in Greenland", Vol. 49, Sept. 1944, 218-222, API Too general to be of much value.

CONRAD, V.

- (1) "Polygon Nets and Their Physical Development", American Journal of Science, Vol. 244, No. 4, April 1946, 277-296, SPDO-P.

This paper is a summary of studies made by the author in 1933 of a well developed stone polygon net located in the Hochschwab Mountain group of the East Alps. The small stone polygons, less than 2 meters in diameter, described in this paper are not related to "soil polygons" in appearance or physical development. There are 3 different hypothesis explaining rock polygons. The theory forwarded by B. Hogbom emphasizes the pushing force of water. The 2nd hypothesis by Nordenskjold, Low and Gripp considers convectional currents in an unstable soil caused by temperature differences. The last hypothesis by Steche stresses the fact that those soils likely to develop structures have colloid properties. A bibliography of 28 references is listed.

CONSTRUCTION METHODS

- (1) "Working Frozen Ground in the Arctic; Building an Earth-Fill Dam", Same as author, Vol. 30, April 1948, 92-95.

COOGAN, C. H., JR.

- (1) "Heat-transfer Rates", Mech. Engng., 71, June 1949, 495-498.

The rate of heat transfer from earth to a refrigerant flowing in copper tubes buried at various depths in the earth was measured over long periods of time. The data obtained are useful in the design of underground pipes of heat pumps and of other pieces of equipment which use the earth as a source of heat, or which are used primarily to cool sections of the earth. It was found that a moist soil yielded higher rates of heat transfer to a buried tube than a dry soil, and that small tubes are preferable to large tubes with the optimum size having a diameter between $\frac{1}{2}$ and $\frac{3}{4}$ in. The measured temperature distribution in the soil around the buried pipes agreed reasonably well with the calculated values based on line-sink theory.

COTTON, C. H.

- (1) "Steam Pipes in Tunnel Under Frozen Pavement Aids Excavation", Engineering News-Record, Vol. 81, Nov. 28, 1918, 1001.

CRESSY, G. B.

- (1) "Frozen Ground in Siberia", Journal of Geol. Vol. 47, No. 5, July & August 1939, 472-488, SPDO-P.

A discussion of the types, depths, distribution of, and research history on permanently frozen ground in Siberia. Included also is discussion on Pleistocene Glaciation and present climatic conditions in Siberia and causes of permanently frozen ground (permafrost).

CRUMLISH, WM. S., CAPT., CE

- (1) "Exploratory Well Drilling in Permafrost", Report 1045, 23 April 1948, 77 pp. Eng. Res. & Develop. Laboratory, Ft. Belvoir, Va., SPDO-F/S.

This article is an investigation of equipment used in drilling operations, geophysical studies of the area, climatic conditions and sites selected. It also discusses availability of ground water at Fort Churchill, the presence of permafrost, drilling techniques and recommendations for future planning.

DACHNOWSKI, A. P. - STOKES

- (1) "Peat Resources in Alaska" Technical Bulletin, TB 769, April 1941, 84, US Department of Agri., Washington, D. C.

DAHL, ANDREW I. AND ROESER, WM. F.

- (1) "Reference Tables for Iron-Constantan & Copper-Constantan Thermocouples", Journal of Research of the National Bureau of Standards, Res. Paper RP 1080-Vol. 20, March 1938, 337-355, U.S. Dept. of Commerce, Washington, D. C., SPDO-P.

Severe temperature and thermal electromotive force at temperatures from -200°C to $+1000^{\circ}\text{C}$ (-300 to $+1800^{\circ}\text{F}$) for iron-constantan thermocouples. Similar tables, -200°C to $+400^{\circ}\text{C}$ are given for copper-constantan thermocouples. Also gives average values of the thermal emf of copper, iron, and constantan against platinum, and variations which might be expected from the same lot and from different lots.

D'APPOLONIA, ELIO

- (1) "Permanently Frozen Ground and Foundation Design, Pt. 2", Engineering Journal, Canada, Vol. 29, No. 1, Jan. 1946, 7-12.

Reasons for failure of foundations for structures on permafrost and examples of designs to prevent melting of permafrost and causing excessive settlement of foundations.

- (2) "Wood Pile Foundations in Permafrost Regions", (Manuscript) 1 Aug. 1944, Microfilm in AUL (EL 6295).

- (3) "Foundations in Permafrost Regions", Northwest Service Command Report (Tentative Report) 1 Aug. 1944.

Part I deals with construction in permafrost regions and shows the results of improper construction in various buildings at the Koldern Repeater Station, Y.T., and Northway, Alaska. Points out in each case that construction was done incorrectly because of lack of knowledge that transfer of heat caused melting of permafrost and settlement to failure of many of the structures; that construction with an air space using piling is a solution of the problem.

DARTON, N. H.

- (1) "Geothermal Data of the United States", Geothermal Data of the United States, Bulletin, No. 701, Dept. of Int. U.S.G.S.
Temperatures are given for wells, mines, etc. This bulletin is chiefly concerned with temperature measurements made with maximum self-registering mercury thermometers lowered, bulb end up into wells, mines, etc. There are many tabulations of temperatures and reference is made to J. Prestwicks' "Underground Temperatures", Royal Society, London Proceedings, Vol. 41, pp. 1-116, 1886.

DATSKIJ, N. G.

- (1) "Permanently Frozen Ground and Building Conditions in the Usinsk Region", Series Severnaya, Facs. 2, 1934, 44-142, Russian, NN.

- (2) "Ground Swelling Under Railway Beds Under Permafrost Conditions", Trudi of the Commission for the Study of Permafrost, Vol. IV, 1935, 170-187, Ac. of Sci., Moscow, Russian, DLC, Engl. abstr. & trans. by Stef. avail. in SPDO-P.

The author cites an example of his observations at the Bonnak and Skovorodino stations where the phenomenon of ground settling causes the deformation of constructions and testifies to the lack of temperature balance in the upper part of the permafrost layer. These temperature observations, given in table form, show marked differences in localities having various exposures to the sun. It is also observed that excavation lowers the upper horizon of permafrost.

- (3) "The Southern Limit of Permafrost Distribution in the Mezen District of the Northern Region", Trudy of the Commission for the Study of Permafrost, Vol. V, 1937, 5-91, Acad. of Sci., Moscow, USSR, Russian, NN, Engl. Abstr. by Stef. avail. in SPDO-P.

The author gives a detailed description of the vegetable covering and soils of the region as well as ground composition as shown in the exposed shores of rivers and springs. A number of test pits were made and temperature observations conducted, enabling the author to construct temperature curves. In a number of places, permafrost was encountered at various depths from the surface. The temperature data at a depth of the upper border of permafrost under various conditions are very instructive.

DAUBEL, PAUL G. - LT. (j. g.) C.E.C. USNR

- (1) "Excerpts from Pipeline Survey Report", 12 Dec. 1944, Naval Battalion Detachment, DES.
Construction of pipeline from Fairbanks to Livengood, Alaska.

DAUBENMERE, R. F.

- (1) "Plants and Environment, A Textbook of Plant Autecology", 1947, John Wiley & SONS inc., 440 4th Ave. N. Y. 16.

DAUBENMERE, R. F. (cont'd)

Autecology is a study of the interrelations between the individual and its environment. The environment is essentially those phases of climatology, botany, geology, soils, zoology, chemistry and physics which are more or less concerned with the development and growth of the species. Thus, environment is a composite of many factors which influence plant growth. The author groups these factors into 7 major categories: (1) soil; (2) water; (3) temperature; (4) light; (5) atmosphere; (6) fire; and (7) the biotic factor. In boreal America, which abuts the Polar Region, temperature is often the controlling factor determining whether or not a particular species is established on a given site. Throughout the forested interior of Alaska, the minimum moisture requirement of certain species is generally a contributing factor delimiting distribution. The sections of this text pertaining to soil, water, temperature and the environmental complex are most important.

DAVENPORT, R. W. and ELLSWORTH, C. E.

- (1) "Surface Water Supply of the Yukon - Tanana Region, Ala.", Water Supply Paper 342.

Introduction includes scope of investigation. General features of area - geology, geography, climate, vegetation (including map) covered. Measurement of stream flow, methods of unity, accuracy, tables, and description of main drainage areas included. Runoff data for various creeks in vicinity included in tables. Extensive tables of data taken, stream flow, etc. Streams taken up individually, some details included within reports on individual streams. Several maps included within report. Topographic maps showing gaging stations, also some sketch maps, i.e., distribution of vegetation in region covered. Bibliography of Government papers on area covered. (About 50 papers listed).

DAVIES, W., and PEAKE, W. E.

- (1) "Permafrost is Sure a Devil", Nations Business, Vol. 35, Nov. 1947, 65-67.

This article contains only very general information.

DAVYDOV, L. K.

- (1) "Breaking Up of Ice in the Rivers of the Arctic and SubArctic Zone of USSR", Probl. Arctic, No. 1, 1939, 15-31, Russian.

DECKSTADER, E. A.

- (1) "Effect of Freezing and Thawing of Soil under Foundations of Cold Storage Warehouse", Proc. of the International Conference on Soil Mechanics and Foundation Engineering, Vol. III, June 1936, 171-172.

DEMCHINSKY, B. N., and SUMGIN, M. I.

- (1) "Conquest of the North (In the Province of Permanently Frozen Ground) 1938, 156, Acad. Sci., Moscow, USSR, Russian.

DEMCHINSKY, B. N. (cont'd)

- (2) "The Program of Agricultural Field Experiments in the Areas of Permanently Frozen Ground", Instructions and Program Directions for the Study of Frozen and Permanently Frozen Grounds. 1938, 245-251, Acad. Sci. USSR, Russian, DLC.
- (3) also SUMGIN, M. I.
"Region of Permafrost", Izd. Glavsevmorputi, 1940, 240, Moscow-Leningrad, Russian, Microfilm SPDO-P, DLC.

DEMENTIEV, A. I. and V. F. TUMEL

- (1) "Civil Engineering in Frozen Soil, U.S.S.R.", Canadian Geographical Journal, Vol. 32, No. 1, Jan. 1946, 32-33.
A brief general description stating that progress has been made in combating drifting snow, mining, construction on permafrost (One statement that buildings are designed to prevent thawing, another that subsoil is warmed electrically using 300 to 1300 volts); and in the problem of drinking water in the eternally frozen areas (artesian wells through 700 ft. of permafrost to depth of 1600 ft. at Irkutsk). Permafrost covers 47% of area of U.S.S.R.
- (2) "Classification of Permafrost From the Point of View of Construction", Russian, DLC.

DEPT. OF AGRICULTURE, BUREAU OF SOILS

- (1) "Soil Reconnaissance in Alaska with an Estimate of the Agricultural Possibilities", Field Operations Report, No. 16, 1914, 42-236, U. S. Printing Office, Washington, D. C.
- (2) "Soil Survey", Soil Survey Manual, Misc. Publ. No. 274, 1938, U. S. Printing Office, Washington, D. C.
- (3) "Climate and Man", 1941 Yearbook of Agriculture (book), 1941 1248 pages, US Gov. Print. Ofc. Washington, D. C., SPDO-P.
- (4) FOREST SERVICE, ALASKA REGION
"The Forests of Alaska", 1 July 1944, 16, San Francisco, Avail. SPDO-P.

This pamphlet describes the national forests of Alaska, including water power and agriculture, and home sites. A map showing the forest zones of Alaska is included.

DEPT. OF THE AIR FORCES

- (1) "Weather Stations - In Alaska and Western Canada", 15 Feb. 1945, Regional Control Off. - 16th, Weather Region - A.A.F.
This pamphlet contains a complete and accurate compilation of all information available at the time of publication on weather stations in Alaska and Central and Western Canada. The information is divided into 3 parts as follows: Part I-List of Weather Stations in Alaska and Central and Western Canada; Part II-Alphabetical List of Call Letters for Weather Stations in Alaska and Central and Western Canada; and Part III-Numerical List of Index Numbers for Weather Stations in Alaska and Central and Western Canada.

DEPT. OF THE AIR FORCES (cont'd)

- (2) "Pile Pullout Tests in Frozen Ground", Feb. 1948, Hdqtrs. Air Material Command Air Installations Division, SPDO-P.

In this memorandum, Mr. L. A. Nees deals with experiments by the author made at the Wright-Patterson Air Force Base. One inch and one quarter inch black steel pipe, 6, 12, 18 and 24 inch lengths, were used as test piles and frozen into one cubic yard of soil. The pull-out resistance did not go below forty pounds per square inch except where the soil was very dry. The pull out resistance increased rapidly as the optimum moisture and density were approached. Although the tests are admittedly lacking in adequacy, it was concluded of the work that a working value of 20 pounds per sq. in. could be safely adopted as the pull-out resistance value and that the tests should be supplemented by prototype tests as well as more laboratory work. It is also noted that the minimum permissible length of pipe below permafrost table should be 20 feet, and the minimum depth of a pile joint below permafrost table should be five feet. These tests were made for use in designing the Loran tower at Project Beetle Able (Skull Cliff).

- (3) "Instructions for Measuring Ground Temperatures", Permafrost Studies in Connection with Engineering Projects in Arctic and Subarctic Regions, Part I, December 1944, 1-37, SPDO-P.

The article is concerned mainly with instructions for measuring ground temperatures, test pits, and uses of ground temperatures along with definitions, principles and conversion tables of measurements.

- (4) "Proposed Steel Foundations for L. F. Loran Towers", Feb. 1948, 1-7 and Plates, HDQTRS - Air Material Command, SPDO-P.

Report covers such topics as - origin, basic conditions, structural features, design aspects, and advantages.

- (5) "Climatology of Alaska", Publications of the Weather Division, Hdqtrs. A.A.F., Report #444 (Suppl), U.S.W.B. & A.A.F., SPDO-P.

Table of Contents:

List of stations, general climatic considerations, air masses wind cloudiness and ceilings, icing, visibility, fog, flying weather, temperature and precipitation.

- (6) "Climatic Atlas for Alaska", Publications of the Weather Information Branch, Report #444, Sept. 1943, Prop. by U. S. Weather Bureau, SPDO-P.

Table of Contents

1. List of Tables
2. List of Illustrations
3. List of Stations (in Alaska)
4. Brief description of Alaskan Climate
5. Explanation of Charts & Tables

The mean climatological charts were prepared from Alaskan observations of 5 or more years duration, some thru 1940, and some thru 1941. The average length of record is 17 years Sitka observations began in 1842 but are intermittent.

DEPT. OF THE AIR FORCES (cont'd)

- (7) "Roads and Highways in Alaska", 1948, Hdqtrs. 925th Eng. Aviation Group, Fort Richardson, Alaska.

Part I, The Spring Thaw, 30 June 1948

Part II, The Summer Season, September 1948

Reconnaissance teams began gathering information concerning conditions of roads and highways in Alaska during the spring thaw of 1948 on 1 April. Information was obtained from actual observations made during 5100 miles of traveling in Alaska. The worst piece of road was found on the Palmer Highway connecting Anchorage and Palmer. The second poorest stretch of road in Alaska was the road between Fairbanks and Eielson Air Force Base. The following highways were investigated: Palmer, Glenn, Richardson (Paldez to Gulkana), Richardson (Gulkana to Big Delta), Richardson (Big Delta to Fairbanks), Slana-Tok, Alaska, and Edgerton Cutoff, Steese Highway and Elliott Highway. This report is illustrated with excellent pictures showing the methods used in taking care of icing and other work necessary in Alaska to maintain traffic.

DEPT. OF THE ARMY, ALASKAN DEPT.

- (1) "Airfield Reconnaissance Survey, American River Site, Seward Peninsula, Alaska, Jan. 1945, Avail. in SPDO-P.

A report on a survey of the Area "American River, Alaska, Airbase Site Project Location" to obtain general information for a proposed airfield site, in order that the airbase could be planned, material quantities determined, housing areas established, as well as to locate the runways, taking into consideration the glide angle of planes, possibility of fog accumulation, air drainage from the field, accessibility for transportation to and from the base to navigable water, and other items. This site was covered in a report of May 1944 entitled "Reconnaissance Survey Airfield Site, American River Area, Alaska".

- (2) "Airfield Reconnaissance Survey, Noxapaga-Imuruk Site, Seward Peninsula, Alaska", Jan. 1945.

A report of the survey of the areas "Noxapaga-Imuruk" and "Collins-Hannum" of the Seward Peninsula for a proposed airfield site.

- (3) "Winter Conditions and Problems, Adak., Alaska", 12 June 1944, DES.

A narrative of experiences during 1942-43 and 1943-44. A great many photographs of installations are included.

DEPARTMENT OF THE ARMY

- (1) "Estimating Soil Tractionability by Climatic Analysis", Environmental Protection Section, Report #167, April 1950, 1-54, U. S. Army, Washington, D. C., SPDQ-P.

This is an attempt to develop a means of predicting the conditions of serious soils at any season of the year for their use by any means of transportation. The article gives a good review and collection of supporting data with respect to the climate and its effect on soils. The hydrological aspects of

DEPT. OF THE ARMY (cont'd)

the relationship is discussed. Charts and graphs of soil and air temperatures in Iceland and the U. S. are given. There is mention of the phenomena of Arctic and Subarctic agriculture and also examples. Part of the article discusses Arctic problems with permafrost and transportation and also the influence of the vegetation cover. The effect of snow cover and the moisture content and densities of snow are enlarged upon. A selection of references for a bibliography is included.

- (2) "Ice Bombing", 1948, 1-2 and photographs, 57th Fighter Group, Elmendorf AFB, Alaska, SPDO-P.

Describes methods of aerial bombing of ice jams on the Kuskakwin, Yukon, and Kobuk Rivers in Alaska and gives conclusion drawn. Photographs show explosions of bombs in ice jams.

- (3) "Report of Field Airdrome Construction, Adak, Alaska", 15 May 1943, 807th Eng. Avia. Bat., DES,

Description of the problems encountered at Adak, Alaska. Many pictures are included.

- (4) "Report on Field Airdrome Construction, Attu, Alaska", 15 Dec. 1943, 807th Eng. Avia. Bat., DES.

- (5) "Report of Test of Earth Augers at Fort Churchill, Canada", Test Report #T-1203, 27 April 1949, Signal C. E. Lab., Fort Monmouth, N. J., SPDO-S.

These tests on earth augers were made during the winter of 1948-49. Equipment tested consisted of the following:

1. Truck V18 with Highway Trailer Co. type HD Earth Auger-power take-off type.
2. Electric Earth Auger, KA-MO Tool Co. Commercial type - (Bit only)
3. Portable Earth Auger, Highway Trailer Co. Type PE-flexible shaft, gasoline engine drive.
4. Special cutting bits and edges such as
 - a. Finger type
 - b. Straight Edge
 - c. Saw tooth type
 - d. Spearhead type
 - e. Diagonal tooth cutter

The purpose of the tests was to determine the mobility and feasibility of drilling holes in ice and frozen ground and to determine the cutting bit most suitable for drilling.

- (6) "Cold Weather Tests on Shaped Charges for Hole Driving at Fort Churchill, Canada", Test Report #T-1198, 12 April 1949, Signal Corps Engineering Lab., Fort Monmouth, N. J., SPDO-S.

The purpose of these tests was to determine the feasibility of the use of shaped charges to drive holes for

- a. Gen. Stakes
- b. Transmission poles

charges tested were the following: M9-A1, M6-A3, M2-A3, M3, and 30 cal. armor piercing shell.

DEPT. OF COMMERCE, WEATHER BUREAU

- (1) "Average and Extreme Depth of Frost Penetration".
Undated maps. Maps of the U. S. showing (1) extreme frost penetration and (2) average annual frost penetration.
- (2) "Climatic Summary of the United States", Bul. W., Sec. 1 to 105, 1930.
Climatic data from the establishment of stations to 1930 inclusive. See also monthly summaries of weather data by states for climatic data from 1930 to the present.
- (3) "Pyreheliometers and Pyrehelietric Practice", Circular, Cir. Q, Gov. Printing Office.
Out of stock - re-checked 2 May.
- (4) "Observations of Nocturnal Radiation at Fairbanks, Alaska, & Fargo, North Dakota", Monthly Weather Review, Suppl. No. 46, 12 June 1940, U. S. Printing Office, Washington, D. C.

DEPT. OF THE INTERIOR, BUREAU OF MINES

- (1) "Great Circle Map Showing Fairbanks, the Center of Europe, Asia, & American, Map No. 8", U. S. Printing Office, Washington, D. C.
- (2) "Placer-Mining Methods and Costs in Alaska", No. 258 or 259, 1927, 236 pp.
See Wimmeler, N. L. for same article.

DEPT. OF INTERIOR, GEOLOGICAL SURVEY

- (1) "Photo Interpretation of Vegetation in the Tropical Pacific Area and Use as an Indicator of Kind of Ground", Engrg. Notes No. 20, No. 20, Aug. 1944, Avail. in SPDO-P.
Prepared under direction of Off., Chief of Engrs., Military Intell. Div. This paper is a compilation of such information on tropical Pacific forests and cultivated crops as may be of military value, particularly to engineers. The illustrations include aerial photographs of most of the described vegetation types, these are mounted by pairs so that they can be studied under the stereoscope.
- (2) "Alaska Volcano Investigations", Progress of Investigations in 1946, Rpt. No. 2, 1946, U. S. Gov. Print. Ofc., Dept. of Interior, Geol. Survey, Washington, D. C., SPDO-P.
Written for the Corps of Engineers, U. S. Army.
In the interests of protecting military installations from destructive volcanism, the War Department, in October 1945, requested the Geological Survey to undertake a program of volcano research in the Aleutian arc. The general objective of the program is the collection and interpretation of geologic information which may be applicable to military operations in this area of active volcanism, with the ultimate aim of developing techniques for predicting the nature, location and time of volcanic eruptions near military establishments.

DEPT OF INTERIOR, BUREAU OF RECLAMATION (cont'd)

- (3) "Thermal Properties of Concrete", Thermal Properties of Concrete - Boulder Canyon Proj., Final Reports, Bull. I, 1940, 154, US Dept. of Int., Bur. of Recl., Denver, Colorado, Avail. in SPDO-P.

Chapter I - Introduction & Summary
II - Materials, Specimens and Test Methods
III - Results and Conclusions
IV - Development of Formulas
V - Concrete Materials
VI - Equipment, Test Procedures and Computations
VII - Consideration of Errors
VIII - Verification of Results

This bulletin is one of a series prepared to record the history of the Boulder Canyon Project, the results of technical studies and experimental investigations, and the more unusual features of design and construction.

- (4) "Concrete Manual", Concrete Manual, Oct. 1942, US Dept. of Interior, Bureau of Reclamation, Denver, Colorado.

- (5) "Terrain Intelligence, Revised Report, Strategic Engineering Study #27, Alaska", No. 27, April 1943, SPDO-P.

Written for Strategic Studies Unit, Intelligence Branch, Corps of Engineers. This report consists of a folio of maps and explanatory tables outlining the principal geographic and related features of Alaska. They cover such subjects as terrain, climate, water supply, construction, transportation, geology, and mineral resources.

- (6) "Map of Alaska", Series E, 1946.

Political divisions, towns, cities, railroads, highways, and other pertinent information are shown. Scale is 1:2,500,000.

Map was compiled by the Alaskan Branch of the United States Geologic Survey.

- (7) "Krasnoyarsk-Welkal Air Route, Siberia, USSR", Strategic Engineering Study, #47, No. 47, Jan. 1943, 57 pp, Dept of Int. - Geol. Survey, Washington, D. C., SPDO-P.

A folio of maps, explanatory tables, and photographs which outline the principal terrain features of the following places and immediately adjacent areas: Krasnoyarsk, Ust-Kut, Kirensk, Tommot, Yakutsk, Oimyakon, Seimchan and Welkal. For each area, one or more maps and tables describe such subjects as topography, passability of terrain, anchorages, ports, landing beaches, possible airfield sites, kind and availability of construction materials, fuels, water supply, and special engineering problems connected with the permanently frozen ground.

- (8) "Ground Temperatures", Bull. No. 701, U. S. Printing Office, Washington, D. C.

DEPT. OF MINES & RESOURCES - CANADA

- (1) "An Outline of the Canadian Eastern Arctic", Construction and Maintenance of Airdromes on Ice Caps and Ice Masses, 26 June 1946, Office, Chief of Engineers, Washington, D. C. SPDO-P.

Discusses the following subjects:

1. Hydrography - Arctic Islands
2. Hydrography - Hudson Strait & Hudson Bay
3. Climate & Weather
 - a. Temperature
 - b. Precipitation
 - c. Winds
 - d. Fogs
4. Ice Conditions
 - a. Sea Ice
 - b. River and Lake Ice
5. The Northwest Passage
6. All-season Transportation - Air

DEPT OF NATIONAL DEFENSE, DIRECTORATE OF ENGINEER, DEVELOPMENT, CANADA

- (1) "Report on Snow and Ice Data", 24 April 1944, Ottawa, Canada, on microfilm in AUL & CEL. 3995/3) on paper in SPDO-P/S.

This article deals principally with snow and ice as a function of hauling and sleigh roads. Describes the various types of snow and ice roads with a discussion of maintenance and construction methods. Also discusses the fundamentals of construction and survey. Part I discusses briefly construction and maintenance of winter roads; Part II discusses preparation and maintenance of airfields in winter; Part III discusses ice as a winter highway; Part IV discusses use of explosives in blasting ice, particularly ice jams.

- (2) "Data Available on Safe Thickness of Ice for Transport Over Frozen Rivers, etc.", Memo #11, 2 Nov. 1944, Canadian Army Oper. Group, On Microfilm in AUL (EL-6224).

DEPARTMENT OF THE NAVY

- (1) "Operations Report, Seismograph Exploration in Naval Petroleum Reserve #4, Alaska, June to September 1945," SPDO-P.

This article discusses equipment and methods of operation of a seismograph party operating in Naval Petroleum Reserve #4. Recommendations as to modifications for future work are included.

- (2) "Naval Construction Battalion Detachment 1058, Summary Report on Cold Weather Operations, Dep't of the Navy at U. S. Naval Petroleum Reserve #4", SPDO-P.

This is a report by S. H. Folk made in February 1946 from information compiled from reports made by various personnel attached to NCBD 1058, covering operations in Naval Petroleum Reserve No. 4 during the winter 1944-45. A caterpillar D-8 tractor when winterized becomes very satisfactory by increasing the traction by cutting holes in grouser plates to clear packed snow and replace the top carrier rollers with wooden beams to carry the tracks. The weasel is a very effective

DEPARTMENT OF THE NAVY (cont'd)

vehicle for travel over Alaskan arctic terrain. However, the transmissions are too light and the vehicle is not sturdy enough for long cross country trips over rough terrain. There is also a discussion of the operation of bob-sleds, wahigans and arctic cloghting together with some observations regarding sled-freighting operations.

- (3) "Geological Reconnaissance of Sentinal Hill Area, U. S. Naval Petroleum Reserve #4, Party #1, June, July, August, 1945", SPDO-P.

This article briefly discusses the plan of work, equipment used, logistics related to moving personnel to and from field, and recommendations as to future work.

- (4) "Permafrost Must Be Respected", Civil Engineer Corps Bulletin, Vol. 2, No. 18, May 1948, 123, Bureau of Yards and Docks.

General rewrite of U. S. Army field experience in permafrost together with some outside information. Work covers Army's work at Ladd Air Force Base, Fairbanks. General information on permafrost included; that is, types of vegetation, the significance of the various types, some preventative measures to be taken in permafrost areas, mention of the active and passive methods of dealing with permafrost. Sketches showing construction methods to be used are included; that is, insulation, the various types of insulation, methods of placing insulation, methods of insuring flow of air beneath building.

- (5) "Umiat Test Well #1, Temperature Survey", May 1946, Bureau of Yards and Docks, EL.

A report, including tables, of temperatures taken in test well at Umiat, Alaska.

- (6) "Bibliography on Ice of the Northern Hemisphere", H. O. Pub. #240, 1945, Hydrographic Office, Washington, D. C., DN and SPDO-P.

Table of Contents

1. World-wide references
2. Geographic Divisions such as Arctic Ocean, Coastal Waters of N.E. North America, Greenland Sea, Bering Sea, etc.
3. General References

The titles of many of these articles have not been translated and the language in which the original is written is not given.

- (7) "Outline of Problems Involved in Operations in the Arctic", Naval Petrol. Reserve #4, 24 March 1947, Bureau of Yards and Docks, DES.

DEPT. OF THE NAVY (cont'd)

- (8) "Army Observers' Report of Operation High Jump (Task Force 68)", Sept. 1947, U. S. Navy and War Dept., Washington, D. C. SPDO-P.

This is an expedition or operation in the Antarctic rather than the Arctic. No direct connection with permafrost but contains material on transportation, aircraft operations, photography, meteorology, snow, ice, glaciology, mapping, etc.

- (9) "Cold Weather Engineering", Vol. I and II, 1948-1949, Vol. I, 109 pp., Vol. II, 148 pp., Bureau of Yards and Docks, Washington D. C., SPDO-S&P.
- Vol. I. A. The Polar Challenge to Engineers
B. Character of the Polar Region
C. Basic Arctic Engineering Problems
D. Cold Weather Living
E. Operation and Maintenance of Transportation and Construction Equipment in Polar Region
- Vol. II. F. Building and Utility Construction in Polar Region
G. Construction of Airstrip and Roads in Polar Region
H. Ship Supply and Moorings
I. The Challenge of Current Polar Problems
J. Construction of an Advance Base in Polar Region

- (10) "Geological Reconnaissance of Ninuluk - Prince Creek Areas", U. S. Naval Petroleum Reserve No. 4, Party No. 4, June, July, August, 1945.

Discusses equipment and methods used in doing ground geological work. Includes a description of the area. It is pointed out that aerial photography, preferably vertical, affords great assistance in this type of work.

- (11) "Geological Reconnaissance of a Part of the Chandler River, Alaska", U. S. Naval Petroleum Reserve No. 4, Party No. 5, Aug. Sep., 1945.

Discusses equipment and methods used in doing ground geological work. Includes a description of the area. It is pointed out that aerial photography, preferably vertical, affords great assistance in this type of work.

- (12) "Geological Reconnaissance of Maybe Creek - Ikpikpuk - Colville River Area", U. S. Naval Petroleum Reserve No. 4, Party No. 3, June, July, August, 1945.

This article briefly discusses the difficulties of working areas and recommendations for future work.

DEPARTMENT OF TRANSPORT AIR SERVICES BRANCH, METEOROLOGICAL DIVISION, CANADA

- (1) "Meteorology of the Canadian Arctic", 1944, Above, SPDO-P.

This manual contains a summary of the reports of meteorological observations which have been taken in the Canadian Arctic, together with an analysis of upper air conditions prevailing in this region. It is necessarily incomplete,

DEPARTMENT OF TRANSPORT, AIR SERVICES BRANCH, METEOROLOGICAL DIVISION,
CANADA (cont'd)

chiefly because no long series of observations is available for this territory. Most of the observing stations are concentrated in the southeastern part of the Archipelago, leaving large areas of Canadian Territory within the Arctic Circle untouched. Tables and graphs are included showing monthly values of temperature, precipitation, wind and fog at certain selected stations.

DIEBOLD, C. H.

- (1) "The Effect of Vegetation upon Snow Cover and Frost Penetration during the March 1936 Floods", Journal For., Vol. 36, 1938, pp. 1131-1137.

(2) also SPAETH, J. N.

"Some Inter-relationships between Soil Characteristics, Water Tables, Soil Temperature, and Snow-Cover in the Forest and Adjacent Areas in South Central New York", Empire Forestry Journal, Vol. 18, July 1939, 157-158.

DONABEDOV, A. T.; OBRUCHEV, V. A.; and SHEVIAKOV, L. D.

- (1) "A. A. Petrovsky (Obituary)", Trudy, Permafrost Institute, Vol. 5, 1947, 5-14, Academy of Science, Moscow, USSR, Russian, NN.

DORE, S. M. and PLUMMER, F. L.

- (1) "Soil Mechanics and Foundations", 1940, 473 total, Pitman Publishing Corp. New York - Chicago, SPDO-P.

Heaving of highway slabs, ice segregation, effect of texture, effect of colloidal material, movement of water to form ice crystals, effect of consolidation, effect of water table level, effect of surface load, unfavorable subgrade conditions thawing of frozen soil, frost in foundations, typical frost heaving example, and prevention of frost heaving.

DOSTOVALOV, B. M.

- (1) "Electrical Characteristics of the Frozen Formations, The", Trudy of the Institute of Permafrostology, Vol. V, 1947, 8-35, Inst. of Permafrostology, Moscow USSR, Russian, DIC Engl. abst. by Stef. avail in SPDO-P, AUL or EL.

A description of the methods and results of investigations of several authors is given. The author emphasizes the importance of the utilization of electrical characteristics of various formations in addition to petrographic classification. He concludes with a series of recommendations for further research. A bibliography of 25 titles is included.

- (2) also PETROVSKY

"First Experiments of the Transmission of Electromagnetic Waves through the Permafrozen Layers, The", Proc. of the Obruchev Inst. of Permafrostology, Vol. V, 1947, 121-160, Moscow, Russian, NN, Eng. abst. by Stef. avail. in SPDO-P, AUL & EL.

This article deals with the study of the transmission of electromagnetic waves through the mass of permafrost and with the work of an expedition to Igarka in 1940.

DOSTOVOLOV, B. M. (cont'd)

Igarka is the site of a special experimental station for the study of permafrostology. In addition to other information, it was stated that the shorter wave penetrates the frozen ground a great deal easier than the long one. Bibliography of ten titles is given.

- (3) "Application of the Wave Length Method for the Study of the Upper Layer of the Ground", Proc. of the Obruchev Inst. of Permafrostology, Vol. V., 1947, 161-174, Moscow, Russian, NN. Eng. abst. by Stef. avail. in SPDO-P, AUL & EL.

The author states, on the basis of his work reported elsewhere, that the wave length method can be used for the electric mapping of the geologic structure of the upper surface of the earth along two lines; the dielectric constant and the specific resistance. The author discusses results of experiments made in Moscow, over the ice in Lyublino near Moscow, and the work in Igarka. Six diagrams are given to illustrate why the application of horizontal antenna to determine the upper thickness of the layer can give good results only when the upper layer has a small dielectric constant. A bibliography of 5 titles is given.

- (4) "Method of Rock Examination by Means of Electro-Magnetic Waves and Its Application to Regions of Permanently Frozen Grounds", Trudy of the Inst. of Frozen Ground, Vol. 5, 1917, Acad. of Sciences, USSR, Russian, DIC, Abstr in DGS.

DRANIZIN

- (1) "Certain Zonal Forms of Relief in the Extreme North", Pochvovedenie, No. 4, 1914, Soil Science, Russian.

DREIBELBIS, F. R. and POST, F. A.

- (1) "Some Influences of Frost Penetration and Microclimate on the Water Relationships of Woodland, Pasture, and Cultivated Soils", Proc. - Soil Science Society, 1942, SPDO-P.

This paper summarizes the data obtained on the above subject in the years 1939-1942. It deals with such coverings as pasture, winter wheat, meadow, and woodland. Its paragraph headings are:

1-Experimental procedure

2-Results

a. Structure of Frozen Soil

b. Effects of Vegetal Cover on Snow Depth and on Frost Penetration

c. Temperature Relations Affecting Freezing and Thawing

d. Moisture Relationships of Frozen Soil

3-Summary

4-Literature Cited.

BUCKER, A.

- (1) "Investigations on the Frost Danger Element of Cohesionless Soils", Band 17, 1939 (orig) 79 pp (orig) German, (orig) The results of experimental studies on the effect of texture of noncohesive soils and the freezing of texture fractions of soils and their mixtures.

- (2) "Soil Colloids" and Their Behavior When Subjected to Frost Action, Der Baingenieur (Orig), Vol. 23, 5 August 1942, 235-237, German, W.E.L., Trans. avail in B.S.L. & Penn, Sect-St.P.D.L. Trans by H.B. Edwards.

Review of and discussion on the Schmid and the Casagrande criteria for the effect of frost on a soil; data and discussion on results of freezing tests on soil colloids; bibliography. Title in German: Ueber "Boder Kolloide" und ihr Verhalten bei Frost.

DUNLAP, SHARP, AND SHAW

- (1) "Airport Engineering", Book, 1944, John Wiley and Sons, SPDO-P.

A book on the engineering work involved in the planning and design of a modern air terminal.

DURDENEVSKAYA, M. V.

- (1) "Ancient Glaciation and Contemporary Permafrost in the Irkut-Baikal Depression, The", Trudy Commission for the Study of Permafrost, Vol. III, 1934, 89-105, Acad. of Sciences, Leningrad, USSR, Russian, DIC. Eng. abst. by Stef. avail in SPDO-P, AUL & EL.

On the basis of published material cited in considerable detail, the author concludes it is possible to establish the former existence of glaciation of the Alpine type on the mountains surrounding the valley. In the appendix to the main article, the author gives detailed geological descriptions of the valley in question with mechanical analysis of the sand and a geological map of the valley. A bibliography of 7 titles is included.

- (2) "Permanently Frozen Ground and Ground Ice in the Lake Shores in the Irkut Valley", Trudy Comm. Study Permafrozen Ground, Vol. I, 1932, 55-67, Academy of Sciences, Moscow, USSR, Russian, NN.

Origin of ground ice is shown to be due to snow on icings buried beneath the silts. Investigations to determine what will happen to permafrost after the flooding of areas by a dam.

- (3) "Lakes on the Permanently Frozen Ground", Nasha Strana (Our Country), No. 1, 1939, 48, Russian.

DZENS-LITOVSKY, A.I.

- (1) "Mineral Lakes Under the Permafrost Conditions", Trudy (Committee on Permafrost), Vol. 6, 1938, 79-103, Acad. of Sciences, Moscow, Russian, Eng. sum., Eng. abst. by Stef. avail. in SPDO-P, AUL & EL.

DZENS-LITOVSKY, A.I. (cont'd)

This article is devoted to characteristics and genesis of mineral lakes in the Trans-Baikal region of Siberia. Some of these lakes abound in mineral salts, including mirabilite, sodium-chloride, and soda. The author states that under the permafrost conditions, the regime of the mineral lakes acquires a peculiar character. The author discusses formation of mineral lakes as well as the formation of fresh water lakes with particular reference to permafrost. He also points out that chemical weathering takes place more intensely under the climatic conditions of permafrost which also produces greater mechanical weathering on various formations. A bibliography of 29 titles is given.

EAGER, WM. L. and PRYOR, W. T.

- (1) "Icing Studies, F-2", 1944, Public Roads Administration, SPDO-P.

This folder consists of a series of letters written to the Public Roads Administration by engineers engaged in the construction and study of icing conditions along the Alaska Highway principally in Canada. It points out the various serious icing areas and the corrective measures employed at various points.

- (2) "Ice Formation on the Alaska Highway", Public Roads, Vol. 24, No. 3, Jan., Feb., March 1945, 55-74.

A treatise on the formation of surface ice. Includes discussion of factors associated with icing and methods to prevent or reduce icing on new construction.

EAKIN, H. M.

- (1) "The Conditions of Altiplanation in Sub-Arctic Regions", Journal Washington Acad. of Sciences, Vol. 4 - No. 7, 1914.

- (2) "The Cosna - Nowitna Region, Alaska", Bull. #667, 1918, 54, USGS, Washington, D. C., DGS.

- (3) "The Iditarod-Ruby Region, Alaska", U. S. Geological Survey Bulletin, 578, 1914, U.S.G.S., Washington, D. C.

This volume is the third report based on work inspired by the discovery of gold in the Innoko district in 1906.

- (4) "The Yukon-Koyukuk Region, Alaska", U. S. Geological Survey, Bulletin, 631, 1916, U.S.G.S., Washington, D.C.

Description of the process of solifluction (Soil flow) or migration of detritus under thrust and heave of frost action under subarctic climatic conditions. Also include visible features of frost heave mounds and the distribution of rock in mounds. Illustrated.

EARDLEY, A. J.

- (1) "Unconsolidated Sediments and Topographic features of Lower Yukon Valley", Vol. 49, Feb. 1938, 303-342, Geological Society of America.

EARDLEY, A. J. (cont'd)

Report contains important material, geologic and topographic, on lower Yukon. Report locates gravel, sand, silts, and muck; their origin is a problem but some conclusions are stated. In general, it appears in the most part to be fluvial but the silt a combination of fluvial and eolian. Regional topography appears as mature hills rising above lowlands. Much material, detailed on local topography, is presented. Valley shapes, stream patterns, stream-re-entrants described. Gravels are high and low level, gravel cliffs (Palisades) pp. 315-319. Silts are very widespread, complex bedding and origin; several types or groups (Palisades, delta sands at Cave-Off Cliffs and Anvik, Koyukuk-Anvik blue loam in lower Koyukuk and Yukon below Cave-Off Cliffs, muck of Palisades Cave-Off Cliffs and upland placers. "Inlaid" series (complex) exist in meander belt below Cave-Off Cliffs). 13 pages on analysis, distribution, origin of silts. Brief coverage (4 pages) on late geologic history contained, very sketchy; mention of uplift, gently rejuvenated streams, etc. Mention of ice lenses, frozen ground. Many good photographs to illustrate features discussed in text and to show general topography of region, many oblique air photographs. Tables used in silt identification, soil sizes and comparisons. Bibliography includes many USGS references on Alaska.

- (2) "Aerial Photographs and the Distribution of Constructional Materials", Proc. 23rd Annual Meeting, 1943, 557-568, Highway Research Board, SPDO-P.

Sources of data on the distribution of constructional materials in an area are contained on soil maps and geologic maps; and aerial photographs should be considered as another form of map for distribution studies. Since detailed soil and geological maps are not available everywhere, aerial photographs may be the only source of information preliminary to field surveys. Aerial photographs may best be interpreted by considering them as soil or geologic maps. Soil and geologic maps are briefly described and their relation to aerial photographs is illustrated. The examples contained in this report demonstrate the great utility of aerial photographs in mapping soil types as well as hard rock formations.

EARNshaw, H. P. J.

- (1) "Steam Jets Thaw 3 Feet of Hard Frost in 15 Minutes", Engineering News Record., Vol. 79, Sept. 13, 1917, 519, McGraw Hill, New York, New York.

EFIMOV, A. I.

- (1) "Deep Freezing of the Ground and the Regime of the Waters Above the Frozen Ground Under Heated Buildings", Trudy Obruchev Institute of Permafrostology, Vol. IV, 1944, 205-225, Obruchev Inst. of Permafrostology, Moscow-Leningrad, Russian, NN. Eng. abstr. by Stef. avail in SPDO-P, AUL & EL.

EFIMOV, A.I. (cont'd)

This paper is the result of observations and experiments conducted by the Trans-Baikal Expedition of the Ob-tuchev Institute of Permafrostology in 1941-43. The author describes the geological structure of two sections and gives a schematic diagram of thawing observed in 1942, together with the resultant pressure of water. A description of the character of permafrost conditions in this area is given as well as data about the seasonal freezing and thawing of the ground. The author gives the temperature conditions of ground under heated buildings, the variation of the depth of freezing of water and its temperature, and discusses the hydrological characteristics of the area. The author concludes that, in general, where there is water above the permafrozen ground, building is very difficult, as preventive measures are not yet completely worked out. A bibliography of 10 titles is included.

- (2) "The Yakutian Artesian Basin of Water Below the Permanently Frozen Ground", Priroda (Seria Geologicheskaya), No. 4, 1945, 128-140, Academy of Sciences, Moscow, USSR, Russian, DIC.
- (3) also MELNIKOV, P. I.; and SOLOVIEV, P. A.
"Water Below the Permanently Frozen Ground in the Region of the Town of Yakutsk", Priroda, Vol. 7, 1946, 50-53, Russian, DIC.
- (4) "Instructions about Methods of Making Hydrogeologic Observations in the Permanently Frozen Ground of the Yakutsk Bore Hole #2, drilled in Order to Use the Water from Below the P.F.G. for the Water Supply of the Town", Russian.
- (5) also NACHURIN, S. P.; KLIMASHKIN, V. S.; POHELINTSEV, A. M. and SALTNIKOV, N. I.
"Geochemical Exploration of Ground Under Existing Buildings in the Environs of the Town Chita, in Order to Establish the Most Practicable Principles of Foundation Construction", Russian.
- (6) "Geologic Sketch of Olekmo - Tyndinsky Region", Materials on Geology of North Baikal Upland Soviet on Research of Productive Forces, Vol. 2, 1935, 13-72, Academy of Science, Moscow USSR, Russian.

EHRENBURG, D. O.

- (1) "Mathematical Theory of Heat Flow in the Earth's Crust", Univ. of Colorado Bulletin, Vol. XXXII, No. 12, Gen. Series 316, May 1932, Univ. of Colorado, Boulder, Colo., SPDO:P.
I Introd. - The mathematical Theory of Heat Conduction becomes important adjunct to physical geology from both a theoretical and a practical viewpoint.
II Fourier's Conduction Equation.
1. Fourier's Law
2. Cylindrical and Spherical Flow

EHRENBURG, D. O. (cont'd)

III Head Sources

1. Instantaneous plane source
2. Instantaneous point source
3. Instantaneous line source
4. Semi-Infinite Homogeneous Solid
5. Cooling of Lavas

EIGENSON, MORIS S.

- (1) "Solar Activity and Its Terrestrial Effects", 1948, 323 pp. diagrams, Moscow, USSR, Russian.
Solar radiation, upper atmosphere, and terrestrial magnetism are discussed in this article.

EKBLAW, W. E.

- (1) "The Importance of Nivation as an Erosive Factor and of Soil Flow as a Transporting Agency in Northern Greenland", Proceedings, National Academy of Sciences, Vol. 4, No. 9, 15 Sept. 1918, 288-293.

A description of the process of nivation (the formation and melting of snow-ice) and its effect on the disintegration of rocks; the destruction of some land forms and the formation of others. A description of solifluction (soil flow) and its connection with nivation is also given.

ELIAS, M. M. and VOSEBURGH, R. M.

- (1) "Permafrost Program - Progress Report No. 1 - Terrain and Permafrost in Galena Area", 1946, U. S. Geol. Survey, Dept. of Interior, O.C.E. & SPDO-P.

This report is a study of terrain and permafrost in a part of one of the large alluvial basins which characterize the topography in central Alaska. The report describes the general terrain of the basin, the relationship of ground and permafrost conditions to topography, suitability of the terrain units for construction, and criteria for interpreting the terrain from aerial photographs. The report presents the results of field investigation of two terraces near the Galena Air Base; the suitability of the two terraces for possible airfield sites is discussed.

ELSASSER, WALTER M.

- (1) "Heat Transfer by Infrared Radiation in the Atmosphere", Harvard Meteorological Series No. 6, 1942, 107 pp. Harvard University, Milton, Mass, SPDO-P.

This article consists of three parts.

Part I - Principles of Radiative Transfer. This part deals with the general theory of radiative heat transfer in the atmosphere.

Part II - Structure and Absorption of Infrared Bands. This part analyzes the infrared spectrum and shows the connection between its structural elements, which are the primary data of spectroscopy, and the integral effects observed as radiative heat flow.

ELSASSER, WALTER M. (cont'd)

Part III - The measurement of Atmospheric Emission. This part deals with the direct measurement of radiative heat flow in the atmosphere, with empirical relationships derived from such measurements.

EMREY, D. J.

- (1) "Subgrade Soils, Their Analysis and Drainage", The Canadian Engineer, Periodical, Vol. 72, Nos. 12, 13, 15, March and April 1937, 5-9, B.S.L.

A review of published material (largely from Public Roads Administration, New Hampshire and Michigan sources) on subgrade soils, classification, frost heaving and drainage. Included is a good popularly written review of the theory of frost heaving and a number of figures illustrating installation of underdrains to intercept seepage.

ENENSTEIN, B. S.

- (1) "Observation Under Natural Currents in the Permafrozen Layers in the Igarka Region, The", Institute of Permafrost also (Comptes Rendus No. 4, Acad. of Science, USSR, 1940), Vol. V, 87-92, Academy of Science, USSR, Russian, DIC. Eng. abst. by Stef. avail in SPDO-P, AUG & EL.

The author describes the results of field work of a geophysical expedition of the Obruchev Institute of Permafrostology in the region of Igarka in 1940 where observations were made on the natural electric current existing within the limits of the active layer. He cites the only previous work on this subject done by K. P. Kozin in the Chata region. The author describes a new design of non-polarized electrode which can be easily made under field conditions. One reference is cited in this article.

- (2) "Results of Application of Electrometrical Investigation by Direct Current in the Region of Permafrost, The", Proc. of the Obruchev Inst. of Permafrostology, Vol. V, 1947, 36-86 Acad. of Science, USSR, Moscow, Russian, DIC. Eng. Abst. by Stef. avail in SPDO-P.

In this article the author discusses the application of direct current for investigations in the regions of permafrost.

- (3) "Instructions on Temperature Observations in Areas of Permanently Frozen Ground", Instructions and Program Directions for the Study of Frozen and Permanently Frozen Grounds, 1938 9-40, Academy of Science, USSR, Russian, DIC.

ENGINEER BOARD

- (1) "Demolition and Exploratory Drilling Tests with Model 43-S Airborne Rotary Well-Drilling Machine", Rpt. 868, 18 Sept. 1944, 1-27, Corps of Engineers, U. S. Army, Fort Belvoir, Va. SPDO-P.

This report covers tests of Model 43-Sanborne Rotary Well-Drilling Machine with 10" Auger bit.

ENGINEER BOARD (cont'd)

- (2) "Extracts from Permafrost Literature", Parts I-III, Proj. ACS 498, Oct. 1944, Engineer Board-Technical Staff, Fort Belvoir, Va., SPDO-P, Microfilm in AUL, DES

These are short extracts from permafrost literature on the following subjects:

1. General
2. Reconnaissance and Site Selection
3. Planning for Construction
4. Drainage
5. Runways, Taxis, and Aprons
6. Maintenance of Landing Strips
7. Roads
8. Water Supply and Distribution
9. Design and Location of Buildings

Some of these are English articles and some Russian translations. Originals of Russian translations are included in this compilation of extracts.

- (3) CONFIDENTIAL

"Investigation of Airfield Construction in Arctic and Sub-Arctic Regions", Report 881, 28 Oct. 1944, Corps of Engineers USA, Fort Belvoir, Va.

The purpose of the investigations covered by this report was the assembly of basic data pertinent to the reconnaissance, location, design, construction, and maintenance of airfields in arctic and subarctic regions, including runways and airfield installations. The investigation was confined to published literature, to the review of reports prepared by agencies familiar with construction practices in such regions, and to limited field examination of existing installations in Alaska.

- (4) RESTRICTED

"Cold Weather Tests of Construction and Maintenance Equipment" Report 1008, Part I and II, 8-26-47, 148 pp. Corps of Engineers, USA, Fort Belvoir, Va. SPDO-S.

The purpose of the work covered by this report was to determine the effectiveness of Engineer Construction and maintenance equipment under extreme cold conditions of the Arctic.

- (5) RESTRICTED

"Summary of Operations - Cold Weather Tests of Engineer Equipment at Fort Churchill, Manitoba, Canada, Winter, 1946-47", Report 1010, 29 August 1947, 201 pp. Corps of Engineers, USA, Fort Belvoir, Va. SPDO-S.

Summary-This report covers the establishment of the Arctic Test Station of the Eng. Res. & Dev. Lab. at Fort Churchill, Man., during the winter of 1946-47. Includes list of Reports on Cold Weather Tests, 1946-47. More important subjects covered are: Arctic test program, physical characteristics, natural features and meteorology, facilities at Fort Churchill Canadian arctic indoctrination course, winter maintenance of roads and airfields and tests of bridging and bridge equipment under subarctic conditions.

ENGINEER BOARD (cont'd)

(6) RESTRICTED

"Cold Weather Tests of Transportation and Fire Fighting Equipment", Report 1009, 27 Aug. 1947, 211 pp, Corps of Engineers, USA, Fort Belvoir, Va. SPDO-S.

The purpose of the work was to cover the effectiveness of Corps of Engineers Transportation and Fire Fighting Equipment under subarctic conditions.

(7) RESTRICTED

"Cold Weather Testing of Demolition Equipment", Report 1005, 22 Aug. 1947, 182 pp., Corps of Engineers, USA, Fort Belvoir, Va., SPDO-S.

The purpose of the work covered by this report was to determine the effectiveness of demolition equipment when used under subarctic conditions.

Investigation

- A. Facilities for Explosive Storage
- B. Description of Demolition Area
- C. Climatic Conditions During Testing
- D. Ground Conditions Encountered
- E. Items of Demolition Equipment Tested
- F. Test Procedure
- G. Tests

(8) RESTRICTED

"Cold Weather Testing of Water Supply Equipment", Report 1005, 22 Aug. 1947, 79 pp. Corps of Engineers, USA, Fort Belvoir, Va., SPDO-S.

The general purpose of this work is to determine the effectiveness of standard and experimental water supply equipment under actual arctic conditions.

III Discussions

- A. Problems of Water Supply in the Arctic
- B. General Considerations
- C. Proposed Solution
- D. Need for Further Research and Investigation

Append. A - Cold Weather Testing of Water Truck

- B - " " " " Winterized Water Purification Shelter
- C - " " " " Ice and Snow Melter
- D - " " " " Special Winterized Water Purification
- E - Steam Melting of Ice in Place
- F - Examination of Diatomite Filters
- G - Water Quality Control Set #1
- H - Water Purification Unit.

(9) RESTRICTED

"Performance of Standard Engineer Processing and Packing Materials and Procedures Under Arctic Conditions", Report 1002, 15 Aug. 1947, 31 pp., Corps of Engineers, USA, Fort Belvoir, Va., SPDO-S.

The purpose of the work was to determine the effect of arctic conditions on processing and packaging procedures and materials currently used by the Corps of Engineers for overseas shipment of Engineer Equipment and Supplies.

ENGINEER BOARD (cont'd)

(10) RESTRICTED

"Cold Weather Tests of Topographic Equipment - Winter 1946-1947, Fort Churchill, Canada", Report 1001, 65 pp, Corps of Engineers, USA, Fort Belvoir, Va.; SPDO-S.

Table of Contents

Summary - Surveying equipment requires proper lubricants. Photogrammetric equipment is usable after a short conditioning period. Map reproduction operations in van trucks require better heating, ventilating, and insulation.

- (11) "Memorandum Report on Methods of Making Borings and Taking Samples in Permafrost", Memo Report, Fort Belvoir, Va.

ENGINEERING AND CONTRACT RECORD

- (1) "Inexpensive Treatment for Frost Boils Helps Prevent Costly Pavement Repairs", Engineering and Contract Record, Vol. 55, No. 42, 21 October 1942, 33.

Brief discussion on drainage, crack sealing and use of calcium and sodium chloride to prevent frost heave.

- (2) "Extent of Frost Penetration in Soils", Vol. 50, No. 89, 8 Sept. 1937, 11.

A tabulation of depth of frost penetration at ten locations and depth of permafrost at five locations in Canada.

ENGINEER RESEARCH AND DEVELOPMENT LAB.

- (1) "A Study of Trafficability Under Combat Conditions in Southern Russia", Fort Belvoir File No. D10.10 (Loose Sheets), 14, Corps of Engineers, USA, Fort Belvoir, Va.

This is a report by Dr. Ing. Hoffman, German Geologist transl. by Fort Belvoir. Hoffman was head of the German Soil Mechanic Research Society. Describes the geology of the East European plains in Southern Russia. Also the forests, vegetation and agriculture briefly. The last half of the article describes military vehicles and operation, such as tanks and routes.

ENGINEERING NEWS RECORD

- (1) "Mitigating Frost Action on Road Surfaces", Engineering News-Record, Vol. 104, June 19, 1930, 1021-1023, A.H.L.

A staff review of and extracts from the report of the Committee on Subgrades and Pavement Bases, 1930 convention of the American Road Builders Association. Discussed are: surface damage from freezing and thawing; granular sub-bases; and drains and backfilled trenches. A summary of early experiences with frost action on road surfaces. The preparation of drains and backfilled trenches was suggested as a cure.

- (2) "Ice Pressure Determinations in Clay Soils", Engineering News-Record, Vol. 115, No. 4, 25 July 1935, 127, BSL.

Staff review of a paper given by A. Casagrande at the 1935 meeting of the Society for the Promotion of Engineering Education. The review gives data and shows graphically

ENGINEERING NEWS RECORD (cont'd)

the unit pressures (in a consolidation test) required to reduce the soil moisture contents to the values obtained during ice segregation in freezing tests.

- (3) "Frost Penetration Studies of Portland, Maine", Engineering News-Record, Periodical, Vol. 116, No. 15, April 19, 1936, 537-6, B.S.L.

This article deals with studies of frost penetration at Portland, Maine, carried out by the city water department. Thermometers were set in the ground at six inch intervals to a depth of 52 feet.

- (4) "Saga of the Greenland Bases, The", Engineering News Record, Periodical, Vol. 133, No. 10, Sept. 7, 1944, 96-100.

This article describes the construction of some major bases, a few auxiliary airfields, and several weather stations in Greenland by American contractors and U. S. Army Engineer troops.

- (5) "Test Study of Foundation Design for Permafrost Conditions", Vol. 139, Sept. 18, 1947, 404-407, AUL.

A report on the St. Paul District Study. Some of the findings and conclusions are given.

- (6) "Clearing Snow at a Northern Air Base", Engineering News Record, Vol. 135, No. 12, Sept. 20, 1945, 373-377, EL.

Plenty of snow-handling equipment, operated by regularly assigned enlisted personnel under direction of the post engineer, has kept the Presque Isle airfield in northern Maine always ready for traffic. Trucks with one-way plows do most of the work with blowers used to boost the snow over the runway lights where the plows again push it to the edge of the safety strip. A plow with a powered vane in the wing is used to cut down the final bank left by the plows. Notes on snow handling at several other northern fields are appended.

- (7) "Building the Alaska Highway", Vol. 129, No. 12, 17 Sept. 1942, 4-5.

A short article on the construction of a pioneer road for the Alaska Highway. Includes several photos of the road, bridges and contractors' camps.

ENO, F. H.

- (1) "Influence of Climate on the Building, Maintenance and Use of Roads in the U. S., The", Highway Research Board, Periodical, Vol. 9, 1929, 211-243, B.S.L.

Charted maps of the U. S. giving winter temperature data and suggestions for research on frost action.

ENO, F. H. (cont'd)

- (2) "Field Experiments in Subgrade Drainage and Treatment, Highway Research Board, Periodical, Vol. II, Part I, 1931, 178-197, Lord Baltimore Press, Baltimore, Md., SPDO-P. Presents results of four experimental projects beneath concrete pavements and six projects with traffic bound roads. Comparisons are on the basis of crack ratios.
- (3) "Some Effects of Soil, Water, and Climate upon the Construction, Life and Maintenance of Highways"; Ohio State Univ. Eng. Exp. Sta. Bulletin No. 85, Bull. No. 85, Nov, 1934, 57-60, Ohio St. U. Eng. Exp. Sta., Columbus, Ohio. Brief discussion of capillarity and frost action in subdrainage of highways in Ohio.

ERAKHTIN, D. C.

- (1) "Single-track Ice Road for Tractors", Lesnow Khozyaistvo i Lesoeksploataziya, No. 3, 1934, 36, Russian.

ERLENBACH, L.

- (1) "Recent Observations and Research on Frost Damage in East Prussia", Vol. 5, No. 2, Orig. (abstr.) Road Abstracts, Vol. 5, No. 3, Abst. No. 139, pp. 39-40, May 1938, 1937, 42-6, German w/Eng. sum.

A description of severe longitudinal cracking and heaving in East Prussia during the severe winter of 1936-37; nature of the soil, nature of the sand used in the "protective course"; and ineffectiveness of drainage by side ditches to prevent frost damage.

ERLENMEYER, HANS

- (1) "The Migration of Salts in Soil", Chemical Abstracts 28, 1934, 1803.

ERMAN, ADOLPH

- (1) "Notes on the Frozen Soil in Siberia", Journal of the Royal Geographic Society, Vol. 8, 1938, 212-213.

EVDOKIMOV-ROKOTOVSKY, M. I.

- (1) "Building and Maintenance of Engineering Constructions in the Permanently Frozen Ground", 1931, Siberian Civil Engineering Institute, Tomsk, USSR, Russian.
- (2) "Methodology of Scientific Work on Permanently Frozen Ground", Trudy Comm. Study Perm. Frozen Ground, Vol. I, 1932, 23-27, Academy of Science, Moscow, USSR, Russian, DLC.
- (3) "Construction on Stude", Gosstroizdat, 1941, 132 pp. Moscow-Leningrad, USSR.

FAGIN, K. MARSHALL

- (1) "Petroleum Development in Alaska", The Petroleum Engineer, Aug., Sept., Oct., and Dec. 1947, SPDO-P.

A series of articles on the Navy's exploration for oil in Naval Petroleum Reserve No. 4. Articles entitled:

1. Oil Prospecting in Alaska
2. Exploration in Alaska
3. Drilling Problems in Alaska
4. Economics of Alaskan Exploration

These articles contain valuable information regarding the area north of the Brooks Range.

FARRELL, J. W. B.

- (1) "Winter Precautions at Regina, Saskatchewan, Water Works, Engineering, Vol. 98, Dec. 26, 1945, 1501-1520, E.L.

This article discusses the problems of water works maintenance at Regina.

FEDOROV, E.

- (1) "Calculation of Pull for Setting in Motion a Tractor-Train for a Snow-Ice Road", Lesopromyshlennoe Delo, 10/11, 1931, 520-525, Russian.

FEDORTSEV, V. A.

- (1) "Permafrost and Naledi in the Northeastern Yakut Region", Proc. of the Committee on Permafrost, Vol. IV, 1935, 93-104, Acad. of Science, Moscow USSR, Russian, DLC. Eng. abstr. by Stef. avail. in SPDO-P, AUL & EL.

The material for this article is based on observations made by the author in geological investigations in the north-eastern portion of the Yakut region. Two shafts, a deep pit, and numerous trenches were dug and temperature observations were made both during the course of excavations and afterwards. The author gives three tables of temperature observations and a map showing the location of the points where the work was done. The second portion of this article is devoted to the author's observations on several naleids. He distinguishes ground and river naleids as well as seasonal ones and those of long duration. The article concludes with a detailed description of a large naleid located on the Taryn-Tustja River, the left tributary of the Dogdo River.

FEDOSOV, A. E.

- (1) "A New Method of Laboratory Determination of the Volume of the Freezing Ground", Trudy Kom. Perm. Frozen Ground, Vol. VI, 1938, 173-176, Academy of Science, Moscow, USSR, Russian with English Summary.
- (2) "Forecasting of the Settling of Buildings After the Thawing of Permanently Frozen Ground, by the Method of Moisture Diagrams", No. 1, 1942, 52-85, Acad. of Sci., Moscow-Leningrad USSR, Russian, DLC, Eng. Abstr. by I. Poire avail in SPDO-P, AUL, EL, & DGS.

FEDOSOV, A. E. (cont'd)

This paper is a result of investigations by author in 1941 in Yakut. Gives computations for forecasting settling by moisture diagrams and the mathematics of the derivation of the method. App. 1 - "Testing the Settling Under a Load of Frozen Ground Undergoing Thawing," Apparatus described. Results of Test given - App. 2 contains sketches and diagrams.

- (3) "Phase-composition of Frozen Ground", In-t Merzlotovedeniia, No. 1, 1942, 18-43, Acad. of Sciences, Yakutsk, USSR, Russian, DLC.
- (4) "Prognosis of the Settling of Buildings Caused by Thawing of the Ground Under Their Foundations", Trudy of the Obruchev Inst. of Permafrostology, Vol. IV, 1944, 93-124, Russian, DLC, Eng. transl. and abs. by Stef. avail. in SPDO-P, A.U.L., E. L.

Annot: The author emphasizes the fact that thawing of the ground under foundations is of more consequence than failure of frozen ground and declares the necessity of developing methods of calculating settlement due to thawing. A good discussion of the theory of freezing and thawing of several soils types, the relation of moisture, and a development of the formulas for settling is given. Instructions are given for taking samples of frozen ground for laboratory analysis to determine constants used in the compilation of a tabular chart of the settling characteristics. A description of the laboratory apparatus used for testing is also included. Contains a bibliography of 8 titles.

- (5) "Physico-Mechanical Processes in the Grounds During the Freezing and Thawing", Tranzheldorstroi, 1935, Moscow, Russian.

FEHRMAN, R. G. and WINTERKORN, H. F.

- (1) "Effect of Freezing-Thawing and Melting-Drying Cycles on the Density and Bearing Power of Five Soils", Proc. Soil Science Society of America, Vol. 9, 1944, 248-252.

Results of accelerated laboratory tests to determine the effect of: (1) immersion only; (2) twelve cycles of freezing and thawing; (3) twelve cycles of freezing and thawing with subsequent water immersion for 12 days; (4) twelve cycles of wetting and drying; and (5) 12 cycles of freezing and wetting on the density, moisture content and California bearing ratio of the B horizon soils from five Missouri, Oklahoma and Kansas soils.

FEILDEN, H. W.

- (1) "Notes on the Glacial Geology of Arctic Europe and Its Islands, Part II, Quart Tour", Vol. 52, 1896, 738, Geol. Society.

FILATOV, M. M.

- (1) "The Subject and Problems of the Science of Grounds", Pochvovedenie (Soil Science), No. 8, 1940, 8-27, Russian.
- (2) "Soils and Grounds in Road Building".

FINK, O. I.

- (1) "Stability of Structures Under the Conditions of Deep Freezing Soil", Permanently Frozen Ground & R. R. Construction, Vol. 8, 1931, Inst. Puti, N.K.P.S., Gostransizdat, Moscow, Russian.

FINNIE, RICHARD

- (1) "Canol", 1945, Taylor and Taylor, San Francisco, California. General pictorial history of Canol project. Numerous excellent pictures of construction, terrain, difficulties encountered. Brief text included to serve as introduction and explanation of pictures.
- (2) "A Route to Alaska Through the Northwest Territories", Geographical Review, Vol. 32, No. 3, 1942, 403-416.

FIVEYSKY, D. K.

- (1) "Shaft Sinking in Permanently Frozen Ground in the Northern Part of the USSR", Trudy of the Institute of Permafrostology, Vol. VI, M-L, 1944, 86-168, Acad. of Science, Moscow, USSR, Russian; NN, Partial Abstr. avail. in DGS.

FLOROV, E. A.

- (1) "Results of Tests of Tractor Rolling-Stock on an Ice-Road", 1931, 23, Leningrad, Russian.
- (2) "Theory of Pull for Setting in Motion a Traction-Train on Snow-Ice Road", 1931, 32, Leningrad Forest-Indus. Acad. Leningrad, Russian.
- (3) "Further Calculation of the Pull for Setting in Motion a Tractor-Train", Lesnoe Khozyaistvo i Lesoksploataziya, No. 12, 1932, 19-27, Russian.

FORAN, WM. T., LT. CMDR., C.E.C., USNR

- (1) "Geological and Geophysical Report Concerning the Potential Oil Possibilities of the Umiat and Cape Simpson Areas of Naval Petroleum Reserve No. 4 in Northern Alaska, May - September 1945", SPDO-P. Discusses aerial photography, electrical surveys at Umiat Well No. 1 and Simpson Core Hole No. 11, temp. survey at Umiat.

FORT BELVOIR ENGINEER SCHOOL

- (1) "Airfield Construction-Airfield Drainage", Instructor's Manuscript, sub-title, Airfield Drainage, July 1943, 12 total, Fort Belvoir Engr. School, Fort Belvoir, Va. SPDO-P. Discusses drainage problems, including subsurface, frost action and drainage structures.

FORT BELVOIR ENGINEER SCHOOL (cont'd)

- (2) "Military Roads - Drainage Structures and Subgrade Preparations", Instructor's Manuscript, May 1944, 11, Fort Belvoir Engr. School, Fort Belvoir, Va., SPDO-P.

Describes basic principles of drainage work for military road construction.

- (3) "Water Supply in Arctic, Subarctic, and Antarctic Regions", June 1948, The Engineer Center, Fort Belvoir, Va., SPDO-P.

This report presents the results of a study of arctic, subarctic, and antarctic water supply problems and methods. Its purpose is to furnish information needed to develop water supply methods at military bases and during field operations, and also to estimate future Army requirements. Much of the information was obtained from official reports of military operations by the armed forces of the U. S. and Canada and from Government publications of both nations. Various subjects covered are types of natural water resources; civilian water supply methods; military and naval water supply; recent developments in field water supply equipment, etc.

FRANKLIN, T. B.

- (1) "The Effect of Weather Changes on Soil Temperatures", Proc. R. Soc., Vol. 40, 1919-20, 56-79, Edinburgh.

FREUCHEN, P. and MATHIASSEN THEO.

- (1) "Contributions to the Physical Geography of the Region North of Hudson Bay", Geog. Review, Vol. 15, No. 4, 1925, 549-561.

FRITZ, SIGMUND

- (1) "Solar Radiation During Cloudless Days", Heating and Ventilation, Reprint, Jan. 1949, U. S. Dept. of Com.

This report contains estimates of the radiation present on cloudless days in the U. S. A study of the "all day" radiation is now being undertaken.

FROST, ROBERT E.

- (1) "Identification of Granular Deposits by Aerial Photography", Proc. 25th Annual Meeting, 1945, 116-129, Highway Research Board SPDO-P.

This paper discusses techniques used to interpret granular materials from aerial photographs. This method of granular surveying is of great importance to highway and airport engineering because good sand and gravel are always at a premium whether it be as a source of borrow for subgrade improvement, base courses, for concrete aggregate, or for location purposes. Since the average pattern produced by granular materials is one of the easiest to identify it is possible to make an airphoto survey of an exceedingly large area in a very short time.

FROST, ROBERT E. (cont'd)

(2) also MOLLARD, J. D.

"New Glacial Features Identified by Airphotos in Soil Mapping Program", Proc. 26th Annual Meeting, 1946, 562-577, Highway Research Board, SPDO-P.

At the outset of the current soil mapping program, from aerial photographs of the State of Indiana, certain glacial airphoto patterns were found to be very complex and, as a result, an endeavor was made to trace the glacial features which have complicated the patterns. The first part of this paper discusses the areal soil mapping program and how it is being done from aerial photographs. The common bedrock and glacial patterns are discussed and illustrated so that the reader may better understand the complex patterns. The remainder of the paper discusses many of the complex patterns and the glacial features which cause them to be developed.

(3) "Use of Aerial Maps in Soil Studies and Location of Borrow Pits", July 1, 1946, Purdue University, Lafayette, Indiana, SPDO-P.

This article deals with the use of aerial maps in soil studies as indicated in the title. It points out that one of the chief advantages of mapping soils from aerial photos lies in the fact that detailed soil maps cannot be made in any other way at a comparable cost, or made as efficiently from the standpoint of time. The basis for this is that soil and rock patterns are repetitive in their natural environment which means that any two materials derived from the same soil or rock pattern material, under the same climate and both occupying the same relative topographic position, will have similar soil profiles, engineering properties, native vegetation and airphoto pattern. Other requirements are that the photographs be of good quality so that stereo vision is possible. The pamphlet is well illustrated with photographs and soil maps made from the adjoining photographs.

(4) also HITTLE, JEAN E., and WOODS, K. B.

"Use of Aerial Photos in the Correlation Between Permafrost and Soils", The Military Engineer, Vol. XL, No. 277, Nov. 1948, SPDO-P.

This article gives a brief discussion of the methods and results obtained in the use of airphoto patterns to identify soils and permafrost for site selection, thus concentrating field reconnaissance on the best sites available. It is based upon three years' field work by Purdue University in Alaska, under contract with the Corps of Engineers, St. Paul District Office.

FRY, W. H.

(1) "Petrographic Methods for Soil Laboratories", Technical Bulletin, TB No. 344, January 1933, 95, U.S. Dept. of Agriculture, Washington, D. C. SPDO-P.

This bulletin describes in detail the fundamental properties of light, the petrographic microscope, optical methods and the application of methods.

FULLER, H. U.

- (1) "Frost Penetration as Affected by Weather and Snow Conditions", Journal of the New England Water Works Assoc., Periodical, Vol. 50, No. 3, Sept. 1936, 299-301, E.L.

A discussion of frost penetration, depth of snow blanket depth of frost penetration, and temperature deficiency (freezing index) at Portland, Maine.

- (2) "Studies of Frost Penetration", Journal of New England Water Works Assoc., Vol. 54, No. 3, Sept. 1940, 275-281, Avail. in E. L.

Data are presented showing depth of frost penetration and soil temperatures in gravel and clay. Temperature deficiency curves show the range of severity of the winters at Portland, Maine.

GARDNER, D. L. and WRIGHT, G. C.

- (1) "Frost Heave Measurements for 1938-39", Thesis, 1939, 45, Univ. of New Hampshire.

Report of the continuation of a study of the relation between accumulated air temperatures and frost heave begun in 1928 under the direction of Professor A. Casagrande. The thesis reports data obtained during the winter of 1938-1939.

GARDNER, R.

- (1) "Some Effects of Freezing and Thawing on the Aggregation and Permeability of Dispersed Soils", Soil Science, Vol. 60, No. 6, Dec. 1945, 437-443.

A discussion on the effect of freezing on soil aggregation and permeability with experimental data on restoration of structure to puddled saline (sodium) soils; and the effect of freezing on the permeability of dispersed soils.

GARNEAU, J. B.

- (1) "Soil Stabilization and Prevention of Frost Heaves", The Canadian Engineer, Vol. 77, Sep. 19, 1939, 52-54.

A review of data on frost penetration, drainage, grain size, and the mechanics of frost heaving. Included is a table of depths of frost penetration in 8 principal cities of Canada.

GARSTKA, WALTER U.

- (1) "Hydrology of Small Watersheds Under Winter Conditions of Snow and Frozen Soil", Trans. Am. Geo. Union, 1944, 838.

Readings during three winters at E. Lansing, Michigan. Very good report of conditions, also good data. Could possibly be used to check rate of thaw, snow-melt, run-off from frozen soils, moisture content as affected by frost - and possibly other uses. Believe data and work is outstanding.

GAVEMAN, A. V.

- (1) "Aerial Survey and Investigation of Natural Resources", 1944, 65-80, Russian.

The status of the problem in the USSR is discussed. A list of ten books on the subject is given. It is stated that there are about 1,000 items in Soviet literature on this subject.

GEOLOGICAL PROSPECTING ADMINISTRATION

- (1) "Materials Concerning the Geology and the Mineral Resources of the North-Eastern Regions of the USSR", Sovetskaya Kolyma, USSR, Russian.

GEORGIEVSKII, N. P.

- (1) "Description of Instruments and Methods Used in Combating Certain Practicable Engineering Problems in the Arctic", 1940, Glavsevmorput, USSR, Russian, DIC.

GERASIMOV, I. P., and MARKOV, K. K.

- (1) "Glacial Period in the Territory of USSR, The", Tr. Inst. Geog., Fasc. 33, 1939, 462 pp. Acad. of Science, Moscow, USSR, Russian, with summary in Eng.

GERDEL, R. W.

- (1) "Temperature-Gradient Observations", Trans. Am. Coop. Union, Part I, 1943, 182 pp.

Temperatures relate to 0 to 24" above surface, but use for Alaska may be limited due to adverse conditions.

GESLIN, E.

- (1) "The Rate of Freezing in Soil and Its Dependence on the Thickness of the Snow Layer", Comptes Rendus (Also Hwy. Res. Abstr., April 1943), 214 (3) #99, 1942, 124-125; Fr. (Orig:).

Depth of snow cover necessary to prevent freezing of the underlying soil.

GIGNAUX

- (1) "Soil Polygons", Annales de Geographic, 15/XI, 1931.

GILBOY, G.

- (1) "Soil Mechanics Research", Proceedings, American Society of Civil Engineers", Vol. 57, No. 8, Oct. 1931, 1185-1186.

An explanation of the mechanics of frost action based on results of field laboratory studies in cooperation between U. S. Bureau of Public Roads, the State of New Hampshire, and M. I. T.

GILKEY, H. J.

- (1) "Freezing Ground Acts Like Hydraulic Jack", Engineering News-Record, Vol. 79, No. 8, Aug. 23, 1917, 360-361, AHL.

A brief statement concerning heaving of bridge piers to the extent of 2½", 36,000 lb. piers founded in blue clay 3½ to 4½ ft. below the surface. The location is given as "an important midwestern city."

GILL, A. F. and ROWAT, R. M., 'HIGHWAY RESEARCH BOARD

- (1) "Frost Heaving Reduced by Salt", Proc. of 19th Annual Conv. of Highway Research Board, 7 Dec. 1939, National Research Council, Washington, D. C.

GLADZIN, I. N.

- (1) "On the Question of Causes of Salinity of Siberian Lakes", G.E.N.I.I., 1927, Russian.
- (2) "Geomorphological Observations in Hibinsk Tundra, Trudy. In. p o i zucheniiu, Fasc. 39, 1928, USSR, Russian.
According to Soboleosky, this article contains a list of important literature on frost action.
- (3) "Die Steinige Polygonen oder Polygonboden", Bull. Russ. Geogr. Soc. Vol. 60, 1928, 305-322, Russian, resume' in German.
- (4) "Stone Polygons", Izv. Russ. Geogr. Soc., Vol. 60-Fasc. 6, 1936, 811-843, Russian with Engl. Summary.

GLAZOV, N.Y.

- (1) "Method of Studying the Degradation of Permafrost, The", Proc. of the Commission on Permafrost, Vol. VI, 1938, 155-161, Acad. of Science, Moscow, USSR, Russian, DIC. Eng. abstr. by Stef. avail. in SPDO-P, AUL & EL.

The author states that the degradation of permafrost has not received sufficient study. He points out that observations of the "island type" of permafrost will supply the desired information but will require a long period of observations. As an alternative, he suggests observations on those traces which freezing and thawing leave in the ground such as the sinking of the ground, the infiltration and chemical effect of soluble salts in the ground, and the difference in salt concentration and coloration of the ground.

GLOVER, M. P., KIMBALL, D. A., and RUHNKE, G. N.

- (1) "A Comparison of Temperatures in Air and at Various Depths in a Light Sandy Soil in Southern Ontario", Scientific Agriculture (La Revue Agronomique), Vol. XIV, No. 7, Mar. 1934 353-359, Can. Soc. of Tech. Agriculturists, Ottawa, Canada, SPDO-P.

An example is given of recorded temperature data taken with recording thermograph of the 2 pen type with mercury in steel cables. Tabulated data are given showing average monthly temperatures of air and of the soil at depths of 4, 12 and 24" from July 1930 to June 1932.

GLOVER, ROBERT E.

- (1) "Flow of Heat in Dams", Proc. of A. C. I., Nov. - Dec. 1934.

GOFLIN, Ia. L.

- (1) "Study of Temperatures and Thermal Flows Within the Ice Cover", Morekaja Gidrofizicheskaja Laboratoria, Acad. of Sci., USSR, Russian.

GOKOYEV, A. G.

- (1) "On Swelling-mounds and Hydrolaccoliths in the Kazakhsk Steppe" Investia Russ. Geogr. Soc., Vol. 71, No. 4, 1939, 541-546, Russian.

GONCHAROV, V. I.

- (1) "Thermal Regime of a Water-Conduit", Bull. Hydrol. Inst., Vol. 10, 1933, 100-125, Russian.

GOODELL, B. C.

- (1) "Soil Boring Tool for Frost Depth Determination", Journal of Forestry, Vol. 37, No. 6, June 1939, 457-459.
An illustrated description of a small diameter boring tool (soil tube) for determining depth of frost penetration.

GORBATSKY, G. V.

- (1) "Post Pliocene Deposits and Relief of Southeastern Coast of Kanin Peninsula", Izvest. Russ. Geogr. Soc., Vol. 64 - No. 6, 1932, Russian.

GORODKOV, B. N.

- (1) "Peat Mounds and Their Geographic Distribution" Priroda, No. 6, 1928, 559-601, Russian.
- (2) "Permanently Frozen Ground and Vegetation", Gom. Research Nat. Prod. Forests, No. 80, 1930, 135-156, Acad. Sci., USSR, Russian, NN.
- (3) "Permanently Frozen Soil in the Northern Region", Sovet Izuchen, Proizvod Sil, Ser. Severnaya, Fasc. 1, 1932, 3-109, Russian & Eng. Summary, NN.
- (4) "Botanico-Geographic Sketch of the Clinkotsk Coast", Scientific Notes of the Pedagogical Institute of Gertsen, Vol. 21, 1939, 99-173, DIC.

GOTTSTEIN, E.

- (1) "Fundamentals on Frost Damage to Roads, Its Causes and Prevention", Grundsatzliches uber Frostschaeden an Strassen, ihre Ursachen und ihre Verhutung, 1937, 19, Fig. 28, Volk and Reich Verlag, Berlin, German, Road Abstracts, Vol. 5, No. 2, Abst. No. 74, p. 21, April 1938.
Abstract of an original article dealing with the underlying principles of frost effects and measures to obviate the damage. The author gives experience on German roads during the severe winter of 1935-1936 and refers to a comprehensive bibliography by H. Petermann and E. Boedeker (see Road Abstracts 1937-38, Vol. 4, No. 213)

GOULD, C. B.

- (1) "Tile Drains Solve Frost Boil Problems", Roads and Streets, Vol. 71, No. 7, July 1931, 257-258.
A description and tabulation of cost data of trenching, backfilling and installation of drain tile for correcting frost boils in Washtenaw County, Mich. on eight roads.

GRAVE, M. A.

- (1) "Fossil Ice in the Lena-Aldan Water Divide, The", Proc. of the Obruchev Inst. of Permafrostology, Vol. IV, 1944, 10-32, Acad. of Science, Moscow, USSR, Russian, DIC. Eng. abst. by Stef. avail in SPDO -P, AUL & EL.

The author emphasizes the importance of the study of fossil ice from the practical point of view as a phenomenon which, with change of thermal balance of the surface, may cause a considerable deformation of the surface. In 1940, the Yakuts expedition of the Obruchev Institute began a study of the fossil ice in the region of a salt lake, Abalakh, which is situated at the Lena-Aldan water divide. The author states that the fossil ices of this locality may be divided into two groups; buried ice, and the mass of ice formed within the ground. The author cites a series of observations of the temperatures of the ground and fossil ice in a 32 meter deep pit which was located on the western shores of Lake Abalakh where there was fossil ice 22.75 meters thick. In conclusion, the author suggests the method of mapping the fossil ice which, worked on a very small territory, would permit by prognosis, mapping the occurrence of it in a very large territory. Bibliography of 25 titles is given.

GRAY, G. D. B.

- (1) "Soviet Land: The Country, Its People, and Their Work", 1947 312 pp, Adam and Charles Black, Soho Square, London, SEDO-P. Contents of Interest are:

The Country

- a. Position and size
- b. Physical features
- c. Climate
- d. The Soil & Vegetation cover of the Soviet Union

Work

- a. Agriculture
- b. Industry
- c. Transport

GREENMAN, R. L.

- (1) "Runway Design in Arctic and Sub-Arctic Regions", Runway Design in Arctic and Sub-Arctic Regions, Runway Design in Arctic and Sub-Arctic Regions, 1944, Northwest Service Command.

GREGORY, J. W.

- (1) "Stone Polygons Besides Lock-Lomond", Geogr. Journal, Vol. 76, 1930.

GRIGGS, R. F.

- (1) "The Forest Limit in Alaska", Geographical Review, Vol. 24, 1934, 652-653.

This article deals with the timber line of coniferous forests. This is a review of Mr. Griggs' articles: "The Problem of Arctic Vegetation" published in G. Washington Academy of Science, Vol. 24, pages 153-175, 1934, and "The

GRIGGS, R. F. (cont'd)

Edge of the Forest in Alaska and the Reason for Its Position," published in Ecology, Vol. 15, pages 88-96, 1944. The reviews say: the Arctic timber line (coniferous forest), one of the chief vegetational boundaries of the earth, is of "fundamental importance from every point of view." On the Alaska Peninsula, the forest which ends at Kodiak is 250 miles south of the isotherm; east of the McKenzie it is nearly 150 miles in advance of the isotherm of 10° C. (50°F).

- (2) "Timber Lines as Indicators of Climatic Trends", Science, Vol. 85, No. 2202, May, 1937, 251-255, Science Press, Grand Central Terminal, N.Y.C.

Canadian white spruce is on mainland of Alaska and Sitka spruce, among the conifers has advanced as far as Kodiak. The important points contained in this article are as follows; The forest is advancing in Alaska. Petrof in 1884 and various U.S.G.S. explorers have noted the advances in western and northern Alaska. The most easterly point at which an advancing timber line has been definitely reported is at Wiseman, latitude 67°30', longitude 150° by Robert Marshall... No fossil pollens except an occasional grain were found in bogs at Kodiak by Dr. Paul W. Bowman (Ecology, 15:97:100, 1934). The general belief among botanists is that tree growth is limited by isotherm of 10°C. (50°F). In southwest Alaska the isotherm stands 250 miles beyond the edge of the forest. Now there is a plant migration; apparently, the climate of Alaska has become mild so recently that the trees haven't been able to keep up with the change and occupy the terrain suitable for them. The advance is slow, at Kodiak one mile per century, on account of the fact that the ground is thickly covered with vegetation which chokes intruders. The advance in northwest Alaska is probably 1/10th mile per century." It was noted that Canadian white spruce is on the mainland of Alaska and that Sitka spruce is the conifer which has advanced as far as Kodiak.

GRIGOREV, A. A.

- (1) "Concerning Some Corrections in the Work 'Permafrost and Ancient Glaciation'", Trudy, Commission for the Study of Permafrost, Vol. I, 1932, 113-115, Russian, NN.

- (2) "The Sub-arctic", 1946, 3-161, Acad. of Science, Moscow-Leningrad USSR, Russian, NN. Eng. abst. by Stef. avail in SPDO-P, AUL & EL.

Most of the material on permafrost in this work is in chapter 3 where the author examines in detail the permafrost as a factor of the geomorphological process, and the character and behavior of rivers and lakes under permafrost conditions. However, through the work are scattered references to permafrost and its relation to flora, fauna, and the process of soil formation. Bibliography of several titles included.

GRIM, R. E.

- (1) "The Clay Minerals in Soils and their Significance", Circular #65, 1941, 11-12.
Relation of frost heaving to clay mineral composition; clay minerals discussed include montmorillonite, kaolinite and certain illite soils.

GROBER, H. and ERK, S.

- (1) "Penetration of the Heat into the Ground", "Die Grundgesetze der Warmenbertragung", 1933, 118-121, Julius Springer, Berlin, Germany, German.

GROMOV, V. I. and MIRCHINK, G. F.

- (1) "Geological Observations on Terraces of Yenisei and Angara", Sibirvedenie, No. 5-6, 1930, NOVOSIBIRSK, USSR, Russian.

GROZD

- (1) "A Natural Ice Cold-Storage Plant in Dzerzhinsk, Kholodilnoe Delo", Vol. 10, 1932, 30, DIC.

GUMENSKAYA, O. M.

- (1) "The Influence of Dampness and Temperature Upon the Resistance of Frozen Grounds to the Suezze", Sovet Izuchen, Proisvod, Sil, Kom. Izuchen Vechnoi Meraloty, fasc. 2, 1936, 105-135, Russian with Eng. Summary, NN.

GUTERMAN, I. T.

- (1) "Results of Observations on the Temperature Regime of Permanently Frozen Ground in Lower Yenisei", Meteorol. Vestnik, No. 10-12, 1932, Comm. Russian Geogr. Soc., Leningrad, Russian.

HABERLE, CAPT. A. E.

- (1) "Reconnaissance to Determine the Feasibility of Winter Operation of the Richardson Highway in Alaska", 20 Dec. 1943, Fort Richardson, Alaska.

An informal report on the feasibility of keeping the Richardson Highway open for freighting operations during the winter season, the problems to be encountered in such an undertaking, and the considerations involved, from an engineering standpoint.

HALLIDAY, W. E. D.

- (1) "A Forest Classification for Canada", Forest Service Bulletin No. 89, 1937, 50, Dominion Forest Service, Ottawa, Canada.

Canada is divided into 3 broad Climax Formations, the ultimate vegetative cover for a given region. The general divisions are (1) Arctic Alpine Tundra Formations, (2) the Forest Formation, and (3) the Grassland Formation. The widespread nature of the Forest Formation and the varying characteristics and responses to climate of the dominant species in a particular area render it necessary to acknowledge major cover types within the general Forest Formation. The author recognizes 8 Forest Regions in Canada. A brief description of each of the regions is presented. Of special interest is the Boreal Forest Region as all of the Permafrost Zone in Canada falls in this region. A complete check list of tree species occurring

HALLIDAY, W. E. D. (cont'd)

in Canada and a bibliography of 39 references is included.

HAND, I. F. and KIMBALL, H. H.

- (1) "Reflectivity of Different Kinds of Surfaces", Monthly Weather Review, Vol. 58, 1930, 280-282.

These reflection-coefficient values are based on observations made from air planes when over twelve different types of soil, conifers, deciduous trees, grass, snow of different textures, the ocean (both with and without breakers), sand of many colors, etc.

- (2) HAND, I. F. only

"Monthly Weather Review", Monthly Weather Review, No. 1148, Vol. 63, No. 1, Jan. 1935, 24-29, U. S. Dept. of Comm., Washington, D. C.

- (3) HAND, I. F., only

"Review of United States Weather Bureau Solar Radiation Investigations", Monthly Weather Review, Vol. 65, Dec. 1937, 415-441, U. S. Dept. of Commerce, Weather Bureau, SPDO-P.

This paper presents a summary to date of the methods employed and the results obtained in the solar radiation investigations conducted by the Weather Bureau. Many data are here published for the first time, while several tables and charts previously published in the Monthly Weather Review are revised and brought up to date. Numerous references to literature are included.

- (4) HAND, I. F. only

"A Summary of Total Solar and Sky Radiation Measurements in the United States", Monthly Weather Review, Vol. 69, April 1941, 95-125, U. S. Dept. of Commerce Weather Bureau, SPDO-P.

This paper presents a summary to date of the total solar and sky radiation measurements made by the Weather Bureau and cooperating institutions and individuals; the data are presented in tabular form, and also graphically by 18 isopleths.

- (5) "Observations of Radiation Penetration Through Snow", Monthly Weather Review, Vol. 70, Feb. 1942, 23-25, U. S. Dept. of Commerce.

- (6) HAND, I. F. only

"Pyreheliometers and Pyreheliometric Measurements", Nov. 1946, 55 pp., US Dept. of Comm., Washington, D. C., SPDO-P.

The Table of Contents of this article includes the following headings:

1. Types of Measurements and Instruments
2. Recording Device
3. Standardization of Pyreheliometers

HAND, I. F.

4. Calculations

- a. Air Masses at Stations
- b. Solar Altitudes
- c. Sunrise, Sunset and Twilight

5. Tables

- a. Solar Altitudes and Solar Azimuths
- b. Conversion Table-Degrees of Arc to Minutes & Seconds of time
- c. Values of Air Mass at Sea Level
- d. Daily Total Solar and Sky Radiation Received at Outer Limit of Atmosphere
- e. Sunrise, Sunset and Twilight Tables.

HANSEN, C. G. & Swanberg, J. H.

- (1) "Development of a Procedure for the Design of Flexible Bases", Proc. Highway Research Board, Vol. 26, 1946, 44-57.

The results of field and laboratory studies to establish the relationship between field performance of flexible type bases and bearing values obtained in the laboratory. Included are significant data on soil moisture and density changes.

HARDEN, M. J.

- (1) "Use of Stereoscopic Methods in Preparing Topographic Maps from Aerial Photographs", Proc. - 23rd Annual Meeting, 1943, 552-4, Highway Research Board.

This paper describes the preparation of topographic maps by the multiplex instrument. The process involves the use of aerial photographs to form true scale stereoscopic models of the terrain in which the necessary measurements for position and elevation can be made much more rapidly than similar determinations can be made by survey parties operating in the field. The process has many other advantages not shared by the customary way of making maps in the field and lends itself well to the mapping of areas through which it is proposed to locate new highways, particularly those routed through mountainous regions.

HARDY, R. M.

- (1) "Permanently Frozen Ground and Foundation Design, Part I", Engineering Journal (Canada), Vol. 29, No. 1, Jan. 1946, 4-7.

Limited largely to discussion of permafrost but includes a review of theories of frost heave, and shows relationship between soil types and ice segregation in permafrost.

- (2) "Soil Sampling and Testing for Highways and Airports", Roads and Bridges, Vol. 84, No. 2, Feb. 1946, 63-122, AHL.

HARDY, R. M. (cont'd)

The author describes different kinds of tests which should provide a classification of soils relative to:

1. Load carrying capacity
2. Behaviour under change of moisture content
3. Permeability
4. Behaviour under freezing conditions

HARRINGTON, E. L.

- (1) "Soil Temperatures in Saskatchewan", Soil Science, Vol. 25, 1928, p. 183.

Thermometers were placed in the ground at depths from one to eight feet at the University of Saskatchewan at Saskatoon, Saskatchewan. It is pointed out that the temperature varies rapidly at the one foot level and that the lag in soil temperature below a two-foot depth is marked. A comparison of the temperatures at Saskatchewan with those obtained by other observers in Kansas is made. It is pointed out that the maximum temperature at the 8-foot depth was reached in April and the first half of May. Permafrost is not discussed in this article. Graphs showing the results are included.

HARRINGTON, G. L.

- (1) "Anvik-Andreafski Region, Alaska, The", Bulletin No. 683, 1918, 70 pp., U.S.G.S., Washington, D. C., DGS.

- (2) Also, MERTIE, J. B. Jr.

"The Ruby-Kuskokwim Region Alaska", U.S.G.S. Bulletin-754, 1924, p. 136, Government Printing Office, Washington, D. C., SPDO-P.

Bulletin 754 describes the geography, drainage, and geology, and other features of a mining region located south and west of Fairbanks, Alaska, extending from Ruby on the Koyukuk River to the Kuskokwim River. The information was gathered from 1896 to 1920 and combines all available information up to the time of preparation of the report. It was prepared principally to assist mining operations in the Ruby-Kuskokwim Region.

Describes the general geology and geography of the region. Includes several illustrations and maps.

HARRINGTON, LYN

- (1) "Tractor Trails in Manitoba", Canadian Geographical Journal, Vol. 38, No. 2, 1949, pp. 70-77.

Freighting on winter roads used by tractor freighting companies; with illustrations.

HARRISON, J. L.

- (1) "First Frost is Never Responsible for Cracked Concrete Roadways", Engineering News-Record, Vol. 80, No. 9, Feb. 28, 1918, pp. 418-420.

An attempt to establish the hypothesis that heaving can occur only as a result of more than one 'freeze' of the subgrade soil. No literature is cited and no supporting data are given. The author bases thickness of subbase design on the maximum depth of winter thaws.

HARRISON, J. L. (contd)

- (2) "Water and the Subgrade", Public Roads, Vol. 1, April 1919, 11-18, Gov't Printing Office, Washington, D. C.

HARSHBERGER, J. W.

- (1) "Tundra Vegetation of Central Alaska Directly Under the Arctic Circle", Tundra Vegetation of Central Alaska Directly Under the Arctic Circle, Vol. 67, 1928, 215-234, Am. Philos. Soc. Pr.

HAWKES, L.

- (1) "Frost Action in Superficial Deposits, Iceland", Geol. Magazine (London), Vol. 61, No. 725, Nov. 1924, 509-513, SPDO-P.
A description of several distinct types of effects of frost action in surface deposits in Iceland. Included are cracks in clays, knolls in grasslands, rings of stone, and formation of shallow hollows in gravels.

HAYES, W. P. & MCCOLLOCH, J. W.

- (1) "Soil Temperature and Its Influence on White Grub Activities", Ecology, Vol. 4, No. 1, Jan. 1923, 29-36.
Authors, in their study of white grub activities, obtained daily soil temperatures at Manhattan, Kansas at depths of 1-6 feet from March 1, 1920 to December 31, 1921. Although a mild winter with no soil freezing, the temperature data are of general interest for the locality.

HEJE, K.

- (1) "Studies of Frost Heaving Carried Out of the Norwegian Technical College and Their Economic Results", Orig. Meddelande Veiderekkl Norsk Ing., Abstract - Road Abstracts, Vol. 9, No. 6, Vol. 9, No. 6, 1941, 65-71, Abst. No. 217 - May 1942.
Required depth of non-frost-susceptible granular bases, insulating materials and drains to prevent detrimental heaving; frost storage capacity (freezing index); and costs of various methods of preventing frost damage.

HENKEL, H. L.

- (1) "Foundation Problems at Bethel Airport", Pacific Builder and Engineer, Vol. 51, No. 5, May 1945, 56-60, SPDO-P.
An article on the location and construction of the Bethel Airport on the Kuskokwim River, on the southwestern mainland of Alaska. It describes how failure is changed to success when suitable site and borrow area are finally located for strategic base.

HENTON, J. T.

- (1) "Modern Subdrainage Proves Successful Cure for Frost Boils", Highway Magazine, Vol. 19, No. 12, Dec. 1928, 316-318.
A brief article describing the installation and performance of a corrugated metal pipe on State Truck Highway No. 60, west of Columbus, Wisconsin, to prevent frost boil.

HEWES, L. I.

- (1) "American Highway Practice", Vol. 1, 1942, 183-184, John Wiley and Sons, New York.

Includes a summary statement on theory of frost heaving.

HIERONYMUS, G.

- (1) "Earth Ambient Temperatures for Cable Loading Limits", Electrical World, Vol. 122, No. 24, 9 Dec. 1944, 92-93, BSL.

Results of a study of air and ground temperatures in Kansas City, Missouri, to determine relationship between temperature and depth; cyclic changes from year to year; lag between surface air and earth temperatures at various depths; and location of "sink" value at which there is no apparent response to variation of surface air temperatures.

HIGHLAND, SCOTLAND, G.

- (1) "Study of Year Round Soil Temperatures", Journal of American Water Works Association, Vol. 16, Sept. 1926, 342-354, BSL.

Includes tabulated data on year around temperatures at Clarksburg, West Virginia, and depth of frost penetration in 11 cities in U. S. and Canada.

HIGHWAY RESEARCH BOARD

- (1) "Treatment of Subgrade Soils with Calcium Chloride to Prevent Detrimental Frost Action", Highway Research Abstracts, No. 118, March 1945, 9-10, Nat. Res. Council, Washington, D. C., BSL.

- (2) "Airport Runway Evaluation in Canada", 1947, Nat. Res. Council, Washington, D. C. SPDO-P.

This report outlines results of investigations of runways at a number of Canada's principal airports in 1945-46. Program of tests in pedological soil survey and preparation of a pedological soil map for each site; field moisture and density tests in place on base course and subgrade for physical and compaction tests; and undisturbed samples for OBR, triaxial compression, and shear, and consolidation tests, etc.

HILL, E. M. M.

- (1) "Perpetually Frozen Subsoil in Northern Canada", Canadian National Railway, 29 March 1940, Winnipeg, Manitoba, Canada, SPDO-P.

This article deals with perpetually frozen subsoil in the regions of the Province of Manitoba principally. It is pointed out that the southern boundary of permafrost exists somewhere between latitude $54^{\circ}30'$ and $55^{\circ}0'$ in Manitoba. Permafrost in this area may exist in the form of islands. North of $56^{\circ}30'$ latitude, permafrost and tundra vegetation are continuous. There is a table showing thickness of permafrost in various parts of Manitoba, Northwest Territory, and the Yukon Territory. A list of references regarding frost and soil temperatures in Canada is given.

HITTLE, J. E.

- (1) "The Use of Aerial Photographs in Identifying Granular Deposits and Other Soils", Engineering Bulletin, Vol. XXVII No. 2, March 1943, 79-86, Purdue University., SPDO-P.

A general review of the use of aerial photographs in dealing with highway location problems, especially in Indiana. A discussion is given of the means of locating granular deposits by the proper interpretation of information contained on aerial photographs.

- (2) "The Application of Aerial Strip Photography to Highway and Airport Engineering", Proc. 26th Annual Meeting, 1946, 226-235, Highway Research Board, SPDO-P.

This paper presents a method of gathering pavement performance data by the use of aerial strip photography. This method of aerial photography offers a quick, convenient method of making a permanent record of the essential features of pavement performance that heretofore could only be obtained by visual inspection in the field.

- (3) "Special Survey Report on a Landslide Condition on the Alaska Railway Between McKinley Park Station and Healy, Alaska, Purdue Univ. Engineering Experiment Station, Jan. 1948, SPDO-P.

A report on a special survey made on a section of the Alaska Railroad which was in distress because of a landslide, as requested by the Alaskan Command through the Alaska District.

HMYSNIKOV, P. K.

- (1) "Hydrology of the Yana River Basin", Acad. Sci. and G.U. S.M.P., 1934, Acad. Sci., Leningrad, USSR, Russian.

HOBBS, H. E. & KIMBALL, H. H.

- (1) "Monthly Weather Review", Vol. 51-No. 5, May 1923, 239-242, U. S. Dept. of Com. Washington, D. C.

HOBBS, W. H.

- (1) "Soil Flow", Am. Geographical Society, No. 45, 1913, 281-284.

Discussion and explanation of the phenomena of freezing and thawing as related to the formation of soil polygons and the lifting of rock fragments and depositing them on edge at the edge of the polygon. Some discussion given to soil flow as the result of freezing and thawing.

HOGENTOGLER, C. A., WINTERMEYER, A. M. AND WILLIS, E. A.

- (1) "Subgrade Soil Constants, Their Significance and Their Application in Practice", Public Roads, Vol. 12, Nos. 4 and 5, June and July, 1931, 89-108.

The authors review the work of Bouyoucos and Taber and discuss the frost heave characteristics of the various Public Roads Administration soil groups. Quite a comprehensive article on soils. A small part deals with heaving and gives theories on ice lense formation.

HOGENTOGLER, C. A.

- (1) "Engineering Properties of Soil", 1937, 125-158, McGraw-Hill, Book Co. New York.

Heat transfer, insulating properties of materials, effect of air temperature, effect of types of covering, growth on freezing, direction of growth, ice lenses responsible for heave, freezing of supercooled water, heave in permeable soils, heave in soils of high capillarity, moisture requirements for frost heave, effect of soil character, results of controlled experiments, effect of climatic changes, effect of soil profile, effect on road surfaces, and drainage of frost heaving silts.

HOPKINS, DAVID M.

- (1) "Thaw Lakes and Thaw Sinks in the Inniruk Lake Area, Seward Peninsula, Alaska." The Journal of Geology, Vol. 57, 1949, 119-131.
- (2) "Terrain and Permafrost in the Inniruk Area, Alaska", U. S. Geological Survey, DGS.

HOPP, HENRY & SLATER, C. S.

- (1) "Action of Frost on the Water Stability of Soils, The", Hwy. Res. Abstracts, Vol. 19, No. 7, July 1949, Nat. Res. Council, Washington, D. C., SPDO-P.

Gives the results of six different frost treatments on two different soils and conclusions drawn therefrom. It states that methods designed to overcome the harmful effects of frost action should be based on reducing the depth and frequency of freezing and on maintaining drainage channels to keep the moisture content as low as possible.

HORNER, SEWARD E.

- (1) "Anticipated Maintenance Aspects of "Icing" on the Alaska Highway", 1943-44, 1-56-65-68, Public Roads Adm., Alaska District, SPDO-P.

This article describes briefly the nature of the "Icings" and suggested maintenance procedures. A list of "icing" areas with maps showing locations is included along with a general maintenance discussion of each area.

HOWARD, CAPT. HERBERT H.

- (1) "Report of Arctic Indoctrination Tour of February 1948", April 1948, 1-38, Corps of Engineers, US Army, Fort Belvoir, Va. SPDO-P.

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L. Goose Bay, Labrador

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N. Bluie West 8, Greenland

O. Torbay, Newfoundland

Sect. III - Summary of Observations

P. General

A report on observations of various airfields and stations throughout the arctic and subarctic regions of North America.

HUBBARD, LEE D.

- (1) "Construction Methods at Juneau", Pacific Builder and Engineer, Vol. 51, No. 4, April 1945, 56-57, SPDO-P.

An article briefly describing the problems encountered such as flooded fill areas, continuous rainfall, and frozen borrow pits in the construction of the CAA Airport at Juneau.

HUGHES, A. D.

- (1) "Frost Damage to Roads on a Chalk Subsoil", Surveyor, Vol. 106, No. 2909, 7 November 1947, 581-582, London, England.

A general descriptive article on depth of frost penetration and effect of drainage, exposure, subsurface water through cracks in pavements, grades, cuts, embankments and traffic on frost heaving and frost boils; and the nature of successful treatments.

HUNT, HAL. W.

- (1) "Fighting Snow to Keep 'Em Flying", Engineering News Record, Vol. 129, No. 19, 5 November 1942, 89-100.

With regard to the removal of snow from Alaskan airfields the following is quoted from this article: "Alaskan procedure on preparing and maintaining snow surfaces is substantially different from that described as Canadian practice, perhaps due to the different characteristics of the snow... Dragging with the proper equipment has proven the most efficient method of field maintenance, with the exception of actual snow removal, according to our Alaskan informant." The remainder of this article describes snow removal from airfields in the States and in Canada. Briefly the consensus is that the one desirable method of handling snow on airports is to get it off, and keep it off, the runways at all times. The means of removing snow from runways most favored are machines that pick up the snow and deposit it well away from the used areas. This is usually done by plows, powered by high-tractive-effort trucks, working with rotary blowers or other snow throwing machines.

HUNT, RALPH W., CAPT. C. E.

- (1) "AFG Tests - Frigid, Williwaw, and Frost - Summary Reports of Engineer Operations", June 30, 1947, The Engineer School, Fort Belvoir, Virginia, SPDO-P & EL.

This is a summary report of engineer operations related to Army Ground Forces tests, Frigid, Williwaw, and Frost. Prepared by a representative of the Arctic Research Section of the Engineer School. The mission of the Task Forces was to obtain basic information necessary to develop equipment, techniques, tactical doctrine and training methods necessary for efficient operation under winter conditions. The tests were conducted in areas with Arctic, cold-wet, and heavy winter conditions from October 1946 to April 1947. There is no permafrost available in the area of Task Force Williwaw at Adak Island since the island is mostly solid rock. There is no permafrost in Camp McCoy near Sparta, Wisconsin. Other more detailed reports are to be prepared on these task force operations.

- (2) "Report of Operation Nanook", Arctic Research Section, Dec. 1946, The Engineer School, Fort Belvoir, Va.

This report is a detailed account of an arctic expedition conducted by Navy Task Force 68 in which Army, Coast Guard, Weather Bureau and other personnel participated to obtain military and scientific information for use in planning future Polar operations. Operations were conducted in the eastern Canadian Archipelago and at North Star Bay in northwest Greenland near the Village of Thule. The report is liberally illustrated with maps and photographs. In connection with the operations conducted, reference is made to the permanently frozen soil beneath an active layer of surface soil.

HUNTING, M. T.

- (1) "Geology in Highway Engineering", Trans. of Amer. Cos. of Civil Engineers, Vol. 110, 1945, 278-280.

A brief and general review of the area affected by frost action, Taber's work, and the cooperative survey between the state highway departments of Michigan, Minnesota, Wisconsin, and the Public Roads Administration.

HURST, W. D.

- (1) "How Winter Problems are Handled at Winnipeg, Canada", Water Works Engineering, Vol. 98, No. 25, Dec. 12, 1945, 1432-1435, On file in Engineer School Library.

This article discusses waterworks maintenance at Winnipeg. Author points out trouble developed with one type of hydrant because condensation moisture collected beneath operating nut froze onto its bearing. Other operating experiences recounted.

HUTTEL, J. B.

- (1) "Building an Earth-Fill Dam in Arctic Placer Territory", Engineering and Mining Journal, Vol. 149, July 1948, 90-92.

HUXLEY, J. S. AND ODELL, N. E.

- (1) "Notes on Surface Markings in Spitzbergen", The Geog. Journal, Vol. 63, No. 1, 1924, 207-228.

HVLORSLEV, M. JUUL, DR.

- (1) "The Present Status of the Art of Obtaining Undisturbed Samples of Soils", American Society of Civil Engineers, Proc. of Purdue Conf. on Soil Mechanics and its Application, Sept. 2-6, 1940, Purdue Univ., Lafayette, Ind., Committee on Sampling and Testing, March 1940, Harvard University, Cambridge, Mass, SPDO-P.

This report is divided into two main parts. In the first part is given an analytical review of the character and influence of the various types of disturbance to the soil sample and of the problems encountered in securing such samples with a minimum of disturbance. The second part contains a comprehensive review of the methods and equipment currently used to obtain undisturbed samples of soils in this country and abroad. Bibliography.

- (2) "Subsurface Exploration and Sampling of Soils", Report on a Research Project of the American Society of Civil Engineering, November 1948, 465 pp., U. S. Waterways Exp. Sta., Vicksburg, Miss., SPDO-S & W.E.L.

The contents are:

Part I - Principles of Exploration and Sampling

Part II - Details of Sampling Equipment and Methods

Bibliography.

HYDE, J. C.

- (1) "Graphic Presentation of Temperatures in the Surface Foot of Soil in Comparison with Air Temperatures, A", Proc. Soil Science Society, 1942, On Microfilm in AUL & in print in SPDO-P.

Three dimensional presentation of daily fluctuations of temperature and the relationship between temperatures at different depths of soil with that of air.

HYLAND, W. L. & MELLISH, M. H.

- (1) "Steam Heated Conduits, Utilidors, Protect Service Pipes from Freezing in Regions of North America Where Permafrost Exists", Civil Engineering (NY), Vol. 19, January 1949, 15-17 f.

IANOVSKII, V. K.

- (1) "Permanently Frozen Ground in the Vicinity of the Vorkuta Coal Deposit", Russian.

- (2) "Contributions to the Method of Studying Permafrost for the Purpose of Proposed Engineering Construction", Geol. and Mineral Deposits of the North of the USSR Glauzevmorput, Vol. 3, 1936, 42-77, Russian, DIC. Eng. abstr. by Stef. avail. in SPDO-P.

This article proposes that for an area under consideration for construction, the following order of study should be made: Preliminary and final investigations, detailed permafrost survey, geophysical explorations, suprapermafrost waters, field ground investigations along with their analysis and conclusions.

- (3) "Academician V. A. Obruchev and Soviet Permafrostology", Proc. of the Inst. of Permafrostology, Trudy Inst. Merzlotovedeniya, Vol. 4, 1944, 5-9, Acad. of Sci., Moscow, USSR, Russian, NN.

IAKOVLEV, V. I.

- (1) "Foundations of Dwelling and Social Buildings at the Town of Igarka in the Region of Permanently Frozen Ground", Russian.

IELPACHEV

- (1) "On Methods of Exploitation of the Chernov Mines", Ugol, No. 155, 1938, 25-35, Moscow, USSR, Russian, DIC.

IGNATEV, V.

- (1) "Permafrost on the Kola Peninsula", Priroda, No. 2, 1933, 58, Russian, DIC.

INGERSOLL, L. R. AND KOEPP, O. A.

- (1) "Thermal Diffusivity and Conductivity of Some Soil Materials", Physical Review, Vol. 24, July 1924, 92-93, SPDO-P & BSL.

The authors present a method of measuring diffusivity and give tabulated data on percentage moisture, diffusivity, specific heat, density and conductivity for four different soil materials and densely packed snow.

- (2) Also ZOBEL, O. J.

"An Introduction to the Math-Theory of Heat Conduction with Engineering and Geological Applications", 1913, Ginn and Company, New York.

INNIS, HAROLD A.

- (1) "Hudson Bay Railway, The", The Geographical Review, Vol. 20, 1938, 1-30, AUL.

In constructing sections of the road, rails were laid directly on the frozen ground. Ballast was then carried by trains and the rails later jacked up. Steam pipes were used to set piling. One story buildings were preferred. Ample insulation was used.

INTERNATIONAL CONFERENCE ON SOIL MECHANICS AND FOUNDATION ENGINEERING

- (1) "Proceedings of the Second International Conference on Soil Mechanics and Foundation Engineering", Vol. 7, June 21-30, 1948, Rotterdam, Holland, English, SPDO-P.

These volumes are the complete "Proceedings of the Second International Conference on Soil Mechanics and Foundation Engineering" which conference was held at Rotterdam, Holland on June 21-30, 1948. The 7 volumes are divided into 12 sections with subsections under each. The titles of the 12 sections follows:

1. Theories, Hypothesis, Considerations of a General Character
2. Laboratory Investigations
3. Field Investigations
4. Stability and Deformations of Earth Constructions
5. Earth Pressure; Stability and Displacement of Retaining Constructions
6. Foundation Pressure and Settlements of Buildings on Footings and Rafts
7. Pile Foundations, Pile Loading Tests
8. Problems of Road and Runway Constructions
9. Improvement of the Mechanical Properties of Soil
10. Groundwater Problems
11. Suggestions for International Collaboration, Exchange of Informations
12. Subjects of a General Character.

ITTER, Y. V.

- (1) "Thickness of the Layer of Ever-Frozen Ground in the Region of Verkhoyansk, The", Problems of the Arctic, No. 6, 1939, 85-86, Leningrad, USSR, Russian, Eng. abst. by Stef. avail. in SPDO-P, AUL & EL.

This is a short note reporting some of the results of the mining expedition of 1938 which was conducted in the Yana River region, 90 kl. below Verkhoyansk. In a cut 40 meters deep, a series of temperature observations were made on the layer of permafrozen soil. This layer was formed of gravel-pebbly sand of the quaternary age. The author concludes that (1) the belt of constant temperature lies at the depth between 10-15 meters (2) geometrical gradient is about 25 meters; and (3) the depth of the permafrozen layer is equal to 25×7.2 plus 12 or in round figures 200 meters. A table of temperatures at various depths is given.

IVANO AND LEONTIEVA

- (1) "Climatic Characteristics of the Ob-Yenisei District", Trudy of the Arctic Institute, Vol. 133, 1939, 3, USSR, Russian.

IVANOV, B. G.

- (1) "Electrometric Method of Studying the Freezing of Soils and Ground", Climate and Weather, No. 5, (56), 1934, Leningrad, USSR, Russian.

IVANOV, I. M.

- (1) "Soils in the Ice Zone", Trans. Arct. Inst., Vol. 12, 1933, 183-202, Russian.

JACOBSEN, I. A.

- (1) "Norway's Arctic Problem; Grim Difficulties Tackled", Foreign Commerce Weekly, Vol. 22, March 1946, 9-10, DLC.

JAILLITE, W. MARKS

- (1) "Permafrost Research Area", The Military Engineer, Vol. XXXIX, No. 263, Sept. 1947, 375-9, SPDO-P

This article describes construction by the Corps of Engineers, D. A., of a research area near Fairbanks, Alaska, for the purpose of studying the effect of permafrost (permanently frozen ground) on various types of foundations, using different kinds of insulation, piling, gravel fills, etc. Some of the difficulties of construction are described, including what happens when flowing artesian well is obtained when drilling for water through the frozen ground.

JENNESS, JOHN L.

- (1) "Permafrost in Canada", Journal of the Arctic Institute of North America, Vol. 2, No. 1, May 1949, 13-27, Geographical Bureau, Ottawa, Canada.

The article concentrates mostly on the origin and distribution of the permafrost with regard to the influence of the climate and vegetative cover. Some examples of severity of seasons for year to year and their influence on the thermal gradient are given. Several cases of absence of permafrost under rivers and lakes are shown along with soil temperatures at several specific locations.

JOHNSON, A. W.

- (1) "Frost Action in Subgrades and Bases", Roads and Bridges, also, Engineering and Contract Record, Vol. 60, No. 11, November, 1947; Vol. 85, No. 9, Sept. 1947, 104-110, 146-150, Canada, AHL.

A review of literature on factors which determine the nature of frost action, freezing and heaving of saturated soils; depth to water table, its effect on heaving; effect of dissolved substances; freezing of nonsaturated soils; effect of nature of materials; and design to reduce or prevent the detrimental effects of frost action.

A formal paper in which the author discusses causes and cures for frost action in subgrade and bases of roads and paved areas.

JOHNSON, W. A.

- (1) "Frozen Ground in the Glaciated Parts of Northern Canada", Transactions, Royal Society of Canada, Third Series, Vol. 24, Sec. IV, 1930, 31-40.

A review of work by other investigators on permafrost (permanently frozen ground)

JOHNSTON, R. W.

- (1) "Speeding Up the Alaska Highway by Aerial-Survey Methods", Roads and Bridges, Vol. 80, No. 11, Nov. 1942, 17.

Brief coverage of the planning, location, construction and economics of the Alaska Highway. Army's task to construct road from location to actual construction. Schedule set for completion. Aerial surveys aided in location when work began to lag behind schedule. Air surveys were used to locate gravel deposits when needed, and access roads were built to them.

JOURNAL OF AGRICULTURAL RESEARCH

- (1) "Movement of Soil Moisture from Small to the Large Capillaries of the Soil Upon Freezing", Journal of Agr. Res., Vol. 24, No. 5, 1923, 427-431.

JURGENSON, L.

- (1) "Field Test for Identification of Soil Capable of Frost Heaving", Proc. of the International Conference on Soil Mechanics and Foundation Engineering, Vol. II, Appendix 22-26 June 1936, 320, BSL.

A rapid field test to identify frost susceptible soils; the test is based on rate of settlement when suspended in water, the quantity of fines being related to the depth of sediment.

KACHINSKY, N. A.

- (1) "On Soil Drills for Obtaining Samples with Undisturbed Structure", Pochvovedenie (Soil Science), No. 4, 1925, Russian.
- (2) "Freezing, Thawing and the Moisture Content of the Soil During the Winter Season in the Forest and in Open Fields", Trudy Sci. Res. Inst. Soil, 1927, Moscow Univ. Moscow, USSR, Russian.

KACHURIN, S. P.

- (1) "The Degradation of Permafrost", Doklady of the Ac. of Sci. Vol. XIX, No. 8, 1938, 593-597, Acad. of Sci., Moscow, USSR, Russian; Eng. Abstr. by Stef. avail. in SPDO-P.

Author begins this article with reference to the famous expedition of Academician Middendorf in the vicinity of Staro-Turukhansk which according to Middendorf was located on the southern limit of permafrost. The results of an expedition in 1937 in the region of the middle course of the Yenisei River show that the southern border of permafrost passes 250-300 km. south of the town of Turukhansk. This article deals with the results of boring and thermic observations in this town. The author feels that his observations definitely demonstrate that during a period of about 100 years, the upper border of permafrost was lowered considerably, showing also the contraction of the permafrost area in the Staro-Turukhansk region, and a new confirmation of the phenomenon of the degradation of permafrost in Western Siberia.

KACHURIN, S. P.

- (2) "Instruction for the Study of Thermokarst (Phenomena of Caving and Settling)", Instructions and Program Directions for the Study of Frozen and Permanently Frozen Grounds, 1938, pp. 103-112, Acad. of Sci., USSR, Russian, DLC.
- (3) "Abrasion and Permanently Frozen Ground at Anadyr", Izv. Russian Geogr. Society, Vol. 71, No. 7, 1939, pp. 1005-1019, Russian.
- (4) "An Attempt to Subdivide into Regions the Grounds in the European Territory of the USSR in Which the Phenomenon of Seasonal Freezing Occurs", Depth of Foundation Placement for Buildings with a Few Stories in Conjunction with Seasonal Freezing of the Ground, 1946, pp. 43-63, Acad. of Science, Moscow, USSR, Russian, NN., English abst. by Stef. available in SPDO-P, AUL & EL.

The author emphasizes the practical importance of seasonal freezing of the ground, and the necessity for systematic plotting of its distribution. A schematic map of the various depths of freezing of the ground is given but the author stresses its inadequacy and gives a method for gathering material for a revised schematic map which would give a much fuller picture of the problem.

KAFADAR, A. D., BUDENHOLZER, R. A., FIELDHOUSE, I. B.

- (1) "Temperature Distribution and Effect of Ice Formation Around the Ground Coil of a Heat Pump", Report of the Armour Research Foundation, pp. 25, Ill. Inst. of Tech., Chicago, Illinois, SPDO-P.

ABSTRACT: The extraction of heat from the earth has become an important problem because of the possibility of using this heat as a source of supply for the heat pump. This paper presents a method of computing the temperature distribution about a cylindrical sink when withdrawing heat at a constant rate from an infinite mass of surrounding soil. An approximate method is presented for calculating the effect of latent heat of fusion of ice formed on the temperature distribution in the soil. Graphs which may be used in solving practical problems are presented together with some illustrative examples applied to the heat pump. The method is especially applicable to a single vertical cylinder extending deep into the earth but may also be applied with reasonable accuracy to a horizontal cylinder.

KALITIN, N. N.

- (1) "The Role of Actinometry in the Solution of Permafrost Problems", Symposium on Permanently Frozen Ground, Materialy Kon. po Iz. Estestv. Proizvod. Sil USSR, Merylots, Materials #80, 1930, pp. 157-176, Acad. of Science, Moscow, USSR, Russian, NN.
- (2) "O Summakh Tepla Solnechnoi Radiatsii v Arktike", (On Total Solar Radiation Heat in the Arctic), Problemy Arktiki, No. 10, 1940, pp. 32-42, Russian.
- (3) "Solntse Arktiki", (The Arctic Sun), Aktinometricheskie Nabliudeniia (Actinometric Observ.), No. 8, 1940, pp. 21-7, Russian.

KAPTEREV, P. N.

- (1) "The Thermal Balance of the Ground in Skovprodino (Far Eastern Region)", Trudy, Comm. Perm. Frozen Ground, Vol. VI, 1938, pp. 127-153, Acad. of Science, USSR, Russian with English summary.
- (2) "New Data on Revitalization of Organisms from Perpetually Frozen Grounds", Comptes Rendus, Vol. XX, No. 4, 1938, pp. 315-317, Acad. of Science, Moscow, USSR, English.

KARELIN, D. B.

- (1) "On the Periodicity of Ice-Regimes", Sovetskaja Arktika, No. 11, 1936, p. 106, Russian.
- (2) "Some Data on Ice-Cover in the Arctic: (1) The Growth of Ice; (2) Forecasting the Dates of Ice-Breaking and of Freezing", Priroda, Vol. 26, No. 6, 1937, pp. 32-38, Russian.
- (3) "Ice-Cover of the Soviet Arctic", Meteorologia i Hydrologia, Vol. 3-No. 2, 1937, pp. 43-50, Russian.
- (4) "Air Expedition to High Latitudes of the Arctic in 1941", Investigation of, Construction and Maintenance of Airdromes on Ice--1946-47 Translations, May 1947, pp. 203-214, U.S. Engr. Corps, New Eng. Div., Boston, Mass.; Russian, Transl. by Stef. available in SPDO-P.
Describes equipment, personnel, purpose, flight stages of air expedition to "Pole of Inaccessibility".

KEEN, H. A. AND RUSSELL, E. J.

- (1) "The Factors Determining Soil Temperatures", Journal of Agricultural Science, Vol. 11 - Part 3, July 1921, pp. 211-240, SPDO-P.
This article presents soil and air temperature data, describes apparatus and methods of obtaining soil temperatures, bringing out the relationship between soil and air amplitudes, and discusses factors which influence soil temperatures.
- (2) "Soil Temperature", Physical Properties of the Soil, Chapter IX, 1931, pp/ 297-333, Longmans, Green & Co., London or New York, English, BSL.
A discussion of the effect of temperature of earth's interior, solar radiation, latitude and slope of ground, altitude, distribution of land and water, vegetative cover, winds, snow, frost, and nature of soil on soil temperature; and of the characteristics of temperature waves in soil.

KEIL, K.

- (1) "How Can We Judge the Liability of Stratified Rocks to Frost Damage", Strassenbau (Orig.), (Abstract) Road Abstracts, Vol. 4, No. 8, Abst. #348, pp. 121-22, Nov. 1937 -- Vol. 28, No. 9 (Orig.), 1937, pp. 121-22, German.
A general discussion of various rocks and their susceptibility to frost action.

KEIL, K.

- (2) "Results of a Frost Action Study on a Stretch of Motor Road", (Abstract) Road Abstracts, Vol. 5, No. 5/Abstr. No. 273, Aug. 1938, pp. 73-4. (Orig). Strassenbau, 1938, 29 (5) pp. 67-71; (6) pp. 94-97; (8) pp. 126-129.

Experiments involving use of 'protective' courses of sandy gravel and fresh quarry waste; dowels in concrete pavements; waterproof fabrics to limit moisture movement in subgrade; and underdrains are described.

- (3) "Results of Frost Action on Experimental Road", Public Works, Vol. 70, Sept. 1939, pp. 49-50, BSL.

KENDREW, W. K.

- (1) "Climates of the Continents", Oxford Univ. Press, New York, N. Y. Mean Monthly Isothermal Charts.

KENE, V.

- (1) "On Subterranean Waters", 1932, Moscow, USSR, Russian.

KENNEDY, ROBERT E.

- (1) "Computation of Daily Insolation Energy", Bulletin of the Amer. Meteorological Society, Vol. 30, No. 6, June 1949, pp. 208-213, Amer. Meteor. Society, Lancaster, Pa.

The object of this paper is to describe a shorter and simpler method for computing daily insolation. Two tables are submitted for use with the standard equation of insolation. One is the average daily solar air map which can be used for either a day or a half-day. The other is the daily insolation at the outside of the atmosphere. It may be divided by two for half-days.

KERSTEN, M. S.

- (1) "Survey of Subgrade Moisture Conditions", Proc. of Highway Research Board, ALSO Roads and Streets - Vol. 89, No. 10 - October, 1946, - Vol. 24, 1944, pp. 497-512, SPDO-P.

Compilation and analyses of data on soil moisture under existing highway pavements.

- (2) "Subgrade Moisture Conditions Beneath Airport Pavements", Proc. of Highway Research Board, Vol. 26, 1945, pp. 450-463, SPDO-P.

An analysis of subgrade moisture data from subgrades under the flexible and rigid type airfield pavements in 17 states.

KHOMICHEVSKAJA, Mme. L. S.

- (1) "Compressive Strength of Ice and Permafrozen Ground Under Natural Conditions", Trudy of the Committee on Permafrost, Vol. X, 1940, pp. 37-83, Acad. of Science, Moscow, USSR, Russian, DLC & DGS., English abstr. by Stef. available in SPDO-P, AUL & EL.

The necessity of rechecking the results of laboratory experiments on permafrozen ground under natural conditions resulted in a series of experiments which a group of scientists of the committee for Permafrostology conducted in 1937 in the Tajmir Peninsula. The author describes some differences in methodology and the processes of experimentation. Two large and very detailed tables on these investigations provide comparison with the work of three other authors. A bibliography of eight titles is given.

KHOMICHEVSKAJA, Mme. L. S.

- (2) "Hydrological Conditions of the Above Frozen Soil Horizon in the Upper Part of the River Zeia", Trudy of the Comm. for the Study of Permafrozen Ground. Vol. IX, 1940, pp. 135-154, Acad. of Science, Moscow, USSR, Russian with English summary.
- (3) "Dynamics of the Active Layer and of Horizons Above the Permanently Frozen Ground Due to Alterations of the Natural Cover of Vegetation", Russian.

KHRGIAN, A. K.

- (1) "Struggle Against Snow on Mountain Sections of Railroads", Nauchno-Issledovatel'skiy Institut Puti NKPS, Vol. 33, 1934, pp. 226-236, Russian.

KIEFFER, WILLIAM B.

- (1) "Bearing Tests on Middle East Airfields", Dec. 7, 1948, p. 56, U. S. Air Attache, London, England, DES.

KIMBALL, H. H.

- (1) "Albedo of Various Surfaces of Ground", Monthly Weather Review, Vol. 54, 1926, p. 453.
A review of article by A. Angstrom.
- (2) Monthly Weather Review, Vol. 58, No. 2, Feb. 1930, pp. 43-52,
One of the best articles showing the effect of the atmosphere on incoming solar radiation.
- (3) "Radiation in Arctic", Monthly Weather Review, Vol. 59, 1931, pp. 154-157.

KINCER, J. B.

- (1) "Precipitation and Humidity", Atlas of American Agriculture, Part 2 (Climate) Sec. A (Precipitation and Humidity), Advance Sheets No. 5, March 15, 1922.
Charted maps of the U. S. giving data on precipitation and humidity on basis of monthly, seasonal and annual averages. Records for the uniform 20 year period, 1895-1914, were used in construction of the principal charts and diagrams.
- (2) "Temperature, Sunshine and Wind", Atlas of American Agriculture, Part 2 (Climate) Sec. B (Sunshine and Wind), Advance Sheets No. 7, Nov., 1928 - Nov. 1928

KIUZ, P. P.

- (1) "Questions of Agrotechnique and of Culture of Vegetables in the Far North", Trudy N-I Inst. Poliar Zemledelia Izd Glavsevmorputi, 1941, p. 108, USSR

KLEIN, G. J.

- (1) "Method of Measuring the Significant Characteristics of a Snow Cover", Report #MM-192, Nov. 1946, Nat'l. Res. Council of Canada, Canada, DES.
This report describes equipment and methods of measuring snow cover.

KNUTSEN, WILLIE

- (1) "Milestones in My Arctic Journeys", National Geographic Magazine, Vol. XXVI - No. 4, pp. 543-570, Nat'l. Geog. Soc., SPDO-P.

Article describes Knutsen's travels in the Arctic before and during World War III. Covers following subjects: New Island, new weatherports, Greenland, animal life, Count Micard, experiences Arctic search, and rescue section, weather maps.

KOBEKO, S. V.

- (1) "Non-freezing Ice Holes", Fiziko-technicheskii Inst., Acad. of Science, Moscow, USSR, Russian.

Use of a pipe, filled with mineral oil or kerosene, and the construction of a non-freezing water container for fire-fighting use is elaborated.

- (2) "Study of Fluctuations of Ice-Cover", Fiziko-technicheskii Inst., 1943-44, Acad. of Science, Moscow, USSR, Russian.

KOLOSKOV, P. I.

- (1) "Seasonal Frozen Ground Science", Russian.

- (2) "An Attempt at Classifications of the Objects of Cryosphere", Trudy Com. Study Permafrozen Ground, Vol. I, 1932, pp. 51-54, Russian, NN.

- (3) "Relation of the Temperature of Soil to the Temperature of Air, etc.", Trudy Com. Study Permafrozen Ground, Vol. I, 1932, pp. 77-88, Russian, NN.

- (4) "Theoretical Possibility of Soya and Rice Cultures in the Province of Permanently Frozen Ground", Trudy Comm. Study Permafrozen Ground, Vol. I, 1932, pp. 69-76, Russian, NN.

The author claims that growing of rice and soya is possible over a wide area now underlain by permafrost.

- (5) "Evaporation in the Amur Province According to Wild's Evaporimeters", Izvestia Meteor. Bur. Amur Region, Fasc. 2, Blagovestchensk, Russian.

KOPEIKIN, V. F.

- (1) "On Types of Tractor-sledges", Lesnaya Industriya, No. 5, 1937, pp. 28-32, Russian.

KORIDALIN, E. A.

- (1) "The Possibility of Application of Seismic Investigations for the Study of Permafrost", Trudy of the Com. for the Study of Permafrost, Vol. III, 1934, pp. 13-19, Leningrad, USSR, Russian.

KORIDALIN, E. A. (cont'd.)

The author states that the method of immediate observation by drilling or pit sinking for the study of permafrost is both expensive and limited to the specific area of investigation. Consequently, other physical methods which utilize specific characteristics of various soils (the electric, magnetic, gravitational and seismic methods) are used, the seismic method forming the subject matter of this article. The principle of seismology is based on the rate of transmission of vibration waves, both longitudinal and transversal. Specifically, for the study of permafrost, the seismic method can be used to determine the subterranean relief and geological structure of layers adjacent to the surface of the earth. The author concludes with the suggestion of application of this method for the study of fossil ice.

KORSTIAN, CLARENCE F. and TOUMEY, JAMES W.

- (1) "Foundations of Silviculture Upon an Ecological Basis", 2d Edition, 1947, John Wiley and Sons Inc., New York, N. Y.

This volume is divided into three parts. Part I - Environment of Forests; Part II - Influence of Forests on their Environment; Part III - Forests, which include the basic concepts of plant growth, form and life of forest trees. The following chapters are of special interest with regard to permafrost studies: II - Solar Radiation; III - Air Temperature; V - Climate; VI - Soil Conditions; VII - Soil moisture and its influence on forest vegetation; VIII - Physiographic conditions; IX - Biotic factors; XVIII - Forest Vegetational Units and their Classification; XVIII - Origin and Development of Forest communities. A bibliography of over 600 references is included.

KORUNOV, M. M.

- (1) "Some Data on the Work of Tractor-Sledges for Timber-Transportation", Russian.
- (2) "Investigation of the Resistance to the Motion of Sledges on Snow-ice Roads", *Leznaya Industriya*, No. 3, 1938, pp. 19-27, Russian.
- (3) "Ice on Rivers and Lakes for Land Transport, Computations, Concerning", 1938, Russian.
- (4) "The Naledi of Rivers on Timber-Transport Roads", 1938

KORZHAVIN, K. V.

- (1) "Work of Ice-cutters of Bridge-piers Under the Conditions of Ice-drifting in Siberian Rivers", *Trudy Novosibirskogo Instituta Voennykh Inzhenerov Zheleznno-Dorozhnogo Transporta*, Vol. 3, 1938, pp. 3-54, Russian.

KOSTENKO, N. P.

- (1) "Problems of Planning and Construction of Railroads in Regions of Permanently Frozen Ground", 1938, Moscow, Russian.

KOSTYCHEV, P. A.

- (1) "Soils of the Chernozem Province of Russia, Their Origin, Composition, and Properties", 1937, Moscow-Leningrad, USSR, Russian.

KOVNER, S. S.

- (1) "On a Certain Problem of Heat-conductivity", Journal Geophys., Vol. III, fasc. 1, 1933, Russian.

- (2) "Concerning the Mathematical Theory of Freezing", Geol. and Mineral Deposits of the North of USSR Trudy 1st Geol. Pros. Conference, Vol. III, 1936, pp. 34-41, Russian, DLC, English abstr. by Stef. available in SPDO-P.

Author discards Stefan's 1889 solution of the subject problem as too complex. Applies Leibensohn's solution to freezing of water in pipes and freezing and thawing of spheres. Gives formulas, calculations, and diagrams.

- (3) "Theory of the Thermal Prospecting, On the Location of an Artinskian Block on the Decline of the Gravitation Maximum", Doklady (Comptes Rendus), Vol. 6, 42, 1944, pp. 273-275, Acad. of Science, Moscow, USSR, Russian.

KOZLOV, N.

- (1) "Phenomena of Permanently Frozen Ground in Certain Places in Eastern Siberia," Izvestia East Siberian Branch Russ. Geogr. Society, Vol. 33, Russian.

KOZMENKO, M.

- (1) "Types of Horse Ice-roads, On the", Lesnoe Khozyaistvo i Lesnaja Promyshlennost, No. 7, 1931, pp. 50-54, Russian.

KRAT, V. A.

- (1) "Some Questions Concerning the Theory of the Visibility of the Terrestrial Item from the Aeroplane", Glavnaia Astronomicheskaya Observ., Acad. of Science, Moscow, USSR, Russian.

KRISCHER, O.

- (1) "Experiments on Heat Conductivity of Soils; Principally Quartz and Calcareous Sands, Lime, and Clay. Effect of Dampness, Texture, Porosity, Temperature etc., on Thermal Conductivity", 1934, Oldenbourg, Munich and Berlin, Germany, German.

KROPOTKIN, P. N. AND SHATALOV, E. T.

- (1) "Geology of the North-East of USSR", Contr. Knowl. Okhotsk-Koynma Land, Ser. 1, Geology and Geomorphology, Fasc. 3, 1936, pp. 1-148, Russian with English summary.

- (2) "General Sketch of Orography of Eastern Siberia", Zapiski Russ. Geographical Society, Vol. V, Russian.

KRYLOV, M. M.

- (1) "Thermotechnical Analysis of Freezing of Soil, On the ", Vestnik Inzhenerov i Tekhnikov, No. 10, 1934, pp. 456-57, Russian.

KRYLOV, M. M.

- (2) "Thermotechnical Analysis of Freezing of Soil and of Snow Amelioration, On the. First Communication", Doklady Vsesoyuznoi Akademii Selskokhozyaistvennykh Nauk, No. 1, 1937, pp. 31-5, Russian.
- (3) "Schematic Design of an Ice-frozen Dam", 1938, Russian.
- (4) "Isothermic Ice Warehouses", 1942, pp. 3-77, Inst. of Permafrostology, Moscow-Leningrad, Russian, Eng. abst. by Stef. available in SPDO-P, AUL & EL.
This book, issued by the Institute of Permafrostology, shows methods of utilizing natural winter cold for construction and use of ice storage houses. The work is divided into five chapters dealing with general data, construction, calculation of temperature, maintenance of ice warehouses, and conclusions. There is a bibliography of 22 titles.
- (5) "Typical Design for an Ice Warehouse", 1943, pp. 1-33, The People's Commissariat of Trade, Moscow, Russian, English abst. by Stef. available in SPDO-P.
This pamphlet contains 17 pages of detailed drawings covering construction of an ice warehouse proposed by Krylov in cooperation with the Obruchev Institute of Permafrostology. The notes accompanying the drawings deal with the general construction, insulation, framing, sheathing, and illumination. There is also a chart showing the average cost and time involved in construction.
- (6) "Experimental Gallery Constructed in March-April 1944 in the Vorkuta Region, An", 1944, Russian.
- (7) "Building of Cold Stores from Ice and Frozen Ground", Kholodilnoe Delo, Vol. 9, No. 7, 1931, pp. 16-20, DLC...

KRYNINE, DIMITRI P.

- (1) "Soil Investigations in Russia", Proc. Highway Research Board, Vol. 9, 1930, pp. 66-74.
Author presents general review of soil studies in USSR. General history, soil profiles, design of soil mixtures, frozen soils, rolling of earth roads, and research are briefly discussed. As to frozen soils, author notes difference as to freezing and thawing when area is insulated, also the destructive effect and inherent instability of roads on these areas. Bibliography of eight titles (mostly English) are noted.
- (2) "Some Principles of Soil Surveying and Soil Mapping for Road Purposes", Proc. of the 11th Annual Meeting of Highway Research Board, Vol. 11, Part I, 1931, pp. 199-215, Lord Baltimore Press, Baltimore, Md., SPDO-P.
Contents:
A. General considerations referring to soil mapping.
B. & C. Discussions of the moisture equivalent and shearing resistance of soils and methods of determining these characteristics.
D. Some facts referring to a soil survey in New Haven County and some general principles as to the preparation of soil maps is given.

KRYNINE, D. P.

- (3) "Frost Action in Soils", Notes on Applied Soil Physics, Chap. IV, 1937.

- (4) "Pleistocene Glaciation of Siberia", American Journal Science, Vol. XXXIV, No. 203, Nov. 1937, pp. 389-397, SPDO-P.

This article describes the results of field work done by Russian geologists pertinent to the Pleistocene Glaciation in Siberia. The regions discussed include: The Western Siberian Lowland, The Central Plateau, and The Siberian Highland.

- (5) "Soil Mechanics, Its Principles and Structural Applications", 1st Edition, 1941, pp. 77-84, McGraw-Hill Book Co., New York, SPDO-P.

General discussion of frost action, freezing point, ice crystals, open and closed systems, influence of the size of particles, massive and ice stratified frozen formations, mechanics of moisture movement during the soil freezing process, capillary capacity, and permeability as controlling the maximum amount of heave, and technical measures against frost action.

- (6) "Some Experiments on Capillary Flow of Moisture Thru Gravels and Silts", Proc. 26th Annual Meeting, 1946, pp. 474-483, Highway Research Board, SPDO-P.

Capillary movement of moisture in gravels and silts, and also in combined systems (silt-sand and silt-screenings) is described in this paper. The experiments were performed in large lucite tubes, 5-5/8 in. and 3-5/8 in. in diameter and 4 feet high. The shape of the time curves obtained by plotting the height of the visible moisture boundary against time was parabolic of variable order.

KRZHIVITSKY, A.

- (1) "Auto Transport for Sledge Roads", 1930, pp. 259, Moscow-Leningrad, USSR.

KUDRIAVTSEV, V. A.

- (1) "Eternal Frost Dynamics in the Basin of the Middle Reaches of the River Selenja and the Building Conditions in this Region Associated Therewith", Trudy of the Comm. for the Study of Permanently Frozen Ground, Vol. VIII, 1939, pp. 81-117, Acad. of Science, Moscow, USSR, Russian with English summary, DGS.

- (2) "Methods for Determination of the Principal Direction of Frozen Ground Process and its Microdynamics During Engineering Geologic Explorations", Russian.

- (3) "Dynamics of Frozen Ground Processes and Engineering Geologic Explorations. Dissertation, 1944", 1944, Russian.

- (4) "Determination of the Lower Limit of Permafrost", Merzlotovedenie, Vol. 2, No. 1, 1947, pp. 44-47, Acad. of Science, Moscow, USSR.

KULIK, M. S.

- (1) "Contribution to the Question of Condensation of Water-Vapor in Soil During the Winter-time", *Meteorologia i Hydrologia*, Vol. 4, No. 4, 1938, pp. 102-105, Russian.

KUSHEV, S. L.

- (1) "Permafrost in the Lower Reaches of the Lower Tunguska River", *Proc. of the Comm. for Study of Permafrost*, Vol. III, 1934, pp. 73-88, Acad. of Science, Leningrad, USSR, Russian, DLC. English abstr. by Stef. available in SPDO-P, AUL & DES.

This paper is the result of geomorphological and permafrostological observations by the author made during the summer of 1932. A series of test pits and trenches were made with temperature observations every 50 cm. in the thawed ground along the south walls of the trench and in the frozen ground in special bore holes. The author discusses the valley of the lower Tunguska and breaks it into two parts. One of them is the plateau region and the other is a terrace composed of laminated sands underlain by gravels. The author gives a series of tables and cross-sections and concludes that the region of the Yenisei Valley of the lower Tunguska has permafrost of the island type. A bibliography of three titles is given.

- (2) "Geomorphology of the Lower Course of the Lower Tunguska River", *Trudy of the Polar Commission*, Vol. XV, 1934, pp. 37-63, Leningrad Russian, NN, English abstr. by Stef. available in SPDO-P.

This article is primarily devoted to a description of geomorphological observations and the study of local permafrost conducted by the author in 1932 in the valley of the lower Tunguska River. In the portion devoted to the study of permafrost, the author states that his observations were restricted to the character of the grounds; the depth of deposition of the upper border of permafrost, and the temperature of the permafrozen layer. On the plateau section of this area, all test pits showed the presence of permafrost, of considerable thickness, which apparently had a continuous distribution. Permafrost was observed on terraces of various heights as well as along the slopes of some mountains. Subtracting 60 m. for the thickness of the layer of winter freezing in Pit no. 5 of the Noginsk Mines, it is possible to estimate the thickness of the permafrozen layer here as equal to 27 m. The presence of permafrost is a factor in landslides in this region, usually on the steep slopes of the valleys. The author concludes this section with some observations on frost-swellings which were discovered on the peat covered bottom of the former lake, north of Lake Nalin. Permafrost is found on the top of these mounds at a depth of 50-60 cm.

- (3) "Observations on Peat-mounds and Grave-mounds (Hummocky swamps)", *Instructions and Program Directions for the Study of Frozen and Permanently Frozen Grounds*, 1938, pp. 113-128, Acad. of Science, Moscow, USSR, Russian, DLC.

KUSHEV, S. L.

- (4) "Morphology and Genesis of Hilly Mar's and Their Geographical Distribution," Trudy of the Comm. for the Study of Permanently Frozen Ground, Vol. VIII, 1939, pp. 119-161, Acad. of Science, Moscow, USSR, Russian, English summary, DGS

KUZNEVA, O. I.

- (1) "Evolution of Swamp Formations in the Amur Province and An Attempt at Their Classification," Pochvovedaniye (Soil Science), No. 2, 1911, Russian.

KUZNETSOV, N. I.

- (1) "Maidy' in the Lower Reaches of the Yenisei River, Their Structure, Origin and a Place in a Classification Scheme of Swamps and Forests", Trudy Polar Commission, Fasc. 12, 1932, pp. 5-40, Russian, NN, DLC.

KUZNETSOV, Y. A.

- (1) "Geology of the Krasnoyarsk", Izvestia West-Sib G.P.T., Vol. XII-fasc. 2, 1932, Russian.

KVASHIN-SAMARIN, N. V.

- (1) "On the Question of Frozen Ground as a Factor in the Formation of Soil in the Western Part of the Amur Province and on the Olyokma Divide", Materials on Study of Russian Soils, Fasc. 20, 1911, DLC.

LANCASTER, C. M.

- (1) "Discussion on Survey of Subgrade Moisture Conditions", Proceedings, Vol. 24, 1944, pp. 512-13, Highway Research Board, SPDO-P.
Significant data from a long time moisture study under flexible type pavements in Missouri.

LANDER, ROBERT

- (1) "Effect of Surface Resistance on Thermal Conductivity by the Hot Plate Method," Tech. Paper #40, May 1942, Univ. of Minn. Engr. Experiment Station, Minneapolis, Minn., SPDO-P.
The article contains the following headings: Hot Plate Apparatus, Effect of Surface Resistance, Sanding, Different Types of Pads, Different Thickness of Insulation, Paper Boundary Surfaces, and Conclusions.

- (2) "Factors Affecting Thermal Conductivity", Tech. Paper #49, July 1944, Univ. of Minn., Minneapolis, Minn., SPDO-P.

The article is divided as follows: Test apparatus, Effect of plate temperatures, Effect of internal radiation, Effect of thickness, Comparison of hot plate results, Effect of moisture content.

This paper is the second in a series of papers pertaining to the hot plate apparatus by the same author.

LANE, A. C.

- (1) "Northern Climatic Variations Affecting Geotherm Initial", Canadian Mining and Metallurgical Bulletin, No. 410 or 11, July 1946 and June 1946, pp. 397-402

LANE, A. C. (cont'd.)

A review of the works of Fitton and Brooks (Monthly Weather Review, Vol. 59, pp. 6-16, January 1931), on the relationship between air and soil temperatures in the upper few inches of permanently frozen ground with remarks by the author. Discussion of factors influencing the depth of permafrost.

- (2) Also, NICHOLS, H. B.
"Frozen Assets", Christian Science Monitor Magazine, May 18, 1946, p. 5, MCL.

A very general statement on permafrost. Reference is made to Strategic Engineering Study #62.

LANG, F. C.

- (1) "Discussion-Subgrade and Pavement Bases", 27th Annual Convention, 1930, pp. 508-516, Amer. Road Builders Ass'n.

A description of frost heaving and frost boils and a suggested means of "curing" frost boils.

- (2) "Combating Frost and Drainage Problems", Proc. 23rd Annual Road School, Vol. 21, No. 3 (Ext. Ser. #39), May 1937, pp. 46-56, Purdue Univ.

This article is similar in content to "Soil Science Applied to Flexible Surfaces" by F. C. Lang, Better Roads, Vol. 5, No. 2, pp. 20-27, Feb. 1935.

- (3) "Frost Action on Highway Subgrades and Bases", Proc. of the Purdue Conference on Soil Mechanics and its Applications, July 1940, pp. 457-460, Purdue University, Lafayette, Ind., SPDO-P.

Description of heaving in the form of high joints in Portland cement concrete pavements in Minnesota and means of preventing their occurrence. Data on change in density of a clay soil subjected to absorption and freezing and thawing are included.

- (4) "Progress Report of Committee on Freeze-Proofing Treatment of Subgrade Soils with Calcium Chloride to Prevent Detrimental Frost Action", Highway Research Abstracts, No. 118, March 1945, pp. 9-10.

This is a report of the special committee of the Highway Research Board, 1944. A description of installations in Michigan, Minn., and Indiana in which calcium chloride was introduced into the subgrade through holes in the pavement to prevent frost heave.

- (5) "Frost Boils and Their Elimination", Public Works, Jan. 1928.

LANG, W. B.

- (1) "Ten O'Clock Marks; Frost-Striae Exposed to Sun's Rays", Science, Vol. 100, Sept. 29, 1944, p. 288, API.

Peculiar marks caused by alternate freezing and thawing. Such freezing and thawing affect the soil contours.

LANGE, U. V.

- (1) "On Fall of Freezing Point of Water in Capillaries and on the Dependence of Freezing Temperature of Water Upon the Diameter of Capillary," Trudy 1st All-Russian Hydrogeol. Congress in 1924, 1925, pp. 404-405, Leningrad, Russian.

LAPKIN, G. I.

- (1) "On the Question of Construction of Foundations in the Permanently Frozen Ground", 1935.

LAUCHLI, E.

- (1) "Ground Temperature Variations Decrease with Depth", Engineering News, Vol. 74, No. 11, 9 Sept. 1915, pp. 510-11.

A brief statement on the need for steel in a cutoff wall to care for local stresses set up by temperature changes at different depths. Included are five time-temperature charts showing mean air and ground temperatures.

LAVROVA, M. A. (Mme.)

- (1) "Presence of Permafrost in the Region of the Volch'ya and Moucha Tundra on the Kola Peninsula", Proc. of the Comm. for the Study of Permafrost, Vol. 3, 1934, pp. 117-210, Acad. of Science, Leningrad, Russian, DLC, English abstr. by Stef. available in SPDO-P, AUL & EL.

This paper reports on some observations made by the Kola expedition which studies primarily the quaternary of the Volch'ya and Moucha tundras. A series of peat mounds found in the Volch'ya Lak. at a distance of 14 to 15 meters from the shore are cross-sectioned. Permafrost usually lies at a depth of 40 to 42 cm from the top of the higher mounds and 30 to 35 cm from the top of the lower mounds. The author considers this permafrost to be of recent origin. In conclusion, the author states that permafrost is encountered north of the forest zone under favorable conditions and that it was found sporadically in small islands in peat mounds and was completely absent in the forest zone in mineral grounds.

- (2) "A Note on the Presence of Permafrost on the Southern Shores of the Kola Peninsula", Trudy of the Comm. for the Study of Permafrost, Vol. IV, 1935, pp. 253-255, Moscow, Russian, DLC, English abstr. by Stef. available in SPDO-P.

The author conducted some investigations of the precise limits of the southern distribution of permafrost and the presence of permafrost on the Kola Peninsula. Permafrozen ground was encountered in large peat mounds which reached 2 m. in height and, by the end of July, frozen ground was encountered in the peat at a depth of 40 cm. Most of the peat mounds show traces of disintegration, some have cracks; the areas between the mounds are usually filled with water. The intensive destruction of peat mounds containing frozen lenses apparently testified to the gradual rise of the temperature regime. Bibliography of seven titles included.

LEBEDEV, A. F.

- (1) "Soil and Ground Waters", Selkhozizdat, 1930, Moscow, Leningrad, USSR, Russian, LOC.

LEFFINGWELL, E. DeK.

- (1) "Ground Ice Wedges; The Dominant Form of Ground-ice on the North Coast of Alaska", Journal of Geology, Vol. 23, No. 7, Oct-Nov, 1915, pp. 635-654, SPDO-P.

A description of soil polygons and inclosing wedges of ground ice with an explanation of their origin and growth.

- (2) "The Canning River Region, Northern Alaska", U.S.G.S., Professional Paper, No. 109, 1919, pp. 179-243, U.S.G.S., Washington, D. C.

An excellent early treatise on ground ice and permanently frozen ground. Included is a discussion of diffusivity of frozen ground.

LEGGETT, ROBERT F.

- (1) "Soil Mechanics in Canada", Dec. 1947, Ottawa, Canada, SPDO-S.

LENINGRAD HYDRAULIC INSTITUTE

- (1) "Handbook of Water Resources of the USSR", Spravochnik, Vols. XVI and XVII, 1936, USSR, Russian.

LEPENSOV, P. L.

- (1) "The Rational Utilization of Tractors in Timber-Transport over Ice Roads", Trans. Ural Forest Techn. Inst., Russian.

LEVITSKY, A. N.

- (1) "Upper-Zeya Expedition", Colonization Service. Preliminary Report on Botanical Investigations in Siberia and Turkestan in 1909, 1910.

- (2) "On the Question of Evolution of Swamps in the Amur Province", Pochvovedeniye, No. 1, 1910, Russian.

LEWIN, JOSEPH D.

- (1) "Essentials of Foundation Design in Permafrost", Public Works Magazine, Vol. 79, No. 3, Feb. and Mar, 1948, pp. 27-30, 28-30, Public Works Journal Corp., New York 17, New York, SPDO-P.

This series of articles described foundation conditions in areas such as Alaska and Northern Canada where permanently frozen ground is encountered. Foundation design, including the effect of ice and other factors, is discussed. Design of a dam on a permanently frozen foundation is also discussed. References are made to several Russian articles on permafrost. Several illustrations are taken from publications of the Corps of Engineers, Department of the Army; a short bibliography is given.

- (2) "Dams in Permafrost", Public Works Magazine, Vol. 79, May, June and July 1948, Public Works Journal Corp., New York 17, New York, SPDO-P.

LEWIS, M. R.

- (1) "Rate of Flow of Capillary Moisture", Tech. Bulletin No. 579, Oct. 1937, 29 pp. US Dept. of Agriculture, BSL.

The results of experimental studies in which water was added at various predetermined rates to one end of a number of soil columns which were exposed at the other end to a current of air maintained at a constant temperature and humidity. The purpose of the experiment was to determine the distance through which water can be moved by capillary forces in a range of moisture between the field capacity and the permanent wilting percentage. Data and discussion are included on effect of soil type and gravity on rate of flow, and moisture content gradient for different rates of flow. Bibliography.

LINDE, S. F.

- (1) "The Freezing of the Foundation Soil Under Cold Storage Buildings", *Warne u. Kältetechnik*, 1942, 44(2), 17-23; (3), 34-8; Building Science Abstracts, Vol. 16 (New Series) No. 3, Abst. No. 198, March 1943, p. 41.

Soil temperatures correlated with vertical movements of a cold storage warehouse and conclusions concerning design of foundations for cold storage warehouses.

LIVEROVSKY, A. V. AND MOROZOV, K. D.

- (1) "Construction Under Permafrost Conditions", 1941, pp. 1-224, (The Peoples' Commissar of Constrn.) Stroiizdat Narkomstroia, Russian, DLC, English abst. by Stef. available in SPDO-P, AUL, and IES.

This book represents a summary of the most pertinent information relating to the construction of industrial buildings and private dwellings. It is written by two specialists and consists of seven chapters subdivided into 22 sections and contains 151 drawings, illustrations and maps. Chapter headings include general data on permafrost, deformation of engineering construction under permafrost conditions, and methods of investigation in surveying for the construction of buildings under permafrost conditions, basic instructions and considerations for stable construction, consideration of the maintenance of constructions under permafrost conditions, and remarks on scientific investigations and experiments. A bibliography of two titles is included.

LIVEROVSKY, YU. A.

- (1) "Soils of the Tundra-Swamp Belt", *Soil Inst. Dokuchaeva*, 1937, p. 54, Acad. of Science, Moscow, USSR. *

LIVSHITS, R. M.

- (1) "Laboratory Experiments in the Study of Properties of Frozen Grounds and the Shatterability of Ballast", *Trudy M.I.I.T.*, fasc. 18, 1931, Russian.

*A discussion of the development of the soils such as their source the bedrock, means of deposition, processes of disintegration such as chemical action, weathering, vegetation, etc. and their relationships.

- LOPAREV, N. G. and TOLSTIKHIN, N. I.
 (1) "Hydrolaccoliths of Khada - Bulak", Izv. Russ. Geogr. Society, Vol. 71, No. 9, 1939, pp. 1295-1311.
- LOPATIN, J.
 (1) "Some Data on the Ice Layers in East Siberia", Vol. XX, 1877, Acad. of Science, St. Petersburg.
- LOVE, H. W.
 (1) "A Terrain Study of Canada", Military Engineer, Sept.-Oct. 1950, pp. 350-355, Mills Building, Washington, D. C., SPDO-P.
 This article intends to give a general picture of the main terrain features of Canada in respect to defense of North America. The mountains, boreal region (forest), arctic plains etc. are some of the main terrain divisions. Also mentioned are the transportation facilities, climate, human factors of existence and natural resources. The article gives a limited picture of the engineering problems associated with the Arctic.
- LUKASHEV, K. I.
 (1) "Granulometric Composition of Ground in the Permafrost Area", Annals Leningrad Univ., ser. Geol., Soil Science and Geography, Pochvoved., i Geog., Issue 4-No. 16, 1937, pp. 170-184, Leningrad Univ., Leningrad, USSR, Russian.
 (2) "Soil Creeping and Flow Under Eternal Frost Conditions", Ser. Geol. and Soil Science, Bulletin Inst. Study Earth's Crust, Annals No. 26, 1938, pp. 5-22, Russian.
 (3) "Ground of the USSR", 1939, p. 363, Leningrad Univ., Leningrad, USSR, Russian.
 (4) "Permafrost Regions as a Specific Physico-Geographical and Construction Area", Leningrad, Russian. DLC - English abstr. available in SPDO-P by AMC & SDS.
 Article contains 10 chapters.
 Part I - Characteristics of Permafrost as a Specific Physico-Geogr. Region.
 Chap. I - Morphology and Geography of Permafrost.
 Chap. II - Climatic and Thermic Conditions of Permafrost.
 Chap. III - Hydrological Conditions of Permafrost.
 Chap. IV - Basic Characteristics of Macro & Micro Relief of Permafrost Region.
 Chap. V - Brief Description of Soils.
 Chap. VI - Brief Description of Swamp and Soil Formations Essential with Respect to Structures in Permafrost Regions.
 Part II - General Description of Permafrost Region as a Specific Building Region.
 Chap. VII - Bulging of Soils and Causes of This Phenomenon.
 Chap. VIII - Phenomena of Soil Settling. Deformation of Struc.
 Chap. IX - Phenomena of Landslide and Loosening of Soils.
 Chap. X - Ice Formation and Deformation of Structures caused by Ice Formations.
 (Orig. is incomplete - Begins with p. 35, Chap. II)

LUKASHEV, K. I.

- (5) "Elements of Genetic Study of Surficial Deposits", 1938, p. 280, Leningrad University, Leningrad, USSR.

LUKIN, G. O.

- (1) "Construction and Care of the Foundations Under Small Industrial Buildings in the Dudinka Regions", Trudy of the Obruchev Inst. of Permafrostology, Vol. I, 1946, pp. 27-101, Acad. of Science, Moscow, USSR, Russian, DLC, DGS, NN. English abstr. by Stef. avail. in SPDO-E, PAUL & DES.

This article contains 18 tables, 50 diagrams and illustrations. It is the result of an investigation and study of methods of construction and utilization of small industrial buildings on the Taimyr Peninsula by a special group of permafrostologists. General characteristics of the region are given and include topography, temperature, and precipitation and winds. Observations conducted during the construction of the Dudinka electric power station are shown. Observations are also shown of a temporary electric power station and a brick factory. These observations consider the nature and occurrence of permafrost.

LUNIN, B. B.

- (1) "On the Question of Calculations of Foundations Under the Permanently Frozen Ground", Trudy of the Com. for the Study of Permafrost, Vol. VI, 1938, pp. 203-206, Acad. of Science, Moscow, USSR, Russian, DLC.

L'VOV, A. V.

- (1) "Prospecting for and Testing of Sources of Water Supply Along the Western Part of the Amur Railroad", Dorogi, 1916, p. 881, Irkutsk, USSR, Russian, NN.

Separate album of maps, cross-sections, diagrams.

MCCARTHY, E. E.

- (1) "Stripping Frozen Gravel", Vol. 10, 1914, pp. 289-295, The Mining Magazine, London.

MCCLAINE, C. W.

- (1) "Combating Frost and Drainage Problems", Proc. 23rd Annual Road School, Purdue Univ., Engineering Bulletin, Vol. 2, No. 3, - (Extension Ser. No. 39), May 1937, pp. 57-58.

A discussion of a general nature on F.C. Lang's paper in same publication. No data are given.

MCCOOL, M. M. and WHEETING, L. C.

- (1) "Movement of Soluble Salts Through Soils", Journal of Agri. Research, Vol. 11, No. 11, Dec. 10, 1917, pp. 531-547.

Migration of salts in soils from regions of higher to lower concentrations and with movement of soil are discussed. Determination of salt concentrations was made by the freezing point method.

MCLEOD, N. W.

- (1) "Climate and the Arctic Route; Recession of the Polar Ice Caps", 19th Century, Vol. 136, July 1944, pp. 14-19.

McLEOD, N. W.

- (2) "Soil Science Applied to Subgrade and Base Course Design", The Canadian Engineer, Vol. 77, No. 5, 1 Aug. 1939, pp. 5-6 and 52-54, BSL.

A review of published theories on the mechanics of frost heave constitute a portion of this article.

- (3) "Flexible Pavement Foundations", Roads and Bridges, Vol. 83, No. 9, Sept. 1945, pp. 74-80 and 120-121, API.

The author suggests five fundamental principles of subgrade construction: Adequate drainage, Maintenance of the grade line at least 4 feet above the soil water table, Proctor compaction, Elimination of pockets of frost-heave material, and Elimination of deposits of peat and muck from under the subgrade.

McLEOD, NORMAN W.

- (4) "Airport Runway Evaluation in Canada", Research Reports #4B, Oct. 1947, National Research Council Highway Research Board, Washington 25, D. C., SPDO-P.

This report outlines results of investigation of runways at a number of Canada's principal airports in 1945-46. Program of tests, included: a pedological soil survey and preparation of a pedological soil map for each site; field moisture and density tests in place on base course and subgrade; securing large undisturbed samples of base course and subgrade for physical and compaction tests; and undisturbed samples for CBR, triaxial compression, shear and consolidation tests, etc.

MABEE, W. C.

- (1) "Lessons from the Winter of 1935-36", Journal, American Water Works Association, Vol. 29, No. 1, 1937.

This article deals with freezing and thawing of water pipes in the ground. Degree days below freezing and depth of pipes in ground discussed. Discusses the effects of an extremely cold winter on the freezing of water service lines. It was stated that in a normal winter in Indianapolis, 200 degrees of mean daily temperature below 32 degrees F. accumulated, whereas in the winter of 1935-36, 885 degrees accumulated. Two thousand or 2.7 percent of all private lines froze and these were mostly those which had less than 54 inches cover. Practically all thawing of pipes was done with gasoline motor-driven generators. The most satisfactory condition was at 40 volts with the average of 15 to 20 minutes of current application at 300 amperes to thaw a service. This article includes a graph showing accumulated degrees of mean daily temperature below 32 degrees F. and depth of frost penetration and number of frozen services through the winter months.

MACKINTOSH, A.

- (1) "Progress Report on an Investigation of Frost Action in Soils", Proc. of Int. Conf. in Soil Mechanics and Foundation Engineering, Vol. 2, 22-26 June 1936, pp. 260-63, Harvard Univ. BSL.

A description of the cold room and equipment for temperature measurement at Harvard Univ. and progress in a determination of the magnitude of force which is associated with the growth of ice in soil.

MADDERN, A. G.

- (1) "Smithsonian Exploration in Alaska in 1904", Smithsonian Miscellaneous Collections, Vol. 49, #1741 and #1584, 1907, pp. (1741) 42-44 and (1584) 1-117.

The author quotes Tyrell's hypothesis on the mode of formation of Crystospheres (underground 'wedges' of sheets of clear ice) found in the Klondike Country. An important report of both general and specific nature. Much detailed material of value is contained in report including land forms, soil types, etc. Chapter headings are as follows: Introduction; Itinerary; Field of search; Glacial period and the mammoth; Horizon of Mammoth in Alaska; Pliocene in Alaska; Gravels underlying pleistocene silts mentioned; Brief outline of Pleistocene in Alaska; Depth of frost in circumpolar regions; Land Ice of Arctic and Subarctic Regions; Land Ice and the Mammoth; Conclusion - Mammoths died out due to change in climate - climate never necessarily colder than at present - deposits of ice tundra, etc., are products of recent time. The appendix discusses the descriptions of ice beds of the Escholtz Bay in Kotzebue Sound and Kobuk River areas. There are many references scattered through report and many good photographs.

MAIDEL, G.

- (1) "Travel in the North-Eastern Part of the Yakutsk Province in 1868-1870", Supl. to Vol. 74, 1868, Zapiski Acad. of Science, Leningrad, USSR.

MAIESPERGER, WALTER P., Major

- (1) "Canadian Winter Exercise 'Musk-Ox'", Oct. 1946, Air Material Command, Wright Field, Dayton, Ohio, SPDO-P.

Exercise Musk-Ox was a movement of ground vehicles supported entirely by air. It has as its objective three broad subjects; (1) Air Force cooperation in the Arctic; (2) evaluation of over-snow vehicles under winter conditions; and (3) certain technical and scientific research projects in the Arctic.

MAIL, G. A.

- (1) "Soil Temperatures at Bozeman, Montana, During Subzero Weather", Science, Vol. 83, #2163, June 12, 1936, p. 574.

A brief discussion and graphical presentation of air and soil temperatures at depths of 9, 3 and 6 feet for the period commencing January 25, 1936 during which time Bozeman experienced its coldest and most extended period of subzero weather ever recorded.

MAKARENKO, F. A.

- (1) "On the Role of Ground Water in the Formation of Swellings on the Auto-Truck Roads", Trudy Geol. Inst., Vol IX, 1939, pp. 269-297, Acad. of Science, Moscow, USSR, Russian.

MAKIMOV, V. M. and TOLSTIKHIN, N. I.

- (1) "On Hydrological Conditions in the Vicinity of the Town of Yakutsk" Comptes Rendus, No. 1 - Vol. 28, 1940, pp. 93-96, Acad. of Science, Moscow, USSR, Russian and English.

MALCHENKO, E. V.

- (1) "Climatic Conditions in the Region of Permanently Frozen Ground", Com. for Res., Nat'l. Prod. Forces, Materials #80, Vol. "Per. Froz. Ground, 1930, pp. 105-134, Acad. of Science, Moscow, USSR, Russian, NN.

MALYSHEV, V. M. and MOLODYH, I. F.

- (1) "Investigation of Eastern Siberian Rivers", Izvestia East Siberian Division Russian Geographical Society, Vol. 47, 1924, pp. 54-104, Russian.

MAMANING, L.

- (1) "Effect of Insulating Layers on the Rise of Capillary Moisture in Heavy Loams", (Orig.) Pochvovedeniia (Pedology, also (Road abstr. #173, Mar. 5, 1946, p. 34), Vol. 13 #3, 1944, pp. 2-3 and 101-105, Moscow, Russian.

Results of laboratory experiments on the effectiveness of layers of gravel and sand in preventing the rise of capillary moisture in heavy loams.

MANGER, H. J.

- (1) "Alaska Permafrost Investigation", Civil Engineering, Vol. 17, Aug. 1947, p. 449, AUL, SPDO-S.

An abstract of a paper reporting on the work of St. Paul District. In this connection, the work being done at Purdue University and at the University of Minnesota, under the supervision of the St. Paul District, are also discussed.

MARKOV, K. K.

- (1) "Formation of Polygons in the Northern Pamir", Bulletin Soc. Russ. Geogr., Vol. 66, 1934, pp. 402-8, Russian, USSR.

MARAMZIN, A. V.

- (1) "New Data on Survey Drilling in the North", Glavsevmorput, 1940, p. 67.

MARZHEVSKII, V.

- (1) "Mechanical Means of Transportation in the Arctic", Glavsevmorput, 1940, Russian, DLC.

MASLOV, N. N.

- (1) "Problems of Construction on Permafrost", Engineering Geology, Chap. 30, 1941, Gov't. Press for Constr. Lit., Moscow, USSR, Russian, Transl. by DGS in DGS AND SPDO-P.

Article discusses occurrence and distribution of permafrost in Russia, presents a map, treats damages to structures by permafrost, gives table of all freezing forces, discusses icings, and relates important points to be investigated at a construction site.

MATSEYEVICH, D.

- (1) "Cases of Erection of Structures on the Permanently Frozen Ground", Soc. Civ. Eng., Izvestia, Vol. 12, 1907, Russian.

MATTIMORE, G. B. and BARN, G. A.

- (1) "Research on Concrete Disintegration", Proceedings, American Society for Testing Materials, Vol. 35, Part 2, 1935, 410-420.

The authors present data on air temperatures and soil temperatures at one ft. depth for the years 1930 to 1934, in northern Pennsylvania and show a correlation between freezing and thawing and concrete condition of 45 test culvert headwalls.

MEISTER, L. A.

- (1) "Systematic Observations in 1943 of the Temperature, Seasonal Freezing and Thawing of Ground in the Experimental Area of the Igarka Station for Permanently Frozen Ground", USSR, Russian.

MEL'NIKOV, P. I.

- (1) "Conference on the Construction of Transport Under the Permafrost Conditions", Vestnik Academy Sci. (News of the Acad. of Sci.), No. 1-2, 1940, 103-107, Acad. of Sci., Moscow, USSR, Russian, on microfilm in SRDO-P.
- (2) "The Pumping Plant in the Town of Yakutsk and its Influence on the Regimen of the Permanently Frozen Ground", Merzlotovedenie (Permafrost), Vol. II, No. 1, 1948, 48-68, Acad. of Sci., Moscow, USSR, Russian, DIC.

MENDENHALL, W. C.

- (1) "Geology of the Central Copper River Region, Alaska", U. S. Geol. Survey Professional Paper, No. 41, 1905.
Introduction reviews history of area. Geography of Chugach and Wrangell Mountains, Alaskan Range, interior valley and Copper River areas is given. Geology introduced--earliest rocks are pre-Silurian with Silurian rocks such as conglomerates, arkoses, shales, and schists. Sediments and volcanics are carboniferous or devonian; carboniferous greenstone and lavas are present. Widespread Permian and Triassic marine influence. Erosion then followed by Eocene sedimentation of fresh water variety. Then post-Eocene uplift, out-pouring of lavas, and Pleistocene silts, sands, and gravels. Description of formations together with some excellent photographs follow.
- (2) "Reconnaissance from Ft. Hamlin to Kotzebue Sound, Alaska", U.S.G.S. Professional Paper, No. 10, 1902.

MERKING, LUDWIG

- (1) "Polar Regions; A Regional Geography", from "The Geography of the Polar Regions", Special Publication No. 8, 1928, 93-141, Am. Geog. Society, New York, German, Transl. by W. L. G. Joerg.

The author, a professor of geography at the University of Munster, has worked with all branches of geography, especially polar geography, oceanography, and climatology. This book is divided into two main sections, namely, the Arctic and the Antarctic.

MERKING, LUDWIG (cont'd.)

The Arctic: A complete, brief chronological history of polar exploration describes the progress made by various explorers and discoverers, starting with Pytheas of Massilia in 325 B.C. to Wilkins in 1927. Much valuable information on climate, geology, geography, and the flora and fauna of the Arctic is contained in memoirs of the early explorers. In the bibliography of several hundred publications, particular emphasis is placed on expeditions made in the 18th and 19th centuries. The author divides the Arctic into three major geographical provinces: (1) Rock desert; (2) Ice desert; and (3) Tundra. Brief references are made to surficial markings common to the Arctic. These include polygonal cracks, stone circles, upraised clay areas, long solifluction stripes, and cryoconite holes. Detailed discussion of various subdivisions of the Arctic is made.

The Antarctic: The author describes in detail the Antarctic and describes 11 individual regions.

- (2) "Geography of the Polar Regions (consist of a general Characterization of Polar Nature by Otto Nordenskjold and a Regional Geography of the Arctic and the Antarctic by Merking", Special Publication, No. 8, 1928, pp. 1-90, American Geog. Society, New York, DLC.

MERRITT, A.

- (1) "Construction Methods in Sub-Arctic", Pacific Builder and Engineer, Vol. 50, Feb. 1944, pp. 33-34, DLC.

MERRITT, M. L.

- (1) "Forests of Alaska," U. S. Forest Service Report, 1931, p. 4, U. S. Dept. of Agri., Washington, D. C., SPDO-P.

These are notes on the western and northern distribution of tree growth in Alaska. The author discusses the effect of climate on tree growth quoting various authorities, making references to notes on trees planted by the Russians in 1805 at Dutch Harbor. Table 1 gives temperature and forest cover data regarding various Alaskan localities as prepared from data obtained by the U. S. Weather Bureau.

MERTIE, J. B. Jr.

- (1) "A Geologic Reconnaissance of the Dennison Fork District", U. S. Geological Survey Bulletin, No. 827,

Location of area, previous investigations, limitations of this report, geography, drainage, relief, climate, vegetation, animal life settlements, all covered in introduction. Geology: Sedimentary and igneous rock outcrops - greenstone, granite, volcanic rocks (early, recent), limestone, schist (Birch Creek), conglomerates described. Alluvial deposits: silt bluffs, possibly some glacial deposits, mentioned. Many benches occur, rejuvenation of forty mile river erosion to lower base level. Benches exist at various levels. Alluvial deposits are gravel, sand, silts, some to considerable thicknesses. Mineral resources discussed and classified. Coal-lignitic is primary mineral of importance.

MERTIE, J. B. JR. (cont'd)

(2) also SMITH, P. S.

"Geology and Mineral Resources of Northwestern Alaska", U. S. Geological Survey Bulletin, No. 815.

Introduction, past and present reports, including discussion of authors' trips, is included. Much covered on relief and drainage of (1) general features (2) Koyukuk Plateaus, (3) Brooks Range province (4) Arctic Plateaus, and (5) Arctic coastal plain. Description of climate, vegetation, wildlife, and population included. Geology broken down into periods for discussion; a very good table showing age and type of rocks in Northwestern Alaska, Chandalor-Koyukuk Region, Canning River Region, Porcupine Valley region, and Eagle Circle District contained in report. More exact locations within Northwestern Alaska are found within the individual reports. Mention of ice in ground, ice wedges, some large masses, others vertical dikes. Description of igneous rocks, greenstones, basic intrusives and extrusives, granites, lavas with location noted included. Discussion of economic geology, petroleum, coal, gold placers, description of areas of importance in each category contained in report. Gold lodes, lead, iron, copper included, but are primarily of concern in bedrock studies. Good topographic and geologic reconnaissance maps of area. Many photos that are of value in description of text.

(3) "Chandalor-Sheenjek District, Alaska", U.S.G.S. Bulletin, 810-B, 1929, 54, Gov't Printing Office, Washington, D. C., SPDO-P.

This bulletin discusses the geography and geology in connection with the mineral resources of the Chandalor-Sheenjek Rivers and the streams in the vicinity.

(4) "Mineral Deposits of Ruby-Kuskokwim Region, Alaska", Bulletin, U.S.G.S., No. 864-C, 1936, Dept. of Interior, SPDO-P.

This bulletin discusses the geography and geology in connection with the mineral resources of the Ruby-Kuskokwim Region in west-central Alaska between the Yukon and Kuskokwim Rivers.

(5) "Yukon-Tanana Region, Alaska", U. S. Geological Survey Bulletin, No. 872.

Initial surveys, extent of present survey (scale, detail, etc.) contained. Geography (details on drainage of area, pp. 11-32) covered. Settlements, population, transportation, climate, general information discussed. Geology outcrops of schist (fairly extensive) limestone, sandstones, shales, fossil studies are correlated in description. Unconsolidated deposits exist, not glacial, but much glacial outwash material reworked, smoothbed, water-worn. No direct glaciation exists but much material washed into valley-boulder pavements, soil slumping, alluvial terraces, and deposits. Many deeply buried channels, cutting into older terraces and deposits. Streams seem to be in cycle of

MERTIE, J. B. JR. (cont'd)

rejuvenation, i.e., islands in Yukon flats are not growing but are being weathered and dissipated. Other material on igneous rocks, intrusives, geologic history and economic geology, placer deposits, hillside, valley, older alluvium, placers covered in remainder of report. References scattered through report. Geologic map included.

- (6) "Geology of the Eagle-Circle District, Alaska", U.S.G.S. Bulletin, No. 816, 1930, 173, Gov't Printing Office, Washington, D. C., Dept. of Interior, SPDO-P & DGS.

This bulletin covers the area along the Yukon River between Circle and Eagle, from Circle upstream to the United States boundary. This bulletin discusses the geography and geology as well as climate and mining in an area which has been very active as a gold mining region since 1897. The work is based on field work by the writer in 1925 and includes references to statements from all prior geology work in this area. It is illustrated with many photographs and diagrams. A very brief reference to permafrost indicates that it has restricted the circulation of the deeper groundwater.

- (7) Also MOFFIT, FRED H.
"The Kotsina - Kuskulana District, Alaska", U. S. G. S. Bulletin, 745, 1923, 158, Gov't. Printing Office, Washington, D. C., SPDO-P.

A geological survey to determine, examine and map in detail, copperbearing areas which give promise of yielding commercial ores. Survey was made in the Kotsina-Kuskulana district in the part of Alaska known as the Copper River Region. It lies at the west end of Chitina Valley on the southwest slope of the Wrangell Mountains.

MEIER, E. V.

- (1) "Cell Concrete", Twenty-Five Years of Civil Engineering, Christiani and Nielsen, 1904-1929, 139-153, B.S.L.

Cell concrete insulation - a discussion of the manufacture and use of cell concrete, using the foam compound developed by Christiani and Nielsen.

- (2) "Conference Report on Porous (Cellular) Concrete", First Int. Cong. for Concrete & Reinforced Concrete, Leige, Vol. 2, Ques. VI-9, 1930, 139-144, French w/Engl. Sum.

A description of porous light-weight concrete used for insulating purposes. Charts show the coefficient of conductivity and compressive strength characteristics.

MIASKOV, COL. B.

- (1) "Preparation of the Airfield for Winter Exploitation", Russian, SPDO-P.

Divides Soviet Union into 4 zones by snow cover and air temperature. Give methods of preparation of airfields by zones. Given economic comparison of methods. Two methods are rolling and clearing.

MICHIGAN, STATE HIGHWAY DEPT. OF

- (1) "Subgrade Soil Exhibit", Twenty-Ninth Annual Convention and Exposition of American Road Builders Association, January, 1932, 11 pp., Am. Road Builders Assn'n.

A description of capillary experiments, drainage experiments, discussion of typical field conditions and grade design measures for elimination of frost heaving and exhibit of frozen soil specimens.

- (2) "Field Manual of Soil Engineering", Rev. Edition, Feb. 1946, 64, 77-82, 106-09, Lansing, Michigan.

Frost heave excavation, frost heave, capillary action, free water, collection of water in voids, textural changes, frost boils, spring breakup and location, investigation, and inspection for preventing heaves.

MIKHALEV, P. F. AND SEMIAKIN, F. M.

- (1) "Formation of Periodic Ice Streaks During Soil Freezing", (Orig.) Comptes Rendus de l'Academie des Sciences, U.S.S.R. --also (Science Abstracts, Vol. 41, (484), 1938) -- also (Road Abstracts, Vol. 5, No. 7, Abstract No. 388, October, 1938), 17 (8), 1937, 405-7, Russian / Eng. abstr.

By using an analogy between the differential equations of diffusion and heat conduction, a law has been obtained giving the spacings between ice-streaks in frost heaving. The law is said to be in accordance with the observations of Taber.

MILLER, H. H. AND SMITH, D. N.

- (1) "Methods for Prevention of Road Failures Due to Frost", Roads and Streets, Periodical, Vol. 77, June 1934, 219-221, SPDO-P.

Article deals with the use of calcium chloride in preventing road failures due to frost.

- (2) "Prevention of Frost Heaving in Roads", Roads and Streets, Vol. 78, August 1935, 273-274.

A review of the author's report in "Roads and Streets" Vol. 77, No. 6, pp. 219-221, June 1934, and description of additional experimental test sections to determine the effectiveness of treatments of existing heaves by drilling holes through the surface and backfilling with calcium chloride and gravel. Includes cost data on drilling holes.

MINNESOTA, U. OF

- (1) "Final Report, Laboratory Research for the Determination of the Thermal Properties of Soils", June 1949, 1-225, Eng. Exper. Sta. U. of Minn., St. Paul, Minn., SPDO-P.

In the preparation of this report, the interim reports listed on the reverse side of this card were put out.

Name	Date
1. Lab. Res. for the Det. of the Therm. Prop. of Soils - Quarterly Report	1 April 1946
2. Lab. Res. for the Det. of the Therm. Prop. of Soils - Semi-Annual Report	1 October 1946

MINNESOTA, U. OF (cont'd)

- | <u>Name</u> | <u>Date</u> |
|--|----------------|
| 3. Det. of the Therm. Prop. of Soils for Invest. of Airf. Const. in Arctic and Subarctic Regions | January 1948 |
| 4. Final Rep., Lab. Res. for the Det. of the Therm. Prop. of Soils | September 1948 |
| 5. Final Rep., Lab. Res. for the Det. of the Therm. Prop. of Soils (printed) | June 1949 |

A report on a research program to determine, under varying conditions of temperature, moisture, bulk density and composition the thermal properties of representative soils and organic material from Alaska. Soils tested were typical materials from regions of permafrost. Mechanical analysis, plasticity and compaction tests have been made on all of the soils. The program also included tests on precast insulating slabs prepared from materials used in the foundation of some of the experimental field installations in Alaska. The soil testing equipment used was designed and built in the Engineering Experiment Station.

MIRAMITIAN, K. P.

- (1) "New Data on Permafrost in the Armenian SSR", Trudy of the Committee for the Study of Permafrost, Vol. 5, 1937, 181-182, Acad. of Sci., Moscow, USSR, Russian, DIC.

MIRONOV, A. F.

- (1) "Field Experiments and Observations on the Swelling of Ground and Heaving of Posts on the Experimental Lot of Petrovsky Permanently Frozen Ground Station", Materials of the Leningrad Inst. Constr., 1934, Russian.

MISSOURI, STATE HIGHWAY COMMISSION OF

- (1) "Soils Manual", 1948, 130-133, Missouri State Highway Com., Jefferson City, Missouri.

A discussion of fundamental concepts of the freezing and heaving phenomena, probable location of frost boils, reduction in bearing value during the frost melting period and methods for overcoming the detrimental effects of frost heaving subgrades.

MITCHELL, L. R.

- (1) "Arctic or Antarctic and Polar Fronts", Weather Dev. Res. Bull., No. 15, 1950, 40-50, Commonwealth (Australia) Australia, Met. Bur.

MITCHELL, M. R. C. AND ROCHE, M. A.

- (1) "Water Works and Sewerage in the Far North", Public Works Magazine, August 1948, pp. 21-23.

A. Unusual Distribution System at Flin Flon, Manitoba, by M. A. Roche. Permanent frost exists here between 1 and 16 ft. below the surface. Water pumped through

MITCHELL, M. R. C. AND ROCHE, M. A. (cont'd)

13,000 ft. of 20" woodstave pipe has not frozen in 18 years. Heating required on one occasion. Storage tanks and utilidors for distribution are steam heated. Distribution lines are in 4,000 ft. circuits in which water is circulated continuously. Steam is used to hold temperature at not less than 38°F.

B. Water and Sewerage at Sherridon, Manitoba, by M. R. C. Mitchell. Water mains and sewers are laid close together in trenches about 8 ft. below the ground surface or together with steam pipes on the surface in wooden boxes packed with sawdust. The water mains are discharged into the dead ends of sewers to prevent freezing. Sewers laid in boxes are cast iron pipe and those buried in the ground are vitrified clay. The cost of heating the pipes in the boxes is quite high. Boxes inclosing pipes, in general, are large enough to permit a man to work inside without opening the box from the outside.

MOFFIT, F. H.

- (1) "Geology of the Nome and Grand Central Quadrangles - Alaska" U. S. G. S. Bulletin, No. 553, 1913, 53-54.

Restatement of Tyrrell's description of "Crystosphaeres or Buried Sheets of Ice in the Tundra of Northern America."

- (2) "Geology of the Slana-Tok District, Alaska", Title: U. S. Geological Survey Bulletin, Vol. 904, p. 54, U. S. Dept. of Interior, Geolog. Survey, Washington, D. C.

Discussion of area is covered (geographic) by previous work. Contains information on relief, drainage, transportation, vegetation. Geology of consolidated (schists, igneous rocks, sedimentary) and unconsolidated deposits (glacial, alluvial, colluvial) is given. Extensive glacial deposits are in area. No proglacial deposits in evidence. Slana River shifts its channel over wide flood plain - moraine still occupying most of valley to about 400 to 500 ft. above river, kettle kame topography, ponds, lakes numerous; some kames relatively dry but moist soil in base gives luxuriant growth of grass. Morainal deposits occur elsewhere but not as conspicuously as in this valley. They occur especially where they are covered with trees. High gravels found at various levels to 2,000 ft. above stream. Low benches occur on almost all streams. Description of placer and lake deposits follows geologic data and history. Geologic map of area included as well as some sketch maps and photographs of area.

- (3) "Geology of the Nutzotin Mountains, Alaska", Geology of the Nutzotin Mts., Alaska and Gold Deposits Near Nobeena, U. S. G. S. Bulletin, 933-B, 1943, 103-174, Gov't Printing Office, Washington, D. C., SPDO-P.

Bulletin describes the general geology and geography of this region. Includes several illustrations and maps.

MOFFIT, FRED H. (cont'd)

- (4) "Geology of the Upper Tetling River District, Alaska", U.S.G.S. Bulletin, 917-B, 1941, 46, Government Printing Office, Washington, D. C. SPDO-P.
Describes geology and geography of this region with illustrations.

MOHR, H. A.

- (1) "Exploration of Soil Conditions and Sampling Operations", Publication from the Grad. Sch. of Engineering, No. 376, 1943-44, 1-63, Harvard University, Cambridge, Massachusetts, SPDO-P.

Main Report Consists of:

Field Identification of Soils, Methods of Exploration for foundation purposes, Analysis of typical examples, Conclusions, and also a Supplement consisting of recent developments with thin-walled to be samplers.

MOLODYH, I. F.

- (1) "Problems of Waterways in Eastern Siberia", Izvestia East-Siberian Div., Vol. 49, 23-62, Russ. Geogr. Soc., Russian.
- (2) "Brief Preliminary Data on Field Work for the Expedition on Exploration of the Kolyma River in 1928-1929. Bull. State Hydrol. Inst., No. 31, 1930, 43-72, Leningrad, USSR, Russian.

MONTGOMERY, R. H.

- (1) "Precise Levelling on the Alaska Highway", Transactions, American Geophysical Union, Vol. 29, No. 1, Feb. 1948, Nat'l Res. Council of the Nat'l Academy of Sciences, Washington, D. C.

This paper presents the history of precise vertical control in Alaska and the Yukon; discusses particular problems encountered in bench-mark construction and description when working in the northern latitudes; and comments on the evidence indicating regional earth movement.

MOORE, W. L.

- (1) "Descriptive Meteorology", 1910, 107-114, 344, D. Appleton & Co. New York.

A comprehensive treatise on meteorology. Included is a discussion of "Frosts; Influence of Soil and Vegetation on Minimum Temperatures", a major portion of which is devoted to conditions under which frost occurs in bogs, and the effect of sanding or flooding bogs to prevent frost.

MOOS, A. VON

- (1) "Part Played by the Foundation in Road Failures", (Orig.) Strasse u Verkehr---also (Abstract) Road Abstracts - Vol. 12 - No. 3 - Abstr. 118, March 1945, page 25, 29, 1943, 1-7 and 21-29, German.

Purpose of foundation or base, effect of faulty construction and criteria for detecting materials or conditions likely to cause trouble. Special reference is given to prevention of frost damage.

MORDVINOV, A. I.

- (1) "Relief and the Permafrost of the Left Bank of the Middle Course of the Byssa River, and the Adjoining Hills of the Southern Slopes of the Turanian Mountain Chain, The", Proc. of the Comm. of Permafrostology, Vol. IX, 1940, Acad. of Sci. Russian, Abst. by Stef. avail. in SPDO-P. Abstr. also in AUL & EL.

The author discusses the general character of the topography of the area together with the occurrence of permafrost, drainage, ground temperatures, frost mounds, and interrelation of permafrost and topography. A bibliography of 71 titles is inclosed.

MORIARTY, C.

- (1) "So You Think You Have Transportation Problems", Pacific Builder and Engineer, Vol. 51, No. 5, May 1945, 52-55.

An article by the Assistant General Manager, C. F. Lytle Company and Green Construction Co., on how Lytle and Green moved equipment, supplies and men to CAA project sites in the primitive Alaska Interior despite some of World's toughest natural barriers of weather, water and terrain.

MORTON, J. O.

- (1) "Soil Profile Field Methods in New Hampshire", Proceedings, International Conference on Soil Mechanics and Foundation Engrg., Vol. 1, June 22-26, 1936, 247, Harvard University.

A brief description of soil survey methods in New Hampshire.

- (2) "Application of Soil Mechanics to Highway Foundation Engineering", Proc. of the International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, June 1936, 243-247, B.S.L.

Discussed are: frost heaving as related to the various soil groups of the New Hampshire State Highway Department and Public Roads Administration soil classification systems; the use of the soil survey in locating frost susceptible soils and soil conditions; providing data for design of subsurface drainage systems, and locating base materials, etc. Typical sections of the New Hampshire, S.H.D. soil profile showing information as it is presented to design and construction engineers are included.

- (3) "Prevention of Frost Heave", Proceedings of the 16th Annual Meeting Highway Research Board, July 1940.

MOSKVITIN, A. I.

- (1) "Ice Field (wedge) Crack and Their Stratification Significance", 55-72, Russian, on microfilm-SPDO-P.
- (2) "Traces of Permafrost and the Necessity of Recognizing Them", Merzlotovedenie (Permafrost), Vol. 2 - No. 1, 1947, 3-22, Acad. of Sci., Moscow, USSR, Russian, DLC.

MOTL, C. L.

- (1) "Curing Minnesota Frost Boils by Drains", Engineering News-Record, Vol. 106-No. 7, February 12, 1931, 270-272, B.S.L. & A. H. L.

Discussed are definition and description of frost boils; primary and secondary conditions contributing to frost boil occurrence; depth of frost penetration; and remedial excavation, backfill and/or drainage measures and results in practice. A description of such drainage. Some illustrations.

- (2) "Study of Laws and Practices Applying to Special Load Limitations to Prevent Pavement Damage", Progress Report of Subcommittee No. 2, Maint. Comm., 1947, Am. Assoc. of State Hwy. Officials.

Status of enforcement of load limit laws and results of load bearing tests on Minnesota pavements in early fall and in early spring during the frost melting period.

MOZLEY, A.

- (1) "Frozen Ground in the Sub-Arctic Region and its Biological Significance", Scottish Geographical Magazine, Vol. 53, No. 4, July 1937, 266-270.

Data on mean annual air temperatures, depth of snow cover, depth of perennially frozen ground and ground temperatures in northern Asia, and minor reference to the existence of plant and animal life in those regions.

MULLER, DR. SIEMON WM.

- (1) "Permafrost or Permanently Frozen Ground", Strategic Eng. U. S. Engineers, Sp. Rpt. 62, March 1943, 136, U. S. Engineers.

One of the most complete books on permafrost in the English language at least up to the time of publication. It is largely a collection of knowledge about permafrost to date both from North American and foreign sources. The book deals more with the practical problems of permafrost than with the technical theories that have been evolved and covers a wide variety of subjects. Contains a large list of references.

- (2) SECRET

"Construction of Runways and Buildings under Arctic and Subarctic Conditions", Pamphlet, 11-21-44, SPDO-P.

A letter on the above subject to the Commanding General, Alaskan Divn. ATC, which points out conclusions and recommendations as to the various methods of construction on permafrost. Also outlines a set of tools and the scope and plan of the study of permafrost for use by field men.

- (3) "Permanently Frozen Ground and Related Engineering Problems" Special Report, Strategic Engineer Study, Military Intelligence Division, No. 62, August 1945, Office, Chief of Engineers, Washington, D. C.

MULLER, DR. SIEMON WM. (cont'd)

A comprehensive treatment of ice and permafrost. Of interest pertaining to normal frost action are: lag of ground temperatures behind air temperatures; fundamental principles governing formation of ice in soil; freezing temperatures of salt solutions; heat conductivity of soils; and swelling of ground during freezing.

MULLIS, IRA E.

- (1) "Illustrations of Frost and Ice Phenomena", Public Roads, Vol. 11, No. 4, June 1930, 61-79, Gov't Printing Office, Washington, D. C., SPDO-P.

The author illustrates various forms of detrimental frost phenomena and discusses and presents data on volume change-temperature change characteristics of water and ice; pressure effects due to frost action; direction of heat radiation; size of soil particles; and the amount of water available. The article contains a bibliography.

MUSKAT, M. AND WYCKOFF, R. D.

- (1) "Flow of Homogeneous Fluids through Porous Media", 1st Edition, 1937, 782 pages, McGraw-Hill Book Co., Inc., New York.

This book consists of the following: Part I - Foundations; Part II - Steady-State Flow of Liquids; Part III - The Nonsteady State Flow of Liquids; Part IV - The Flow of Gases through Porous Media; and the subject matter of this treatise, the flow of homogeneous fluids through porous media while distinctly limited by the qualifications "homogeneous" and "Porous", is nevertheless sufficiently wide in scope to find application in many branches of applied science. In such fields as groundwater hydrology, encompassing the provision and maintenance of water supplies, irrigation, and drainage problems, and petroleum engineering involving the production of gas and oil from their underground reservoirs, the applications are evidently of basic importance. Equally important are applications to specific problems encountered in civil engineering, agricultural engineering and many industries.

NATIONAL GEOGRAPHIC SOCIETY

- (1) "Top of the World - The National Geographic Society's New Map of Northlands", National Geographic Magazine, Vol. XCVI - No. 4, October 1949, 524-528, National Geographic Society, SPDO-P.

A very good map of the Arctic North covering the area No. of the 50° of Lat. is included. The article itself covers the following subjects: flights over the North Pole, life in the Arctic, Arctic weather outposts, natural resources, Soviet activity, and table of airline distances.

NATIONAL RESEARCH COUNCIL OF CANADA

- (1) "Soil Temperatures in Canada - Observations of Soil Temp." Feb. 1937, Ottawa, Canada.

NATIONAL RESEARCH COUNCIL OF CANADA (cont'd)

Observations were made from 1894 to 1900 at McGill University. Thermometers were placed at depths from 4" to 9' in sandy soil. Other observations were made at Guelph, Ontario, from 1930 to 1932 and at the University of Saskatchewan from 1921 to 1923 and from 1929 to 1934. Some of these results have been taken from other papers. The effect of snow, rain and air temperatures on soil temperatures is discussed at length. The frost penetration and depth of water mains in various Canadian cities is given including Calgary, Edmonton, Moose Jaw, Regina, Winnipeg, Windsor, Brantford, Chatham, Ottawa. Permafrost in the Hudson Bay area and the Klondike region is stated to be over 200 feet deep. At the maximum thaw, it is generally 6" to 10' in the summertime.

NATURE

- (1) "The Permanently Frozen Soils of Russia", Nature (London) Vol. 123, No. 3106, 11 May 1929, 741-742.

Abstract of a monograph "Everfrozen soil in the Boundaries of USSR", by M. Sungin. The Far Eastern Geophysical Observatory Vladivostok, 1927. Gives definition of perpetually frozen soil, shows its geographical distribution, and depth; correlates depth of snow cover with seasonal fluctuations of temperature in soil; cites three different types of temperature distribution in permafrost; discusses the origin of permafrost and describes the hydrological conditions of the permafrost regions.

NAVROTSKY

- (1) "Selling of the Frozen Ground in the Far East", Zhelezho-dorozhoe Delo (Railroad Industry) Track (Put'), 1928, 7-8 (9).

NAZAREVSKII, N. B.

- (1) "Permafrost, Sunken Lakes, and Frost Mounds of the Trans-Baikal Region", Trudy of the Comm. for the Study of Permafrost, Vol. 5, 165-178, Acad. of Sci., Moscow, USSR, Russian, DIC.

NEDOKUCHAEV, N. K.

- (1) "Soil and Conditions for Agriculture, Pasture Lands, and Truck Farming in the Yakut USSR, The", Proc. of the Council for the Study of Resources, The Yakut USSR, Vol. 4, 1932, 1-103, Leningrad, Russian, NN. Eng. Abst. by Stef. avail. in SPDO-P, AUL & EL.

A small portion of this lengthy article, devoted to the description of the soils of the Yakut region, deals with the permafrost conditions and their relation to agriculture. A point of interest is the fact that the author states that permafrost is a positive factor for agriculture in this region inasmuch as, in view of the scant precipitation in the summer, the permafrozen ground being impervious to water, serves to preserve the supply of spring snow water and summer precipitation. Without this factor, this region would be a desert.

NEZHEDANOV, M. I.

- (1) "From the Experience of Constructive Building Foundations Under the Conditions of Permanently Frozen Ground", Vol. 8, 1931, Inst. Puti N.R.P.S., Russian.

NICHOLS, D. A.

- (1) "Solifluction and Other Features in Northern Canada Shown by Photographs from the Air", Trans. Royal Society of Canada, Third Series, Vol. 26, Sec. 4, May 1932, 267-275.
Description of various aspects of solifluction (soil flow) in sub-polar regions due to effect of freezing and thawing. Also includes description of soil polygons, soil stripes and such topographic features as raised beaches, eskers and faults.

NIKIFOROFF, CONSTANTIN

- (1) "Perpetually Frozen Subsoil of Siberia", Soil Science, Vol. XXVI, No. 1, July 1928, 61-79.

This article discusses the location, thickness and temperature of permafrost, particularly in the vicinity of Yakutsk, Russia. The well of Shergeen at Yakutsk is stated to be 382 feet deep and the temperature at the bottom to be -3°C . A hypothesis as to the origin of permafrost is discussed. There is a discussion of soil blisters and ice caverns. It is pointed out that agriculture by the Yakuts has been successful in spite of the fact that the growing season is only 100 days long. Of course, during the growing season, the sun shines from 21 to 22 hours per day. Dairying is the principal agricultural pursuit. A series of maps and graphs illustrating the author's dissertation are included.

NIKOLAEV

- (1) "Struggle Against Snow on Aerodromes", Vestnik Vozdushnago Flota, Vol. 10, 1934, 41-42, Russian.

NORDENSKJOLD, OTTO

- (1) "Polar Nature: A General Characterization", The Geography of the Polar Regions, No. 8, 1928, 1-90, Am. Geog. Society, New York.

The presence of the Polar Regions of today enables scientists to visualize more clearly the conditions existing during the Ice Age. The climate, the ice covering and the sparse vegetation are the 3 main factors which make polar nature what it is. The author, a geography professor at the University of Gothenburg, Sweden has assembled climatological data and information of the flora and fauna gathered by numerous expeditions to various parts of the arctic and antarctic. A brief reference is made to soil forming agencies and soil formations, especially solifluction, polygonal soils, soil stripes and typical landforms occurring in polar regions. The author suggests that permanently frozen ground should be distinguished from layers of pure ground ice occurring directly beneath a thin

NORDENSKJOLD, OTTO (cont'd)

vegetation mantle, found in Alaska, Siberia, and especially in the New Siberian Islands. A bibliography of 24 references, principally European Polar Expedition papers, is included.

NORTON, C. D.

- (1) "Water Expansion in Ground Cause of Heaving in Winter", Engineering News-Record, Vol. 80, No. 22, 30 May 1918, 1058.

The author attempts to prove that ground heaves because water in the soil expands, and not as Prof. Taber suggests, by the formation of ice crystals. No factual data are given.

NOSOV, N. M.

- (1) "The Winter Regime of Mountain Water-Streams and its Influence on Roads", Doroga i Avtomobili, No. 4, 1937, 21-22, Russian.

NOVAK, V. J.

- (1) "On the Theory of Piedmont Benches", Zbior Prac. Poswieconych Przez Towarzystwo Geog. Lwowie, 1934, 290-318, Russian.

NOVOZHENOV, I. S.

- (1) "The Influence of Heated Buildings Upon the Depth of Ground Freezing", Construction Industry, Vol. 16, No. 10, 1938, 38-39, Russian.

NUNN, E. H.

- (1) "Subgrade Protection and Winter Paving on Access Roads", Calcium Chloride Association News, Vol. 8 - No. 4, 1 Aug. 1942, 4, 5, & 10.

Brief description of the use of calcium chloride to prevent freezing of the subgrade in winter construction.

OBIDIN, N. I. & TOLSTIKHIN, N. I.

- (1) "Icings of Eastern Trans-Baikal", Izv. Gos. Geogr. Soc. Vol. 68, Fasc. 6, 1937.

OBRUCHEV, V. A.

- (1) "Engineering Work Under Permafrost Conditions", Polevaia Geologiya (Field Geology) 4th Ed., Vol. 2, 1932, 242-250.

- (2) "Orthogonal Formations in Permafrost Regions", Izvestia of the Geographical Society, Vol. 70, No. 6, 1938, 737, Russian.

- (3) "Eternally Frozen Soil", Highways, Bridges and Aerodromes, June 27, 1945, 4-10, Russian, Abstr. in AUL.

A very general summary of some of the work done in Russia. The article is too brief to be of much value.

- (4) "Fifteenth Anniversary of the Ground Frost Study of the Academy of Sciences of the U.S.S.R., The", Priroda, USSR Acad. of Sciences Publ. No. 5, 1946, P. 92, Russian, DIC, Eng. Abst. & Trans. by Stef. at SPDO-P & AUL & EL.

This article is a brief review of the study of Permafrost beginning in Russia in 1845. The 100th anniversary is also the 15th anniversary of the establishment of a special commission for permafrost research. The commission became a special committee and is now the Institute for the Study of Ground Frost. Various definitions of terms are given. Reference is made to publications prepared in the 15-year period.

- (5) "One Hundredth Anniversary of the First Expedition of the USSR Academy of Sciences for the Study of Permafrost", Izvestia of all Union Geographical Society, Vol. 78, Part 5-6, 1946, 439-474, Russian, Eng. abst. by Stef. avail in SPDO-P, AVE & EL.

The author describes the expedition of A. F. Middendorf as the first scientific attempt to study permafrost. Middendorf left St. Petersburg on 14 November 1842 and returned from Siberia on 1 April 1845. His expedition studied organic sea life far from the shores of the Taymyr Peninsula, and verified the presence of frozen ground discovered by local settlers while digging a well at Yakutsk. Obruchev points out that after this preliminary work had been accomplished, nothing was done for the 85 years intervening between 1845 and 1930 when the study of permafrost was again resumed.

- (6) "Housing and Light Industrial Construction in Permafrost Regions", Work of the Inst. for the Study of Frozen Soils of the Acad. of Sci. of the USSR in 1946, 1946, Acad. of Sci. Moscow, USSR, Russian, Eng. abstr. by OCE, avail. in SPDO-P.

This chapter of the main publication consists of the following articles:

1. Some Features of Dwelling House Foundations in the Northern Parts of the Permafrost Region. - Tumel, V. F. 21 pp.
2. Constrn. and Maintenance of Small Industrial Building Foundations in the Dudinka Region - Lukin, G. O.
3. Building Foundations at Yakutsk - Saltikov, N. I.
4. The Temperature Field Laws of the Permafrost of the Vorkuta District - Redozubov, D. V.

- (7) "The Electrometry and Ondometry of Permafrost Strata", Works of the Inst. for the Study of Frozen Soils of the Acad. of Sci. of USSR in 1947, Vol. V, 1947, Acad. of Sci. Moscow USSR, Russian, Engl. abstr. by OCE avail in SPDO-P.

This article consists of a summary of articles written in 1947 by several authors.

1. A. A. Petrovsky - In Memoriam - V. A. Obruchev, L. D. Shevyakov, and A. T. Donabedov.
2. The Importance of Electrical Methods for the Study of Permanently Frozen Ground - I. M. Sumgin, A. A. Petrovsky.

3. The Electrical Characteristics of Permanently Frozen Rocks - B. N. Dostovalov.
4. The Results of Electrometrical Invest. Carried out by Direct Current on Permafrost - B. S. Emenstein.
5. Observation of Earth Currents (Spontaneous Polarization) connected with the Permafrost of the Igarka Region - Emenstein, B. S.
6. Development of Observations of Capacity Made with a Horiz. Antenna, Petrovsky, A. A.
7. The Application of the Wave Length Method to the Study of the Upper Layer of Ground - Petrovsky, A. A., Dostovalov, B. N.

(8) "Early Paleozoic Sedimentary Rocks of the Lena River Valley Between the Stations Kachug and Vitim", Zap East Siberian Geogr. Branch of Russian Geogr. Soc., Vol. II, Fasc. 1, 1891, Russian.

(9) "The Work of the Obruchev Institute of Permafrostology in 1944", Academy of Sciences of the USSR, 1945, 114-132, Acad. of Sci., Moscow, USSR, Russian.

This article is a review of the work accomplished by the members of the Obruchev Institute of Permafrostology during 1944. In addition to the material published during this year (1944); 41 papers by 29 different authors were submitted for later publication. In 6 instances the papers represent the work of a group of scientists, as many as 7 in number. Eight papers deal with the various aspects of construction of building foundations in permafrost areas. One paper deals with canalization under permafrost conditions. One paper deals with coal mining. Five papers deal with problems of construction of airfields in the areas of permafrost. One paper deals with the method of construction of snow galleries for the protection of roads. One paper deals with storage houses made of ice. One paper describes ice and its properties. Three papers deal with frozen ground. Eight papers deal with freezing. Two papers deal with frost mounds and permafrost. Several other papers deal with the use of electro-magnetic waves in analysis of rock formations, hydrological observations, methods of increasing vegetable crops, etc. all under permafrost conditions. One paper deals with the methods of salt extraction in the Yakut USSR by means of freezing. Many of these papers as set forth in this article are abstracts of the papers as published originally.

(10) "The Work of the Obruchev Institute of Permafrostology in 1945" Academy of Sciences of the USSR, 1947, 152-173, Acad. of Sci. Moscow, USSR, Russian.

This article points out that during 1945, the Institute of permafrostology was occupied with three major problems:

OBRUCHEV, V. A. (cont'd)

(1) Genesis of Permafrost, the theory of the freezing process; (2) Conditions of stable construction under permafrost conditions; and (3) Seasonal freezing and seasonal reserve of cold. The study of regional permafrost is covered by 12 chapters which include observations in the region of Kahl'mer-U (European Russia), thermokarst lakes of the Yakut, Baikal, Amur, Kolyma, Anadyr, Far East, and Manchuria. Observations deal with the general study of general permafrostology. Construction under permafrost conditions is dealt with in five chapters. Three chapters deal with seasonal freezing; two with nalyeds. Ground temperatures are considered in two chapters. Five chapters deal with such aspects of permafrost as the thermal properties of the ground, migration of water in frozen ground, and ice storage. A list of 16 articles published in 1945 is included.

O'NEILL, J. J.

(1) "The Geology of the Arctic Coast of Canada, West of the Kent Peninsula", Rept. Canadian Arctic Exped. - Geology and Geography, Vol. 11, Part A, 1924, 1-107.

ORESHKIN, I. I.

(1) "Permanently Frozen Ground on the Botogolsk Peak, Eastern Sayans," Zemlevedenie, Vol. 37, Fasc. 1, 1935, Russian.

OSADCHICH, M. P.

(1) "Is the Arctic Cooling or Not?", Sovetskaya Arktika, No. 8, 1936, 77-78, Russian.

OSTERBERG, J. O.

(1) "A Survey of the Frost Heaving Problem", Civil Engineering, Vol. 10, No. 2, Feb. 1940, 100-102, BSC & AUL, SPDO-P.

A description of damage due to frost heave and review of the mechanics of frost heave; the relationship between grain size and capillary action and heaving; and practical means of preventing frost heaving.

A report on experiences with frost-heaving of soil and pavements. Freezing and building up of ice lenses is thought to be due to capillary action. Swedish experiences with frost heaving are reported.

PALMER, C. A.

(1) "Permafrost Problems", Civil Engineer Corps Bulletin, Vol. 2, No. 17, April 1948, Bureau of Yards & Docks, U. S. Navy.

Report consists primarily of a list of precautions that must be taken when building in permafrost areas (list has 16 precautions); that is, variation in supporting power between frozen and thawed ground, the ground under buildings on permafrost tends to freeze less and thaw more thereby effectively lowering the permafrost table, etc. The origin of "Nalyeds"

PALMER, C. A. (cont'd)

and ice mounds are discussed. The necessary research investigations that should be carried on are discussed. Discussion of personnel and field and laboratory equipment necessary for the research is included.

PALMER, L. A. AND THOMPSON, J. B.

- (1) "Pavement Evaluation by Loading Tests at Naval and Marine Corps Air Stations", Proceedings 27th Annual Meeting, 1947, 125, Highway Research Board, SPDO-P.

Data of interest relative to studies of frost action are existing soil moisture contents correlated with soil type.

PALMER, LAWRENCE J. AND ROUSE, CHARLES H.

- (1) "Study of Alaska Tundra with Reference to its Reactions to Reindeer and Other Grazing", Research Report 10, Department of Interior, No. 10, 1945, 48, Dept. of Interior - Fish and Wildlife Service, Washington, D. C., SPDO-P.

The tundra region of Alaska varies in width from a few miles to 200 miles along the Bering Sea and from 100 to 150 miles along the Arctic Coast. Vegetation cover types are largely sedges, grasses, lichens, heaths, and procumbent woody plants. The authors list 16 distinct vegetative types in the report. A map showing the approximate distribution of tundra is included. A detailed list of plants occurring in the tundra regions includes 20 grasses, 25 sedges and reeds, 200 herbaceous plants, 25 woody plants, 40 mosses, and 40 lichens. Throughout the paper, emphasis is placed on forage value, although occasional references are made to soil, moisture and frost conditions, landforms and climatic influences which are of special interest.

PANOV, D. G.

- (1) "Polygonal Formations in the Kaninsk Tundra", Izvestia Russian Geogr. Soc., Vol. 65, No. 4, 1933, 320-334.

PARADIS, ALPHONSE

- (1) "Foundations and Protection Against Frost Heaving", The Canadian Engineer, Vol. 67, October 16, 1934, 21-24, BSL.

A description of field experiments involving the use of "sand cushions" up to 12 in. in depth and, a discussion of the use of "sand cushions" as bases under roads to prevent frost heaving. The use of sand is advocated because "...it has a much lower thermal conductivity than any other road building material." The author recommends the use of a sand cushion to protect against frost heaving.

PARKHOMENKO, S. G.

- (1) "Problems of the Ural-Kuznetsk Combine and the Phenomena of Permafrost", Sovetskaya Azia, No. 3-4, 1931, 116-118, Russian, NN.

PARKHOMENKO, S. (cont'd)

- (2) "Permanently Frozen Ground and the Construction of the Tunguska Cultbase", Soviet North, No. 1, 1931, 89-96, Russian, DLC.
- (3) "Program of Study of Phenomena Connected With the Frozen Soils and Grounds", 1932, Moscow, Russian.
- (4) "Program and Instruction for the Study of Permanently Frozen Ground", Kooperativnoe izdatel'stvo "Zhizn i Znanie", No. 79-81, 1935, 64 pp., Moscow, USSR, Russian, DGS, DLC, & NN.
- (5) "The Science of Eternally Frozen Grounds as a Knowledge of Kryophyll Rocks", Trudy Comm. for the Study of Permafrost, Vol. VI, 1938, 177-194, Acad. Sci., Moscow, USSR, Russian Engl. Summary.
- (6) "Preparation for Field Work", Izd. Committee on Permafrost, 1938, 7-8, Acad. of Sci., Moscow, USSR, Russian, DLC.
- (7) "Instruction for the Study of the Thawing and Freezing of Soil Based on the Presence of "Pereletoks" and the Depth of the Upper & Lower Surfaces of Permanently Frozen Ground", Instrns. and Program directions for the Study of Frozen and Permanently Frozen Grounds, 1938, 145-156, Acad. Sci. Moscow, USSR, Russian, DLC.
- (8) "Instruction for the Study of Structural Soils", Instrns. and Program Directions for the Study of Frozen and Permanently Frozen Grounds, 1938, 199-143, Acad. of Sci., Moscow, USSR, Russian DLC.
- (9) "Reply to the Remarks of M. I. Sumgin on my Article "Permafrostology as the Science of Cryophilic Formations", Trudy of the Committee for the Study of Permafrost, Vol. 9, 1940, 163-168, Acad. of Sci., Moscow, USSR, Russian, DGS.
- (10) "Report on a Trip to the Vilyuisk District", 1928, Acad. of Sci., Moscow, USSR, Russian.
Reports boslgoonyakh (or hydroloccolith) in the Bililyakh Lake. Another boslgoonyakh is near the village of Elgyai; is caved in, and the crater contains palatable water.

PARVIS, MERLE

- (1) "Development of Drainage Maps from Aerial Photographs", Proc. 26th Annual Meeting, 1946, 150-163, Highway Research Board, SPDO-P.

This paper reports the development of techniques for compiling drainage maps of fine detail from aerial photographs of the several counties in Indiana. The airphotos used for this work were taken in 1937-1943 in connection with the United States Department of Agriculture map program.

PERVIS, MERLE (cont'd)

- (2) "Regional Drainage Patterns", Thesis, June 1947, Purdue University.

This is a very complete paper on the various sections of Indiana covered and also contains much important material on general airphoto interpretation. General survey of previous history of aerial photography, including material on color, importance of drainage patterns, and the classification and significance, is discussed. Then general airphoto interpretation is discussed with particular attention to land form, drainage pattern, erosion features, soil color, and vegetative cover and land use. Origin of stream systems in various types of material is discussed. Important material on drainage pattern types is included. Description of the various types (18 in all) are given together with a sketch of each type. Dendritic patterns, being the most widely spread, are discussed further in another chapter and additional sketches are included to demonstrate them. Remainder of report is concerned with the physiographic units, drainage characteristics, and drainage maps of Indiana. Numerous photographs included as well as an extensive bibliography (100 titles).

PASSEK, A. N.

- (1) "Local Conditions of Climate and Permafrost at the Head Section of the Western Part of the Amur Railroad", Izv. Assoc. of Engin. of Means of Communication, No. 3, 1911, USSR, Russian.

PASSEL, C. F. AND SIPLE, P. A.

- (1) "Measurements of Dry Atmospheric Cooling in Subfreezing Temperatures," Proc. of the Amer. Philosophical Society, Vol. 89, No. 1, 1945, 177-199, DLC.

PATERSON, T. T.

- (1) "The Effects of Frost Action and Solifluction Around Baffin Bay and in the Cambridge District", Quarterly Journal of the Geological Society of London, Vol. 96, No. 381, April 1940, 99-130.

Description of frost cracking, mud and stone polygons and solifluction (soil flow); and discussion of the origin of frost cracks, theories of the formation of polygonal structures, and mechanics of solifluction.

PATTEN, HARRISON E.

- (1) "Heat Transference in Soils", U. S. Dept. of Agric., Bureau of Soils Bulletin No. 59, Pamphlet, Bulletin No. 59, Sept. 1909, 54, BLM and SPDO-P.

The results of lab experimental study and review of literature on thermal properties of soils. Presented are experimental and derived data on heat of melting, diffusivity rate, relation between surface area, moisture film, and heat conductivity, and diffusivity for seven soils ranging from coarse quartz to clay.

PAYNE, H. M.

- (1) "Development and Problem of the Yukon, The", Trans. Con. Min. Int., Vol. 16, 1913, 228-240.

PEARCE, E. E.

- (1) "Methods and Cost of Thawing Frozen Gravel by Means of Cold Water", Engineering and Contracting, Vol. 57, Feb. 15, 1922, 157-158.

PENIN, M.

- (1) "Construction of Wooden Buildings on Permanently Frozen Ground", Soviety Sever ("Soviet North"), No. 10, 1931, 85-88, USSR.

PENNSYLVANIA ROAD BUILDER

- (1) "Preventing Detrimental Frost Heaving", Pennsylvania Road Builder, Vol. 15, No. 9, September 1942, 4 and 15.
Brief discussion on the use of calcium chloride in soils and soil-aggregate mixes to prevent detrimental frost action.

PETROV, V. G.

- (1) "Naledi (Icings) On the Amur-Yakutsk Highway", 1930, 177 pp. album of sketch maps - 36 plates, Acad. of Sci. - USSR and Sci. Invest., Leningrad, USSR, Russian, AGS.
- (2) "Dynamics of Frozen Grounds as a Basis for the Railroad Construction, The", Problems of Frost in Construction, 1933, Siberian C.I.S., Novosibirsk, USSR, Russian.
- (3) "Attempt of Calculating the Pressure of Ground Waters in the Naledi (Ice Frostings), The," Proc. of the Comm. for the Study of Permafrost, Vol. III, 1934, 59-72 incl. Leningrad, Russian, DLC. Eng. abst. by Stef. avail. in SPDO-P, AUL & EL.
The article is devoted principally to a description of a field experiment conducted at the Skovorodino permafrost station on the Amur-Yakutsk Railway in 1930-31. The author describes a triple action apparatus which measures the pressure of the water in a naled mound. He states that the pressure equaled 52 atmospheres in this particular instance.
- (4) "New Data on the Southern Border of Permafrost in Western Siberia", Trudy of the Commission for the Study of Permafrost, Vol. V, 1937, 105-9, Acad. of Sci., Moscow, USSR, Russian, DLC, Eng. Abstr. by Stef. avail. in SPDO-P.
The author cites in detail and describes some 14 localities where permafrost was observed, mostly in the region of the upper Yenisei River from the town of Minusinsk down to Yenisei at 58°.

Northern Latitude. An island of permafrost was also recorded in the region of the Og River just below the town

PETROV, V. G. (cont'd)

of Tomsk. The author gives a new map of this area showing the corrected border of permafrost distribution. Bibliography of two titles.

- (5) "Permafrost Expedition Along the Highway Between Tajshet and Padun in 1933, The", Trudy of the Commiss. for the Study of Permafrost, Vol. V, 1937, 111-30, Acad. of Sci. Moscow, USSR, Russian, DLC, Engl. Abstr. by Stef. avail. in SPDO-P.

This article summarizes the results of an expeditionary investigation of permafrost conditions along the highway between the town of Tajshet and the town Padun. 83 tests holes were made, 15 of which show the presence of Permafrost. Bibliography of two titles given.

PETROVSKY, A. A.

- (1) "Determination of the Lower Limits of Permafrost by the Electrometric Methods", Proc. of the Comm. for the Study of Permafrost, Vol. III, 1934, 5-11, Acad. of Sci., Leningrad, USSR, Russian, DGS. Eng. Abst. by Stef. avail. in SPDO-P, AUL & EL.

This article deals with the results of achievements during the 3½ years of study of application of electrical methods for the determination of the thickness of permafrost. It is interesting to point out that the best results were obtained at night when the surface of the ice was frozen. During the day, a thin layer of water was formed on the surface of the ice which increased the capacity and disrupted the observations.

- (2) also AKIMOV, A. T.
"Instructions on the Use of the Direct Current Electro-Survey in Areas of Permanently Frozen Ground", Instructions and Program Directions for the Study of Frozen and Permanently Frozen Grounds, 1938, 85-102, Acad. of Sci., Moscow, USSR, Russian, DLC.
- (3) "Physical Constants of a Monometric Transmitter", Trudy Geological Institute, Vol. IX, 1939, 327-347, Acad. of Sci., Moscow, USSR, Russian.
- (4) "Work of An Ondometric Transmitter, The", Trudy Geol. Inst. Vol. IX, 1939, 301-325, Acad. of Sci., Moscow, USSR.
- (5) also SUMGIN, M.I.
"Importance of Electrical Methods for the Study of Permafrost, The", Proc. of the Obruchev Institute of Permafrostology, Vol. V, 1947, 15-17, Acad. of Sci., Moscow, Russian, DLC Eng. abst. by Stef. avail. in SPDO-P, AUL & DES.
- The author explains the many uses of the magnetic and electric methods is due to their comparative cheapness and rate of adaptability under a variety of conditions. Map is shown giving the area in which geophysical methods have been applied. Bibliography of six titles is included.

PEWE, TROY L.

- (1) "Terrain and Permafrost of the Galena Air Base, Galena, Alaska", 1947, U. S. Geol. Survey, Washington, D. C., SPDO-P.

- (2) "Permafrost Program Preliminary Report, Permafrost Investigation, Fairbanks Area, Alaska", September 1948, Dept. of Int., U. S. Geol. Survey, Mil. Geol. Section, SPDO-P.

This report summarizes the progress of terrain and permafrost investigations in 1947 in the Fairbanks area, Alaska. The purpose is to make available preliminary interpretations of permafrost conditions in the Fairbanks area prior to the completion of the project. To supplement the general terrain and permafrost investigations, geophysical investigations of the permafrost will be initiated in the summer of 1948 in the Fairbanks area. In 1947, permafrost information was obtained from foundation excavations, hydraulic mining areas, wells, and drill holes. Depth to permafrost was determined in many places with steel hand augers. D. J. Cederstrom of the Water Resources Branch of the U. S. Geological Survey studied the ground water conditions of Fairbanks concurrently with the terrain and permafrost investigations of the area and will continue the study of the ground-water resources in 1948. In February and April 1948, data on groundwater in the Fairbanks area were released; tables of data on approximately 500 wells were put on file for public inspection at the Geological Survey in Washington, D. C., and in Fairbanks and Juneau, Alaska, and at the office of the City Engineer in Fairbanks. Report includes preliminary permafrost map of the Fairbanks area and sketches on distribution of permafrost and artesian conditions of water confined by permafrost in the Fairbanks area.

- (3) "Preliminary Report of Permafrost Investigations in the Dunbar Area of Alaska", Geol. Sur. Cir. No. 42, Feb. 1949, 1-3, U. S. Dept. of Int. Geol. Sur. Washington, 25, D. C., SPDO-S.

The purpose of this report is to present a preliminary description of the Permafrost conditions in the Dunbar region. It is a result of reconnaissance on August 6, 1948. Chapters include:

1. General Geologic Setting.
2. Depositional Slope and Hills
3. Economic Application.

This is an article of general nature on a specific location.

PISAREV, G. F.

- (1) "Permafrost in the Tunka Depression", Trudy of the Commission for the Study of Permafrost, Vol. IV, 1935, 189-223, Acad. of Sci. Moscow, USSR, Russian, DIC, Eng. Abstr. by Stef. avail. in SPDO-P.

The author describes his investigation of permafrost conditions in the Tunka depression in 1931 as a part of a general study for the Angara construction project. Includes observations on permafrost degradation and character of soils of the region. Outward manifestations of the degradation process were thawing of ground ice, the occurrence of sunken lakes and pits, and the typical knoll-depression micro-relief. Bibliography of 13 titles.

POBEDONOSTSEV, B. D.

- (1) "Experience in Erecting Artificial Ice-barriers on Rivers", Meteorologia i Hydrologia, Vol. 4, No. 4, 1938, 111-117, Russian.

PODOLSKI, V.

- (1) "Experience of Excavation in Mining in the Arctic Under Permafrost Conditions", Problems of the Arctic, No. 4, 1939, 79-82, Leningrad, USSR.

This article cites the results of experiences of mining under permafrost conditions. All mining, both surface and underground, requires the use of explosives under permafrost conditions. Because of the difficulty of transportation and the extremely low temperatures, the choice of explosives is important. The author states that ammonite in capsules is the best type of explosive for this purpose.

PODYAKONOV, S. YA

- (1) "Icings of Eastern Siberia and Causes of Their Appearance", Izv. Russ. Geogr. Soc., Vol. 39, Fasc. IV, 1910.

POKROVSKY, G. I.

- (1) "The Mechanics of the Frozen Ground", Jour. Tech. Physics, Vol. 5, Fasc. 6, 1935, Russian.

POLEVOY, P. I.

- (1) "The Anadyr Region, Mem. Com. Geol., 1915, Russian with Eng. Summary.

POLLARD, WM. S.

- (1) "Special Airphoto Investigation of Soils and Permafrost in the Vicinity of Bethel, Alaska", September 1948, 1-43, 42 figures, Purdue University, Lafayette, Indiana, SPDO-P.

Table of Contents are as follows: Location, Bedrock Geology, Landform, Alluvium, and Terrace Area.

POLOVINKIN, A. A.

- (1) "On the Question of the So-called 'Permanently' Frozen Ground of Siberia", Tr. Inst. Narod Obr. Vol. 1, 1922, 64pp

POLYNOV, B.

- (1) "Regarding 'Permanently' Frozen Ground and the Forms of Ice that Survive the Summer in the Amur Province", Zemlevedeniye, Vol. 17, No. 3, 1910.

PONOMAREV, V. M.

- (1) "Preface", Trudy, 1936, 3-5, Leningrad, Russian, DLC, Eng. Abstr. by Stef. avail. in SPDO-P.

This is a short introduction to a volume containing five articles listed below.

1. Sumgin, M. I. - "Permafrost in the North of the USSR"
 2. Kovner, S. S. - "Concerning the Mathematical Theory of Freezing".
 3. Ianovskii, V. K. - "Contributions to the Method of Studying Permafrost for the Purposes of Proposed Engineering Constructions".
 4. Tsytoich, N. A. - "Principles of Construction and the Calculation of Foundations Erected on Permafrost".
 5. Tolstikhin, N. I. - "Hydrogeological Conditions of Water Supply in the Regions the Frozen Zone of the Lithosphere (Permafrost)".
- (2) "Permafrost and Mine Waters in the Arctic", Soviet Arctic No. 4, 1936, 111-116, Russian, NN.
Near the Shore of the Arctic Ocean, permafrost is in the state of degradation. In the Shergin shaft, the temperature gradient increases downward.
 - (3) "Permanently Frozen Ground on the Basis of the Newest Data", Prob. Sov. Geol., No. 4, 1937, 360, Russian.
 - (4) "On the Question of the Study of Permanently Frozen Ground in Connection with the Construction of Shafts and Tunnels", Instructions and Program Directions for the Study of Frozen and Permanently Frozen Grounds, 1938, 215-232, Acad. of Sci. Moscow, USSR, Russian, DLC.
 - (5) "Quaternary History of the Kozevnikova Bay Area", Soviet Geology, No. 11, 1940, 82-93, Russian, on microfilm in SPDO-P.
 - (6) "The Study of Permafrost in 1936", The Soviet Arctic, No. 2, 1936, 111-112, Moscow.
The author states that prior to 1935, little work had been done in the territory served by the Department of the Northern Sea Route. In 1936, three new permafrost stations were established at Anadyr, Yakutsk, and Amerda. Additional work was planned at other stations.

POPOV, A.

- (1) "Ground Ice in the Islands of the Lena River", Vestnik Znaniya (Scientific Herald), No. 9, 1934, Russian.

POPULAR SCIENCE MONTHLY

- (1) "Revolt of the Earth; Permafrost Tests Ingenuity of Arctic Builders", Popular Science Monthly, Magazine, Vol. 149, November 1946, 126-9, AUL.

Difficulties of building in permafrost regions. A very general statement covering some of the more obvious aspects of permafrost and based on the St. Paul Study and Strategic Engineering Study No. 62.

PORSLID, A. E.

- (1) "Earth Mounds in Unglaciated Arctic Northwestern Alaska", Geographical Review, Vol. 28, No. 1, 1938, 46-58,

Origin of mounds - hypotheses covered are: (1) by hydraulic pressure - cracks caused on surface with possible steady seepage afterward, (2) so-called "local upheaval" on low marginal plains. Descriptions and photographs of "pingoes" with cross-section of one, also discussion of remnants and their cause included. Local upheaval is due to expansion of water as downward freezing progresses. Mention of cold storage vaults on "pingoes" in Kotzebue region with discussion of their mode of origin. "Pingoes" due to hydraulic pressure occur on slopes, to establish necessary head. "Pingoes" of upheaval type on flat lying land.

PORTLAND CEMENT ASSOCIATION

- (1) "P.C.A. Soil Primer", 1946, 1-76, Portland Cement Assn. Chicago 10, Ill., SPDO-P.

Table of Contents

- I Soil and Soil Properties.
- II Soil Identification and Classification
- III Soil Surveys and Soil Sampling
- IV Soil Bearing Value Tests
- V Example of Soil Surveys, Tests and Analysis

The "PCA Soil Primer" is intended for the use of the PCA staff and the practicing highway engineer. Includes classification of soils by P.R.A., U.S.B.C.S., USED, and C.A.A.

POVKH, I. L.

- (1) "Permafrost Conditions in the Village of Samarova on the Orb River, The", Proc. of the Permafrost Committee, Vol. 9, 1940, 150-162, Acad. of Sci. Leningrad, USSR, Russian, DGS. Eng. Abst. by Stef. avail. in SPDO-P, AUL & EL.

This article deals with the discovery of permafrost conditions in the village of Samarova in the region of the Orb River. The author concludes that the permanently frozen ground is of recent origin inasmuch as the layer of ground has been recently deposited as the result of considerable shifting of the Irtysh River bed.

FRANSES, 1ST LIEUT., ANTHONY L.

- (1) "Tractor Train Operation in Arctic and Sub-Arctic Regions, Report on", 1 April 1944, US Eng. Off-Alaskan Dept., on microfilm at AUL (F250) in print in SPDO-P.

FRANSES, 1ST LIEUT., ANTHONY L. (cont'd)

Table of Contents

- I Purpose
- II Historical
- III Equipment
- IV Personnel
- V Supply Problems
- VI Loading
- VII Selection of the Route
- VIII Normal Operation and Operational Difficulties
- IX Night Operation
- X Operations in Extreme Cold
- XI Conclusions and Recommendations
- XII Diagram Supplement
- XIII Photographic Supplement

This report concerns the operation of large tractor-trains for supplying large quantities of supplies over long distances.

FRASOLOV, L. I.

- (1) "On the Question of Classification and Nomenclature of Soils", 1936, Russian.

Commemorative volume to F. Yu. Levinson-Lessing on the 50th Anniversary of his scientific and social activity.

PRATT, F. R.

- (1) "Depth of Frost Under Pavement", Engineering News Record, Vol. 125, Dec. 19, 1940, 835, API and AHL.

Report of a test showing time required for cold to penetrate a pavement.

PRESTWICK, J.

- (1) "Underground Temperatures", Proceedings of the Royal Society, Vol. 41, 1886, 1-116, London.

PROKHOROV, N. I.

- (1) "A Preliminary Report Regarding the Investigation of Soils of Asiatic Russia in 1909-1911, Colonization Service, 1913, Russian.

PROTANSKIY, V. V.

- (1) "From the Works of the North Experimental Stations on Construction of Ice Roads", Lesopromyshlennoe Delo., No. 1, 1930, 25-29, Russian.

PUBLIC WORKS

- (1) "Preventing Spring Breakup of Roads", Public Works, Periodical, Vol. 75, No. 8, August 1944, 18, BSL.
Description of a method of introducing calcium chloride into holes in the subgrade to prevent spring breakup.

PURDUE UNIVERSITY

- (1) "Alaskan Photographs, Permafrost Airphoto Investigation", 1945, Purdue Univ. Engineering Experiment Station, SPDO-P.

PURDUE UNIVERSITY (cont'd)

This volume consists of a series of black and white photos taken by D. J. Belcher of Purdue University during a field trip to Alaska in August and September 1945, in connection with the aerial photographic reconnaissance investigation under contract held by Purdue University with the St. Paul District CE. The depth to permafrost, various kinds of silt, sand and gravel formations, as well as vegetation and similar items pertinent to permafrost, are shown. The photos are taken along the Alaska Highway and include areas in the vicinities of Northway, Tanacross, Big Delta, Fairbanks, Cleary, Summit, Bettles, Selena, Nome, and Point Spencer.

RABOTNOV, T. A.

- (1) "The Flora of the Naledi", Izvestia Geographical Society, No. 3, Vol. 69, 1937, 395-408, Moscow-Leningrad, Russian, DIC. Eng. abst. by Stef. avail. in SPDO-P, AUL & EL.

This is the report of the investigation in the basin of the upper part of the Aldan and Timpton Rivers in the Yakutsk ASSR. The conclusions cite the wide distribution of low shrubs as a factor of the peculiar ecological conditions typical for tundra flora yet connected genetically with the forest areas. The author considers the shrub birch more ancient than other low scrub vegetation and a relic of the ice age and points out the economic value of the low shrub area for reindeer breeding. Bibliography of 14 titles is given.

RAKITOV, A. I.

- (1) (Migration of Petroleum in Permanently Frozen Ground) Migratsiia nefiti v Usloviakh Rechnoi Merzloty, Razvedka Nedr, No. 10-11, 1940, 72-76, Russian.

RAMBAUT, A. A.

- (1) "Results of Meteorological Observations, also Underground Temperatures in Twelve Years, 1898-1910", Radcliffe Observations, Vol. 51, 1916, 103-215, Radcliffe Observatory, Oxford.

This publication describes apparatus and methods of reducing observations of earth temperatures, discusses observations, computation of thermal diffusivity of gravel in which thermometers were placed, and amplitudes of temperature waves. Charts showing mean monthly temperatures of the ground for various depths are included.

RATHJENS, G. W. AND RICE, N. W.

- (1) "Compilation of Some Construction Problems, Their Determination, and Possible Solution, in Areas of Permafrost" 1-15, SPDO-P.

RATHJENS, G. W. AND RICE, N. W. (cont'd)

This article discusses such soils as black muck, silt, red muck, sand, gravel and sliderock, and clay. Subjects covered include permafrost, drainage, sitka spruce, and ground water. This is a compilation of ideas intended to supplement SES. No. 62 by USGS.

RAUP, HUGH M.

- (1) "Botanical Problems in Boreal America I & II", The Botanical Review, Vol. 7, No. 3, Vol. 7, No. 4, March 1941, April, 1941, 148-208, 209-248.

The author emphasizes the difficulties encountered in attempting to classify forests or to present logical arguments for the existence of a particular plant association in a given location. This paper is principally a review of literature of approximately 250 papers and a statement of the author's opinions of the other investigators' concepts and methods. The paper gives a very technical discussion of the original and distribution of flora. A short section of the paper is devoted to a discussion of stone polygons. Briefly, in order to have stone polygons, no vegetation can be present during their development. Thus, if both stone polygons and vegetation are present, the vegetative cover is comparatively recent. There is also a discussion of plant succession. Mapping of vegetation by air photos and the construction of cover type maps from air photos is discussed.

REDOZUBOV, D. V.

- (1) "Laws Governing the Regularity of the Temperature Field in the Permafrost Region at Vorkuta", Proc. of the Obruchev Inst. of Permafrostology, Vol. 1, 1946, 137-166, Moscow, Russian, DLC. Eng. abst. by Stef. & OCE avail. in SPDO-P, AUL & EL.

This article consists of 2 parts. Part one deals with the laws of temperature in the permafrost region and part two deals with the application of these laws to specific conditions at Vorkuta. The author emphasizes the importance of the detailed study of temperature curves to determine the existence of permafrost degradation. Bibliography of nine titles is given.

REVERDATTO, V. V.

- (1) "Morphology and Vegetation in the Spotted Tundra of Arctic and Alpine Provinces of Siberia", Izv. Tomsk. Branch Russ. Botan. Soc., Vol. 3, No. 1-2, 1931, Russian, DLC.

RICE, N. W.

- (1) "Care of Airfields on the Northwest Ferry Route", 1943.

RICHARDS, L. A.

- (1) "Laws of Soil Moisture", Transactions of the American Geophysical Union, Vol. 31, No. 5, October, 1950, 750-756, Nat. Acad. of Sci., Washington, D. C., SPCO Lib.

A discussion of the phenomena of boundary conditions in soils in regard to outflow of soil moisture. It has a special application in problems of underground drainage. Several discussions by other persons follow the main report as well as several lists of references.

RICHARDSON, HAROLD W.

- (1) "Alcan Highway Diary", Engineering News Record, Vol. 129, No. 21, 19 December 1942, 54-55.

The following is quoted from Mr. Richardson's diary with regard to permafrost: "Whitehorse, Y. T., ... October 21, 1942..... Interesting construction over perpetually frozen ground. Permanent frost here is 12 inches below surface. Rather than try to disturb it, the procedure is to leave the moss and humus in place, fell the trees and brush across the line as further insulation, then fill for the road on top of the brush and trees. Difficult to find enough unfrozen material for fill, but they are getting most of it out of slide banks and side-hill cuts."

- (2) "Alcan-America's Glory Road", Engineering News-Record, Pt. I, II & III, Vol. 129, Nos. 25, 27, December 1942 and January 1943.

Part I - Strategy and Location. This is the first of a series of three articles on the Alcan Highway. This article tells of the purpose of the project and describes the route location. With regard to permafrost, the following is quoted from the article: "Other troops, working in the northern sector of the highway, learned to leave permanently frozen ground alone. They learned from experience it was best to leave the humus in place as insulation, to cover it with brush and trees cleared from the site, then fill over the whole for the road." Included are numerous photos and a map of the route of the highway.

Part II - Supply, Equipment and Camps. This is the second of the Alcan Highway series. This article tells of the problems of supply, how equipment, materials and supplies were gotten into the wilderness and distributed throughout the project. Also describes living and working conditions of the road camps and headquarters, and the difficult equipment repair and maintenance problems. Includes numerous photos of equipment and camps, and one photo of the permanently frozen ground.

Part III - Construction Tactics. This is the third and concluding article of the Alcan Highway series. This article describes actual construction operations, how the Army put the various regiments on the project and attached the work, how the contractors worked and how the bridge and drainage problems were solved. Includes photographs and a map of the route of the highway.

RICHARDSON, JOHN

- (1) "On the Frozen Soil of North America", Edinburgh New Philos. Journal, Vol. 30, 1841, 120-123.

RICHTER, G. D.

- (1) "Notes on Peat Mounds in the Region of Nudoxero Lake" Proc. of the Comm. for the Study of Permafrost, Vol. 3, 1934, 121-126, Acad. of Science, Leningrad, Russian, DIC. Eng. abstr. by Stef. avail. in SPDO-P, AUL & EL.

This paper is the result of observations made during the work of the Kola Peninsula expedition.

RIDDICK, THOMAS M.

- (1) "How to Prevent Pipeline Freezing", Engineering News Record, Vol. 145, No. 19, 9 November 1950, 38-41, McGraw Hill, New York, SPDO-P or any technical library.

This article contains the information and formulae needed to calculate heat gain and heat loss in various types of pipes. It is especially written for the problems of transmission of water in cold climates which is a great problem in the arctic regions.

RIPPAS, P.

- (1) "Geological Investigations in the Southern Part of the Upper Zeya Basin in 1902", Geol. Invest. of Goldbearing Provinces in Siberia, Amur-Maritime Region, January 5, 1904, Russian.

RIVERS, VICTOR C.

- (1) "Tractor Train Freighting in Alaska, Report on", 15 May 1943, U. S. Engr. Office, Anchorage, Alaska, Microfilm in AUL (1-250) and in print in SPDO-P.

This report covers a compilation of existing data on tractor-train development and operation in cold climates and on related problems such as fuels equipment, etc.

ROADS AND STREETS

- (1) "Alaska Highway Flight Strips", June 1944, 80.

Introduction expresses need for auxiliary strips. Construction and location problems similar to those faced on the Alaskan Highway. Preliminary surveys, then final surveys after official approval. Route closely follows highway. Construction details discussed in brief. Clearing and grading done by Public Roads Administration, base course and wearing surface placed by contractor.

- (2) "Simple Method of Preventing Spring Breakup of Roads" Roads and Streets, Vol. 87, No. 10, October 1944, 81.

Description of method of introducing calcium chloride and pea gravel in holes in subgrade to prevent spring breakup.

ROBERTS, M.

- (1) "Notes on the Action of Frost on Soil", Journal of Geology, Vol. 11, No. 3; April-May, 1903, 314-317.
Description of ground surface hoar frost (needle ice, Swedish "pipkrake") formed in the Puget Sound area from Feb. 10 to 18, 1903 with ground temp. as low as 24°F. Includes four photos showing ice formed in six layers ranging in height from 3/8 to 1 in.

ROBERTS, CDR. P. W. AND COOKE, LT. CDR. F.A.F., CEC USN

- (1) "Arctic Tower Foundations Frozen into Permafrost", Engineering News Record, Vol. 144, No. 6, Feb. 9, 1950, 38-39, McGraw Hill Co., New York, N. Y. SPDO-P.

A description of the construction and installation of the foundation and supports for the radio tower at Pt. Barrow, Alaska. The problems and solutions of pouring concrete in the permafrost with excessive thawing kept to a minimum is discussed. The type of insulation used and its placing for is also mentioned along with the installation of temperature reading instruments.

- (2) ROBERTS, PALMER W., CDR. only

"Effects on Materials in Arctic Cold", Military Engineer, XLII No. 287, May - October 1950, 176-178, 272-274, 366-669, Mills Building, Washington D. C., SPDO-P.

A report on various materials from concrete to plastics, including metals and their behavior under the low temperatures encountered under arctic conditions. A general discussion on using concrete in permafrost areas and the use of ice and snow for construction purposes.

ROBINSON, R.

- (1) "Permafrost - Arctic Building Problem", Constructor, Vol. 29, June 1947, 28-32.

ROCHLIN, M.

- (1) "Small Excavations Under Permafrost Conditions by Means of Explosives", Problems of the Arctic, No. 2, 1938, 221-223, Leningrad, Russian, DIC. Eng. abst. and trans. by Stef. avail. in SPDO-P, AUL & EL.

This brief article describes the experience of the first Chunksk geological expedition which conducted a survey of permafrost conditions in the Chunksk gulf region between latitudes 69°-70° N. The author describes the method of thawing the top of ground by burning oil on the surface and the use of explosives.

ROMANOV, V. V. AND ROZHANSKAIA, O. D.

- (1) "Physical Properties of the Seasonally Frozen Ground in Marshes", Priroda, No. 3, 1946, 57, Russian, DGS Engl. abstr. by DGS avail. in SPDO-P, AUL DES & DGS.

ROMANOV, V. V. AND ROZHANSKAIA, O. D. (cont'd)

This article investigates the physical and mechanical properties of a frozen layer of moss-grass marsh in the Leningrad Military District. Scope and results of tests are given; conclusions drawn.

ROOT, W. H.

- (1) "Vertical Drainage", Highway Maintenance Performance Items, Summer 1947, Public Roads Administration. Experience in the use of deep vertical drains to prevent frost heaving.

ROSEN, M. F.

- (1) "Observations on the Distribution of Permafrost in the Delta of the Pechora River," Trudy of the Commission for the Study of Permafrost, Vol. IV, 1935, 151-170, Moscow, Russian, DIC (Eng. abstr. by Stef. avail. in SPDO-P).

This article summarizes the results of field investigations by the author in the region of the delta of the Pechora River where he conducted a geological study of the region in 1935 for the purposes of the planned construction of a river port. Permafrost is encountered at a depth of 30-50 cm. in August, this depth varying with the types of ground. Bibliography of 8 titles given.

ROTHEROCK, J. T.

- (1) "Sketch of the Flora of Alaska", Sub-title, U. S. Smithsonian Museum Report, 1867-8, 433-463, SPDO-P.

This article apparently is based on early explorations immediately subsequent to the acquisition of Alaska by the United States. Although there are some interesting references, undoubtedly more recent publications give greater detail as to the flora of Alaska.

ROWAT, B. M.

- (1) "Control of Frost Heave", Proceedings of the 19th Annual Meeting Highway Research Board, Vol. 19, Dec. 1939, 464-466, SPDO-P.

This article deals chiefly with the use of salt in the prevention of frost heave under railroads and in subgrades for highways.

ROZARKI, G.

- (1) "Stone-Centered Polygons on the Rock Ledge Bordering the Genesee River at Letchworth Park, New York", Journal of Geology, Vol. 51, 1943, 330-341.

Author describes polygons in some detail, slabs of shale 1' in diameter, surrounded by fresh fragments 3' long, 1/4" thick, 3" wide standing on end (photograph included). Bed rock found 6" or less below surface. Origin discussed. Water flowing over thinly bedded shale, upon freezing, causes

ROZARKI, J. (cont'd)

disintegration and separation of bedrock. Subsequent freezing causes further disintegration. End product is mud (silt), but further weathering causes further formation of stone centered polygons. One winter appears to be minimum period of formation at Letchworth Park, polygons formed in 4 years with 300 days of freezing and thawing temperatures.

RUCKLI, ROBERT, DR.

- (1) "Frost Damage in Highway Subgrades", Strasse und Verkehr, Vol. 29, No. 19-22, 24-25, September 17, December 10, 1943, SPDO-P.

A long and informative article arranged in 7 parts:
(1) Types of ice in soil; (2) The mechanics of frost heaving; (3) Frost conditions in Switzerland; (4) Temp. conditions in the soil; (5) Frost penetration in the soil; (6) Theory of frost heaving; and (7) Field experiments.

RUSSELL, I. C.

- (1) "Surface Geology of Alaska, Notes on the", Geology Society of America Bulletin, Vol. 1, 1890, 99-162, Geology Society of America, New York, New York.

RUSSIAN PURCHASING COMMISSION

- (1) CONFIDENTIAL
"Permafrost Data", 25 October 1944, On microfilm in AUL.

RUTLEDGE, P. C. AND WINN, H. F.

- (1) "Frost Action in Highway Bases and Subgrades", Series 73, 1940, 1-100, Purdue Univ. Eng. Exp. Sta., Lafayette, Ind. BSL AND SPDO-P.

This article contains investigations and review of the physical processes of frost action as well as the discussion of the materials and procedures used.

RYABUKHIN, G.

- (1) "Certain Manifestations of Permafrost in the Region of Ust-Port", Problems of the Arctic, Vol. 6, 1939, 82-85, Leningrad, Russian, Eng. abst. by Stef. avail. in SPDO-P, AUL & EL.

This article deals with some observations on the character and manifestation of permafrost in the region of Ust-Port conducted during the oil prospecting in this region in 1939. The author gives a detailed description of the geological structure of the locality including frost blisters and frost heaving. He also points out the difficulty with thawing during the drilling of the oil well. This damaged the drilling machinery. No difficulty was encountered in drilling through the permafrost. Bibliography of 3 titles is given.

RZHONSMITSKY, A. G.

- (1) "Brief Report on the Geological Investigation in the Vilyui and Lena River Basins", Zap. Min. Soc., Vol. 51, fasc. 1, 1918, Russian.

SAKS, V. N.

- (1) "On the Subdivision of Quaternary Deposits of North-Eastern Yakutia", Probl. Arctic, No. 6, 1939, Russian.

SALLER, H.

- (1) "Schneeverhältnisse der Sowjetischen Eisenbahnen" (Snow Conditions of Soviet Railroads), Paper for the Advancement of Railroad Knowledge, Vol. 97, July 15, 1942, 200-203, German, DIC.

SALTIKOV, N. T.

- (1) "Canalization Under Permafrost Conditions", Obruchev Inst. of Permafrostology, Proc. of, 1944, 1-51, Acad. of Sci., Leningrad USSR, Russian, DIC and DGS. Eng. abst. by Stef. avail. in SPDO-P.

This article discusses the construction of a sewer system at one of the experimental stations in the extreme north of the European part of the USSR.

- (2) "Building Foundations in Yakutsk", Trudy - Obruchev Institute of Permafrostology, Vol. I, 1946, 102-136, Russian, DIC & DGS. Eng. abst. by Stef. avail. in SPDO-P, AUL & EL.

This article describes the deformation of buildings in the city of Yakutsk and gives an analysis of the deformation. The following conclusions are reached: In buildings with the basements or cellars constructed directly on the natural or filled-in ground, some local thawing takes place even under the cold climatic conditions of Yakutsk. In the construction of heated buildings, the use of a warm double floor and an ordinary basement, of .4 to .5 meters high, is sufficient to preserve the permafrost. An empty space must be left under the floor to preserve the permafrost under industrial buildings with higher than normal temperatures. Open or ventilated cellars and basements should be used. A bibliography of 9 titles is added.

- (3) "Instructions for the Construction of Building Foundations in the Vicinity of the Town of Chita Where Permanently Frozen Ground is Present", Russian.

- (4) "Construction of Building Foundations in Regions of Unstable Permanently Frozen Ground", Russian.

- (5) "Thermotechnical Calculations for the Planning of Foundations in Regions of Permanently Frozen Ground", Russian.

- (6) "Building Foundations in the Region of the Bolshezemelskaya Tundra", Trudy of the Obruchev Inst. of Permafrostology, Vol. IV, 1944, 124-204, Acad. of Sci., Leningrad, USSR, Russian, NN, Engl. abstr. by Stef. avail. in SPDO-P, AUL & DES.

This lengthy article deals with the author's observations and general conclusions pertaining to the peculiar problems of building in the everfrozen ground of the

SALTIKOV, N. I. (cont'd)

Bolshezemelskaya Tundra in the Vorkuta coal region. The author's conclusions deal with selection of the best type of foundation, its depth, type of building and expected result from the underlying frozen ground.

SAUNDERS, K. D. AND TOPPING, A. D.

- (1) "Thermal Stresses Around an Uncased Hole", World Oil, Vol. 131, No. 7, Dec. 1950, 167-173, Gulf Publ. Co., Houston, Texas.

A series of articles giving a rigorous mathematical analysis of thermal gradients acting radially from an uncased hole. Has some value in possibly determining rate of thaw in drilling in permafrost or in a free flowing well in permafrost.

SAVARENSKII, F. P.

- (1) "Results of a Conference About Ground Investigations in Laboratories for Construction Purposes", Gidrotechnicheskoe Stroitelstvo, No. 2, 1941, 36-38, Russian.

SCHAEFF, L.

- (1) "Frost Damage", (Orig.) Bautechnik (Abstr.) Road Abstracts Abstr. Vol. 10, No. 3, 1943, March 19 (49), 19 (50&51), No. 163, Orig. 1941, 541-43, 529-31.

Discussion of factors that enter into the action of frost in soil and causes of frost damage based chiefly on experience gained in Silesia in winter of 1939-40.

- (2) "The Repair of Frost Damage", Orig. Strosse (German) (Abstr.) Road Abstract, 9 (17/18) Orig. 1942, 173-6, Vol. 12, Abstr. #28; No. 1, B.S.L., 2 Jan. 1945

Comparison of effectiveness and cost between replacing unstable subgrade material and using the old road surfacing as a foundation and rebuilding the road at a higher level.

SCHERRER, FRED. G., CAPT. CE AND SCHIEWE, EUGENE C., CAPT. CE

- (1) "Airfield Construction in Arctic and Subarctic Regions, Ala.", Prepared under direction of Office, Air Engineer, Hqts., AAF, Washington D. C., 30 November 1945, Nov. 30, 1945, Air Engineer Hqtrs., Washington, D. C., SPDO-P.

This unpublished manuscript contains a general description of the geography, meteorology, and ground conditions in Alaska with individual descriptions of the various airfields in Alaska at the time of the report - 1945. Also contains chapters discussing methods of airfield design and construction, airfield site reconnaissance, transportation in the arctic and subarctic regions and particularly by tractor train, winterization of engineer equipment, and conclusions and recommendations. It is well illustrated with many photographs. In general, this is an excellent review of airfield conditions in Alaska in 1945.

SCHMIDT, ROBERT W.

(1) RESTRICTED

"Frost and Permafrost - A Brief Survey of the Agencies and Literature Dealing with Frost and Permafrost", Air University Documentary Research Study, Rev. August 1949, Sept. 1948, Document Research Divn. Air University Libraries, Air University, Maxwell, A.F.B., Ala.; SPDO-P/S and AUL.

A bibliography of 137 pages giving the agencies and literature dealing with Frost and Permafrost prepared for the use of Air University instructors and students.

(2) CONFIDENTIAL

"Arctic Airfields", Arctic Airfields, April 1949, Air University Library, Maxwell Air Force Base, Alabama, SPDO-S & P, & AUL.

Preface - "A Survey of Some of the Problems Involved in Providing Air Fields in Arctic Areas", contents by chapters are:

1. Water Landing Areas
2. Ice Landing Areas
3. Conventional Airdromes

Eight airfield construction problems peculiar to the Arctic are mentioned: short water transportation season, lack of transportation facilities, two years of planning required, two years of exploration required, short working season, personnel problems, and material and equipment problems.

(3) RESTRICTED

"Arctic and Subarctic Transportation", June 1949, 1-10, Documentary Res. Div.-Air, Maxwell Airforce Base, Ala. SPDO-S.

This bibliography on Arctic and Subarctic transportation was gathered from various sources as the author and his assistant were engaged in other studies. It is therefore a tentative and not a comprehensive bibliography. The materials are grouped under the headings of: Air Transportation, Railroads, Roads and Highways, Sleds and Tractor Trains, and Water Transportation.

SCHRADER, F. C.

- (1) "Reconnaissance of Northern Alaska Across the Rocky Mountains Along Koyukuk, Joh, Anaktuvuk and Colville Rivers and the Arctic Coast to Cape Lisburne in 1902, No. 20, 1904, 130 pp. U.S.G.S. Professional Paper.

SCIENCE DIGEST

- (1) "Permafrost, Menace of the North", Vol. 22, August 1947, 44-47, A.U.L.

A general statement summarizing some of the information in Strategic Engineering Study No. 62 and the reports of the St. Paul District.

SCIENCE NEWS LETTER

- (1) "Siberia's Frozen Ground is Survival of Ice Age", Vol. 35
Jan. 28, 1939, 55, A.P.I.
Brief quote from Cressy.

- (2) "Arctic Exploration (Russia's frozen expanses have lessons for U. S.)", Science News Letter, Vol. 42, No. 3,
July 18, 1942, 39, on file in EL & MCL.

Brief general interest article stressing the need for more information on perpetually frozen ground for application to problems in Canada and Alaska. This item mentions Dr. K. I. Lukashev, Pres. of Leningrad University and Deputy Chairman of the Soviet Gov't. Purchasing Commission. It is suggested that Dr. Lukashev discussed the permafrost problem with Air Force personnel and assisted them in the search for further materials. The article contains no specific information on permafrost.

SEDOV, V. P. AND SHVETSOV, P. F.

- (1) "Origin of the Extensive Anfeis (Ice Fields) on the Tos-Khagakh-Takh Range", English, Orig. on microfilm in SPDO-P.

- (2) "Connection Between the 'Naledi' and the Ground Water in Iana River Basin", Soviet Geology, No. 12, 1940, 86-92, Russian, On microfilm in SPDO-P.

This article gives a description and the causes of the naledi which occur in this region. The flow of the ground water is studied.

SEELEG, W. L.

- (1) "How Rains, Cold Weather, Poor Soil Conditions were Licked at Gustavus", Vol. 51, No. 4, April 1945, 48-54, Pacific Builder and Engr., SPDO-P.

A CAA airport built about 50 miles west of Juneau in southeastern Alaska. Describes grading, draining and paving methods which successfully solved unusually tough problems encountered in building an isolated airport in Alaska's rain belt.

- (2) "General Factors Governing Design and Construction in Alaska", Vol. 51, No. 5, May 1945, 64, 67, 68, 70 and 72, Pacific Builder and Engr.

An article giving a brief resume of climatic conditions, geology, construction and transportation in Alaska.

SHALOBANOV, A. A.

- (1) "Is Frozen Soil Permeable?", Pochvovedeniye (Soil Science) No. 3, 1903, Russian.

SHANKLIN, G. B.

- (1) "The Effects of Moisture on the Thermal Conductivity of Soils", Trans. American Institute of Electrical Engineers, Vol. 41, Feb. 1922, 92-98, BSL & SPDO-P.

This article presents a review of previous data on heating by underground cables; gives data showing the effect of soil moisture on the thermal conductivity of soils in dissipating heat generated within the cables; and detailed description of apparatus and test methods for determining the thermal conductivity of soils at different moisture contents. Bibliography.

SHANNON, W. L.

- (1) "Frost Investigations at Dow Field, Bangor, Me.", Proc. Highway Research Board, Vol. 24, 1944, 71-86, SPDO-P.

Design of bases on soils affected by frost; definition and description of frost action; weather, soils and frost heaving data; and accelerated traffic tests on flexible and rigid pavements at Dow Field.

- (2) "Prediction of Frost Penetration", Journal, New England Waterworks Assoc., Vol. 59, No. 4, December 1945, 356-363, BSL.

Data on and discussion of factors influencing frost penetration; the freezing index (with an approximate formula for computing F.I.); thermal properties of soils; depth of frost penetration and means of computing it; correlation between depth of frost penetration and freezing index; and freezing index frequency.

- (3) Also WELLS, W. A.

"Tests for Thermal Diffusivity of Granular Materials", Presented at 50th Annual Meeting, 16-20 June 1947, Amer. Soc. for Testing Materials.

Description of apparatus and test methods, analyses, and results of tests to determine thermal diffusivity of a number of different granular materials.

SHARP, R. P.

- (1) "Soil Structure in the St. Elias Range, Yukon", Journal of Geomorphology, Vol. 5, 1942, 274-301.

Investigations carried on in Wolf Creek Area of St. Elias Range, Alaska. Descriptions with sketches or photographs include those of Stone Nets, Stone Garlands, Stone Stripes, Earth Stripes, and Earth Hummocks. The descriptions are followed by a study of the origin of the various features. Frost action important in the formation of each of the above structures with slope determining the specific shape of various stone and earth features. Age of structures appears to be about 100 to 200 years. However, some may be 4,000 years. Stone nets occur on flat or very gently sloping ground; stone garland on slopes of 5 to 15 degrees, stone stripes on slopes of from 7 to 30 degrees. Fines elevated by the formation of ice wedges below and within them. Earth

SHARP, R. P. (cont'd)

stripes are of unknown origin except for the fact that they are frost phenomena. Earth hummocks are caused by the flow of material away from other areas that froze somewhat earlier. They occur on the flat or slopes up to 20 degrees. Ninety references cited in body of report. Good sketches and photographs describing phenomena.

- (2) "Ground Ice Mounds in Tundra", Geographical Review, Vol. 32, No. 3, July 1942, 417-423.

Description of ground ice mounds in Wolf Creek Region. Photographs and cross-sectional sketches included. Mode of origin discussed may be due to hydraulic pressure or of Porosild's "upheaval" type, definitely not entombed ice because of surface indications of upheaval. Discussion of cycles observed in the development of ice mounds and their relation to the tundra topography produced - knobs and depressions more or less mantled by vegetation contained in report. Ground ice mounds should be considered along with solifluction, frost heaving and "Falsen" formation in the development of tundra topography.

SHARPE, C. F. S.

- (1) "Landslides and Related Phenomena", A Thesis, 1938, 137, Columbia University, New York.

A purely descriptive review, based on a field study of a wide range of typical cases and an extensive review of the literature, of the present state of knowledge of mass movements of soil and rock. It includes a section on "Frost Action and Solifluction (soil flow)" and an extensive bibliography.

SHEIKOV, M. L.

- (1) "Resistance of Frozen Grounds to Shearing", Soviet Izuchen Proizvod Sil, Kom. Izuchen, Vechnoi Merzloty, Fasc. 2, 1936, 55-76 and 85-104, N.N.

- (2) also VOLOGDIN, I. S.

"Instruction for Laboratory Investigations of Mechanical Properties of Frozen Grounds", Instructions and Program Directions for the Study of Frozen and Permanently Frozen Ground, 1938, 167-191, Acad. Science, Moscow, USSR, Russian, DLC.

SHELESNYAK, M. C.

- (1) "History of the Arctic Research Laboratory, The", Journal of the Arctic Institute of North America Reprinted from "Arctic", Vol. 1, No. 2, Autumn 1948, Arctic Institute of North America, SPDO-S.

This article describes the history and formation of the Arctic Research Laboratory at Point Barrow, Alaska. It also describes its cooperation with the Office of Naval Research and lists its basic policies. It lists the personnel and duties of the Arctic Research Laboratory Advisory Board. A description of the research work being carried on by the ARL is given as is also a bibliography of literature on the ARL.

SHEPARD, E. R.

- (1) "Subsurface Explorations Made by Resistivity and Seismic Methods", Public Roads, Vol. 16, No. 4, June 1935, 57.
This article discusses, in detail, with numerous examples, illustrations and photographs, the equipment and technique of subsurface exploration using resistivity and seismic methods. A list of 12 references is given.

- (2) also SWARTZ, J. H.

"Report on a Preliminary Investigation of the Possible Application of Geophysical Methods to Studies of Permafrost Problems in Alaska", 1946, SPDO-P.

Report on an investigation to determine whether depths to permafrost and details of permafrost stratigraphy could be determined by geophysical measurements. Electrical resistivity measurements were made in Northway, Fairbanks and Galena areas, and a seismic station was measured near Northway.

This report was written by these 2 men, who were consultants to the Office, Chief of Engineers, for the St. Paul District.

SHIMANOVSKY, S. V. AND SUMGIN, M. I.

- (1) "Temperatures of Soil at Yakutsk", Trudy Comm. Study of Perm. Frozen Ground, Vol. I, 1932, 111-113, Acad. of Sci. Moscow, USSR, Russian, DIC.

A table of soil temperatures is given with a discussion of the differences with previous readings.

- (2) SHIMANOVSKY, S. V. only
"Thermal Constants of Ground",

- (3) SHIMANOVSKY, S. V. only
"Influence of Cover Upon the Thermal Regime of the Ground" In-t Merzlotovedeniya, vyp 1, 1942, 45-51, DIC.

SHOSTAKOVICH, V. B.

- (1) "Ice-Regime of Water-Bodies of the Union of Soviet Socialist Republics", MS. in Hydrol. Inst., Russian.

- (2) also VOZNESENKY, A. V.
"Basic Data for the Study of the Eastern Siberian Climate" Peresel. Upr., 1913, Irkutsk, USSR, Russian.

- (3) "Permanently Frozen Ground", Priroda, No. 5-6, 1916, 557-580.

Contains the earliest map showing the geographic distribution of permafrost.

- (4) "Climatic Conditions of the Occurrence of Permanently Frozen Ground", Trans. Irkutsk Magn. Meteor. Obs., No. 2 - 3 1928, 120-122, Russian w/German abstr.

SHUMILOVA, L.

- (1) "On Hummocky Peats in the Southern Part of the Turukhansk Krai", Izv. Tomsk Branch Russ.-Bot. Soc., Vol. III, No. 1-2, 1931, Russian, DLC.

SHVETZOV, P. F.

- (1) "Permafrost and the Engineering and Geological Conditions of the Anadyr Region", 1938, 3-78, The Main Northern Sea Communications Dept., Leningrad, Russian, Eng. abst. by Stef. and OCE avail in SPDO-P, AUL & EL.

This article deals with the study of the Anadyr region including permafrost, ground water, etc. and characterization of the ground with a view to determining the suitability for construction.

- (2) "Role of Permafrost and Subpermafrost Waters in the Hydrology of the Basins of the Rivers Indigirka and Yana; The", Izvestia of Acad. of Sci., No. 6, 1946, 137-152, Acad. of Sci., Moscow, USSR, Russian, Eng. abst. by Stef. avail. in SPDO-P, AUL & EL.

This article is devoted to the peculiarities of the water runoff in the basin of the Indigirka and Yana Rivers. The author states that the hydrological peculiarities of the region are factors of the permafrost as well as meteorological conditions. The origin of water underneath the permanently frozen ground, which feeds the icings and rivers is not clear. More work must be done on this subject. A bibliography of 22 titles is given.

- (3) "Underground Waters and Fossil Ice in the Region of the Village Anadyr and the Bering Sea", Nedra Arktiki, Glavsevmorput, Vol. 2, 1947, 204-212, Moscow, DLC.

SIDOROV, M. F.

- (1) "Observations on Frozen Ground in the Middle Part of the Anadyr River", Russian.

SKAVEN HAUG, S. V., C. E.

- (1) "Norse Make Scientific Attack on Heaving Track", Railway Engineering and Maintenance, April 1948, Norwegian State Rwy., Oslo, Norway.

To overcome serious frost heaving on sections of its lines, the Norwegian State Railways have found it necessary to take the drastic step of excavating the frost-forming soils under the track and substituting materials which do not expand materially upon freezing. This article which is an abstract of a detailed treatise on the subject prepared by the author for presentation before the Second International Conference on Soil Mechanics and Foundation Engineering in the Netherlands in May, tells of the replacement material being used, the most effective of which is a layer of pressed peat blocks, topped with gravel, crushed stone or cinders. So effective has this expedient

SKAVEN HAUG, S. V., C. E.

proved in eliminating heaving that plans are underway to pave the subgrade over approximately 300 km. of line which will involve the use of approximately 1,600,000 peat blocks, 1m. by 0.5 m. in plan, and from 0.3 to 0.5 m. thick.

SKELTON, R. R.

- (1) "Field Observations of Frost Heave", Proceedings of the Purdue Conference on Soil Mechanics and Its Applications, Sect. VII, July 1940 or 2-6 Nov. 1940, 460-470, Purdue University, Lafayette, Ind., SPDO-P.

Methods of observation and results of field observations of frost heave and related factors on a Portland cement concrete pavement in New Hampshire.

SKOVORODINO POLAR STATION

- (1) "The Skovorodino Polar Station", USSR Engineering Permafrost Arctic Studies, Feb., 1947, Com. on Geophysics Science, Russian, Trans. by DGS, Avail. in SPDO-P.

Article gives the purpose, scope of investigation, and general information about this station.

SKVORNIYAKOV, P. I. AND TUPITSIN, N. V.

- (1) "Permanently Frozen Ground and the Phenomena Connected with It", Geomorphological Description of the Okhotsk - Kolymsk Land, Fasc. 10, Part I, Chapter VI, 1936, 47-52, Russian.

Permafrost is given in this region as 100-150 meters deep and taliks occur at a depth of a few meters.

SLATE, FLOYD O.

- (1) "Use of Calcium Chloride in Subgrade Soils for Frost Prevention", (Orig.) Proc. of Hwy. Research Board (1) also (Abstr.) Calcium Chloride Ass'n. News (2), (1) Vol. 22, 1942, 422-441, (2) Vol. 9, No. 1, 1 Feb. 1943, BSL AND SPDO-P.

Methods used and results of field application of calcium chloride in pockets cut through road surface and base; results of field and laboratory studies of migration of chloride; and its effectiveness in preventing frost heave.

SLESSER, C.

- (1) "Frost Damage (Migration and effect on frost heave of calcium chloride and sodium chloride in soil)", Purdue University, Engrg. Exp. Sta., Research Series, Vol. 89, 1943, 5-163, DIC and SPDO-P.

Survey of literature, comprehensive field and laboratory studies of migration of chloride salts and laboratory studies of frost heave. Bibliography.

SMIRNOFF, A.

- (1) "Soil Temperatures and Cable Rating", Electrical World, Vol. 82, No. 9, Sept. 1, 1923, 438-439, BSL.

SMIRNOFF, A. (cont'd)

The author presents year-round temperature data of soil at depths of 10, 27 and 36 in.; mean air temperatures; rainfall in inches and solar radiation in G. calories per sq. in. for Washington D. C. and constructs soil temperature -- cable rating charts.

SMITH, ALFRED

- (1) "Daily and Seasonal Air and Soil Temperatures at Davis, Cal", Hilgardia, Vol. 4, No. 3, May 1929, 77-112, Calif. Agric. Exp. Station, SPDO-P.

Observed air and soil temperatures at Davis, California. This reference is given because it describes the installation of thermometer. Winter temperatures of the soil did not fall below freezing.

- (2) "Effect of Paper Mulches on Soil Temperature, Soil Moisture and Yields of Certain Crops", Hilgardia, Vol. 6, No. 6, Nov. 1931, Calif. Agric. Exp. Station, Berkeley, Calif., SPDO-P.

In this investigation, particular emphasis has been placed on soil temperature, soil moisture, and the effects of different types, grades and colors of paper. Certain crops were used as indicators and the effect of different papers and methods of laying them carefully noted.

- (3) "Seasonal Subsoil Temperature Variations", Vol. 4¹, No. 5, March 1, 1932, 421-428, Journal of Agri. Research.

Includes soil and air temperature data taken at Davis, California and a discussion of the range of soil temperatures of various depths and the geometric progression law of daily temperature fluctuations.

- (4) "Comparisons of Daytime and Night-time Soil and Air Temp." Hilgardia, Vol. 4, No. 10, Dec. 1929, Calif. Agric. Exp. Sta., SPDO-P.

A discussion of the relationship between the rate of percolation and soil temperature and a charted summary of soil temperatures. Air temperatures were obtained by means of a thermograph placed in a U. S. Weather Bureau shelter and soil temperatures were automatically recorded every 15 minutes by means of a Leeds and Northrup temperature recorder with electrical resistance thermometers placed at several depths, in an area that was kept free of growing vegetation. Details concerning the area at Davis, Calif. were described in Hilgardia, Vol. 4, No. 3, May 1929.

- (5) "Contribution to the Study of Inter-relations Between the Temperature of Soil and the Atmosphere and a New Type of Thermometer for Such Study, A", Soil Science, 1926, Vol. 22, 447-457, SPDO-P.

Factors influencing soil temperature are summarized and temperature interrelations between soil and atmosphere for daytime and nighttime are given. Bibliography.

SMITH, ALFRED (cont'd)

- (6) "Values of Mean and Average Soil and Air Temperatures", Soil Science Society America Proceedings, No. 4, 1940, 41-50.

SMITH, H. W.

- (1) "Frost Damage to Sealed Surface in Southland", (Orig.) Proc. N. Zealand - Institution of Engineers, Vol. 32, 1945-46, 570-594, Abstr., Roads and Bridge, Vol. 85, No. 8, August 1947, AHL.

Description of road surface failures due to frost action; mineralogical description of aggregates used; specific heat and thermal conductivity of various materials; soil temperatures and computation of time required for frost to penetrate bases of various materials and thickness. The author recommends that all fine grained materials be eliminated from the subgrade. He then proposes that the bed stand during one winter and that any clay that works to the surface during that time should be scraped off.

SMITH, P. S.

- (1) "The Noatak - Kobuk Region, Alaska", U.S.G.S. Bulletin 536 1913, 160.

This bulletin contains reference to "a list of specimens of flora." Much of the material is not directly pertaining to permafrost.

- (2) "Areal Geology of Alaska", U.S.G.S. Professional Paper, 192, 1939, 104, Government Printing Office, Department of the Interior, Washington, D. C., SPDO-P.

A description of the general kinds and areal distribution of the major subdivisions of the different geologic formations that make up the visible rocky crust of the earth in Alaska.

SMITH, W. O.

- (1) "Thermal Conductivities in Moist Soils", Proc. of Soil Science Society of America, Vol. 4, 1939, 32-40.

A supplement to a previous paper by the author on thermal conductivity in dry soils (Proceedings, Soil Science Society, Vol. 3, pp. 13-19, 1938). Experimental data are given for four soils. Of particular interest in the experiment was the movement of moisture from the warm to the cool side of the sample undergoing conductivity test.

- (2) "The Thermal Conductivity of Dry Soil", Soil Science, Vol. 53, No. 6, June 1942, 435-459.

Experimental procedure on monolith samples. Thermal conductivity, porosity, volume weight and specific gravity data on air dry monoliths of several soils; thermal transfer in structureless soils and in structured soils; approximate calculation and values of the thermal structure factor; and thermal conductivity of peat solids.

SNYATKOV, L. A. and VASKOVSKY, A. P.

- (1) "Geological Sketch of the Indigirka-Kolyma Land", Trans-Arctic Institute, Vol. 87, Part 5, 1937, 367-444, Russian.

SOCHAVA, V. B.

- (1) "Tundras of the Peshinsk Bay Basin, On", Izv. Russ. Geogr. Soc., Vol. 64, No. 45, 1932, Russian.
- (2) "Tundras of the Anabar River Basin", Izv. Russ. Geogr. Soc., Vol. 65, No. 4, 1933, Russian.
- (3) "Notes on the 'Spoty' Tundra of the Anadyr Region", Trudy Polar Commission, Vol. 2, 1938, 51-68, Russian, NN.
- (4) "Microrelief Forms in the Tundras in Priamure", Frozen Ground Studies - North Russia and Siberia, 1949, 1-5, Russian, Abstr. avail. in DGS and SPDO-P.
Cemetery hummocks, pingos, bowl-like hollows and spot-medallions are all discussed in detail for the region adjacent to the Amur River. Glossary of terms relating to the above subject is given.

SOFRONOV, F. N.

- (1) "Forecasting Ice-Phenomena on Rivers and Channels, On", Trans. IV. Hydrol. Conf. Baltic Countries, No. 95B, 1933 10-13, Russian.

SOFRONOV, G. P.

- (1) "Quaternary Deposits of the Vorkuta River", Trudy, Permafrost Institute, Vol. 6, 1944, 9-85, Academy of Sciences, Moscow, USSR, Russian, Microfilm in SPDO-P.

SOLOMONS, T. S.

- (1) "Surface Features of Northern Alaska", Appalachia (reprinted from) Vol. XII, No. 1, May 6, 1908.
Good descriptive article on Alaska. Very little of scientific value.

SOLOV'EV, P. A.

- (1) "Ice in the Permanently Frozen Ground in the Region of the Village of Anadyr", Nedra Arktiki, Glavsevmorput, No. 2, 1947, 213-232, Moscow, USSR, Russian, DLC.

SOLOV'EV, S. P.

- (1) "Permafrost in the Mountain Part of the Kabarda Balkariva" Izvestia of the Geographical Society, No. 3, Vol. 69, 1937, 364-368, Leningrad, Russian, Eng. abst. by Stef. avail. in SPDO-P, AUL& EL.
This article describes the layer of permafrost discovered during a geological survey in the Tyrny-aus region of the northern Caucasus, some 90 kilometers west of the city of Nal'chik. Bibliography of 4 titles is given.

SOPER, J. D.

- (1) "Exploration in Foxe Peninsula and Along the West Coast of Baffin Island", Geographical Review, Vol. 20, July 1930, 397-424, DES.

SOURWINE, J. A.

- (1) "A Method of Analysis of Data on Frost Occurrence for Use in Highway Design", Public Roads, Periodical, Vol. II, No. 3, May 1930, 51-60, Govt. Printing Office, Washington, D. C. BSL.

A statistical study of intensity duration and frequency of low temperature occurrence over a period of years and a suggested method by which climatological records may serve as a guide in the determination of probable ground freezing occurrence. Discusses; source of data; suitability of absolute minimum temperatures; critical air temperature for ground freezing; critical depth of freezing; critical soil temperature for freezing; relation between minimum temperature in air and in soil; frequency of minimum temperatures; critical value of lowest monthly average of daily minimum temperature; effect of precipitation; and effect of duration of cold.

SPANGLER, M. G.

- (1) "Some Problems in Subgrade Moisture Control", Highway Research Board Proceedings Twenty-Fifth Annual, Vol. 25, 1945, Nat'l Research Council, Washington, D. C.

This paper deals with humidity of soil beneath pavements. Brings out a recent survey which reveals that some subgrades do approach saturation after a number of years but that many do not and this fact should be considered. Engineers have leaned toward the assumption that all subgrades will eventually become saturated by capillarity and design accordingly.

This survey is in agreement with Buckingham capillary potential concept which is also discussed briefly.

SPENCER, W. T.

- (1) "Subsurface Drainage in Highway Engineering", Proceedings of the Purdue Conference on Soil Mechanics and Its Applications, July 1940, 402-410, Purdue University, Lafayette Indiana, SPDO-P.

Discusses problem in general, including factors which affect flow and drainage of groundwater, design of subsurface drains, etc. At end of paper, author discusses need for additional studies on drainage properties of soil in which he mentions studies being made at Purdue at the time of writing, on permeability of soil and attempts being made to find a suitable means of measuring the permeability of a soil as it exists in its natural state and location.

SPENGLER, O. A.

- (1) "Freezing of Soil and Permanently Frozen Ground" and "Permanently Frozen Ground", Handbook of Water Resources of the U.S.S.R., Vol. XVII, Vol. XVI, fasc. 1, 345-360, 822-833, Russian

SPINDLER, W. H.

- (1) "Second Year of Building the Alaska Military Highway", The Highway Magazine, Vol. XXXIV, Nov. & Dec. 1943.

An interesting discussion of construction of the Alaska Highway showing the problems encountered but very little on permafrost. Drainage problems are the principal items of interest. Notes about traffic using Alaska Highway and what tourists may expect.

- (2) "Drainage on the Alaska Highway", Roads and Bridge, Vol. 82, No. 1, January 1944.

General discussion of drainage problems encountered on Alaska Highway. Drainage characteristics not known and control was based on judgment. Errors were corrected in the following year. "Glaciers" on rivers caused problems (MacDonald Creek "glacier" covered the bridge spanning it). Tundra and moss restricted runoff; gravels, glacial fans allowed seepage and posed no drainage problems. Seepage particularly bad on sidehills where it is likely to cause landslides and road failures along with "glaciers". Many original bridges were only temporary structures that were to be replaced. A few permanent structures were built.

SPIZHARSKY, T. N.

- (1) Geological Sketch of the Lena-Indigirka Region", Trans. Arct. Inst., Vol. 87, Part 5, 1937, 311-366, Russian.

SPOFFORD, CHARLES M.

- (1) "Engineering in the Far North", SPDO-P.

This article briefly discusses field work in the far North; type of clothing to be worn during summer and winter work in the field; temperatures; costs; permafrost design; and sanitary engineering.

SPURR, STEPHEN H.

- (1) "Aerial Photographs in Forestry", 1948, Ronald Press Co. 15 East 26th St., New York.

Although the basic theory of the application of photographic techniques to forest inventory was first worked out by European investigators in 1925, Canadian foresters have employed airphotos for timber cruising on a large scale since 1929. It was not until World War II that the use of aerial photographs in forestry was seriously undertaken in the United States. This book, written by a forestry prof. at Harvard, is intended essentially as a text for advanced forestry students having a knowledge of the fundamentals of silviculture and

SPURR, STEPHEN H. (cont'd)

and mensuration. A considerable portion of the publication is devoted to technique and methods of photo-interpretation applicable to forest management which is of interest only to a trained forester. However, chapters on the elements of photogrammetry, techniques and principles of photo-interpretation, and especially a detailed discussion of photography specifications are of definite value to airphoto interpreters in any field.

ST. AMAND, PIERRE

- (1) "The Central Alaska Earthquake Swarm of October 1947", Trans. American Geophysical Union, Vol. 29, No. 5, October 1948.

The earthquake swarm of October 1947 is discussed. Investigation of the activity is described. Photographs of earthquake activity are included along with an isoseismal map and a plot of epicenters. The only item of interest insofar as permafrost is concerned is the following statement regarding wells: "Increased turbidity was observed in many wells. The Brazil family, residing between Fairbanks and College, reported an increase in their well water. The well at the Experimental Farm began producing copiously for the first time since it was drilled." It may also be noted that wells that had been pumped before began to discharge water freely at Nehana. Intensities of over 200 tremors are noted; this information may be used for structural design.

STARK, S. K.

- (1) "Forests of the Upper Kolyma Region, Map, The", Soc. Izvest. Soviet Asia, Yakutsk Series, 1933, Russian.

STEFANSSON, V.

- (1) "Underground Ice Sheets of the Arctic Tundra", Am. Geog. Society Bulletin, Vol. 40, 1908, 176-177, N-Stef.
- (2) "Region of Maximum Inaccessibility in the Arctic", Geographical Review, Vol. 10, Sept. 1920, 167-172, DES.
- (3) "Some Erroneous Ideas of Arctic Geography", Geographical Review, Vol. 12, April 1922, 264-277, DES.
- (4) "Arctic Manual", 1944, N. Y., MacMillan, New York, SPDO-P.

Only parts are related to permafrost such as physical geography, climate, and weather, etc.

- (5) "Guide Book of Arctic Canada", Construction and Maintenance of Airdromes on Ice Caps and Ice Masses, VIII-X, 26 June 1946, Office Chief of Engineers, SPDO-P.

This is a collection of excerpts from "Guide Book of Arctic Canada" by Stefansson covering the subjects: climate and ice conditions. Areas mentioned are Yukon Territory, and the MacKenzie District. Such items are discussed as temperature, rainfall, freeze-up, breakup and winds.

STEFANSSON, V. (cont'd)

- (6) "Ten Year Program of Arctic Study, A", Construction and Maintenance of Airdrome on Ice Caps and Ice Masses", 26 June 1946, Office, Chief of Engineers, SPDO-P.

Discussion of expeditions of Storkerson and Papanin, the establishment of new observation camps, and estimates of the drift of sea ice.

(7) RESTRICTED

"Air Propelled Sledges", Invest. of Constr. and Maint. of Airdromes on Ice, 1946-47, Aviation Uses, of Ice, Encl. No. 1, May 1947, 108-118, U.S.E.D. New England Div., Boston, Mass., SPDO-P.

Contents by headings are: Propellor Sledge, Design, Propellor measurements, Fuel and Oil Mechanism, Fuel Tank, Performance border zone, Effect of head winds, Effect of Temperature, Effect of Snowdrifts, Performance on Smooth Inland Ice, Loads Carried, Drawbacks, Soviet Experiences, Chukchee Peninsula, Mountain Work, Mean Speed, Fuel Expenditure, Period of Effective Operation, Temperatures, Soviet Analysis of Difficulties, and a Summary.

- (8) "Underground Ice in Northern Alaska", American Geological Society Bulletin, Vol. 42, No. 5, May 1910, 337-345.

A description of ground ice in northern Alaska. Four different processes by which the author... "Has seen underground ice formed..." are described.

STEPANENKO, E. V. and TREGUBOV, V. V.

- (1) "Memoirs on the Problems of Water Supply of the Middle Part of the Amursky Railway", Blagovestchensk, 1915, Russian.

STEPANITSKAYA, N.

- (1) "Permafrost in the USSR, Our Country", No. 10, 1938, 55-56, Russian, Eng. abst. by Stef. avail. in SPDO-P, AUL & EL.

This article discusses the origin and distribution of permafrost in the USSR. A map is given showing the limits of the permafrost area with other notes.

STOECKELER, E. G.

(1) RESTRICTED

"Identification and Evaluation of Alaskan Vegetation from Airphotos with Reference to Soil, Moisture, and Permafrost Conditions, A Preliminary Paper", June 48 & 49, SPDO-P.

The purpose of this paper is to familiarize the airphoto interpreter with (1) the basic natural influences which govern plant growth and distribution; (2) the value of vegetation as an indicator of soil texture, drainage and permafrost conditions; and (3) the description of airphoto patterns of the different cover types

STOECKELER, E. G. (cont'd)

occurring in the permafrost zone in Alaska. This paper is written expressly for engineers and soils men having a limited knowledge of the botanical sciences and is not intended to be an ecological treatise.

STONE, J. F.

- (1) "Insulation for Low Temperatures", Engineering Refrigerating, Vol. 46, July 1943, 31-37, DIC.

STRATONOVICH, V. V.

- (1) "Soil-Geological Sketch of the Vicinity of Verkhne-Zeisk Meteorolog. Station", Materials on Study of Russian Soils, Fasc. 19, 1910, Russian.

STRATTON, J. H.

- (1) "Military Airfields: A Symposium Construction and Design Problems. Design of Drainage Facilities", Trans. A.S.C.E., 1945, 684, 764, 778, 781, 783.

Brief statements on design of military airfield pavements for frost action.

STRELKOV, I. G.

- (1) "International Scale of Temperatures Realized by the Resistance Thermometer Between 0°C and 190°C", Inst. of Physical Problems, 1943-44, Acad. of Sci., Moscow, USSR, Russian.

Tables for general use in converting the readings of platinum-thermometers to the international scale, adaptable to all intervals, with parameters in terms of the international normatives. Discussion about the computation of characteristic parameters of the platinum thermometer according to the etalon data.

STUCKY, A. and BONNARD, D.

- (1) "Theory of Formation of Frozen Lenses in Soils; Application of Theory to Study of Soil Freezing in Subgrades of Several Swiss Highways", Bul. - Technique de la Suisse Romande, Vol. 64, No. 7, March 26, 1938, 85-92, French.

STURDEVANT, CLARENCE L., BRIG. GEN.

- (1) "U. S. Army's First Official Story of the Alaskan Highway" Roads and Bridges, Vol. 81, No. 3, March 1943.

A general overall picture of U. S. Army operations on the Alaska Highway. Some details as to methods, equipment, and personnel used are covered. Many photographs and a few sketch maps used to show progress.

SUIETOSAROV, I.

- (1) "Hydrogeology of Perpetually Frozen Regions Based on Investigations in the Region of the Town of Yakutsk", Problems of Soviet Geology, No. 10, Vol. IV, 1934, 119-132, Russian w/Eng. sum.

This article includes a profile across a stream at Yakutsk showing the recession of the permafrost table below the flowing stream.

SUKACHEV, V. N.

- (1) "On the Question of the Effect of Frozen Ground on Soil" Izvestia Acad. of Science, Vol. 5, No. 1, 1911 & 14, Acad. of Science, Moscow, USSR.
- (2) "Vegetation of the Upper Part of the Tungira River Basin in the Olekminsk District, Yakutsk Province", Trudy Amur Exped., Russian.

SUKHODOL'SKY, E. I.

- (1) "Construction of an Earth Railroad Bed in the Northern Regions Under Permafrost Conditions, The", Trudy of the Obruchev Inst. of Permafrostology, Vol. II, 1945, 37-39 or 1-129, Russian, Eng. abs. & part. trans. by Stef. at SPDO-P, DGS and NN, Abst. also at AUL & EL.

This is a discussion of Russian difficulties experienced in the construction of stable earth railway embankments in permafrost areas. It has been limited chiefly to the areas where there is located the fine grained, frost acting, undesirable soils such as silts, loams, peat, etc. This article is good from the standpoint of experience in the construction of road beds using the materials at hand where more desirable soils are located too far away to make it economically feasible to import them. The associated problems such as drainage, insulation and preservation of permafrost are covered. Contains illustrations.

- (2) "Construction of Wooden Bridges in the Northern Districts of the Permafrost Area", Proc. of the Comm. of Permafrost, Vol. II, 1945, 121-123, Acad. of Sci. Moscow, Russian, DGS & NN. Eng. abst. by Stef. avail in SPDO-P, AUL, & EL.

Material for this study was obtained from the two year expedition of the Committee for the Study of Permafrost which worked in the southwestern portion of the Taimyr Peninsula in the area of a narrow gauge railway. The author discusses the advantages of wooden bridges under local conditions as well as specific types of bridge construction. Bibliography of 12 titles is given.

- (3) "Study of Frozen Ground Conditions and of the Behavior of the Experimental Drainage at the Ksenievskia Station of the Amur. RR, Russian.

SUMGIN, M. I.

- (1) "Permafrost of Ground Within USSR", Authority of the People Commissariat of Agriculture, Chap. VII, 1927, 372, Far Eastern Geo. Obser. Vladivostok (on microfilm and in print), Russian, partial abstr. by S.D.S. and transl. MHD. Avail. in SPDO-P.

Only part of the original is available, Chapter VII being the only complete section. Chapter VII,

SUMGIN, M. I. (cont'd)

entitled "Permafrost in Relation to Agriculture", deals with such things as agricultural possibilities of the permafrost region, possibilities of the construction of railroads and buildings, drilling in permafrost, and gold mining. Also included are a few statistical tables on temperatures of ground at different depths.

- (2) "Origin of Soil in the Province of Permanently Frozen Ground", Pochvovedenie (Soil Science), No. 3, 1931.

- (3) "Basic Problems of Permafrost and Ways to Solve Them", Sovetskaya Azia, Nos. 3-4, 1931, 176-185, Russian, NN.

- (4) "Conditions of Soil Formation in the Region of Ever-Frozen", Proc. of Sec. Int. Cong. Soil Science, (Classification, geography and cartography), Comm. V, 1932, 34-46, Leningrad, Moscow, USSR, English.

- (5) "On Degradation of Permanently Frozen Ground in Certain Areas of the USSR", Trudy, Comm. Study. Perm. Frozen Ground, Vol. I, 1932, 7-22, Acad. of Sci., Moscow, USSR, Russian, DLC & NN.

Change of thermal regime of the ground is caused by: deforestation partial or complete, grass fires destroying moss and peat covers, and plowing of fields.

- (6) "Contribution to the Study of Permafrost in the Peat Mounds of the Kola Peninsula", Proc. of the Comm. for the Study of Permafrost, Vol. III, 1934, 107-115, Leningrad, Russian, DLC. Eng. abst. by Stef. avail. in SPDO-P.

This article is the partial result of the expedition of the Kola Peninsula in 1932 to study the influence of permafrost on the economy. Numerous peat mounds were investigated.

- (7) "Notes on the Degradation of Permafrost", Priroda, No. 1, 1935, 15-21, Russian, DLC.

- (8) "Permafrost, The Soviet Arctic", No. 1, Jan. 1936, 93-97, Russian, Eng. abst. by Stef. avail. in SPDO-P, AUL & EL.

This article points out the importance of the study of permafrost under the program of utilization of resources of the Soviet Arctic. The author states that permafrost is especially important in the study of Siberia.

- (9) "Some Additional Notes About the Eternally Frozen Grounds and Peat Hillocks in Kola Peninsula", Trudy Comm. on Permafrost, Vol. VI, 1938, 163-165, Acad. of Science, Moscow, USSR, Russian w/Eng. summary, DLC.

SUMGIN, M. I, (Cont'd)

- (10) "Some Additional Observations on S. G. Parkhomenko's Article 'Permafrostology as the Science of Cryophilic Formations'", Trudy, Comm. on Permafrost, Vol. 9, 1940, 169-171, Acad. of Sci., Moscow, USSR.
- (11) also KACHURIN, S. P., TOLSTIKHIN, N. I., & TUMEL, D. F. "General Permafrostology", 1940, Acad. of Sciences, Moscow, USSR, Russian, DIC. Abstr. & Trans. by Stef. avail. in SPDO-P, Abstr. in AUL and DES.
- Chap. I Introduction. Terminology. A short history of permafrostology.
- Chap. II Physico-Mechanical Processes in Freezing and Frozen Grounds
- Chap. III Seasonal Freezing & Thawing of the Ground in the Permafrost Region
- Chap. IV Distribution of Permafrost
- Chap. V Thermal Regime of the Soil in the Permafrost Region
- Chap. VI Certain Physical Characteristics of Frozen Ground
- Chap. VII Genesis of Permafrost
- Chap. VIII Degradation of Permafrost
- Chap. IX Regime of Surface and Sub-surface Waters in the Permafrost Region
- Chap. X Some Peculiarities of the Relief and Micro-relief of the Permafrost Region
- Chap. XI Permafrost and Industrial Activity
- Chap. XII General Instructions for the Methodology of the Study of Permafrost

This book is one of the most complete of the known publications on permafrost. It is a collection of articles by specialists in the Russian permafrost literature. Contains numerous bibliographies.

- (12) "Horizontal Soil Thermometer for Shallow Depths", Izvestia Meteor. Bur. Amur Region, Fasc. 3, 1915, Russian.
- (13) "Degradation of Permanently Frozen Ground in Certain Parts of the Permanently Frozen Ground Province in USSR" Trudy, Comm. Study Perm. Frozen Ground, Vol. I, 1927, Acad. of Sci., Moscow, USSR, Russian.
- (14) "Physico-Mechanical Processes in Moist and Frozen Grounds in Connection with the Formation of Road Heaves", Tsudortrans-Transpechyt, N.K.P.S., 1929, Moscow, USSR, Russian.
- (15) "On the Question of Ice-made Dams in the Extreme North of the USSR", Moscow, USSR, Russian.
- (16) "Textbook of Road Geophysics", Gostransizdat, 1930, Moscow, USSR, Russian.

SUMGIN, M. I. (cont'd)

(17) "Method of Freezing of Water in a Film State", Ground, Dirt, and Gravel Roads, Gostransizdat, 1932, Russian.

(18) "also YANOVSKY, V. K.

"Permanently Frozen Ground", The USSR Academy of Sciences Expeditions in 1934, 1936, 253-260, Acad. of Sci., Moscow-Leningrad USSR, Russian.

(19) "Southern Boundary of Permanently Frozen Ground in the USSR", Trudy, Comm. Study Perm. Frozen Ground, Vol. II, 1933, 7-64, Acad. of Sci., Moscow, USSR, Russian, DIC.

The testing of maximum thaw of the ground takes place in the fall when the surface ground already begins to freeze. For practical reasons, late summer is preferred, for construction purposes (longer day, no frozen ground on the surface, better working conditions) but should never be made before the middle of summer.

(20) "Permafrost in the North of the USSR", Geology and Mineral Deposits of the North of the USSR Trudy, First Geological Prospecting Conf., Vol. 3, 1936, 7-33, Russian, DIC. Eng. Abstr. by Stef. avail. in SPDO-P.

Article contains a survey and history of the permafrost conditions and describes six types of ground ice and ground swelling. Tables of air temperatures, precipitation, and snow are included along with an annual ground temperature survey.

(21) "Instructions for the Investigation of Permanently Frozen Ground for Engineering Purposes", Instructions and Program Directions for the Study of Frozen and Permanently Frozen Ground (Supplement), 1938, 253-272, Acad. of Sci., Moscow, USSR, Russian.

(22) "The Future of the Study of Permafrost in the Yakut Republic", Trudy of the Committee for Permafrostology of the USSR Academy of Sciences, Vol. IX, 1940, 5-27, Academy of Science, Moscow.

This article describes the program for the study of permafrost in the Yakut Republic. The author sets up a number of theoretical problems as well as practical problems to be studied and solved. He states that a central laboratory should be set up in the Yakut Republic.

SUSLOV, S. P.

(1) "Construction of a Highway for Automobiles and Horse Transport Under the Permafrost Conditions of the Yenisei Forest Tundra Region", Trudy, Comm. for the Study of Permafrost, Vol. IV, 1935, 95-149, Acad. of Sci., Moscow, USSR, Russian, DIC. Eng. abstr. by Stef. avail. in SPDO-P.

SUSLOV, S. P. (Cont'd)

This article summarizes an investigation conducted by the author during the summer of 1932 as a member of the Khatanga Expedition of the USSR Academy of Sciences for the purpose of supplying data for the construction of the highway between village of Dudinka on the Yenisei River and the town of Noril'sk (location of the famous Noril'sk coal mines). Starts with general characteristics of the region for the intended highway, discusses the existing modes of communication, discusses the possibility of substituting horses for these purposes as well as the caterpillar type truck. Discusses the climate as it affects the construction and maintenance of the highway.

- (2) "Physical Geography of USSR", 1947, 544, Moscow, USSR, Russian, Abstr. in Eng. avail. in SPDO-S.

Part II, Chapter 4 of most value. A good treatise of recent publication covering all or nearly all the phases of permafrost in Siberia.

SWANBERG, J. H.

- (1) "Temperature Variations in a Concrete Pavement and the Underlying Subgrade", Proc. Highway Research Board, Vol. 25, 1945, 169-180.

Temperature variations in concrete and the underlying subgrade over a 5-year period in Minnesota.

TABER, STEPHEN

- (1) "The Growth of Crystals Under External Pressure", American Journal of Science, 4th Ser., Vol. 41, No. 246, June 1916, p. 532-556, Avail. in BSL.

Discusses phenomena associated with growth of crystals in an alum solution and in a copper sulphate solution and relates such crystal growth to the growth of ice crystals associated with frost heave.

- (2) "Pressure Phenomena Accompanying the Growth of Crystals" (Periodical), Proceedings, National Academy of Science, Vol. 3, No. 4, April 1917, 297-302, Avail. in BSL and SPDO-P.

A historical study of the results of experiments made by various investigators to determine the magnitude of force which accompanies the growth of crystals. The author includes mention of his work and explains the pressure phenomena which accompanies crystal growth.

- (3) "Ice Forming in Clay Soils Will Lift Surface Weights", Engineering News-Record, Vol. 80, No. 6, 7 Feb. 1918, pp. 262-263, Avail. in ST.P.D.O.-P.

The author describes the results of placing metal weights on wet sand and on wet clay and freezing during cold nights.

TABER, STEPHEN, (cont'd)

- (4) "Surface Heaving Caused by Segregation of Water Forming Ice Crystals", Engineering News-Record; Vol. 81, No. 15, 10 October 1918, 683-684, Avail. in AHL & SPDO-P.

A discussion of articles by J. L. Harrison, Engineering News-Record, Vol. 80, No. 9, pp. 418-420, 28 Feb. 1918, and C. D. Norton, Engineering News-Record, Vol. 80, No. 22, p. 1058, 30 May 1918, in which Taber disputes their claims and presents his hypothesis on the formation of ice layers and the cause of frost heave.

- (5) "Frost Heaving", Journal of Geology", (Periodical) Vol. 37, July and August 1929, 428-461, Avail. in BSL and SPDO-P. No. 5.

This paper describes a laboratory investigation of problems connected with frost heaving. The principles developed have applications in geology, plant physiology, and engineering. Pressures effects accompanying the freezing of soils are due to the growth of ice crystals and not change in volume. Pressure is developed in the direction of crystal growth, which is determined chiefly by the direction of cooling. Heaving is often greater than can be explained by expansion. It is due to the segregation of water as it freezes, more water being drawn up by molecular cohesion. The chief factors controlling segregation and excessive heaving are: size of soil particle, amount of water available, size and percentage of voids, and rate of cooling. Differential heaving is due chiefly to differences in soil texture and in the amount of available water, but differences in the kind and amount of soil cover are also factors.

- (6) "The Mechanics of Frost Heaving", Journal of Geology, Vol. 38, 1930, 303-317, Avail. in BSL.

A tentative hypothesis explaining the mechanics of frost heave. This article supplements that given in Journal of Geology, Vol. 37, No. 5, pp. 428-461, July-August 1929.

- (7) "Freezing and Thawing of Soils as Factors in the Destruction of : Pavements", Public Roads, Vol. 11, No. 6, August 1930, 113-132, Avail. in BSL & SPDO-P.

A summary of Taber's comprehensive studies of frost action in soils. Apparatus and test methods are described. Freezing effects in closed and open systems; direction of growth of ice crystals; grain size; soil composition; water supply; rate of cooling; effect of load pressure; the mechanics of frost heaving in open systems; and freezing and thawing of soils under pavements are discussed.

TABER, STEPHEN (cont'd)

- (8) "Discussion on Frost Heaving", Proceedings, Highway Research Board, Proceedings of the Eleventh Annual Meeting, V-11, Part I, 1932, 173-177, Lord Baltimore Press, Baltimore, Md.,

A summarization of Taber's hypothesis on the mechanics of frost heaving and discussion of the Benkelman and Olmstead theory.

- (9) "Perennially Frozen Ground in Alaska, Its Origin and History", Bulletin of the Geological Society of America, Vol. 54, No. 10, 1943, 1433-1548.

Comprehensive treatise on permafrost. Principal subject matter includes: extent of permafrost; present climate in Alaska; vegetation, geological processes; quaternary geology; perennially frozen ground, ground ice. Illustrated. Bibliography.

- (10) "Some Problems of Road Construction and Maintenance in Alaska", Public Roads, Vol. 23, No. 9, July-August 1943, 247-251.

Origin, extent and description of perennially frozen ground and a review of the author's theory of segregation of water in the form of ice during freezing of soils.

TAGG, G. F.

- (1) "Interpretation of Resistivity Measurements", Am. Inst. Mining and Metallurgical Engineers, No. 477, 1932.

TAMURU, S. TETSU

- (1) "Observations of Earth Temperature in Japan", Monthly Weather Review, 33, 1905, 296-302.

TANFILYEV, G. I.

- (1) "Limits of the Forest in the North of Russia, The", Odessa, 1911, Russian.

TANNEHIL

- (1) "Weather Around the World" (Book), 1943, Princeton University Press, Princeton, N. J., Avail. in SPDO-P.

This book gives average monthly temperatures for many places in the world and some other information.

TAYLOR, R. F.

- (1) "Yield of Second-Growth Western Hemlock-Sitka Spruce Stands in Southeastern Alaska", No. 412, March 1934, Dept. of Agric., Avail. in SPDO-P.

A bulletin on the forest crops of southeastern Alaska. Gives the results of a study of growth and yield of even-aged, normally stocked, second-growth stands. The data for the study were obtained on 288 sample plots, varying in size from 1/10th to one acre, laid out in representative young forests. Each plot contained from 150 to 300 trees.

TAYLOR, RAYMOND F. (cont'd)

- (2) "Pocket Guide to Alaska Trees", Miscellaneous Publication, No. 55, U. S. Dept. of Agric., Avail. in SPDO-P.

Three general types of vegetation occur: spruce birch forest of interior; non-forested tundra of arctic and Bering Sea slopes; dense hemlock spruce forests of coast. Coastal forests - existing on Pacific side of Alaska range from Southeastern tip to Kodiak - contains 70% hemlock, 25% spruce, 5% cedar, and others. Interior forests, existing in rivers and flats, contain spruce-birch bounded on south by Alaska Range North and West by Tundra and grasslands. Non-forested areas, grasslands, occur in Alaskan Peninsula, Aleutian Islands, south slopes of Alaska Range, Tundra over vast sections bordering Bering Sea and Arctic Ocean north of Brooks Range. Two pages used in brief identification of leaves followed by 27 pages of description of trees - bark, wood, leaves, etc., and location. Pictures of leaves and cones included. Map accompanying report shows general location of trees - scale, 1:5,000,000.

TERZAGHI, KARL DR.

- (1) "The Science of Foundations - Its Present and Future", Trans. Amer. Soc. of Civil Engineers, Vol. 93, 1929, 291-293.

An analysis of the conditions required for producing the lifting effect caused by the adfreezing of soil to piers.

- (2) "Physics of Ground Frost", 1949, Harvard University, SPDO-P.

This article deals with all those physical properties of subsurface materials and physical processes which have a direct or indirect bearing on the thickness of the active and the permafrost zones and on the character of the ice segregation in those zones. The subjects covered are: Soil Constituents; Soil Aggregate; Permeability and Degree of Saturation; Thermal Properties; Geothermal Gradient; Surface and Ground Temperature; Thickness and Continuity of Permafrost; Aggradation and Degradation of Permafrost; Ice Formation in Soils; Surface Movements due to Freezing and Thawing; Strength of Thawed and Frozen Soils. Includes 18 figures and a bibliography of 10 titles.

- (3) "Soil Mechanics in Permafrost Regions", 1949, Harvard University, SPDO-P.

This article covers the aims and scope of soil mechanics; physical properties of soils; soil exploration by boring and sounding; soil testing; geophysical methods; footing and raft foundations; retaining walls; stability of side slopes of open cuts; and slopes of fills. Includes 2 figures and a bibliography of 3 titles.

TERZAGHI, DR. KARL (cont'd)

- (4) "Soil Investigations and Field Tests-Power and Heating Plant, Warehouse Area-Ladd Air Force Base, Alaska", May 7, 1949, Fay, Spofford and Thorndike, Boston, Mass., SPDO-P.

The report contains: Description of structure subsoil exploration, subsoil conditions, permafrost conditions, thawing test, settlement due to thawing, loading test, blasting test, and conclusions and recommendations concerning procedures and the foundation conditions at the site for the plant. Included also in the appendix are the results of the rail penetration tests and specs for thawing and compacting foundation soils.

THEIS, C. V.

- (1) "Report on Water Supply", Nov-Dec. 1943, Fort Belvoir Engr. Bd.

This is a report on water supply at Edmonton Satellite Field, Namsa, Fairbanks District, Nanso and other places in Alaska and Canada.

THOMAS, B. P.

- (1) "Thawing Frozen Subgrade", Calcium Chloride Assoc. News, Vol. 9, No. 1, 1 Feb. 1943, p. 8 & 10.

Review of experiences during wartime construction where calcium chloride was used to accelerate thawing of frozen subgrades.

THOMSON, W. A.

- (1) "Soil Temperatures at Winnipeg, Manitoba", Scientific Agriculture (Canada), Vol. 15, No. 4, Dec. 1934, pp. 209-217, p. 299, Avail. in BSC & SPDO-P.

Describes the installation of electrical resistance thermometers at depths up to 15 ft., presents soil temperature variation curves covering a three-year period, and discusses the effect of snow cover on soil temperature.

THORODDSEN, TH.

- (1) "The Botany of Iceland", Part 1, 1914.

TIKHOMIROV, B. A.

- (1) "O geograficheskoy rasprostraneni bugrovbaydzharakhov na severe Yevrazii (On the Geographical Distribution of Hillocks in the North of Eurasia), Priroda (Nature) No. 1, 1948, 51-53, Leningrad, USSR.

Evidence is given to show that the mounds or hillocks in question appear elsewhere than in fossil ice areas.

TIME

- (1) "Pesky Permafrost", Vol. 48, 4 Nov. 1946, 66, AUL.

A very brief statement on permafrost referring to the beginning of the St. Paul study.

TIUTIUNOV, I. A.

- (1) "Ground-ice and Ground-water of the Anadyr Region", Russian.

TOLMACHOV, A. I.

- (1) "Preliminary Report on a Trip to Lower Yenisei and the Coastal Part of the Gudunsk Tundra During the Summer 1926", Izvestia Acad. Sci., No. 8, 1926, Acad. of Sci. USSR, Russian.

TOLSTIKHIN, N. I.

- (1) "Groundwater of Trans-Baikalia and Their Hydrocolliths" Trudy of the Comm. for the Study of Perm. Froz. Ground, Vol. I, 1932, 29-50, Acad. of Sci., Moscow, USSR, Russian, DIC.

The source of suprapermfrost water is the surface water. From January-February, this water causes icings. Fissure water is the most common of the subpermafrost water. 78 percent of the springs are at the foot of south-facing slopes. Frost mounds, lasting 1-2 years, spill water and silt, although some may undergo settling for many years. Some gush water with gravel and sand.

- (2) "Mineral Springs of Transbaikalia", All-Union Hydrol. Conf. Vol. I, 1934, Leningrad-Moscow, USSR, Russian.

Shiria springs water has -0.10° in Oct. 1929.

Kukinsk springs water has -0.30° in June 1931.

- (3) "Permanently Frozen Ground or the Frozen Zone of the Earth's Crust", Prob. of Soviet Geology, No. 8, 1935, 765-769, Russian.

- (4) "Hydrogeological Conditions of Water Supply in the Regions of the Frozen Zone of the Lithosphere (Permafrost), Geology and Mineral Deposits of the North of USSR (Trudy First Geol. Prospect Conf. - Glavseomorp. put), Vol. III, 1936, 102-127 - 5 Illustr. and Diagrams Russian, DIC, Eng. abstr. by Stef. avail. in SPDO-P.

Article discusses sources of water supply:

1. Surface waters

2. Ground waters

Discusses 3 types of ground waters:

1. Supra - Permafrost

2. Intra - Permafrost

3. Sub - Permafrost

Special recommendations for the construction of wells bore holes, and water collecting basins are given.

- (5) "Classification of Ice and Ice Containing Deposits", Gosgeolizdat (also Problemy Sovetskoi Geologii ONTI 1936 pp. 628-636), 1941, 62-66, Russian, Engl. abstr. by OCE avail in SPDO-P.

This article gives classifications of ice by both Sumgin and Tolstikhin.

TOLSTIKHIN, N. I. (cont'd)

- (6) "Instruction for the Search of Water Supply in the Areas of Frozen Zone (permanently frozen ground)" Instructions and Program Directions for the Study of Frozen and Permanently Frozen Grounds, 1938, 193-213, Acad. Sci., Moscow, USSR, Russian, DIC.
- (7) "Mineral Water of the Frozen Zone of the Lithosphere" Trans-Commission on Permafrost, Vol. 6, 1938, 63-78, Acad. of Sci., Moscow, USSR, Russian w/English Summary.
- (8) "Ground Waters: Instructions and Program Directions for the Study of Frozen and Permanently Frozen Grounds", 1938, 41-71, Acad. of Sci., Moscow, USSR, Russian, DIC.
- (9) "Instruction for the Study of Icings", Instructions and Program Directions for the Study of Frozen and Permanently Frozen Grounds, 1938, 73-84, Acad. of Sci., Moscow, USSR, Russian, DIC.

- (10) "Contribution to the Problem of Provinces of Mineral Waters in the USSR, A", Ann. Institute of Mines, Vol. 12, No. 2, 1939, 99-113, Leningrad, USSR, Russian (with Engl. summary).

From Yenisei to Lena and extending in a tongue to the right tributary of the Aldan, there exists a province of salt ground water of the Middle Cambrian Era with several springs. Along the Arctic coastal region, salt ground water occurs in Quaternary as well as in the older (including Paleozoic) formations. Granite areas as a rule have good water.

- (11) "Schematic Classification of Ground Waters in the Permafrost Region", 1939 Russian, Trans. by N. Stef. avail. in SPDO-P.

This is a schematic classification of ground water by means of a table written by the Russian authority on ground water, NA Tolstikhin. The headings of the table covering the subject are as follows:

1. Freezing Thru
2. Supra - Permafrost
3. Intra - Permafrost
4. Sub - Permafrost

Cross headings are as follows: type of water, type of formations in which primarily found, phase, temperature, pressure, relation to the average level of hydrographical networks, region of feeding and distribution, quality, preliminary remarks on the possible utilization methods of capping or retaining, basic form of the source, naleds and other manifestations of the phenomena.

TOLSTIKHIN, N. I. (cont'd)

- (12) "The Artesian Waters of the Frozen Part of the Earth on the Territory of the USSR", *Merzlotovedenie* (Permanently Frozen Ground), Vol. 2, No. 1, 1947, 31-35, Acad. of Sci., Moscow, USSR, Russian, DLC.

- (13) "The Subterranean Waters of the Lithosphere", Geological Commission of the Sovnarc of the USSR, 1941, 200, State Publishing House of Geological Literature, Moscow, USSR.

This article deals with the various phases of permafrost, ground water, subterranean waters, and surface waters. Bibliography of 189 titles is given.

TOLSTOV, A. N.

- (1) "Concerning the Crushing Strain of Permanently Frozen Ground and of Ice of Natural Structure", *Trudy K-ta po Vochnoi Merzlote*, Vol. XI, 1939, Acad. of Sci., Moscow, USSR, Russian.

- (2) "Some Cases of Formation of Ice-Corks in the Drainage Pipes in the Ground of Airfield in the Vicinity of the Southern Boundary of Permanently Frozen Ground", *Merzlotovedenie* (Permanently Frozen Ground) Vol. II, No. 1, 1947, 69-72, Acad. of Sci., Moscow USSR, Russian, DLC.

TRASK, PARKER D.

- (1) "Applied Sedimentation", 1950, 663, John Wiley & Sons, New York, SPDO-P.

Although the major portion of this book is not directly connected to the subject of permafrost, there are many good references to construction materials, site selection, terrain features, etc. This book is a collection of articles concerning some phase of sedimentary geology and engineering by specialists in those fields. Chapter 14 written by Robert Black deals directly with permafrost and while it is fairly general in information, it has a broad coverage of the subject. A list of references used by each author is included.

TROELSEN, J. C.

- (1) "Contributions to the Geology of the Area Around Jorgen Bronlund's Fjord, Peary Land, North Greenland", *Udgivne af Kommissionen For Videnskabelige*, Bd. 149-Nr. 2, 1949, 28 pp, CA Reitzels Forlag, Kobenhavn, Denmark, English, SPDO-S.

This article deals with the geology of the region mentioned in the title. This area was mapped from a geological stand point by the Danish Peary Land Expedition. A Geologic map of the area is included. The main subjects treated are as follows: Stratigraphy, structure, volcanic activity, remarks on geomorphology, intrusive rocks and a bibliography.

TROFIMOV, A.

- (1) "Oscillation of the Barometric Pressure and Exchange of Gases in a Soil", Jour. Geophys., Vol. 4, No. 4, (14), 1934, Moscow, USSR, Russian.

TRUFANOV, A.

- (1) "On the Question of Running Stream Under Ice-cover", Meteorologia i Hydrologia, Vol. 4, No. 11/12, 1938 106-116, Russian.
- (2) "On the Curve of the Velocity for a Stream, the Surface of Which Is Covered with Ice or a Rough Pellicle" Meteorologia i Hydrologia, Vol. 5, No. 1, 1939, 51-57, Russian.

TRUPAK, N. G.

- (1) "Frozen Soil in The Construction Industry", 1948, 320 pp., Moscow, USSR, Russian.

TSYTOVICH, N. A.

- (1) "Permanently Frozen Ground as a Base for Constructions", Permanently Frozen Ground, Mat. No. 80, 1930, 185-200, Acad. of Sci., Moscow, USSR, Russian.

- (2) "Selection of the Type of Foundation Under the Conditions of Permanently Frozen Ground", Stroit Pomoghl (Construction in the Frozen Ground), No. 6-7, 1930, Russian, Transl. by Helen A. Sheintz avail. in SPDO-P.

In this article, Tsytovich gives some suggestions in regard to the selection of the type of foundation, depending upon conditions of the permafrost. Two types considered: preserved permafrost and vanishing permafrost.

- (3) "Experiments on Determination of Adfreezing Forces", Bull. Leningr. Inst. Const., Bul. No. 25, 1932, Russian.
- (4) "Fundamentals of the Mechanics of Grounds", O N T I, 1934.
- (5) "Computation of the Settling of Foundations as a Function of Time, Properties of Ground, and the Size of a Foundation", Leningrad Inst. Const., 1934, Leningrad, USSR, Russian.
- (6) "Investigation of Stresses in Pillars Surrounded by the Freezing Ground", Lab. Invest. of Mechan. Prop. of Frozen Grounds, Vol. 2, 1936, Acad. of Sci., Moscow, USSR, Russian.

TSYTOVICH, N. A. (cont'd)

(7) "On the Resistance of the Frozen Grounds to a Load", Sovet. Izuchen. Proizvod, Sil, Komissiya po Izuchen, Fasc. 2, 1936, 7-38 pp., Vechnoi Merzloty, Russian w/Engl. summary, NYPL.

(8) "Principles of Construction and Design of Foundations Erected on Permanently Frozen Ground", Geology and Mineral Deposits of the North of the USSR, Vol. III, 1936, 78-102, Russian, DIC, On microfilm in SPDO-P.

(9) "Determination of Certain Constants of Ground Based on the Results of Test Loads", Trudy L.I.T.K.S. Vol. 4, 1936, Russian.

(10) also VOLOGDINA, I. S.

"Determination of Elastic Constants of Frozen Grounds and Examination of Their Properties of Plasticity", Sovet Izuchen Proizvodit, Sil., Kom. Izuchen Vechnoi Merzloty, Fasc. 3, 1936, 7-54, Acad. of Sci, Moscow USSR, Russian w/Eng. Summary, NYPL - Committee for the Study of Permanently Frozen Ground - Acad. of Science.

(11) "Unfrozen Water in Porous Strata, The", Izvestia of the Academy of Science, Geol. Series No. 3, 1947, 39-48, Russian, Eng. abstr. & Transl. by Stefansson in SPDO-P, AUL & EL.

Under certain conditions, water does not freeze at temperatures below 0°C . In explaining some of the physico-mechanical characteristics of frozen ground, the possible existence of a certain amount of water in a liquid state must be assumed. Investigation shows the presence of unfrozen water in frozen ground down to a temperature of -194°C . The quantity, contents and characteristics of unfrozen water in unfrozen ground are not constant and change with a change in conditions. A bibliography of 20 references is also given.

(12) also SUMGIN, M. I.

"Principles of Mechanics of Frozen Ground", Periodical, 1937, 432, Acad. of Sci., Moscow, USSR, Russian, Eng. abstr. & Trans, by Stef. avail. in SPDO-P.

This article by two of the Soviet's greatest specialists on permafrost consists of 10 chapters. Part I of the book deals with experiments and theory, and Part II with the practical application of the principles developed in Part I.

Chap. I Tsytovich - Properties of the Components of a Frozen Ground

Chap. II Sumgin - Physico Mechanical Processes which take place at Freezing and Thawing of Ground.

TSYTOVITCH, N. A. (cont'd)

- Chap. III Sumgin - Physical Properties of Frozen Grounds
- Chap. IV Tsytoovich - Resistance of Frozen Grounds to External Forces
- Chap. V Deformation of Frozen Ground Under Vertical Load (Tsytoovich)
- Chap. VI Tsytoovich - Forces Operating Under Frozen Ground Under the Load
- Chap. VII Sumgin - Permafrost and Its Construction Properties
- Chap. VIII Sumgin - The Interrelation of Permafrost and Construction
- Chap. IX Sumgin & Tsytoovich - Hydrotechnical Investigation of Permafrost for Construction Purposes
- Chap. X Basis for Calculation and Construction of Building on Permafrozen Grounds.

(13) "Instruction for Field Investigations of Physico-Mechanical Properties of Frozen Grounds", Instructions and Program Directions for the Study of Frozen and Permanently Frozen Grounds, 1938, 157-166, Acad. of Sci., Moscow, USSR, Russian, DIC.

(14) "Some Peculiarities of Construction in the Permafrost in the Region of the City of Yakutsk", Trudy of the Committee for Permafrostology, Vol. IX, 1940, 27-37, Acad. of Sci., Akdemii Nauk, Moscow, USSR, Russian in microfilm in SPDO-P, DGS & DIC. Eng. abst. by Stef. avail. in SPDO-P, AUL & EL.

The author discusses the foundations of buildings in the city of Yakutsk, pointing out that the deformation of stone buildings in Yakutsk is very widespread, that brick buildings all show evidence of considerable cracking and settling, and that the preservation of permafrost would have prevented these deformations. He gives suggestions as to the methods of preserving permafrost and notes that small buildings could be erected on sandy, well-drained ground without special anti-permafrost measures.

(15) "Certain Mechanical Properties of Permafrozen Grounds in the Yakut Region", Proc. of the Committee on Permafrost, Vol. X, 1940, 109-136, Acad. of Sci., Moscow, Russian, DIC & DGS, on microfilm in SPDO-P. Eng. abst. by Stef. and Ft. Belvoir avail. in SPDO-P AUL, & EL.

The author describes the results of field and laboratory investigations at several points in the Yakut region, including the town of Yakutsk. The author reaches the following conclusions: The degree

TSYTOVICH, N. A. (cont'd)

of settling of the frozen ground at thaw under pressure depends upon the initial natural state of the ground especially on its porosity. The value of the coefficient of compressability of frozen ground at thawing is a first degree function of the initial coefficient of porosity. The dust-silt sandy clay and argillaceous loams have the greatest degree of compressability at thawing. The sands have the least. The described method of determining the coefficient of compressability at thawing can be applied in practice for construction purposes to enable the predetermination of possible settlement and the application of necessary counter measures.

- (16) "Study of the Elastic and Plastic Deformation of Frozen Grounds", Proc. of the Committee on Permafrost, Vol. X, 1940, 5-35, Acad. of Sci., Moscow, USSR, Russian, DGS, DIC, SPDO-P on microfilm. Eng. abst. by Stef. avail. in SPDO-P, AUL & EL.

The author indicates the importance of the study of elastic deformation for stationary loads on the ground during construction. This is especially important in dealing with frozen ground and it becomes necessary to determine the relationship between these deformations and the minus temperatures of the ground; specifically, at what temperatures the elastic and plastic deformations take place. Results of experiments by the permafrost laboratory of the Leningrad Engineering Institute of Communal Construction are given.

- (17) "Ground Mechanics", Gosstroizdat, 1940, Russian.

- (18) "Computation of Settling of Foundations", Gosstroizdat, 1941, 124 pp., Moscow, Leningrad, USSR.

- (19) "Problems of the Ground as Related to the Determination of the Depth of Foundations, The", Depth of Foundation Placement for Buildings with Few Stories in Conjunction with Seasonal Freezing of the Grounds, 1945, 7-15, Acad. of Sci., Russian, NN. Eng. abst. by Stef. avail. in SPDO-P, AUL & EL.

This article discusses the properties of water in the pores of the ground as related to the freezing of the ground. The article points out there are 3 types of water according to present knowledge: bound water, oriented water, and free water. A discussion of these and other properties is given.

TUCK, RALPH

- (1) "The Loess of the Matanuska Valley, Alaska", The Journal of Geology, Vol. XLVI, No. 4, May & June 1938, University of Chicago Press, Avail. in SPDO-P.

TUCK, RALPH (cont'd)

Four objectives of quantitative study of sediments are outlined, each of which requires specially collected samples. The corresponding techniques of collection are here called engineering sampling, descriptive sampling, environmental sampling and correlation sampling, according to the purpose of the samples. The steps in the systematic collection of samples for the first three purposes are outlined. Certain principles underlying efficient correlation sampling are considered. An example of the use of the sedimentation unit, showing how the boundaries of the individual units are determined, is given in detail. Six general steps for the determination of a sedimentation unit are given. Devices for obtaining the samples are described.

- (2) "Origin of much-silt Deposits at Fairbanks, Alaska" Geological Society of America Bulletin, Vol. 51, 1940, 1295-1310.

Introduction covers a discussion of problems, description of district, mention of permanently frozen ground to depths of 200', mentions general location of frozen ground below much deposits but in general not below silt deposits. Muck exists in valleys with the exception of Tanana River where gravel flats are exposed, but a lower muck horizon exists below present stream gravel. Much organic material, much ice. Muck dark when frozen, but turns light when thawed and oxidized, uniform size. Silt, from a few to 300' thick, with no definite upper limits, contains interbedded, ash layers, roughly horizontal uniform size. Origin - silt has been assigned to lacustrine (not good because of lack of gradation) and sidehill creep and slides (this could hardly have happened in the production of such large quantities). Therefore, aeolian nature best adapted to situation of uniformity and quantity. Relation of silt to glaciation and rock floor of glaciers and indications of climate and vegetation from deposits of much and silt discussed in report.

TUMEL, V. F.

- (1) "Concerning the Depth of Seasonal Freezing of Ground in the Asiatic Part of the USSR", Russian.
- (2) "Seasonal Thawing on the Irkut-Baikal Water Divide in the Area of the Villages of Bystraja-Kultuk", Trudy of the commission for the Study of Permafrost, Vol. IV, 1935, 225-251, Moscow, Russian, DLC, Engl. abstr. by Stef. avail. in SPDO-P.

TUMEL, V. F. (cont'd)

The author presents the results of observations on seasonal thawing of soils, under various natural conditions, which were made by him and G. F. Pisarev as members of the Angaro-troj Expedition in the summer of 1931 in conjunction with a proposed canal joining the Irkut River with Lake Baikal to be used for the construction of a power station. Describes the physico-geographical characteristics of the region, analyzes the general condition of seasonal thawing, then the influence of separate factors, and finally their total inter-relationship.

- (3) "Permafrost in the Region of Vikhoreva River", Trudy of the Commission for the Study of Permafrost, Vol. IV, 1935, 7-91, Acad. of Sci., Moscow, USSR, Russian Engl. abstr. by Stef. in SPDO-P.

This article summarizes the detailed investigations conducted by the Angarostroj (Commission for construction in the region of the Angara River) in 1931 in order to determine the character of distribution of permafrost in the basin of the Angara river and its right tributary, the Ilim River. The study was conducted to determine whether the permafrost in this region is in a state of increase degradation, or has a stable character. Starts with detailed description of the hydrography and climate of the region. Next is a summary of geological information on the basis of existing data and supplemented by detailed field study. This is followed by a chapter devoted to geomorphology which includes a description of recent deposits, soils and the type of vegetable covering.

- (4) "Concerning Certain Changes of the Frost of Grounds in Connection with Incineration of Vegetative Covers" Trudy of the Comm. for the Study of Permafrost, Vol. III, 1939, 3-80, Acad. of Science, Moscow, USSR, Russian w/Eng. summary, DGS.

- (5) "The Sixth All-Union Conference on Permafrostology", Vol. 6, 1939, 65-70, Vestnik of the USSR Acad. of Sciences, Moscow, USSR, Russian, Eng. abst. by Stef. avail. in SPDO-P, AUL & DES.

This article consists of a statement regarding the various reports by many specialists at the conference on permafrostology. Since 47% of the total territory of the Soviet Union is subject to permafrost, the study of permafrost is considered of vital importance to the Soviet economy. The development of a station for permafrostology is being hindered by the insufficient number of trained workers; more instructions and more publication are needed in this field.

TUMAL, V. F. (cont'd)

- (6) "The Science of Permafrost and the Work of the Academy of Sciences in Permafrostology", Geological-Geographical Sciences Essays on the History of the Academy of Sciences, 1945, 96-103, Acad. of Sci., Moscow, Leningrad, USSR, Russian, DIC.
- (7) "Igarka Experimental Underground Chamber in Permafrozen Ground, The", Obruchev Inst. of Permafrostology, 1945, 3-80, Russian, DIC. Eng. abst. by Stef. avail. in SPDO-P, AUL & DES.

The author gives a detailed account of the construction and characteristics of two underground chambers constructed at the Igarka Permafrost Station. Temperatures and planning of such chambers are discussed at length. Bibliography of 12 titles is given.

- (8) "Some Peculiarities of Behavior of Foundations Under Occupied Buildings in the Northern Regions of Permafrost Distribution", Trudy of the Obruchev Inst. of Permafrostology, Vol. I, 1946, 5-26, Acad. of Sciences, Moscow-Leningrad, Russian, DIC and DGS. Eng. abst. by Stef. and OCE avail. in SPDO-P, AUL and DES.

The author cites several examples of building deformations resulting from changes in the permafrozen ground under their foundations and some practical measures which were utilized in an attempt to remedy the situation. The village of Dudinka and the city of Igarka had several problems in house foundations which were investigated. General climatic data of a given region does not give sufficient information for engineering purposes. Specific temperature data at the site are essential. Bibliography of 27 titles is included.

- (9) "Contributions to the Study of Permafrost Conditions in the USSR", Trudy of the Geographical Section" Vol. 37, 1946, 124-131, Acad. of Sci., Leningrad, USSR, Russian, abst. by Stef. avail. in SPDO-P, AUL & DES.

This short article deals with the question of the origin of permafrost. The author compares the process of formation of glaciers with that of permanently frozen ground and indicates the difference between the two. Several genetically different types of permafrost conditions are described. There is a bibliography of 20 titles.

- (10) "Certain Geographical Results of Soviet Permafrostology", Investia of the Academy of Science Geographical-Geological Series, Vol. X, No. 2, 1946, 205-212, Acad. of Science, Moscow, USSR, Russian, Eng. abst. by Stef. avail. in SPDO-P, AUL & DES.

TUMEL, V. F. (cont'd)

The history of the development of permafrostology was summarized in 1943 by Sumgin. The present article deals with the separate geographical aspects of permafrostology. References are made to the distribution of permafrost, temperature of permafrost, and suggested studies. A bibliography of 19 titles is given.

- (11) "A Map of Distribution of Permanently Frozen Ground in the USSR", *Merklotovskoe (Permafrost)*", Vol. 1, vyp 1, 1946, Acad. of Sci., USSR.

TURNER, F. C.

- (1) "Effect of Some Construction Methods Used on the Alaskan Highway on Subsequent Maintenance, A Discussion of", 1-5, Microfilm in A.U.L. and in print in SPDO-P.

F. C. Turner was Engineering Consultant for Alaska Highway Maintenance, Northwest Service Command. Article says:

1. 75 percent of the "Alcan" is on material with unlimited bearing capacity.
2. Muskeg is not bottomless.
3. Where adequate drainage and subgrade support has been obtained, results have been good as in any other region. Gives a description of detailed stretches of road.
4. Conclusions.

TYKASHEV, K. I.

- (1) "Province Eternal frozen", 168 pp., Russian, On Microfilm in SPDO-P.

TYRELL, J. B.

- (1) "Crystospheres or Buried Sheets of Ice in the Tundra of Northern America", *Journal of Geology*, Vol. 12, No. 3, April-May 1904, 234.

Mr. Tyrell presents theories which he thinks account for the formation of glaciers, the surface masses of ice formed each winter by the overflow of springs and ground ice. He suggests that the name "crystocene" (derived from the Greek words "ice" and "fountain") replace the name "glacier" and also suggests the name "crystosphere" (derived from the Greek words for "ice" and "wedge") for ground ice or the ice wedges existing below the ground surface. His theory for the formation of underground ice is that underground flows of water have come to the surface in the form of springs, "freeze at the surface and the ice continuing to form downward until, a few feet below the surface but still within the influence of the external low temperature, a plane of weakness is reached in the stratified frozen vegetation or alluvial deposit, such planes of weakness being generally determined by the presence of thin bands of silt or fine sand... and there the main body of ice wedge is formed". Location discussed is the Klondike Country.

TYULINA, L. I.

- (1) "On the Phenomena Connected with the Frozen Soil and Frost-Weathering on Iripel Mountain (Southern Ural)", Izvest. Russ Geogr. Soc., fasc. 2-3, 1931, Russian.

TZIPLANKIN, E. I.

- (1) "Permafrost and Its Significance for Agriculture", Trudy, 1951, skhoziaistvennii Akademiia Nauk, im. Lenina, Vol. 13, 1951, pp. 199-219, Moscow, USSR, Russian, DLO.

- (2) "Permafrost and Its Influence on Agriculture", Trudy
Obruchev Inst. of Permafrostology, Vol. IV, 1944.
Moscow-Leningrad, Russian, NN. Eng. abst. avail.
AUL & DES.

The cultivation of plants under permafrost is discussed at length. Methods of improving conditions such as the early deep winter plowing and the conditions fertilizers are discussed. Bibliography of 47 Russian use of fertilizers and 10 foreign references is given.

U. S. NATIONAL HERBARIUM

- (2) "Grasses of Alaska", Vol. 13, part 3, Washington, D. C.

3. Printing Office.

U. S. PUBLIC HEALTH SERVICE

- (1) "Progress Report (Alaska Health Service, July 15, 1949, 1-33, U. S. Public Health Service, Sanitation Activities)"
Contains report on: Public Health Service, Sanitation Activities, investigation programs, environmental Sanitation, Single Premise Sewerage, Single premise Water Disposal, water supply, Sewage Disposal, community Sewerage, additional studies, housing, handbook project, suggested other topics not of interest to per-

- (2) (c) - Alaska
"Environmental Sanitation
Sept. 1949, "Sanitation - Research & Investigation Program"
Contract B. Public Health Service, EPDO-P.
current report by paragraphs are as follows: Introduction,
Basic Activities, study projects - Fairbanks, Community
Planning, Community Sewage Disposal, Ladd Airforce
Community Sewage Disposal, Single Premise Water Sup-
ply, Single Premise Sewage Disposal, Septic Tank, Chemical
Waste Disposal, Refuse Disposal, Future Plans, Water Supply, Sewage
and Waste Disposal, Garbage Disposal, Stream Sanitation, Food
Handling, Shellfish Poisoning, Clothing, Possible Sources of
Assistance for Investigative Programs in Arctic Environmental
Sanitation, and Proposed Study for Investigation and Research
in Arctic Sanitation - October 48. 6. App. B. - Excerpts from
Progress Report July 1949.

S. SMITHSONIAN INSTITUTE

- (1) "Cryptogramis notary", Harriman Alaska Series, Vol. 5, U. S. Smithsonian Inst., Washington, D. C.

U. S. SMITHSONIAN INSTITUTE (cont'd)

- (2) "Geology and Paleontology", Harriman Alaska Series, Vol. 4, U. S. Smithsonian Inst., Washington, D. C.
- (3) "World Weather Records", Smithsonian Misc. Collection, No. 79, 90, 105.
- (4) "A New Larch from Alaska", Smithsonian Miscellaneous Collections, Vol. 1, 1907, 174, 1 pl., U. S. Smithsonian Museum, Washington, D. C.

VAL'SKAYA, S. A.

- (1) "Travel Diary of Merchant Bereshiniy, Member of the F. P. Vrangeli Expedition to Northeastern Siberia", News of the All-Union Geographic Society, Vol. LXXX No. 3, May-June, 1948, 277, Russian, DIC.

VAN ORSTRAND, C. E.

- (1) "Observed Temperatures in the Earth's Crust", Physics of the Earth, VII, 1939, McGraw-Hill Co., New York.

VASIL'EV, A. M.

- (1) "Pseudo Sandy Ground and Methods of Their Identification" Problems Sov. Geol. Vol. 10, No. 5-6, 137-144, Russian (Microfilm), SPDO-P.

VASIL'EV, V. A.

- (1) "Coal Deposits of the Anadyr River Basin", Trans. Arct. Inst. Vol. 59, 1936, 103-125.

VELLER - BOLTOVA, A. P.

- (1) "On the Question of the Effect of Moisture on the Compressive Strength of the Frozen Ground", Vol. of Lab. Experiments, No. 25, 1932, Bull. Leningrad Inst. Constr., Russian.

VEL'MINA, N. A.

- (1) "Permafrost Observations in the Area of the Town of Dikson", Nedra Arkht., Glavsevmorput, Vol. 2, 1947, 189-203, Moscow, USSR, Russian.

VERCHOKA, A. O.

- (1) "Excavation of Test Pits in the Permanently Frozen Ground", Razvedka Nedr. (Ground Exploration) 9 & 10, 1937, 42-43 Russian.

VESTAL, DONALD M.

- (1) "Foundation Project No. 10 (Reverse Cycle Heating)", Progress Report No. 9 and 10, September 15, 1948, December 15, 1948, 1-42, 1-88, Tex. A & M Research Foundation, College Station, Texas, SPDO-P.

Report covers:

review of activities for the period, description of equipment, bibliography, quarterly financial statements, and the appendix. This is a study of the method and apparatus used to determine soil diffusivity by Texas A & M Exp. School.

VESTAL, DONALD M., JR. (cont'd)

- (2) "Heat Pump Buried Coil Design - The Soil Problem", Refrig. Engng., 57, June 1949, 612-613.

The author discusses in general terms the effect of moisture migration on the heat transfer to cylindrical heat sources and sinks. A limited amount of field-test results are presented on the moisture and temperature gradients around a single evaporator coil buried at a depth of 4 ft. Some data on the rate of moisture migration in laboratory soil specimens are also given.

VETCHINKIN, N. S., VETCHERIN, J. P., KISHINSKY, M. I. and KOPEIKIN, V. F.

- (1) "Snow-ice Timber Transport Roads", 1930, 164 pp., Moscow-Leningrad, Russian.

VITTENBERG, P. V.

- (1) "Temperature Changes and Underground Water in the Permafrost Zone on the Vaigach and Anderma Islands, The", Problems of the Arctic, No. 9, 1939, 5-29, Russian, Avail. in N. Stef. Avail. in SPDO-P, AUL & DES. Engl. abst. in SPDO-P, AUL & DES.

This technical pamphlet aims to give an answer to the following problems which are important for mining operations in the arctic, (1) depth of active layer, (2) lower limits of permafrost depth to water, and (3) presence of mine waters in zone of permafrost and the state in which they are found - solid or liquid. Bibliography of 10 titles is given. Vittenberg says that:

1. On the island Vaigach, permafrost is 500-600 meters thick
2. Permafrost on the Arctic coast extends seaward 80 meters
3. Surface temperature affects the mine washings to two meter depth.
4. Freezing point of water with 65-67 percent salt is (-3.3)-(-3.6)
5. Artificial freezing stops seepage if pressure is not too great.
6. Temperature measurements should be taken immediately upon excavation in order to be able to compute the thermal regime of the ground.

VLADIMIRSKY, A. A.

- (1) "Soil-grounds of Malozemelskaja and Timanskaja Tundras", Bull. Inst. Study Earth's Crust, Ser. Geol. & Soil Sci., Ann. No. 26, 1938, 23-52, Russian.

VLASOV, I. I.

- (1) "Ice Warehouses for Vegetables", Gostorgizdat, 1944, 20 pp., Moscow, USSR, Russian.

VODOPIANOV, MICHAEL V.

- (1) "U.S.S.R. Expedition to the North Pole, 1937", 1937, Russian, DLC.

Subjects covered are: USSR Expedition to the North Pole, North Pole, Arctic Regions and Aeronautics - Flights.

VODOPIANOV, MICHAEL V. (cont'd)

- (2) "Twice on the North Pole", 1938, 262 pp, plates, maps, Moscow, USSR, Russian, DIC.

VOEIKOV, A. I.

- (1) "Climate Conditions of Glacial Phenomena, Past and Present", Zapiski Russ. Mineral. Soc., 2nd Ser., Vol. 14, 1881, Russian.

VOLIKOV, A. I.

- (1) "The Heat Cycle in the Crust of the Earth", Vol. on Physics Commemorating Prof. F. F. Petrushevsky, 1904, 111-147 and 183-185, Leningrad, USSR, Russian with French Summary.

VOLOGDINA, I. S.

- (1) "The Study of the Adherence Thru the Congelation Force Between the Concrete and Wood and the Frozen Grounds", Sovet Izuchen Prosvod. Sil. Kom. Izuchen Vechnoi Merzloty (Committee for the Study of Permanently Frozen Ground), Fasc. 2, 1936, 39-83, Russian/Engl. Summary, N.Y.P.L.

VOLOSQVICH, K. A.

- (1) "Geological Observations in the Tundra Between the Lower Courses of Lena and Kolyma Rivers", Trudy Com. Study Yakut A.S.S.R., Vol. XV, 1930, Russian.

WALLACE, ROBERT E.

- (1) "Terrain Analysis in the Vicinity of Northway, Alaska with Special Reference to Permafrost", Permafrost Progress Report No. 3, No. 3, July 1946, U. S. Dept. of Int., Geol. Sur. Washington, D. C., Restricted. Avail. in SPDO-P.

This report describes the permafrost conditions, ground types, construction considerations, and methods of identification of five major terrain divisions, their subdivisions, and their associated lakes in the vicinity of Northway in the Upper Tanana River basin of eastern Alaska. The five terrain divisions are river flood plains, sand dunes, lake-sediment terraces, alluvial fans, and bedrock areas. A major purpose of the investigation resulting in this report was to determine the relationship of permafrost to terrain types in the Northway area so that ultimately criteria can be established for the prediction of permafrost conditions in areas of possible military importance not accessible for ground investigation. Emphasis was placed on the use of aerial photographs in the analysis of terrain divisions.

- (2) "Cave-in or Thermokarst Lakes in the Nabesna, Chisana and Tanana River Valleys, Eastern Alaska", Permafrost Program Progress Report No. 4, No. 4, 1946, U. S. Dept. of Int., Geol. Sur. Washington, D. C., Avail. in R & S, SPDO-P.

Report on a study to develop criterial to be used in determining permafrost conditions by means of aerial reconnaissance. The present study of cave-in lakes in the Nabesna, Chisana, and Tanana River valleys of eastern Alaska is part of an investigation of permafrost by the Geological Survey.

- (1) "Frost Investigation, 1944 - Report on Frost Investigations and Pavement Behavior Tests, Dow Field, Bangor, Maine", January 1946, Boston District, CE, Boston, Mass.

This is a report of the frost investigation performed at Dow Field, Bangor, Main during 1944 for the purpose of determining the influence of frost action on the subgrade soils beneath both rigid and flexible pavements at Dow Field upon gross plane weight evaluation of these pavements. Testing program consisted of excavation of test pits, explorations to determine base and subgrade soil profile under test areas, application to paved surfaces of controlled traffic during frost melting period and the performance of pavement bearing tests during frost melting period.

- (2) "Frost Investigation - 1945-1946 - Comp. Report", Compr. Report, June 1946, Boston Dist, CE, Boston, Mass.

This is a report on studies of base course treatment to prevent frost action. This report presents (a) a summary of previous investigations performed by others, to study effect of admixtures on frost action; (b) the results of laboratory tests performed to determine suitability of various admixtures and combinations of admixtures; (c) results of laboratory tests to determine whether leaching of salts could be retarded or prevented by addition of bituminous materials.

- (3) "Frost Investigation 1945-46 - Report on Studies of Base Course Treatment to Prevent Frost Action", June 1946, 1-26, New Eng. Div., USEQ, Boston, Mass. Avail. in SPDO-P.

1. Description of problem
2. Definitions
3. Review of results of previous investigations
4. Description of laboratory cold room & equipment
5. Frost action tests
6. Leaching tests
7. General conclusions

- (4) "Subsurface Drainage Investigation 1945-46", Comprehensive Report, Sept. 1946, Boston Dist., New Eng. Div., C of E, Avail. in SPDO-P.

The purpose of this report is to summarize and correlate the theoretical studies, laboratory model tests, test results from four full-scale field test sections and the data obtained from existing airfield drainage installations during the fiscal year 1945-46 and to present design criteria determined therefrom.

- (5) "Report on Frost Investigation, 1944-45", April 1947, N. E. Divn. CE, Boston, Mass.

Name	Date
1. Summary of Frost Investigations	4 Dec. 44
2. Frost Invest. - 1st Interim Report	Dec. 44
3. Frost Invest. - 2nd Interim Report	Apr. 45
4. Frost Invest. - 1944-45	June 45
5. Frost Invest. - 1944-45 Comp. Rpt.	Feb. 47
6. Rpt. on Frost Investigations	Apr. 47

Contents of all above reports are as follows:

1. Describes purpose and scope of the frost investigation program of the Boston District. This program includes:
2. Review and Analysis of Airfield pavement failure
3. Review and analysis of previous investigations
4. Observation and testing of effect of protection at a number of fields during winter of 1944-45.
5. Performance of labor controlled tests to determine the coeff. of heat transfer of various soils and the effect of compaction of soil upon past action.
6. Presents summary of the studies, observations, and tests made and conclusions based on those data including Part XII, Chapter 4, Ad Interim Engineering Manual.

This report also contains 15 appendices, of which App. 13 is "Laboratory Tests on Frost Penetration and Thermal Conductivity of Cohesionless Soils."

App. 14 is "Reports on Laboratory and Field Test Procedures for Missouri River and Gr. Lakes Divn. and Boston District."

App. 15 is a Bibliography.

The other appendices, 1-12 concern airfields.

(6) RESTRICTED

"Investigation of Construction and Maintenance of Airdromes on Ice, 1946-47, 'Report of Investigations', May 1947, N. E. Divn., CE, Boston, Mass., SPDO-P.

A report on a preliminary investigation of the feasibility of, and methods for, the design, construction and maintenance of airdromes on ice. App. A to this report is entitled "Aviation Uses of Ice" by Vilhjalmur Stefansson and App. B to this report is entitled "Translations". App. A considers aviation uses of lake and river ice, salt water ice, and inland or snow ice in an area farther north than 60° N. latitude. App. B contains material translated from the Russian in the Stefansson Library.

- (7) "Frost Investigation 1946-47 - Comprehensive Report", April 1948, USEO, Boston, Mass.

App. 1 - Report on N. Eng. Div. Invest. - USEO - Boston, Mass. August 1947; App. 2 - Report on Gr. Lakes Div. Invest. - USEO - Detroit, Mich. - August 1947; App. 3 - Report on Missouri River Divn. Invest. - USEO - Omaha Nebr. - August 1947.

WAR DEPARTMENT - GENERAL

- (1) "Airfield Pavement Design: Frost Conditions", Ad Interim Engr. Manual for War Dept. Constn., Part 12, Chapter 4, July 1946, Office, C of E.

Conditions affecting frost action; heaving; insulating materials; base composition requirements; and protection of subgrade for flexible and rigid pavements with examples of design for frost action.

WAR DEPARTMENT (cont'd)

- (2) "Photography, Military, Applications, Aerial", War Dept. Field Manual FM 30-21, 22 Sept. 1944, 42, War Dept, US Gov. Printing Office, Washington, D. C., Avail. in SPDO-P.

The purpose of this manual is to describe in general terms aerial photography and its application to military operations in modern warfare as it relates to air, ground and naval forces. It provides the basic doctrine for the procurement, production and exploitation of aerial photography.

- (3) - Technical Manual 5-246
"Interpretation of Aerial Photographs", TM 5-246, 31 Dec 1942, War Dept., Avail. in SPDO-P.

No reference to Permafrost areas. Of value in aerial photograph study of pictures.

The purpose of this chapter is to familiarize the student with the appearance of general terrain features on aerial photographs. This knowledge is essential for all those who use aerial photographs for tactical purposes as well as for the interpreter who studies them to discover information concerning the enemy.

- (4) "Surveys, Methods of Plotting and Earthwork Computation for Airdromes", War Dept. Technical Bulletin, TB Eng 18, 1 May 1944, U. S. Printing Office, Washington, D. C., SPDO-P.

This bulletin supplements TM 5-255 with respect to survey procedure and earthwork computations for airdromes.

- (5) - Technical Bulletin Eng 32
"Piles and Pile Driving", War Dept. Technical Bulletin TB Eng 32, TB Eng 32, 3 July 1944, War Dept.

This bulletin contains information on standard and expedient pile-driving equipment; preparation and driving of piles, and load capacity of piles and required pile lengths. Both hasty construction of temporary structures and deliberate construction of carefully planned and well designed structures are discussed.

- (6) "Expedient Snow and Ice Roads", War Dept. Technical Bulletin TB Eng 42, 26 Sept. 1944, 1-16, U. S. Printing Office, Washington, D. C., SPDO-P.

This bulletin is a description of roads used in winter logging operations which are practicable for military operations under similar climatic conditions. It consists of the following subjects: Reconnaissance and road location, road construction and maintenance, roads over frozen lakes and rivers, and vehicles used.

- (7) "Construction of Runways, Roads and Buildings on Permanently Frozen Ground", War Dept. Technical Bulletin TB 5-255-3, TB 5-255-3, Jan. 1945, 64 pp., War Dept, US Gov. Printing Office, Washington, D. C., Avail. in SPDO-P.

WAR DEPARTMENT (cont'd)

Good Permafrost tech. data and instruction. Covers wide range of construction data. (This bulletin is being revised).

Construction in arctic and subarctic regions usually requires methods and designs quite different from those used in temperate zones, especially on sites underlain by permanently frozen ground. It is necessary to cooperate with nature; not oppose her. This bulletin presents the best information now available on reconnaissance, design, construction and maintenance for successful work in areas where permanently frozen ground exists.

(8) RESTRICTED

"Laboratory Soil Testing Set No. 1 and Expedient Tests", War Dept. Technical Bulletin, TB 5-253-1, June 1945, U. S. Printing Office, Washington, D. C., SPDO-P.

This bulletin describes the laboratory soil testing set No. 1 and its use for exploring and testing soils for airfields, roads, and shallow building foundations in theaters of operations.

(9) "Construction in the Theater of Operations", War Dept. Technical Manual, TM 5-280, 1 Nov. 1942, U. S. Printing Office, Washington D. C., SPDO-P.

The Manual covers the following subjects:

- I. Construction requirements such as: selection of sites for housing, storage, and supply; planning; buildings; water supply; and sanitary sewers and sewage treatment.
- II. Substitute, expedient, and improvised construction.
- III. Layouts and drawings.

(10) "Well Drilling", War Dept. Technical Manual, TM 5-297, 29 Nov. 1943, U. S. Govt. Printing Office, Washington, D. C., SPDO-P.

This manual covers the development of groundwater sources for military use. It includes detailed construction methods for the important types of wells and gives advantages and limitations of each type. Wells are classified into types according to method of construction as dug, bored, jetted, driven and drilled. Drilled wells, the most important, are covered in greater detail in this manual than the other types.

(11) "Seismic and Resistivity Geophysical Exploration Methods", War Dept. Technical Manual, TM 198-1, Jan. 20, 1943.

(12) - Field Manual 70-15

"Operations in Snow and Extreme Cold", War Dept. Field Manual FM 70-15, FM 70-14, Nov. 1944, War Dept. Printed by the US Govt Printing Office, Washington, D. C., SPDO-P.

Military operations conducted under conditions of snow and extreme cold follow the same basic principles as do operations under other conditions. The differences lie in the tactical and logistical limitations imposed by the adverse climatic conditions and in the special equipment, training,

WAR DEPARTMENT (cont'd)

and procedures necessary to overcome these limitations. The principles and doctrine described in this manual are applicable to operations conducted under conditions of snow and extreme cold in any type of terrain. They are not limited to operations in those portions of the world which are usually designated as "Alpine" or "Arctic".

- (13) "Ground Water Supply for Military Operations", War Dept. Technical Manual, TM 5-296, 1 Feb. 1944, U. S. Gov't Printing Office, Washington, D. C., SPDO-P.

This manual presents information on the occurrence of groundwater and the location of groundwater supplies for military purposes. Covers the occurrence of water in rocks, relationships between rock structure and groundwater movement, the location of usable water in coastal zones and desert regions, the occurrence of springs, the quality of water to be expected from various sources, and methods of groundwater reconnaissance.

- (14) "Water Supply and Water Purification", War Dept. Technical Manual, TM 5-295, 1942, U. S. Printing Office, Washington, D. C., SPDO-P.

This manual discusses those basic principles of water supply and water treatment which pertain to both civilian and military practice and, in addition, the expedients necessary in the field. Discussion includes the following topics; Sources of Water and its Impurities; Development of Water Sources; Water Quality and Purification; Storage Distribution and Measurement of Water; and Operation.

- (15) "Arctic Manual", War Dept. Technical Manual, TM 1-240, 1944, 131, Gov't Printing Office, Washington, D. C.

- (16) "Corps of Engineers Uniform Soil Classification", 8 Feb. 1949, 3 pages, OCE, Washington, D. C., SPDO-S.

This classification of soils, issued officially with a letter dated 8 February 1949, is to be used for both military and civil works in order that identification of soil types will be on a common basis throughout the military and civil activities of the Corps. A manual of explanation is now in the process of being prepared. The manual will contain tables pertinent to embankment and foundations, and roadways and foundations.

- (17) "Laboratory Soil Testing Set No. 1", Army Service Forces Catalog, Cat. ENG 6 560-01, 11 December 1944, Army Service Forces, Washington, D. C., SPDO-P.

- (18) "Construction and Maintenance of Airdromes on Ice Caps and Ice Masses", 26 June 1946, OCE, Washington, D. C., SPDO-P.

Discusses origin and history of the investigation of ice airdromes, possible sites, types of ice and thicknesses for safe landings, and gives tentative conclusions regarding ice as a land surface.

WAR DEPARTMENT (cont'd)

- (19) "Exercise Snowdrop", Army Life, Vol. XXX, No. 3, March 1948, U. S. Army Recruiting News, SPDO-P.

Describes effect of snow, ice, and severe cold on airborne tactics, technique, and equipment. "Exercise Snowdrop" was held by the Army Ground Force from Nov. 1947 to Feb. 1948 at Pine Camp, N. Y. by the 82nd Airborne Division and the 505th Airborne Battalion Combat Team. Tests were made on clothing, equipment, parachute landings, airborne tactics, resupply and reinforcement by air and establishment of an airhead.

- (20) "Airfield Pavement Evaluation - N. W. Staging Route, Namas Airfield", 9 Jan. 1946, 1-13, U.S.E.O.-Missouri R. Divn. Omaha, Nebr. SPDO-P.

This airport is at Namas, Alberta. The article discusses the location, description and history of site, the pavement construction criteria, soils, drainage, climatic conditions, and other points of design and test results.

- (21) - General and U. S. Dept. of Commerce Weather Bureau "Penetration of Solar Radiation Into the Snowpack", Tech. Rep. No. 8, Interim Rep. No. 1, March 1948, 12, U. S. Printing Office, Washington, D. C., SPDO-S.

A very sensitive pyrhelometer was designed and constructed for measurement of quantity of radiation through a snow pack. During March 1947, measurements were made with this pyrhelometer at the Central Sierra Snow Laboratory. This laboratory is one of several included in the Cooperative Snow Investigation Program conducted jointly by the Corps of Engineer and the Weather Bureau. Gives results of tests.

- (22) C/E, Missouri River Division

"Airfield Pavement Evaluation - N. W. - Staging Route - Edmonton Airfield", 17 Jan. 1946, 1-15, Missouri River Divn. CE., Omaha, Nebr. SPDO-P.

A location, description and history of site along with pavement construction criteria, soils, drainage, climatic conditions, and other design criteria. This airport is at Edmonton, Alberta.

- (23) C/E, Missouri River Divn.

"Airfield Pavement Evaluation - N.W. Staging Route, Grande Prairie Airfield", 11 Jan. 1946, 1-18, USEO, Missouri River Divn., Omaha, Nebr., SPDO-P.

A location, description, and history of site, pavement construction criteria, soils, drainage, climatic conditions and other design criteria. This airport is at Grande Prairie Alberta.

WAR DEPARTMENT (cont'd)

(24) - Corps of Engineers

"Resume of Investigations for Development of Military Construction Design Procedures", June 1950, 54, U. S. Gov't Printing Office, Washington, D. C., SPDO-P.

As the title implies this is a review of the investigations currently in progress on military construction - mainly airfields; the history and reason for acceptance for the adopted plan of flexible pavement design and subgrade analysis is given. The changes necessitating advancing knowledge of design criteria are discussed as well as what each investigational group has been assigned. Main value is its use for pavement design of airfields with the loading procedures that have been used in tests.

(25) - General

"Air Base Construction in Arctic Areas", Research and Development Division, OCE, 15 August 1947, U. S. Printing Office, Washington, D. C., DES.

(26) - General

"Permafrost Data From Russian Purchasing Commission", Intelligence Research Project, 1-3, Research Unit, - Military Intelligence Serv. W.D.G.S., SPDO-P.

CONFIDENTIAL

Record of conversation between Colonel Mazecrak (Russian) and members of Engineer Board. Questions covered such subjects as:

1. Runway Construction on Permafrost
2. Seasonal building of runways
3. Weight of planes
4. Thermal insulation by gravel
5. Wooden runways
6. Gravel base courses
7. General Comments

(27) - General

"Airfield Pavement Design: Construction of Airfields on Permanently Frozen Ground", Engineering Manual for War Department Construction, Part 12, Chap. 7, October 1946, Office, Chief of Engineers, Washington, D. C., OCE, SPDO-P, EL.

Design for conditions in permafrost regions, including design for freezing as well as thawing of foundations, for roads, airfields and structures.

(28) - CE, Missouri River Div.

"Frost Investigation, 1944-1945", July 1945, Missouri River Div., CE, Omaha, Nebraska.

Report of investigation to determine the development of frost action in subsurface pavement elements as affected by varying conditions of weather, soils, and groundwater. The airfields studied were: Sioux Falls Airfield; Fairmont Airfield; Great Bend Airfield; Garden City Airfield; and Pratt Airfield.

(1) RESTRICTED

"Interim Report on Arctic Construction Equipment", 12 July 1945, Corps of Engineers, St. Paul, Minnesota, DES, AUL & SPDO-P.

A report on material collected on arctic construction equipment including opinions on airfield site selection, road and landing strip design, and discussions of methods of transporting equipment and supplies to a site, as well as statements pertaining to equipment and its use in the actual construction of airfields in the arctic and subarctic. Includes photographs and illustrations of equipment used in the arctic and subarctic.

(2) RESTRICTED

"Report of Trip to Weather Stations in Alaska", 2 August-14 October 1945.

An unpublished report of trip made by the writer to obtain information which would be of value in the making of ground temperature installations at various weather stations and to obtain data required as ground temperature equipment procurement information including the selection of sites for the temperature test holes. Includes photographs, descriptions and drawings of the weather stations visited.

(3) RESTRICTED

"First Interim Report, Permafrost Field Investigations Northway Airfield, Alaska", 30 Nov. 1945, St. Paul District, St. Paul, Minn., OCE, SPDO-P.

A report on an investigation at Northway Airfield to collect data on soils characteristics, ground temperatures, groundwater, foundation designs and other factors as they affect design and construction at this site, and to observe the effect of permafrost on the facilities at Northway Airfield.

(4) CONFIDENTIAL

"Final Report, Permafrost Field Investigation, Galena Airfield, Alaska", 29 March 1946, St. Paul District, St. Paul, Minn., OCE, SPDO-P.

A report on the construction history of the airfield at Galena, Alaska and observations made by this office.

(5) CONFIDENTIAL

"Final Report, Permafrost Field Investigation, Nenana Airfield, Alaska", 19 April 1946, OCE, SPDO-P.

A report on the construction history of the airfield at Nenana and observations made by this office.

(6) RESTRICTED

"Second Interim Report, Permafrost Field Investigation, Northway Airfield, Alaska", May 1946, St. Paul District, St. Paul, Minnesota.

A summary of an investigation made at Northway Airfield to observe the condition and behavior of runways and structures constructed upon permafrost, to collect basic data, and to analyze these observations so that design formulas might be developed and suitable construction methods peculiar to regions of permafrost evolved.

(7) CONFIDENTIAL

"Final Report, Permafrost Field Investigation, Bettie Airfield, Alaska", May 1946, St. Paul District, St. Paul, Minnesota, OCE SPDO-P.

A report on observations of construction and the construction history of the airfield at Bettles, Alaska.

(8) RESTRICTED

"Final Report, Observations During Construction of Project 'N' Alaska", June 1946, St. Paul District, St. Paul, Minnesota, OCE, SPDO-P.

A report on observations made during construction of an airfield and appurtenant facilities at Project N, Point Spencer, Alaska, with special attention to permafrost conditions.

(9) RESTRICTED

"Methods of Obtaining Core Samples in Permanently Frozen Ground" 23 October 1946, St. Paul District, St. Paul, Minn., OCE, SPDO-P.

A letter report on the experience of the Field Operations Branch, Permafrost Division of the St. Paul District in obtaining core samples from permanently frozen soil in Alaska. Deals primarily with the use of the Longyear Model UG 8" Diamond Core Drill. Contains photographs of drilling operations and equipment.

(10) RESTRICTED

"Report on Foundation Investigation of Nome Post Office and Court House Building", April 1947, St. Paul District, St. Paul Minnesota, OCE, SPDO-P.

A report on an investigation made by the St. Paul District for the Alaska District regarding the damage to the Nome Post Office due to subsidence and changes in frost conditions of the supporting ground.

(11) RESTRICTED

"Pavement Crack Survey, 26 Mile Satellite Field, Near Fairbanks, Alaska", May 1947, SPDO-P.

A report on an investigation of several typical asphalt pavement runway cracks made to ascertain the extent and nature of the cracks and to determine the probable causes of their formation.

(12) RESTRICTED

"Report on Permafrost Investigation for Mile 26, Satellite Field, Ladd Field, Alaska", May 1947, St. Paul District, St. Paul, Minn., OCE, SPDO-P.

A report on the exploration and evaluation of the site of the proposed B-36 Airfield at Mile 26, Satellite Field, Ladd Field, Alaska to determine the presence of permafrost and its influence on the design, as requested by the Alaska District through the Office, Chief of Engineers.

(13) RESTRICTED

"Permafrost Investigation at Skull Cliff", July 1947, St. Paul District, St. Paul, Minn., OCE, SPDO-P.

A report on the excavation and footing construction with regard to permafrost at the Loran slave tower location at Skull Cliff near Barrow, Alaska, as requested by the Alaska District and the Navy made during the period 1 to 9 July 1947.

(14) RESTRICTED

"Permafrost Investigation, Military and Civilian Housing Areas, Ladd Field, Alaska", August 1947, St. Paul District, St. Paul, Minn., OCE, SPDO-P.

A report on the exploration and evaluation of the sites of proposed military and civilian housing at Ladd Field (Ladd AFB) Alaska to determine the presence of permafrost and its influence on design.

(15) RESTRICTED

"First Annual Report, Arctic and Subarctic Drainage Invest.", Sept. 1947, C. of E., St. Paul, Minn., SPDO-P.

A report on an investigation to determine design, construction and maintenance procedures suitable for the drainage of airfields located in arctic and subarctic areas subject to potential military operations.

(16) RESTRICTED

"Identification and Evaluation of Alaskan Vegetation from Airphotos with Reference to Soil, Moisture, and Permafrost Conditions", (See Stoeckler, E. G.).

(17) RESTRICTED

"Report of Soils Analysis for Subgrade Materials at Site of Test of Insulating Properties of Beach Sand Foundations, Point Barrow, Alaska", June 1948, St. Paul District, St. Paul, Minn., OCE, SPDO-P.

A report on the soils analysis and evaluation of subgrade characteristics at the site of an experimental gravel fill in the proposed Fuel Storage Area, Barrow, Alaska.

(18) RESTRICTED

"Engineering Problems and Construction in Permafrost Regions" Encyclopedia Arctica, 1949, 1-91, St. Paul District, St. Paul, Minn., OCE, SPDO-P.

Table of Contents consists of Reconnaissance and Site Selection, Roads and Airfields (Including Planning, Design and Construction), Buildings, with their Location and Design Construction, Water Supply and its Distribution and Sewerage. This article is intended as a chapter in Encyclopedia Arctica to be published by the Bureau of Naval Research - Ecology Branch.

(19) RESTRICTED

"Airfield Drainage Structure Investigation", Final Report No. 54, April 1949, 144, Sub-office, Iowa City, Iowa, St. Paul, Minn., SPDO-S.

The tests whose results are reported in this article were authorized by Chief of Engineers, Dept. of the Army, to be performed under the direction of the St. Paul District Engineer. They cover an investigation of the hydraulic characteristics of airfield gutters, inlet gratings and slots, and curb inlets. Chapter headings are:

1. Introduction
2. Description of Models and Apparatus
3. Tests on Model 1 - Runway Pavement & Gutter
4. Tests on Model 2 - Inlet Grates
5. Tests on Model 3 - Curb Inlet and Extension

(20) RESTRICTED

"Investigation of Airfield Construction in Arctic and Sub-arctic Regions", 1st Annual Report, May 1946, Suppl. to 1st Ann. Report, Oct. 1946, 2nd Annual Report, March 1947, Comprehensive Report, Jan. 1948, St. Paul District, CE, St. Paul, Minn., SPDO-P.

The contents of the various reports are as follows by number:

1. A report on an investigation composed of the following studies:
 - a. Site study of Existing or Proposed Airfields.
 - b. Construction Methods and Equipment
 - c. Meteorological Data
 - d. Theoretical Studies of Heat Flow in Permafrost
 - e. Library Research
 - f. Aerial Photo Reconnaissance
 - g. Geophysical Exploration Methods
 - h. Development of Testing Equipment for Drilling and Soil Sampling work.
2. A Supplement to First Annual Report of May 1946.
3.
 - a. Main Report
 - b. App. A - Photos of Northway Airfield
 - c. App. B - Constr. Photos of F.R.A.
 - d. App. C - Photos of Drill Oper. & Install of Gr Temp Equ.
 - e. App. D - Rep. on Inv. of Foam Comp. for Cell Concr. Conf. by U. S. Waterways Exper. Sta.
 - f. App. E - Comp. Progr. for Inv. of Airfield Constr. in Arctic and Subarctic Regions
 - g. App. F - Lab. Res. for the Determ. of Therm. Prop. of Soils-Univ. of Minn.
 - h. App. G - Rep. on Aerial Photography Recon. Inv. of Frozen Soils in the Territory of Alaska by Purdue.
4.
 - a. Main Report
 - b. App. A - Northway Airfield
 - c. App. B - Meteorological Data Studies

WAR DEPARTMENT - ST. PAUL, MINN., DISTRICT, C. OF E. (cont'd)

- d. App. C - Research Laboratory Investig. Deter. of Therm. Prop. of Soils
- e. App. D - Summary and State of Tech. on Aer. Photo Recomm. Inv. of Frozen Soils in the Territory of Alaska
- f. App. E - Library Research
- g. App. F - Design and Const. Studies
- h. App. G - Fairbanks Research Area
- i. App. H - Ground Temp. Equipment

WATERWAYS EXPERIMENT STATION, U. S.

- (1) "Geophysical Exploration Methods, Seismic and Resistivity", Seismic and Resistivity Geophysical Exploration Methods, No. 198-1, 20 Jan. 1943, War Dept., CE, USA, Miss. R. Comm. Vicksburg, Miss.
- (2) "The California Bearing Ratio Tests as Applied to the Design of Flexible Pavements for Airports", 1 July 1945, U. S. Waterways Exp. Station, Vicksburg, Miss., AUL and SPDO-P.
- (3) "Resinous Water Repellents for Soils", 20 May 1946, U. S. Waterways Exp. Sta., Vicksburg, Miss., AUL.

WATKINS, W. I.

- (1) "Discussion on Frost Heaving, Proceedings, Highway Research Board, Vol. 11, Part 1, 1931, 165-168.

WATSON LABORATORIES

- (1) RESTRICTED
"Installation of the Beetle Chain of L. F. Loran Stations in the Arctic", Memorandum Report WLEPE-2.1, 29 October 1948, Eng. Div. - Watson Lab. Red Bank, N. J.
This report describes construction of base camps and towers in several locations involving permafrost.

WEINBERG, B. P.

- (1) "List of Latest Publications of USSR on Ice and Snow", Trans. American Geophysical Union, Vol. 21, 1940, 757-77, A.U.L.
This bibliography is divided into three parts:

- 1. General (except on frozen ground, underwater ice, and glaciers.
- 2. Underwater (anchor) ice studies.
- 3. Studies on eternally frozen ground and on freezing of soil.

- (2) "Ice", 1940, 524, Moscow-Leningrad, USSR, Russian, On micro-film in SPDO-P.

Map opposite page 462 shows islands of permafrost. In Mongolia, permafrost occurs down to 46° N. Latitude. Sumgin estimates that the total area underlain by permafrost is about 30,000,000 km² which is approximately 20% of the entire land area of the world which is 149 km² in extent.

WERENSKIOLD, W.

- (1) "Frozen Earth in Spitsbergen", Geofysiske Publ. and (Monthly Weather Review, Vol. 51, Apr. 1923); Vol. 2, No. 10, 1922, 10 pp, Kristiania.

WERNECKE, LIVINGSTONE

- (1) "Glaciation, Depth of Frost, and Ice Veins of Keno Hill and Vicinity, Yukon Territory", Engineering and Mining Journal, Vol. 133, 1932, 38-43.

Frozen zone studied in mine shafts. One shaft 400 ft., another 300 ft. without passing out of frozen ground. Where thawed ground is encountered below permafrost, water under hydraulic pressure also encountered which gives rise to mining difficulties. Ice veins observed, but they do not exceed 6 in. Several photographs used to illustrate veins and crystals. Author then discusses occurrences and effect of ice to greater detail.

WEST, E. S.

- (1) "Effect of Soil Mulch on Soil Temperature", Council of Science and Industrial Research, Vol. 5, No. 4, Nov. 1932, 236-246.

Results of an experimental study of soil temperatures and temperature amplitudes in cultivated and uncultivated soils.

WESTERGAARD, H. M.

- (1) "Stresses in Concrete Runways of Airports", Publications from the Graduate School of Engineering, No. 282, 1940-41, 197-202, Harvard, Univ., Cambridge, Mass., SPDO-P.

This paper contains formulas based on the assumption of a constant modulus of subgrade reaction, numerical examples, supplementary computation contemplating a redistribution of the subgrade reaction, and the limitation of the analysis.

WESTERN CONSTRUCTION NEWS

- (1) "Engineers Win Alaskan War", Western Construction News, Vol. 19, Feb. 1944, 59-62.

WEXLER, DR. HARRY

- (1) "Doctor's Thesis on Radiation in Alaska", Weather Bureau, Washington, D. C.

WHITE, A. C.

- (1) "Frost Boils and Their Elimination", Public Works Magazine, Vol. 59, No. 1, Jan. 1928, 10-11.

Description of types of subsurface drainage installations which the author claims have been successful in Mower County, Minnesota.

WILLIAMS, A. M.

- (1) "What Causes the Spring Break-up", Better Roads, Vol. 15, No. 11, Nov. 1945, 22-23, BSL.

Description of the effect of an early deep freeze followed by a fall thaw creating a "frost partition" above which water

WILLIAMS, A. M. (cont'd)

is trapped causing Portland cement concrete to pump and causing distress to other types of roads. Three medial measures are described.

WILLIAMS, G. A.

- (1) "Winter-Maintenance Problems on the Alaska Highway", Roads and Bridges, Vol. 81, Nov. 1943, 27-30, 58-59, DIC.

Besides the discussion on maintenance and operation of machinery there is mentioned difficulties encountered with drainage problems in the road beds.

WILSON, J.

- (1) "Frost Action on Rigid Pavements", Engineering News-Record, Vol. 80, No. 13, March 28, 1918, 626.

The author advocates deep drainage, sufficiently deep to extend below frost line and also to lower the line of saturation below the subgrade. No data are given.

- (2) "Arctic Construction", The Military Engineer, Vol. 41, July-August 1949, 258-260.

A discussion of some of the experiences and lessons learned by the Navy as a result of "Operation Highump" and "Pet 4 Operation" at Point Barrow, Alaska.

WILSON, T. T.

- (1) "Methods and Equipment Used to Keep Manitoba's Roads Open in Winter", Engineering and Contract Record, Vol. 57, August 9, 1944, 28-29, 48, DIC.

WILSON, WALTER K., JR., COLONEL, CE.

- (1) "Problem of Permafrost", The Military Engineer, Vol. XL, No. 270, April 1948, 162-164, SPDO-P.

Describes study of permafrost started in 1945 by CE, St. Paul District. Field work in Alaska includes studies of airfields constructed during World War II, an experimental plot constructed near Fairbanks, weather and ground temperature data from various points, and development of methods for locating airfield sites from aerial photographs. Laboratory studies of thermal properties of soils were made at the Univ. of Minnesota. Object of studies to develop criteria for design and construction of airfields in arctic and subarctic regions.

WINN, H. F.

- (1) "Frost Action in Stabilized Soil Mixtures", Proceedings, Highway Res. Board, Vol. 18, Part 1, 1938, 264-290, SPDO-P.

The results of a laboratory study to determine the frost heaving characteristics of a clay, a concrete sand, a pit run gravel and graded soil mixtures molded without admixtures and different percentages of 11 different "stabilizers".

WINN, H. F. (cont'd)

- (2) "Frost Action in Highway Subgrades and Bases", Proc. Purdue Confer. on Soil Mechanism and Its Application, Symposium on Frost Action, July 1940, 444-457, Purdue Univ., Lafayette, Ind. SPDO-P.

Review of findings of previous investigations and theory of ice segregation. Also results of laboratory studies on frost action in treated and stabilized bases, and a discussion of means of preventing frost action. Discussion by Morton, Tremper and Stockstad. Selected bibliography.

WINTERKORN, H. F. and HYRING, HENRY

- (1) "Theoretical Aspects of Water Accumulation in Cohesive Sub-grade Soils", Highway Research Board Proceedings Twenty-Fifth Annual, 1945, Nat'l Research Council, Washington, D. C.

This is a discussion of the theoretical aspects of non-gravitational water movement in soils.

Discusses water affinity of the soil material, energies and mechanisms involved in the movement of water through soils, and mechanism involved in changing water under tension and water under compression into free water in which form it affects bearing power. Indicates the need for more experimental data concerning the effect of temperature on soil-water relationships which is thought to be highly important.

WINTERMYER, A. M.

- (1) "Percentage of Water Freezable in Soils", Public Roads, Vol. 5, No. 12, Feb. 1925, 5-8, Gov't. Printing Office, Washington, D. C., BSL and SPDO-P.

Apparatus and methods of testing are presented for determination of freezing point of soils by the dilatometer method. Experimental data from tests on 150 soils are given.

WISE, JAMES

- (1) "Comments on Methods of Construction of Airfields and Facilities in Alaska and Aleutian Areas", Alaska Dept. - Office of Engrs. A.U.L.

An article which is too general to be of much value.

WOODS, K. B.

- (1) "Frost Action". Aims and Activities of the Joint Hwy. Res. Project Purdue Univ. Engineering Bulletin", Vol. 24, No. 2, March 1940, 35-37, 41-43, 48-49, (Res. Ser. No. 71 - Hwy. Res. Bull. 3), Purdue University, Lafayette, Ind.

Pictorial and graphical representation and conclusions of frost studies at Purdue University. The data are published in the following reference: Winn, H. F., "Frost Action in Stabilized Soil Mixtures", Proceedings, Highway Research Board, Vol. 18, Part 1, pp. 264-290, 1933.

- (2) "Report of Committee on Frost Heave and Frost Action in Soil" Presented at 27th Annual Meeting, Dec. 1947, Highway Research Board.

WOODS, K. B. (cont'd)

Effectiveness of treatments in which calcium chloride was placed in holes bored through flexible and rigid type pavements into the subgrade or in trenches along the pavements in frost heave areas. Also studies of permanency chloride admixtures.

WYCKOFF, L. B.

- (1) "Some Observation on Effect of Frost in Raising Weight", Engineering News - Record, Vol. 80, No. 13, March 28, 1918, 627-628, McGraw Hill Publ.

The author cites cases of a brick wall, weighing 2000 p.s.f., raised $3/4$ in. and several piers supporting columns and roof trusses raised $1/2$ to $2-3/4$ in. by frost action.

YACHEVSKY, L. A.

- (1) "Experimental Application of a Metallic Thermograph in Geothermal Observations", Gornyi Zhurnal, No. 8, 1912, Leningrad, USSR, Russian.

- (2) "Permanently Frozen Soil in Siberia", Izv. Russ. Geogr. Soc., Vol. 25, 1889, 341-355, Russian.

YAKOVLEV, S. A.

- (1) "Regarding One Type of Dislocation of Swamps", Pochvovedeniye (Soil Science), No. 1, 1911, Russian.

YANOVSKY, V. K.

- (1) "Expedition to the Pechora River for Determining the Southern Boundary of the Permanently Frozen Ground", Trudy Com. Study Perm. Frozen Ground, Vol. II, 1933, 65-149, Acad. of Sci., Moscow, USSR, Russian, DLC, NYPL.

YAVOROVSKIY, P. K.

- (1) "Geological Investigation on the Angara River in 1895", Geol. invest. and prospect. along the Siberian Railroad, fasc. 7, 1898, Russian.

YERMILOV, I. Y.

- (1) "Some Peculiarity of River Deposits of Northwestern and Northern Siberia", Proc. of the Polar Committee, Vol. 20, 1935, 27-33, Acad. of Sci., Leningrad, USSR.

- (2) "Permafrozen Ground in the Bogoslovsk Region of the Central Ural", Izvestia of the Geographical Society, Vol. 78, Part 5 & 6, 1936, 591-593, Leningrad, Russian, Eng. abst. by Stef. avail. in SPDO-P.

This article deals with the occurrence of permafrost outside the limits of its basic distribution. Depths, thicknesses of permafrost, and types of soils in which it is most likely to be found is discussed. Most of the permafrost was discovered during mining operations.

- (3) "The Effect of Permafrost on Relief", Izvestia of the Geographical Society, Vol. 66, No. 3, 1934, 377-388, Russian,

YERMOLAEV, M.

- (1) "Instruction for the Expeditionary Study of Fossil Ice as a Geographical Factor", 1932, 1-42, The Arctic Institute, Leningrad, German, Eng. abst. by Stef. avail. in SPDO-P, AUL & DES.

This pamphlet was issued by the All Union Arctic Institute for the study of fossil ice primarily during expeditions. The article has 10 illustrations and a bibliography of 140 titles, in Russian and foreign languages, containing literature dealing with regional descriptions of fossil ice, general works on the subject, petrography and paleontology.

- (2) "Geologic and Geomorphologic Sketch of the Island Bolshogo Lyakhovskogo", Trudy Soviet Study of Prod. Forces, Vol. VII, Ukut Series, 1932, Russian.
- (3) also TOLSTIKHIN, N. I.
"Brief Instruction for the Study of Ground Ice", 1938, 129-138, Acad. of Sci., Moscow, USSR, Russian, DIC.

ZAIKOV, B. D.

- (1) "Preliminary Report on the Aldan Hydrometeorological Station" Mater. Com. Study Yakutsk. A.S.S.R. (Permanently Frozen Ground), fasc. 10, 1929, 297-313 (311-313) Russian.

ZEITS, R. F.

- (1) "The Thickness of Permafrost in the Kolyma Region", Trudy Commis. for the Study of Permafrost, Vol. 5, 1937, 79-80, Acad. of Sci., Moscow, USSR, Russian, DIC.

ZHUKOV, V. F.

- (1) "Earthworks in the Construction of Foundations in the Region of Permafrost", Inst. of Permafrostology, 1946, Acad. of Sciences, Leningrad - Moscow, Russian, Eng. abst. and part. transl. by Stef. in SPDO-P. Abst. also at AUL & EL.

This book is divided into 8 chapters as follows:

- Chap. I Introduction
- Chap. II Preliminary Work
- Chap. III Methods of Softening Permafrozen Ground
- Chap. IV Methods of Removal of Excavated Earth
- Chap. V Methods of Strengthening Trench Walls
- Chap. VI Methods of Preliminary Preparation of Trenches for Constructions of Foundations
- Chap. VII Refilling of the Trenches
- Chap. VIII Organization of the Earthwork

Chapters I, VI and VII have been translated. One point of interest is the use of the electro-chemical methods of solidifying permanently frozen ground. A table showing the depth of permafrost for different types of soils in various parts of Russia is also given.

ZHUKOV, V. F. (cont'd)

- (2) "Cracking of the Ground Caused by Frost in the Permafrost Region", Trudy of the Obruchev Inst. of Permafrostology, Vol. IV, 1944, 226-229, Moscow-Leningrad, Russian, NN. Eng. abst. by Stef. avail. in SPDO-P, AUL & DES.

This article deals with the often encountered phenomena of cracking of the ground under freezing conditions. Frost cracks are due to the horizontal deformation of ground under the influence of freezing. With a sharp drop of temperature the upper portion of the ground contracts. These cracks may reach a depth of 2.5 meters. Usually cracking takes place in the fall before the ground is protected by a layer of snow. The author suggests that damage to buildings can be prevented by keeping the buildings from being tightly frozen to the ground.

- (3) "Method of Determination of the Side Pressure on Shaft Lining in the Permafrost Region, The", Trudy of the Obruchev Inst. of Permafrostology, Vol. 6, 1944, 169-175, Moscow, USSR, Russian, on microfilm in SPDO-P and DCS. Eng. abst. by Stef. avail. in SPDO-P, AUL & DES.

This technical article deals with the methods of calculation of the stresses for shaft linings in the region of permafrost. The author discusses previous methods for calculating the pressure and suggests a new method. He believes his is more accurate since it takes into consideration the thawing of permafrost adjoining the outer walls of the lining.

- (4) "Construction of Yakutsk Electric Plant Foundation on Permanently Frozen Ground", Construction Industry, Vol. 15, No. 5, 1937, 12-15, Russian.

The author recommends the building of pillar foundation resting on criss-cross cribbing of larch with the surfaces of the larch smooth. Construction should be done later in the fall or in early winter. Concrete pillars should be prepared in the summer.

ZONOX, V. B.

- (1) "Naledi and Polynai" (Unfrozen Spaces) on the Rivers of the Mountainous Part of the Yana-Kolyma Region", Trudy, Permafrost Institute, Vol. 4, 1944, 33-93, Acad. of Sci., Moscow, USSR, Russian, NN.

ZVEREV, V. N.

- (1) "Mineral Deposits of the Yakutsk Republic, Yakutia", 1927, 16, 196, Russian.