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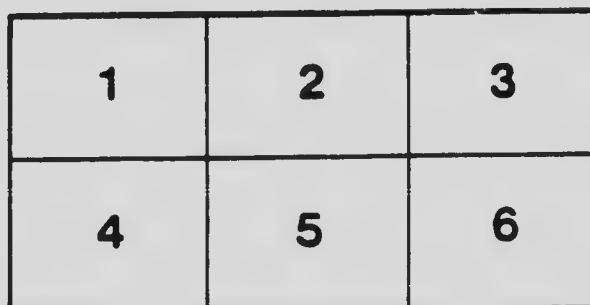
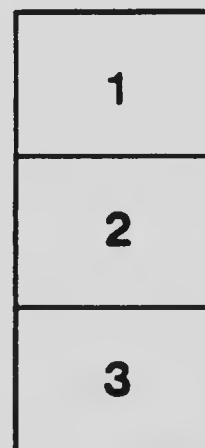
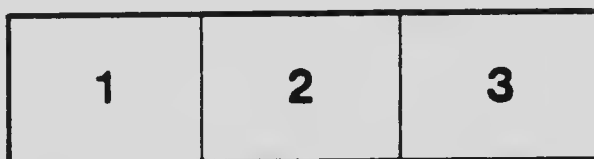
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GEOLOGICAL SURVEY OF CANADA

ROBERT BELL, M.D., D.Sc. (CANTAB.), LL.D., F.R.S., I.S.O.

RECENT
MINERAL DISCOVERIES

ON

WINDY ARM, TAGISH LAKE
YUKON

BY

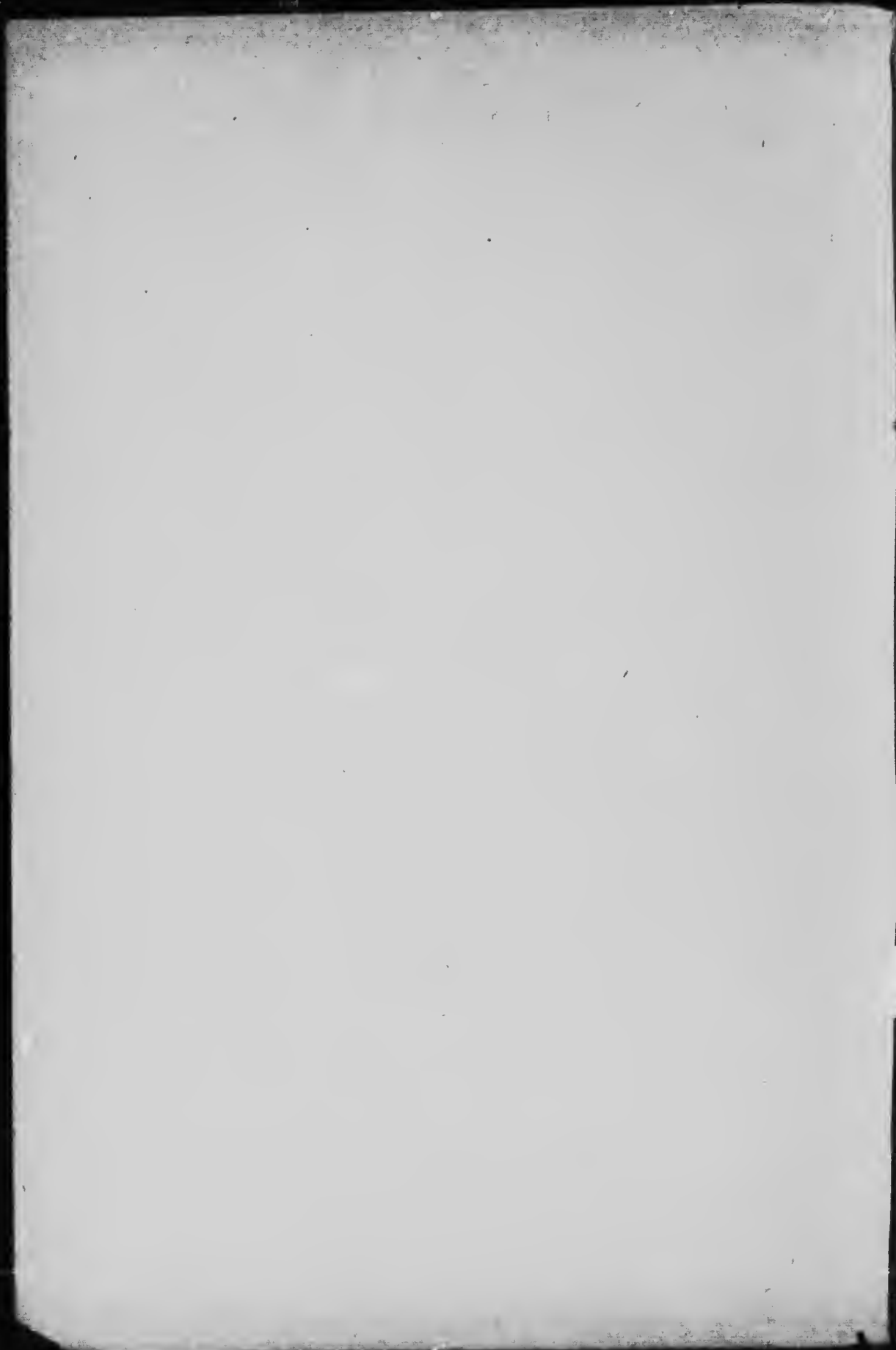
R. G. McCONNELL, B.A.



OTTAWA

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EXCELLENT MAJESTY

1905



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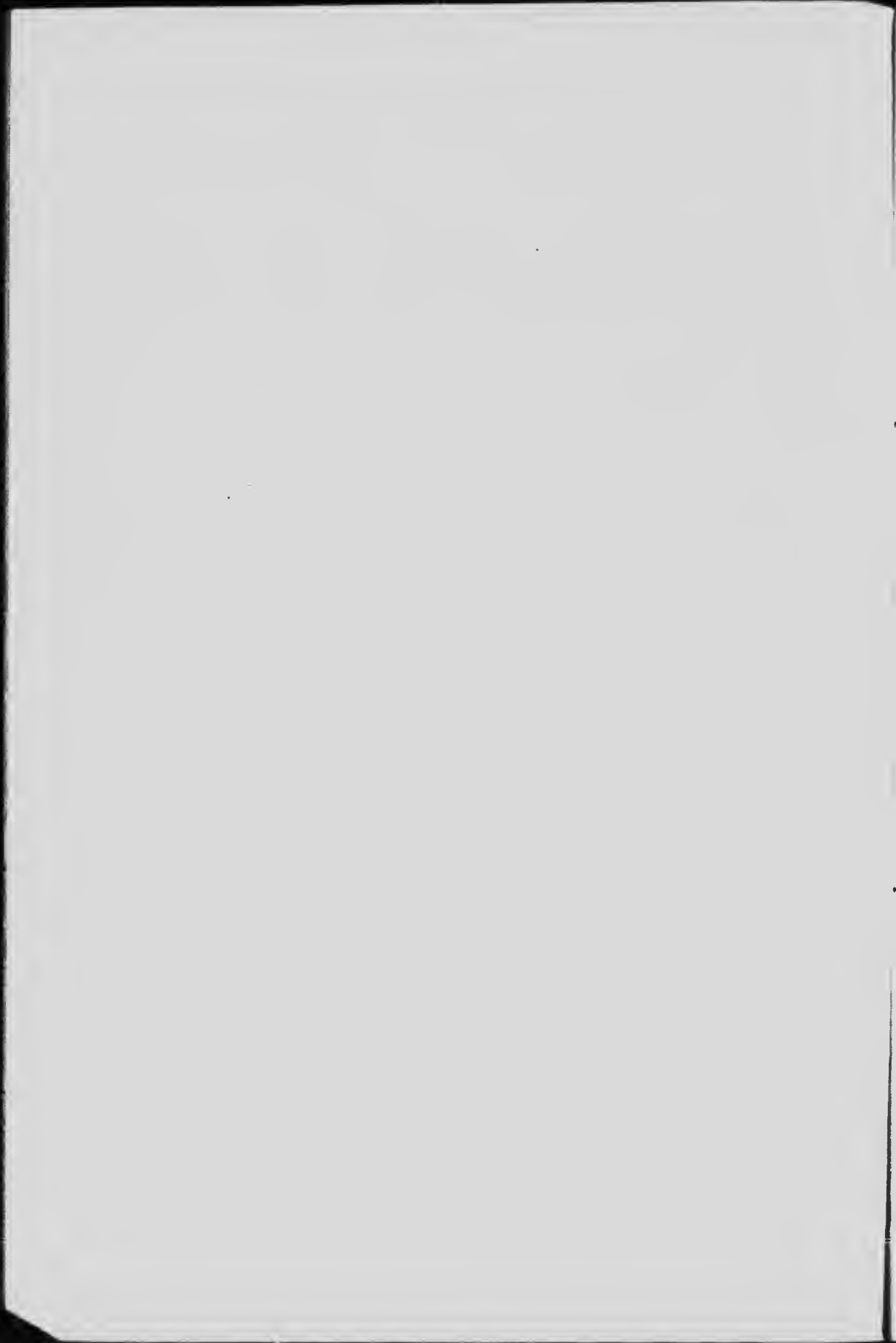
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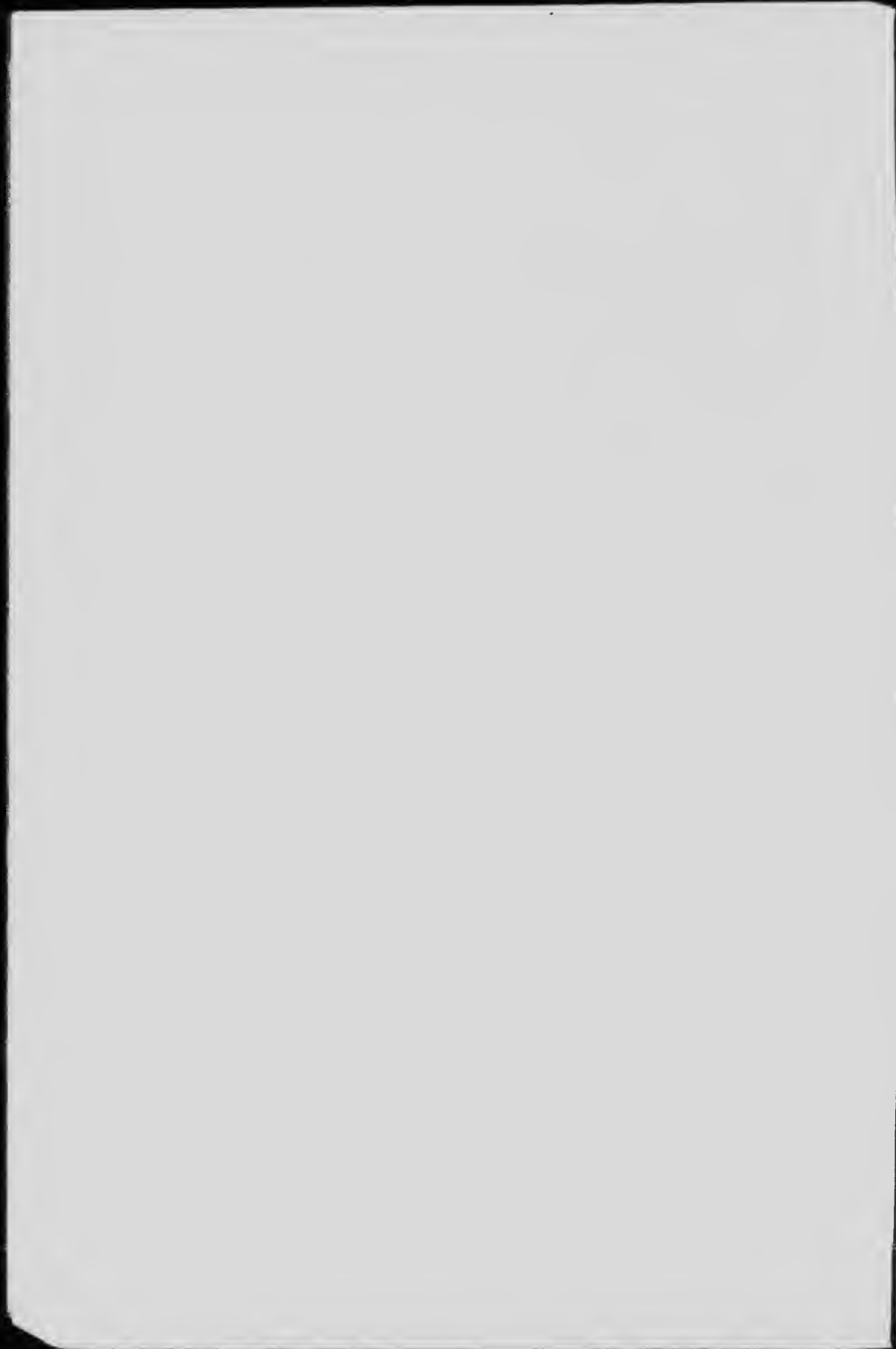
ROBERT BELL, M.D., D.Sc., (Cantab), LL.D., F.R.S., I.S.O.,
Acting Deputy Head and Director,
Geological Survey of Canada.

SIR,—I beg to submit the following general description of the recent important mineral discoveries on Windy Arm of Tagish lake, Y. T. Owing to the interest excited by the discoveries, a hurried examination of the district was made on my way back from the White River country in September last.

I have the honour to be, sir,
Your obedient servant,

R. G. McCONNELL.

GEOLOGICAL SURVEY OFFICE,
November 27, 1905.



THE RECENT MINERAL DISCOVERIES

ON

WINDY ARM OF TAGISH LAKE, YUKON

SITUATION AND COMMUNICATIONS.

The principal ore deposits so far discovered occur on the west side of Windy Arm, a southerly branch of Lake Tagish. Tagish lake forms part of a chain of long narrow lakes including, in order from north to south, Lakes Lindeman, Bennett, Nares, Tagish and Marsh, which commence well within the Coast Range of mountains and extend northward and eastward for a distance of nearly seventy miles. The general direction of all these lakes is north and south, with the exception of Lake Nares and the upper part of Tagish lake, which have an east and west alignment. Windy Arm joins Tagish lake near its head and extends south for a distance of twelve miles. Its course is nearly parallel to that of Bennett lake and the two sheets of water inclose an area of high mountainous country about eight miles in width, the scene of the principal recent discoveries.

The White Pass and Yukon Railway affords easy communication to the new mining district. This line, after crossing the Coast Range, follows the east shore of Bennett lake to Caribou Crossing, at the foot of the lake, from which point steamers run to Conrad City, on Windy Arm, the shipping point of the mines. The total distance from tide water at Skagway, to Conrad City, is 79 miles, of which 67.5 miles is made at present by rail, and 11.5 miles by water. A railway can easily be built from Caribou Crossing along the shores of Lake Nares, Tagish lake and Windy

Arm to Courad City, and surveys for one have already been made by the engineers of the White Pass and Yukon Railway. A second route from Log Cabin station, on the main line of the White Pass and Yukon Railway, above Bennett lake, by way of Tutshi lake to Windy Arm, has also been proposed. The distance to tide water would be reduced considerably by this route, but the mileage of new line necessary would be greater.

CHARACTER OF COUNTRY.

The country bordering the northeastern slope of the Coast Range, including the Windy Arm mining district, may be characterized generally as consisting of a system of wide valleys, often interlocking in a peculiar manner, separated by mountain groups and ridges rising from 4,000 to 5,000 feet above the valley flats. Most of the valleys are bottomed at intervals with long, narrow, deep lakes, due to the blocking of the channel at various points with glacial drift. The uplands are usually fairly regular in outline, but in places are exceedingly rugged and are often deeply incised by the numerous small streams which flow down their sides.

The forest growth is sparse and is confined to the valley flats and lower slopes of the mountains. At an elevation of 2,000 feet above the valley bottoms the forest practically ceases. The principal trees in the district are the white and black spruces, the aspen, the balsam poplar, the balsam fir and the black pine. The supply of rough lumber within easy distance of the camp suitable for ordinary mining purposes is ample for some years at least.

GEOLOGY.

The mineralized area on Windy Arm is situated a few miles north of the great granite area of the Coast Range. The rocks outcropping along the lower part of Windy Arm consist of a wide band of crystalline limestone, followed, going south, by hard slates and shales passing in places into feldspathic quartzites and associated with dark and gray cherts and red jaspers. This elastic series is cut off and replaced about five miles above the mouth of the Arm by an eruptive rock of a porphyritic character, exposures of which outcrop along the shores of the Arm for a distance of about five miles. The porphyrite is followed, going southward, by strongly cleaved dark argillites and fine grained tuffaceous sandstones alternating with bands of conglomerates and limestone. These rocks are less altered than the slates and associated rocks north of the porphyrite

area but no data sufficient to determine the age were obtained. They are cut off a few miles south of Windy Arm by the great granite mass of the Coast Range.

The porphyritic rock separating the two series of elastic rocks constitutes the principal metalliferous formation of the district. It crosses from Windy Arm to Bennett lake in a band about four miles in width and also extends some distance east of Windy Arm. It has not been studied in detail, but is evidently somewhat complex in character. A fine-grained somewhat altered specimen collected from the Montana vein has the character of a porphyrite, while one from Red Deer mountain proved to be a gabbro. The two types may represent portions of the same magma cooled at different depths. The principal structural feature of the porphyrite-gabbro area is the system or systems of strong jointage planes that intersect it everywhere. The joints, like the veins, show little parallelism in either dip or strike in different parts of the area. The porphyrite in many places is heavily charged with iron and weathers to a rusty colour.

A granite area about three miles in width occurs on Lake Bennett north of the porphyrites and associated rocks. The granite is separated from the latter on the lake shore by a narrow band of slates and limestones, but, further inland, comes in contact with them. It is a medium grained, gray rock similar to the Coast Range granites and probably belonging to the same period of igneous activity.

GENERAL CHARACTER OF VEINS.

The largest and most persistent veins so far discovered occur in the porphyrite area. They are not, however, confined to this formation, a few occurring in the granite and some, also, in the slates. The veins occupy typical clean-cut fissures with regular walls often slickensided and grooved. They are comparatively narrow but as a rule exhibit remarkable persistency in strike. The Uranus vein, with a width of from one to four feet, has been traced by small openings and surface showings for a distance of about 1,500 feet and may extend much farther, while the Montana vein, with a maximum width of five feet in the portion explored, has apparently been cut at a distance of 1,600 feet from the main workings and may also of course be very much longer. The Venus No. 2 lead (the largest seen by the writer) has a width of nine feet at two openings about 400 feet apart, and must extend for long distances in both directions. Numerous other veins such as the M. and M., the Joe Petty and Venus No. 1 are traceable by surface outcrops for several hundred feet. Portions of all

these veins are concealed by slide rocks and their full length was not ascertained.

The dip and strike of the veins are exceedingly irregular. The Montana vein strikes N. 43 W., while the direction of Venus No. 2 is about N. 42 E. The M. and M. strikes nearly north and south. The dips are nearly all to the south and west and vary in steepness from 12° in the Montana to 50° in Venus No. 1.

The gangue in all the veins is mainly quartz. Single and multiple lines of interlocking quartz crystals is a constant feature. In a few instances, portions of the vein-filling consist of alternating layers of quartz and country rock. The latter, in such cases, is always heavily mineralized, usually with iron, and weathers to a rusty colour.

The list of metallic minerals contained in the veins as identified in the field, and in the laboratory of the Survey from specimens brought back by the writer includes the following:—

Native Silver.—Occurs in small spangles and in wire form in the Montana and Uranus veins.

Argentite.—Is found in some of the veins but is not abundant.

Stephanite.—Occurs in several of the veins and is an important source of silver.

Freibergite.—A dark, highly argentiferous mineral occurring in some abundance in the Joe Petty, Montana, and some of the other claims has been referred tentatively to this species. A partial analysis by Mr. Connor showed it to contain copper, silver, zinc, arsenic, iron, sulphur and antimony, the constituents of freibergite. The copper percentage in the specimen examined amounted to 9 per cent and the silver to 37 per cent.

Pyrrargyrite (Ruby Silver).—This rich silver mineral occurs in most of the veins, sometimes in considerable quantity.

Galena.—This mineral occurs in all the veins and is usually highly argentiferous.

Tetrahedrite.—Argentiferous tetrahedrite occurs in small quantities in the Montana, M. and M., and probably in other claims.

Chalcopyrite.—Occurs in the Silver Cliff and other claims east of Windy Arm.

Native Copper.—Occurs in the Millet, Fedora and other claims east of Windy Arm.

Malachite and Azurite.—Green and blue incrustations and stains referable to the copper carbonates and due to the leaching out of the copper in the tetrahedrite and freibergite occur in most of the veins.

Specimens of a green mineral stated to be a silver chloride proved on examination to be a copper carbonate. It is possible that such a chloride is present in some of the veins but it could not be detected in the specimens examined.

Iron Pyrite.—Common in all the veins.

Arsenopyrite.—Occurs in a number of the veins but is usually subordinate in quantity to the iron pyrite.

Pyrrhotite.—Occurs in the Big Thing group.

Sphalerite.—Zinc-blende occurs sparingly in most of the veins examined.

MIXING DEVELOPMENT.

Montana.—This important vein is situated on a bleak hillside about 3,700 feet above Windy Arm and 5,860 feet above the sea. An aerial tramway, four miles in length, connecting it with Conrad City, on the lake shore, was nearly completed at the time of my visit. At present, all supplies and materials for the mine, including firewood, are packed on horses.

The principal workings consist of a drift 180 feet in length. The drift pierces 50 feet of slide rock, then meets and follows the vein. A small fault, with a displacement of seven feet, was encountered at one point. The strike of the vein is N. 43 W., and the dip 10 to 12 to the S.W. The width of the vein increases from about two feet near the mouth of the drift to nearly five feet at the face. Some stoping has been done and a considerable quantity of ore has been shipped.

The ore minerals include native silver, pyrargyrite, argentite, freibergite (?), tetrahedrite, galena, and iron and arsenical pyrites. The distribution of the minerals through the quartz gangue is somewhat irregular. In places, especially near the walls, the vein matter is so thoroughly impregnated with silver-bearing minerals that it is rich enough to ship without much sorting—that is, it contains values of \$80 per ton and over. The leaner portion of the vein will require concentration.

The principal values in the vein are in silver. The ferruginous portion of the vein is stated to also carry some values in gold.

At the time of my visit a second drift, intended to cut the Montana vein at a distance of 1,600 feet in a northwesterly direction from the main workings, was being driven, mostly through slide rock. The two workings are connected by a line of float ore and in places where the surface is bare by outcroppings; the management were confident that the vein extended at least that far. Since leaving the camp the vein (or a vein stated to resemble the Montana vein in general character) is reported to have been struck.

Uranus.—The Uranus vein is situated just above the forks of Pooley creek, a small stream tributary to Windy Arm. It is distant from the Montana vein about a mile in a southerly direction, and from the lake about a mile and a half. The elevation above the lake is approximately 2,000 feet. The Uranus vein is traceable by numerous surface outcrops in a direction a few degrees east of south from the north to the south branch of Pooley creek, a distance of about 1,500 feet. The vein crosses a high ridge separating the two creeks and is thus exposed naturally in depth for some hundreds of feet. A tunnel starting at the south fork has been driven 180 feet along the vein, which dips to the west at an angle of about 40° and varies in width from a few inches to three or four feet. It carries considerable quantities of highly argentiferous galena and also some native silver, ruby silver and iron and arsenic sulphides. A few tons of sorted ore have been shipped.

Other important veins in the vicinity of Pooley creek and its branches are the Joe Petty and the M and M. The Joe Petty is a very strong vein. A shaft following the lead has been sunk at one point to a depth of about fifty feet, showing a vein fully six feet in width. The vein material consists of alternating bands of quartz and silicified and mineralized country rock carrying layers and scattered grains and crystals of the rich silver and silver-bearing minerals of the district. The M and M is a much narrower vein seldom exceeding twelve to fifteen inches in thickness, but is very persistent in strike. It is traceable on the surface for several hundred feet at least. This vein is especially rich in places in high grade silver minerals such as pyrargyrite, stephanite and the sulph-antimonite referred as freibergite.

Another important group of claims is situated south of Pooley creek and about half a mile west of Windy Arm. This group includes, among others, Venus No. 1, Venus No. 2, and Ruby Silver. No work was being done on them at the time of my visit. Venus No. 2 is an exceedingly strong vein. The only work done on it consists of two shallow openings

about 400 feet apart. These show a vein fully nine feet in width. The vein-filling consists of three and nine inches of quartz along the foot-wall, followed by alternating bands of quartz and decomposed and mineralized country rock. The ore is principally argentiferous galena. Good assays in gold are stated to have been obtained from this vein. Venus No. 1 is a smaller vein. A shaft following the vein has been sunk on it to a depth of fifty-two feet. This shows a quartz vein, increasing in width from ten inches at the surface to about thirty inches at the foot of the shaft, bordered by several feet of decomposed and mineralized country rock, fissured parallel to the vein. Fifteen tons of ore obtained in sinking the shaft and shipped to outside smelters are stated to have averaged \$65 per ton in silver. Ruby Silver is a narrow siliceous vein spotted, in places, with the mineral from which it takes its name. Very little development work has been done on it.

South of the Venus group, and apparently in the same zone of fracturing, are the Red Deer and Humber claims. The Humber vein, as shown in a couple of small openings, has a width of about two feet. The quartz is bordered above and below by about a foot of decomposed iron-stained country rock which might be considered part of the lead. A shaft twelve feet in depth has been sunk on the Humber Extension, an adjoining claim on the east. The vein followed has a width of about fifteen inches. The ore on the dumps showed galena, ruby-silver, stephanite and green copper carbonate, probably derived from tetrahedrite.

About a mile north of the Montana is the Big Thing group. The conditions here are different, as the country rock is granite. A considerable body of loose ore, principally argentiferous galena, evidently derived from a strong vein, occurs on one of the claims. The vein had not been determined at the time of my visit. A number of other veins are reported to cross the various claims, but were not examined.

The claims briefly described above comprise only a small proportion of those staked in the district, but on most of the remainder little or no development work has so far been done, and the time at my disposal did not permit me to make a systematic examination of them.

The general outlook for the camp is considered exceedingly promising, and its opening up marks an important event in the mining history of the country.

The mining conditions are not unfavourable. Most of the veins are situated at distances of from half a mile to four miles from the lake

and at elevations of from twelve hundred feet to three thousand six hundred feet above it. Aerial tramways can therefore easily be constructed for the carriage of the ores to the lake shore for concentration and can also be used to take supplies to the mines. Miners' wages during the past season amounted to \$3.50 per day for eight hours work, and ordinary labourers obtained the same amount for ten hours work. The cost of supplies, considering the short distance to the seaboard, and the almost continuous rail connection, ought to be moderate. The climate, while severe during a portion of the year, will have little effect on mining operations.

SKETCH MAP OF
WINDY ARM MINING DISTRICT.

YUKON TERRITORY.






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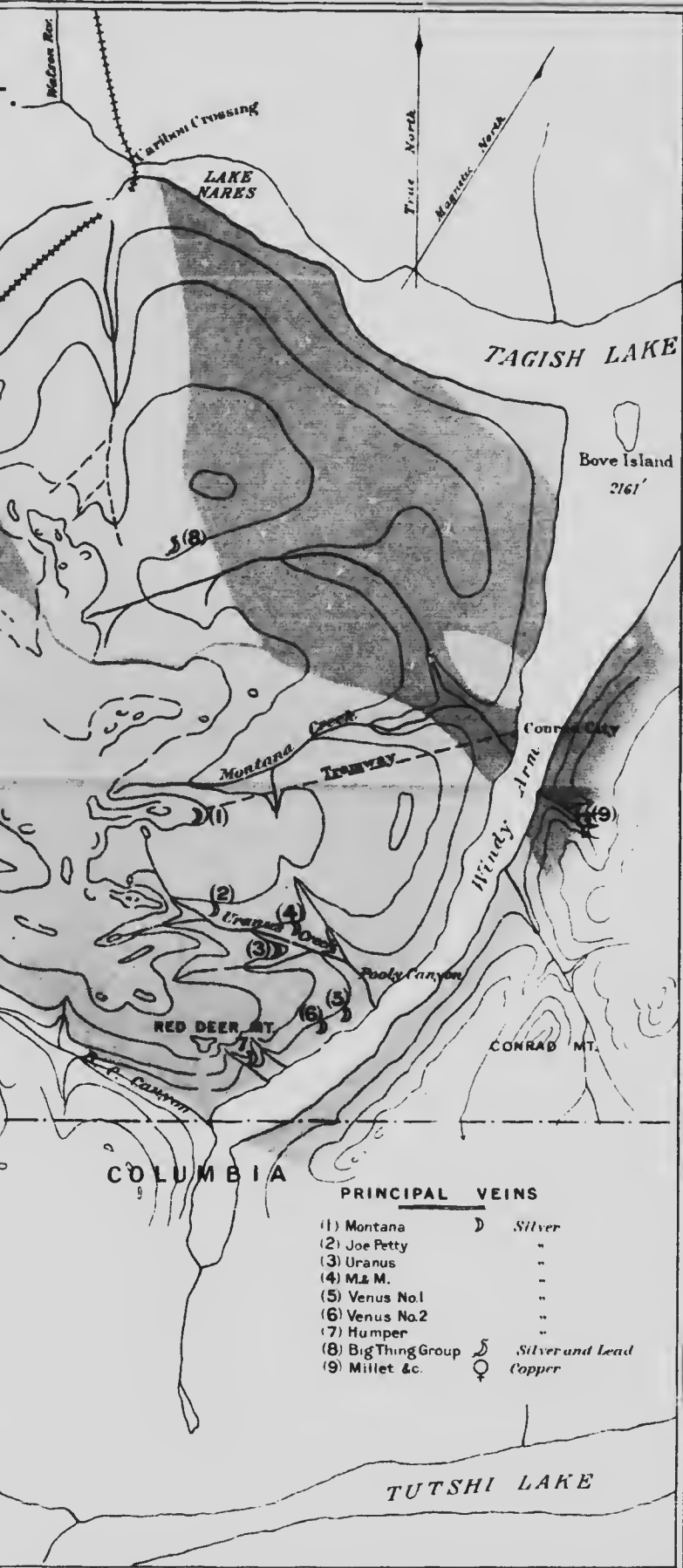
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Scale: 2 miles to 1 inch.



INDEX

-  Porphyrite and gabbro.
-  Granite.
-  Tutshi series - Jurassic?
(Argillites, tubaceous sandstones,
conglomerates, etc.)
-  Crystalline limestone - Carboniferous?
-  Tagish series.
(Slates, quartzite cherts, etc.)
- 2161' Heights above sea-level
- Approximate contour interval, 1000 feet.



PRINCIPAL VEINS

- | | | |
|---------------------|---|-----------------|
| (1) Montana | ⌋ | Silver |
| (2) Joe Petty | | " |
| (3) Uranus | | " |
| (4) M. & M. | | " |
| (5) Venus No. 1 | | " |
| (6) Venus No. 2 | | " |
| (7) Humper | | " |
| (8) Big Thing Group | ⌋ | Silver and Lead |
| (9) Millet & c. | ♀ | Copper |

