STATE OF IDAHO
C. A. Bottolfsen, Governor

IDAHO BUREAU OF MINES AND GEOLOGY
A. W. Fahrenwald, Director

GEOLOGY AND ORE DEPOSITS OF THE FLORENCE MINING DISTRICT,
IDAHO COUNTY, IDAHO

By
John C. Reed

Prepared in cooperation with
the United States Geological Survey

University of Idaho
Moscow, Idaho
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Figure 1. Generalized topographic map of the Florence, Bungalow, and part of the Simpson mining districts, and adjacent areas

Figure 2. Cirque lakes north of Gospel Peak near the Florence mining district

Figure 3. Accordant summits in the Salmon River Mountains from a point near Thunder Mountain. (Photograph by courtesy of Washington National Guard)

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Figure 12. Extensive old placers on the east side of Pioneer Gulch near the Adley cabin, Florence, Idaho. (Photo by Wm. L. Pepe)

Figure 13. Old placer work in weathered bedrock near the head of Baboon Gulch, Florence district, Idaho. (Photo by U. S. Forest Service)

Figure 14. Peat meadow, looking downstream toward mouth of White Sand Creek, from the forks of Sand Creek in SE 1/4 Sec. 19, T. 25, N., R. 4 E. Note dragline of Homestake Placers in background.

Figure 15. Placer cut made in 1935 and 1936 on the lower end of the Homestake group of claims

Figure 16. Site of the old town of Florence. All the old buildings are gone and the ground underneath has been washed for gold. The area shown lies just east of the Ward Cabin (see pl. 1). (Photo by U. S. Forest Service)

Figure 17. Sketch plan of cut on group of veinlets on the Golden Dike claim

Figure 18. Geologic map of the Waverly mine, Florence, Idaho
The Florence mining district is in the Clearwater Mountains of north-central Idaho. The part of the district mapped in detail for this report covers about 6 square miles and includes most of the placered areas and many of the lodes of the district.

The oldest known rocks of the district are quartzites, presumably to be correlated with the Belt rocks of northern Idaho. Quartzite appears in the area mapped in detail in two small outcrops only. The prevailing bedrock of the district is granitic and is part of the widespread Idaho batholith, which is probably of Upper Cretaceous age. Within the mapped area the granitic rock is almost exclusively quartz diorite.

Some parts of the mapped area are covered with gravel deposits herein designated as "older gravel". The areas of older gravel now present are believed to be remnants of a once much more widespread deposit. The older gravel is probably Tertiary or very early Pleistocene.

The valley floors in the mapped area are typically flat and wide. The unconsolidated materials in the valleys, where they have not been disturbed by placer-mining operations, are largely arkosic sand overlain by peat that ranges in thickness up to about 20 feet. Diatomaceous material from the peat and physiographic evidence indicate a post-Wisconsin age for the younger sediments and peat.

The mapped part of the district is a small part of a surface of relatively gentle relief that is 3 to 6 miles wide and stretches from the brink of the Salmon River Canyon on the south northward about 25 miles to the brink of the canyon of the South Fork of the Clearwater. This surface, called the "Florence surface", slopes northward from an altitude of about 6,000 feet near Florence to about 4,000 feet near the South Fork of the Clearwater. It is deeply dissected by several streams.

The Florence surface is believed to be part of an erosion surface, younger than the so-called "Idaho peneplain", which forms the upland of much of central Idaho and was developed before the middle Miocene. Columbia River lava of middle Miocene age is present at several places on the Florence surface.

The Florence surface is bounded on the west by several normal faults of considerable displacement. The east sides of the faults are downthrown. The eastern edge of the Florence surface may be due entirely to the erosional break between that surface and the older "Idaho peneplain", or it may be accentuated by structural warping.

Gold was discovered in the Florence district in 1861. The camp was very productive for a few years, but by 1869 was practically deserted. The early work was almost entirely placer mining. In 1894 quartz mining received a great impetus and several of the Florence lodes were worked for about 5 years, after which the district again became inactive. The Florence district has revived somewhat since 1931, but has not shared in the recent revival in gold mining to the extent of many other central Idaho districts.

The district has produced in total probably between $15,000,000 and $30,000,000 worth of precious metal. Probably less than $225,000 has come from lodes.
The placer deposits of the district embrace three types - deposits in weathered bedrock, deposits in older gravel, and deposits in younger sediments. Of these, the last have been the most productive, but the deposits in weathered bedrock have also yielded a large amount of gold.

The lodes consist typically of zones of small quartz veinlets in altered quartz diorite. The extent and gold content of these zones of veinlets is very imperfectly known. Some zones in the deeply weathered bedrock should be carefully prospected to determine whether or not they could be mined profitably by modern methods.

The placer and lode mines of the district, including all of the active ones and many of the old ones, are briefly described.
The Florence mining district was one of the most productive of the early central Idaho placer gold districts. This report is one of several of the various districts of central Idaho that have resulted from a cooperative investigation of the gold-bearing gravels of central Idaho by the Geological Survey and the Idaho Bureau of Mines and Geology. The cooperative project was instituted in 1933 and is still in progress. The scope of the investigation is outlined in an earlier pamphlet of the Idaho Bureau of Mines and Geology. 1

The field work in the Florence district was done in 1934, 1935, and 1936, and the total time spent in the field study was about seven weeks. In 1934, the writer was assisted by D. W. Koepsch and in 1936 by Vernon E. Scheid and V. F. Hammerand; in 1936 by V. F. Hammerand. Each of these men was deeply interested in the problems encountered and rendered able and enthusiastic service. The writer is indebted to them for much of the material presented herein.

The prospectors of the district furnished much information that has been of value in the preparation of this report. To Otto Egloff and Jack Hardin, the writer is especially indebted. Mr. Walter Hovey Hill of Grangeville was the source of considerable material on the earlier days of the camp.

The helpful and friendly cooperation of the men of the United States Forest Service is greatly appreciated. Special acknowledgment is due Roy H. Phillips, Supervisor of the Nespeca National Forest, and Earl McElwee, Ranger of the Adams district of the Nespeca Forest.

Previous to the investigations resulting in this report only a little geological work, and that of a reconnaissance nature, had been done in the Florence district. The three publications listed below contain practically all of the published information. Of the three, the first is by far the most detailed and informative.


In addition to the above, some of the Annual Reports of the Mining Industry of Idaho by the State Inspector of Mines, annual volumes of Mineral Resources of the United States, published by the Geological Survey until 1924 and by the Bureau of Mines from 1924 through 1931, Minerals Yearbook published by the Bureau of Mines since 1931, and various historical and technical publications contain scattered references to the district. Most of these references are historical or record production only, and few contain geological information.

The Florence mining district (fig. 1) is in the Nez Perce National Forest, Idaho County, Idaho. The district, which includes large areas not covered in detail in this report, is arbitrarily bounded as follows: From the head of Wind River down that stream to its mouth, thence down Salmon River to the eastern tip of the Simpson mining district at the mouth of French Creek (the Simpson district is a long, narrow area that includes the terraces and bars along Salmon River), thence along the north side of the Simpson district to Kelly Creek, thence up Kelly Creek to an altitude of about 6,000 feet, thence northward over the divide into the drainage basin of Slate Creek and roughly parallel to Slate Creek and a short distance east of it to its large tributary that heads in Slate Lake, thence up that tributary to and a little beyond Slate Lake to the divide at the head of Wind River, the place of beginning. The part of the boundary close to and parallel to Slate Creek is common between the Florence district and the Bungalow district, which lies to the west.

The part of the district with which this report is principally concerned, and from which has come most of the production, is an area of about 8 square miles in Township 26 N., Ranges 3 and 4 E. (shaded area, fig. 1). Range 4 E. has not been surveyed by the General Land Office, but Range 3 E. has been surveyed and the section corners that lie in the mapped area are marked on the ground.

Florence, once a thriving mining town of several thousand people, is now almost deserted. A count made in the summer of 1936 showed about 40 people living within about 4 miles of the site of the old town. Many of these are in the district in summer only, however.

Florence in most years is inaccessible by automobile because of snow for about seven months - from the middle of November to the middle of June. Formerly the only means of access to Florence by road was from Grangeville, about 42 miles to the north, by way of Adams Ranger Station. Since 1933 the United States Forest Service and the Civilian Conservation Corps, under the direction of the Forest Service, have built many miles of roads in the mountains of central Idaho, some of these make the Florence district much more accessible. Only one, however, actually reaches the central part of the district. This road leaves the Idaho North-South Highway at Freedom at the mouth of Slate Creek, climbs to the Slate Point-Nut Basin Ridge west of Florence, and then descends from near Nut Basin Lookout across the head of Slate Creek to Florence. The road being built up the Salmon River Canyon from the North-South Highway at Riggins has now been completed to a point east of the Florence district and in the summer of 1937 was reported to have progressed beyond Carey Creek (fig. 1).

The part of the Salmon River Canyon road along the south border of the Florence district is on the south side of the river. However, this road is on the Nez Perce Forest side from south of Kelly Mountain to near the mouth of Lake Creek and a branch road has been started from it at the mouth of Allison Creek. This branch road will lead up Allison Creek for some distance and then climb to Van Ridge east of Allison Creek and connect with the Nut Basin-Florence road near the head of Slate Creek.

A road has been built up Slate Creek to the main forks of the creek south of Adams Ranger Station. There it branches - one branch connects with the Adams Ranger Station-Florence road, the other leads up Slate Creek for about 2 miles. It is understood that the latter branch will eventually be extended up Slate Creek into the heart of the Florence district.
The Florence-Adams Ranger Station road does not reach an altitude much over 6,000 feet and consequently is the first road to open in the spring. The But Basin-Slate Point Ridge is crossed by the road near Nut Basin Lockout at an altitude of between 7,500 and 8,000 feet, and, therefore, that road is ordinarily not free of snow until the middle of July. When completed, the road from Salmon River up Allison Creek and that up Slate Creek will give earlier access to Florence than any of the others.

The road between Adams Ranger Station and Florence has been in relatively poor condition, although it is understood that it was improved in the summer of 1937, and during the summer many automobiles from Grangeville reach Florence by way of the longer Nut Basin road. The latter road is the best and shortest route from points south of Florence or along Salmon River.

Winter travel to and from Florence is commonly by snowshoes or skis directly south over the rim of the Salmon River Canyon to the snowline and then by foot to the Canyon road, which is open all year round and gives access to post offices at the mouth of French Creek and at Riggins.

The whole district is covered by a closely-spaced network of trails, maintained by the Forest Service, most of which are readily traversable by pack and saddle animals during the summer months.

There is no airplane landing field near Florence as there is in many of the central Idaho mining districts, but some of the large meadows along the upper reaches of Slate Creek in the eastern part of the Bungalow district could probably be easily developed into landing fields.

TOPOGRAPHY AND DRAINAGE

Central Idaho is a rugged mountainous region across which the Salmon River flows westward in a canyon locally more than 6,000 feet deep. At Riggins (fig.1) the river turns sharply northward and continues for more than 86 miles before it empties into Snake River, which in a direct line is only 12 miles from Riggins. Between Riggins and Freudom (fig. 1) the river follows the boundary between the mountains on the east and the Columbia Plateau on the west.

The mountains of central Idaho north of the Salmon are called the Clearwater Mountains, and those south of it, the Salmon River Mountains. Geologically, both mountain groups are parts of the same mass of rocks and the two names are merely convenient geographic terms.

Many of the valleys in the Clearwater and Salmon River mountains are deep and steep-sided, and most of them trend in general either north or south roughly parallel to the strike of the rocks. Some of the larger streams, such as the Lochsa, Selway, South Fork of the Clearwater, and Salmon rivers, flow westward in large parts of their courses.

The valleys that extend into the higher ridges and peaks commonly have the characteristic U-shaped cross-section of glacial valleys down to an altitude of 5,500 feet and locally as low as 4,000 feet. Most of these valleys start in glacial cirques whose walls rise precipitously to the upland below which they are cut (fig. 2). Many contain small lakes.

The main ridges of this mountainous area have gentle longitudinal profiles. Some of the ridges are narrow and serrate, but many of them are broad and flat. The ridges rise roughly to accordant altitudes. From elevated viewpoints, the ridge tops and broad upland areas seem to merge into a surface of relatively
Figure 2. Cirque lakes north of Gospel Peak near the Florence mining district.
little relief that stretches to the horizon in all directions (fig. 2). This surface, however, is dissected by innumerable canyons. The deep valleys, except those in the immediate foreground, are hidden from view. A few peaks rise conspicuously above the surface.

This upland surface has local variations, but in general is higher toward its southeast part in the Salmon River Mountains than it is in its northwest part in the Clearwater Mountains, where its general altitude is about 7,000 feet. In the western part of the Salmon River Mountains it lies at about 6,000 feet, but farther east it attains a height of 9,000 feet or more.

In contrast to the deep, steep, and narrow canyons occupied by the major streams, the mountains contain several broad, oval basins such as Elk Valley, Bear Basin, and Bear Valley, which commonly are several miles long and half as wide. As a rule, their longer axes, like most of the ridges, trend northward.

The part of the Florence district covered in detail in this report is a small portion of a surface of relatively gentle relief that ranges in width from about 3 miles to about 6 miles and stretches in a northerly direction from the brink of the Salmon River Canyon south of Florence to the canyon of the South Fork of the Clearwater, about 25 miles away. This surface slopes northward from an altitude of a little more than 6,000 feet at the brink of the Salmon Canyon to about 4,000 feet on Hungry Ridge above the South Fork of the Clearwater.

The surface is deeply dissected by parts of Mill Creek, Johns Creek, Slate Creek, and the main eastern tributary of Slate Creek that rises in Slate Lake, and locally by some smaller streams. In the Florence district it lies conspicuously below the widespread upland surface that is present, as shown on Figure 1, and by some small peaks and basins. The Florence surface is the high ridge west of the Florence surface, marked by Nut, Basin and Slate Point, as shown on Figure 1, and by Dairy Mountain, Jungle Point, and Nut Point. The Florence surface, the high ridge west of the Florence surface, is marked by Nut, Basin and Slate Point, and by Dairy Mountain, Jungle Point, and Nut Point. The Florence surface is the high ridge west of the Florence surface, marked by Nut, Basin and Slate Point, and by Dairy Mountain, Jungle Point, and Nut Point. 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Figure 3. Accordant summits in the Salmon River Mountains from a point near Thunder Mountain. (Photograph by courtesy of Washington National Guard)
rise in general in gentle depressions filled with peat bogs and flow in moderate canyons a few hundred feet deep near Slate Creek. The streams that enter from the west, however, plunge steeply down the scarp that rises to the Nut-Basin-Slate Point Ridge. Their courses are straight, their valleys narrow, and many of them rise in glacial cirques.

Mill Creek rises near Adams Ranger Station and flows northward away from the Slate Creek Canyon. Like Slate Creek, its valley becomes narrower and deeper toward the north. It flows along the west edge of the Hungry Ridge part of the Florence surface and empties into the South Fork of the Clearwater River.

About half of the productive part of the Florence district, the part represented by Plate 1, drains into Salmon River by way of Meadow Creek and Wind River (fig. 1). Above a point about a mile below the confluence of Meadow Creek and Sand Creek, Meadow Creek and its tributaries flow on the Florence surface and are characterized by gentle gradients and broad peat bogs. Below that point the gradient of Meadow Creek steepens and the stream enters a deep and rugged canyon that is tributary to Wind River about 2 miles upstream from its mouth in Salmon River (fig. 1).

The area mapped in detail (pl. 1) is typical of undissected parts of the Florence surface. The streams meander quietly through peat bogs (except where the peat has been removed by placer mining operations). Intermittent divides are low, rounded, and in places scarcely recognizable. At one place in the southwest part of Sec. 13, T. 25 N., R. 3 E., a cut less than 30 feet deep, made to divert water for placer mining, breaches the divide between the Slate Creek and the Meadow Creek drainages and causes the water of Bealy Creek and the head of White Sand Creek to reach Salmon River through Slate Creek 43-1/2 miles below the mouth of Wind River.

CLIMATE AND VEGETATION

The climate of the Florence district, as defined in this report, differs from place to place. The high country around Slate Lake and Hanover Mountain has a much colder and wetter climate than does the Salmon River Canyon, which is locally called "the banana belt". Most of the Florence surface has a climate intermediate between the two, but, as the general altitude is about 6,000 feet, the climate resembles that of the high mountains rather than that of the canyon. In the higher, wetter areas, a larger proportion of the annual precipitation falls as snow than in the canyon areas.

Unfortunately, no systematic weather observations have been made within the district and the scattered figures given below are estimates based on climatological data for localities in central Idaho outside the Florence district published by the U. S. Department of Agriculture, Weather Bureau, and on personal observations and reports of local inhabitants.

On the Florence surface and higher country, the mean annual temperature probably is about 42° F., and mean monthly temperatures possibly range from about 20° in January to 60° in July and August. In the Hanover Mountain-Slate Lake vicinity, winter temperatures as low as 30° below zero are probably not uncommon, but on the Florence surface they are seldom reported to be that cold. Killing frosts may be expected in any month except July and August, and occasionally even in those months.

On the Florence surface, and above, the mean annual precipitation is thought to exceed 30 inches and may occasionally reach 40 inches. Much of this falls as snow, which commonly covers the ground for more than 6 months of the year and often accumulates to depths of 10 feet or more.
GEOLOGIC AND TOPOGRAPHIC MAP OF THE FLORENCE MINING DISTRICT,
IDAHO COUNTY, IDAHO

Some peat areas are underlain by gold-bearing material
1887
The vegetation in the Salmon River Canyon indicates a much drier climate. The Weather Bureau records a total of 9.77 inches for 1936 at Riggs, not far down the Salmon River from the Florence district (fig. 1). The canyon country is reported to receive very little snow and temperatures there are also much higher in the summer than in the mountains.

The part of the Florence surface mapped in detail for this report is too high for the ponderosa pine, which is prevalent in many parts of central Idaho and is abundant on the slopes of the Salmon River Canyon, only a short distance to the south. Most of the mapped area is covered by a moderately dense stand of lodgepole pine, but only a few trees exceed a foot in diameter. Locally, thickets of young lodgepole pine are so dense that travel through them is difficult. Over wide areas, however, where the trees are 6 inches or more in diameter the shade has stunted or prevented the growth of underbrush and travel over the thick carpet of pine needles is easy.

Here and there in the mapped area groups of large tamaracks grow among the younger pines. These have withstood the ravages of old fires that destroyed the pines.

Alder and huckleberry thickets are not uncommon and most of the peat bogs are devoid of trees (see fig. 14). In those places where the peat has been removed or disturbed by mining operations and the swamps partly drained, the pines have encroached over the old meadows and they have overgrown many of the old tailings piles.

**GEOLOGY**

**DISTRIBUTION, DESCRIPTION, AND AGE OF THE ROCKS**

**Quartzite**

Quartzite was seen within the mapped area at only two places, both in the SW 1/4 Sec. 7, T. 28 N., R. 4 E. The area of outcrop at each of these places is only a few hundred square feet, too small to show on the map (pl. 1), and the outcrops are so poor that the structure could not be determined.

At both places, the rock is similar in appearance to, and is correlated with, the typical quartzite that is widespread in central Idaho, and which is known to be abundant within the Florence district in the Hanover Mountain-Slate Lake vicinity and in other parts of the Buffalo Hump quadrangle.

The following quotation is taken from an earlier report by Shenon and Reed on some parts of the Nezperce National Forest, a short distance east of the Florence district /1/, and applies also to the small areas of quartzite in the mapped part of the Florence district:

"The typical quartzite is a snow-white granular rock in which glistening flakes of white mica are visible. ***** It is believed from the incomplete data at hand that much material was added to the quartzite in favorable places by emanations from the Idaho batholith".

Regarding the age of the quartzite, it was stated in Circular 9 /2/ as follows:

2/ Ibid., p. 16.

6.
"The quartz-mica schist, quartzite, gneiss and related rocks, and hornblendite sills are all clearly older than the granitic rocks of the Idaho batholith, which in places cut tightly compressed folds in the older rocks. Although no direct evidence is available for fixing the age of these rocks, they correspond structurally and lithologically with the Belt series, which is widespread in northern Idaho."

The small quartzite outcrops in the mapped area are believed to represent xenoliths of the Belt rocks in the granitic rocks around Florence and perhaps indicate that the granitic rocks now exposed were not far below the original roof of the batholith.

**Quartz diorite**

Quartz diorite (designated quartz monzonite on pl. 1) is the prevailing rock of the mapped part of the Florence district. It is the only bedrock known in the vicinity of Florence with the exception of the two small quartzite areas already described. The quartz diorite is believed to be present also under the parts of the mapped area covered by younger unconsolidated deposits, which will be described later.

The quartz diorite is part of the extensive Idaho batholith that occupies a large part of the mountainous area of Idaho and is one of America's largest batholiths.

The fresh quartz diorite of the Florence district is a light-gray, medium-grained, massive rock. It is locally porphyritic, but the phenocrysts are not abundant nor are they many times larger than the grains of the ground mass that in general are about one-eighth inch in diameter. Biotite, quartz, and feldspar grains are readily recognized and make up the bulk of the rock. Commonly the quartz diorite is foliated, but the foliation is not conspicuous and ordinarily can not be detected easily in the hand specimen.

The quartz diorite has been altered, presumably by hot waters, at many places in the district. Commonly the altered rock is light-buff and is distinguishable in the field by the absence of biotite and the presence of muscovite. Quartz veins or groups of many small quartz veinlets are commonly associated with zones of altered rock. Exposures are not good enough and underground workings are not extensive enough to permit the mapping of any of the zones of altered quartz diorite.

At many places, including the mapped area, the Florence surface (defined on page 4) is deeply weathered. Locally, at least, extensive weathering is known to have taken place to a depth of not less than 50 feet. As the weathered rock crumbles easily to coarse sand that closely resembles the low, rounded outcrops from which it came, it may be distinguished from the hydrothermally altered rock mentioned in the preceding paragraph.

The principal component minerals of the fresh quartz diorite are plagioclase, quartz, and biotite. Accessory minerals include orthoclase, muscovite, sericite, chlorite, epidote, titanite, apatite, magnetite, and zircon. They are not abundant and ordinarily constitute in aggregate less than 5 per cent of the rock. The following table shows the approximate mineral constitution of typical specimens of the fresh quartz diorite as determined by several measurements in different directions across each of several thin sections. Specimen 5 contains enough orthoclase to permit its being classed as granodiorite. The composition of the plagioclase in each section also has been determined approximately.
<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Location</th>
<th>Composition of plagioclase</th>
<th>Major constituents</th>
<th>Accessory constituents (x indicates those recognised but not measured individually)</th>
<th>Total of accessories indicated by x</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SW 1/4 NW 1/4 Sec.22 T 25N, R. 5 E.</td>
<td>Sodic andesine + An 35</td>
<td>Plagioclase 75, Biotite 12, Orthoclase 9</td>
<td>2- x x x x x</td>
<td>2+</td>
</tr>
<tr>
<td>2</td>
<td>Same location as 1.</td>
<td>Andesine Between An35 and An40</td>
<td>Plagioclase 57, Biotite 28, Orthoclase 8</td>
<td>3 x x x x x x x</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Center of SW 1/4 Sec. 12 T 25N, R. 5 E.</td>
<td>Oligoclase andesine + An30</td>
<td>Plagioclase 82, Biotite 28, Orthoclase 8</td>
<td>x x x x x x</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>NE 1/4 NW 1/4 Sec. 12 T 25N, R. 5 E.</td>
<td>Sodic andesine</td>
<td>Plagioclase 58, Biotite 22, Orthoclase 15</td>
<td>2 x x x</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>NE 1/4 NW 1/4 Sec. 25 T 25N, R. 5 E.</td>
<td>Sodic andesine</td>
<td>Plagioclase 52, Biotite 26, Orthoclase 7</td>
<td>12 x x x</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>SW cor. NW 1/4 Sec. 25 T 25N, R. 5 E.</td>
<td>Sodic andesine + An35</td>
<td>Plagioclase 37, Biotite 20, Orthoclase 9</td>
<td>x x x x x x x</td>
<td>4</td>
</tr>
</tbody>
</table>
Microscopic examination confirms the complete absence of biotite in the hydrothermally altered quartz diorite. In general the plagioclase of the altered rock is a little more sodic than that of the fresh rock and appears to range from sodic oligoclase to sodic andesine. As in the fresh rock, the combined plagioclase and quartz makes up about 80 to 90 per cent of the altered rock. The plagioclase in the altered rock is, however, considerably more sericitized, locally, to an extent that makes the determination of its composition impossible. In one thin section of an altered specimen, quartz exceeds plagioclase, but commonly the reverse is true and the ratio of plagioclase to quartz is about the same as in the fresh rock. Flakes of muscovite about one-eighth inch in diameter are common in the altered rock. One specimen contains nearly 20 per cent epidote and about 10 per cent green chlorite. Accessory minerals are not common, but titanite, zircon, apatite, magnetite, and pyrite were noted in very small quantities.

Examination of thin sections of weathered, crumbly specimens, which before grinding were impregnated with bakelite, shows that no appreciable chemical or mineralogical change has accompanied the weathering process. The grains have cracked and broken and have largely lost their adherence to other grains. But even the feldspar crystals are no more altered to sericite and clay minerals than the feldspars of the unweathered rock.

The rocks of the Idaho batholith differ considerably from place to place. Quartz monzonite is perhaps the most abundant rock and granodiorite and quartz diorite both appear to be represented by large masses. In the following few paragraphs the quartz diorite of the Florence district is briefly compared with other rocks of the Idaho batholith, at not very distant localities, in order to emphasize the range of composition within the batholith, the effect on composition of position near the walls, roof, or in the interior of the batholith, and the possible relation between some ore deposits and the composition of the batholithic rocks.

In speaking of the Idaho batholith, in the region around Orofino, about 75 miles north of Florence, Anderson says 1/ "In this region it (the batholith) has a wide marginal zone of gneissic quartz diorite, and a great inner core of quartz monzonite and granite".

The quartz diorite of the marginal zone in the Orofino region is very similar to that in the Florence district. Florence is not far from the western border of the batholith and may be in a marginal zone similar to that described by Anderson. Wall rocks of the batholith crop out in the Bungalow district, less than 3 miles west of the western edge of the mapped area.

In the Elk City district, about 35 miles northeast of Florence, the batholithic rock is granodiorite, and in the Buffalo Hump quadrangle, between Elk City and Florence, it is quartz monzonite. These rocks differ from the quartz diorite at Florence principally in their large microcline content and in having oligoclase as the common plagioclase instead of andesine.

Pegmatitic border zones between the batholith and roof pendants or xenoliths of the enclosing rocks are present in some places in the Buffalo Hump quadrangle. The rocks of these zones are more siliceous than the other batholithic rocks and, like the rock of the altered zones at Florence, contain practically no dark minerals. 2/ Certain mineralized shear zones in the Dixie district a short distance east of the Buffalo Hump quadrangle also contain rocks that are apparently similar to the altered rock near Florence.

2/ Shannon, P. J., and Reed, J. C., op. cit., p. 16.
The Warren district, south of the Salmon River, is deep within the batholith and, so far as is known, about 5 miles from any considerable mass of roof rocks. Roof rocks may, however, have been eroded away from no great distance above the present surface in the Warren district. The typical granitic rock at Warren is quartz monzonite and contains about 20 per cent microcline.

Age of the quartz diorite

The age of the Idaho batholith is not yet definitely established. It is known to be younger than a thick sequence of volcanic and sedimentary rocks of probable Permian and Triassic age which it intrudes in the area that extends from the Seven Devils Mountains northeastward at least into the Orofino region. The batholith is definitely older than the Columbia River lava, which is regarded as of middle Miocene age in this area, and probably considerably older, for the lavas poured out on an erosion surface that had been cut in places deep into the granitic rocks.

Various estimates of the age of the Idaho batholith range from Jurassic to Eocene. Ross has summarized the published material and has discussed the age of the batholith in some detail.

It is felt that the batholith, at least in central Idaho, is probably of Upper Cretaceous age. This is confirmed by a determination of the lead-uranium plus thorium ratio of pitchblende from a placer in the Warren district. The pitchblende is believed to have come from the batholith.

Older gravel

Some parts of the mapped area in the Florence district are covered with gravel deposits herein designated as "older gravel" to distinguish them from younger unconsolidated sediments that floor most of the stream valleys. The thickest and most extensive deposits of older gravel are in Sec. 7, T. 24 N., R. 4 E., southwest of the West Fork of Meadow Creek, but smaller deposits are known at several other places in and near the mapped area, particularly in the drainage basins of Ozark Creek, Pioneer Gulch, tributaries of Miller Creek north of the mapped area in Secs. 11 and 12, T. 25 N., R. 3 E.; a short distance west of the Canfield cabin at Florence, along Summit Creek and some of its tributaries in the SW 1/4 Sec. 18, T. 25 N., R. 4 E.; on the northwest side of Sand Creek in the SW 1/4 Sec. 19, T. 25 N., R. 4 E.; on the southeast side of Sand Creek in the NE 1/4 of the same section; and along the lower parts of Meadow Creek and Sand Creek in the eastern part of Sec. 18, T. 25 N., R. 4 E.

Near some of the small tributaries of Miller Creek a short distance north of the mapped area the gravel has been recognized at an altitude of a little less than 5,900 feet. Near Florence and in the SW 1/4 Sec. 18, T. 25 N., R. 4 E., considerable amounts of it lie about 6,100 feet.

At some places, particularly along lower Sand and Meadow creeks, the gravel forms the floors of present valleys, is locally overlain by peat and by younger arkosic sediments, and is present also in conspicuous terrace remnants. In other places, as near Florence and in the vicinity of the low hill east of the Adley and Pape cabins, the gravel lies on divides and hillides and apparently bears no relation to the present drainage pattern.

Similar gravel, in similar physiographic settings, is known at several other places on the Florence surface - for example, along the Florence-Bat Basin road about one-fourth mile west of Slate Creek; near Royal Creek in Sec. 6, T. 25 N.,
R. 3 E., and along the Hungry Ridge road about one-half mile north of Adams Ranger Station. At all of these places, except those in the mapped area, the gravel is closely associated with flows of Columbia River lava and locally at least appears to be interbedded with it. Near Florence, however, no lava has been found, and thus it is not definitely known that the older gravel there is correlative with the similar gravel at other places on the Florence surface.

Although in and near the mapped area the gravel has been recognized over a vertical interval of more than 200 feet, from altitudes of less than 5,000 feet to more than 6,100 feet, at no single locality is more than 20 feet of it exposed in place. At many places the gravel covers hilltops for a greater vertical interval than 20 feet, but in these its position appears to be partly due to redistribution of pebbles and boulders from higher deposits over lower hill slopes.

At no place in the mapped area is the bedding distinct enough or are the exposures good enough to tell whether or not the gravel has been disturbed by structural movements. In a placer cut near Royal Creek in Sec. 8, T. 26 N., R. 3 E., in the Bungalow district, similar gravel and associated Columbia River lava dip about 10° in a direction about S. 100° W.

The older gravel in the vicinity of Florence is characteristically well rounded and composed entirely of quartz and quartzite, the latter greatly predominating. The observed size range is from pebbles about one-half inch in diameter to boulders up to 2 feet across. The predominant size is probably about 3 inches. At most places on the hilltops the gravel is mixed with the arkosic sand formed by the weathering of the rock of the Florence surface. But where well exposed, as, for example, in the two small placer cuts about one-third mile east of the Adley cabin, the gravel contains little fine-grained material.

As the older gravel near Florence is well rounded, it was probably transported a considerable distance by running water. This is confirmed by the fact that it is largely quartzite, which is scantily present in the mapped area but widespread at other places in the general region. The position of much of the gravel on hilltops and slopes shows that it is older than the present drainage system. The fact that it is now found in separated patches over a considerable area, and through a vertical distance of more than 200 feet, indicates that originally it was much more extensive than it now is. Field relationships indicate that the gravel was deposited on the already deeply weathered Florence surface.

The gravel is therefore certainly much younger than the Florence surface, which was cut deeply into the Idaho batholith of presumably Upper Cretaceous age.

So far as is known, the gravel contains no pebbles and boulders of any rocks other than quartzite and quartz. Therefore, the gravel is probably so old that any pebbles or rocks of the batholith, which it almost certainly once contained, have been completely broken down by weathering. This enables a probable minimum age limit for the gravel to be set. Glacial deposits older than the Wisconsin glacial stage lie in several places on the Florence surface. These deposits contain much batholithic material that has not yet been destroyed by weathering. Therefore, the older gravel is older than this pre-Wisconsin glaciation and is probably not younger than early Pleistocene.

It will be shown later that the Florence surface is believed to be a large depressed portion of a higher erosion surface. The depression of parts of such an erosion surface might well permit the accumulation of gravel deposits on the depressed part.

On the other hand, there is good evidence that the Columbia River lava of
middle Miocene age poured out on the Florence surface before it was depressed. The
similarity of the gravel around Florence, and of that associated with the Columbia
River lava at other places on the Florence surface, has been pointed out already.
There is no lava near Florence, presumably because, before the depression of the
Florence surface, that part of the surface stood above the level of the highest
flows. If the older gravel near Florence iscorrelated with the older gravel at
other places on the Florence surface, it must have been deposited before the de-
pression of the surface. If not, there is gravel of at least two ages on the
Florence surface.

Thus, in summation, the age of the older gravel near Florence can not be def-
initely fixed. It is probably Tertiary or very early Pleistocene. It may have been
deposited on the Florence surface before that surface was depressed, in which case
it probably is correlated with the gravel associated with the Columbia River lava
at other places, or it may be younger and may have accumulated after and because of
the depression of the Florence surface, which took place after middle Miocene time
and before a pre-Wisconsin glaciation.

Younger sediments and peat

All of the stream valleys in the mapped part of the Florence district have
gentle gradients. The valley floors are typically flat and wide and originally
contained accumulations of arkosic sand covered by peat. Most of this valley fill
has been worked during placer-mining operations (see pl. 1) and only in certain
localities can undisturbed sections be found. In places the arkosic sand contains
large quantities of angular to poorly rounded fragments of quartz veinlets. Some
thin peat layers beneath the thick surface layer are interbedded locally with the
sand. In a few places the surface peat contains layers a few inches thick of light-
gray material rich in diatoms.

In many places, where the valleys are relatively narrow, the valley fill con-
tains many partly decomposed angular masses of quartz diorite up to several feet in
diameter.

Along a few creeks, particularly near remnants of the older gravel, the valley
fill in places is locally made up largely of pebbles and boulders of older gravel
that have been moved down into the valleys and there covered by the widespread peat.

The valleys are now better drained than they were before placer mining. The
peat was dug up to reach the gold-bearing material below and as it dried was partly
washed away, but the placer tailings piles contain many pieces of dried peat. Where
undisturbed, the peat still is forming and the valley bottoms are very swampy. The
peat ranges in thickness up to 20 feet and consists of water-soaked, black, vegetable
material that is full of roots, stumps, and logs, many of which are well preserved.
In digging some test pits during this survey, to determine the thickness of the peat
an axe was constantly required. A specimen of the wood from several feet under the
surface of the peat on White Sand Creek was studied by Brown 1/ and was identified
as pinus ponderosa, a tree that is common in central Idaho today, but which does
not grow in any great numbers much above an altitude of 5,000 feet. No ponderosa
pines now grow in the mapped area, but there is a good stand a few miles to the
south at a lower altitude on the middle slopes of the Salmon River Canyon.

The diatomaceous material is very light and soft, and the color is light-gray.
It is interbedded with the peat in layers that at several places attain a thickness
of several inches. Some of the soft light layers may be ash-formed by the burning
of the peat surface during dry seasons many years ago. Microscopic examination 2/

1/Brown, R. W., personal communication.
2/Examination of diatomaceous material by K. E. Lohman.
of some of the material collected shows an abundance of diatoms of many species, all of which are represented today by living diatoms, widely distributed. Lohman also reports that the diatoms are overwhelmingly fresh-water species, living at present in lakes and streams that are low in salines.

The arkosic sand is very similar to the weathered quartz diorite and many test pits dug to determine the depth to bedrock were unsatisfactory for that purpose because of the difficulty in recognizing the contact between the arkosic sand and the weathered bedrock. In some pits the bedrock is seamed with quartz veinlets or small pegmatite dikes that serve to identify the contact.

The sand consists of the individual mineral grains of the quartz diorite as well as small pieces of that rock which have been transported from nearby slopes to their present positions. Much of the sand was apparently carried down the streams, but the heavier minerals and larger pieces of quartz veinlets were selectively left in the upper courses so that the proportions appear larger in the sand than in the bedrock.

Short descriptions and several measured sections of the younger sediments and peat from a number of widely separated localities in and near the mapped area follow. They are given to show the appearance and nature of these materials at typical localities.

On the Cow Creek placer claims, south of the mapped area, along Little Cow Creek, a tributary to Robbins Creek that flows southward into Salmon River, and probably in Secs. 26 and 35, T. 25 N., R. 3 E., the basal layer one to several feet thick is coarse, angular, arkosic sand that is stained with limonite. Locally, the sand contains considerable clay. The sand in some places contains many large, partly decomposed chunks of quartz diorite. Some of the ground contains a few angular pieces of vein quartz several inches in diameter. The sand is overlain by one to six feet of peat and muck.

For nearly half a mile northward from the line between Secs. 23 and Sec. 14, T. 25 N., R. 3 E., the gradient of French Creek is steep and the valley is choked with many huge, only slightly decomposed blocks of quartz diorite. Locally, the interstices are filled with sand, but there is very little peat. Southward, throughout the course of French Creek through Sec. 23, the gradient is much less and the valley, before placer mining, was covered with peat. The placer tailings consist mainly of quartz diorite sand, but contain an unusually large number of moderately well rounded quartz pebbles up to several inches in diameter. At the Chamberlin placer, near the Chamberlin cabin, the section shows a 3-foot layer of limonitic quartz diorite sand with partly decomposed chunks of quartz diorite, overlain by one foot of peaty soil.

Near the head of Healy Creek, where the stream crosses the line between Secs. 26 and 23, T. 25 N., R. 3 E., the peat is 6 feet thick and contains a large amount of wood. It overlies an undetermined thickness, but at least 5 feet, of quartz diorite sand with fragments of quartz.

At the Lost Meadow placer, along Hi-Yu Creek near the Paul cabin, the valley fill is about 50 feet wide, and the following section was measured from the top down: 1-1/2 feet of interlaminated gray and black (peaty) clay with some sand; 1 foot of bedded, red quartz diorite sand containing large quartz diorite blocks; at least 2 feet of quartz diorite sand. Bedrock was not definitely identified.

Farther down Hi-Yu Creek, about 400 feet upstream from its mouth, in Black Sand Creek, old placer tailings of quartz diorite sand contain boulders of the bedrock.
up to 3 feet in diameter. A large amount of vein quartz in angular pieces several inches across is present also. The surfaces of one fragment of quartz about 4 inches in diameter showed at least 30 colors of gold.

The following section was measured in a test pit near the head of White Sand Creek in the NE 1/4 Sec. 23, T. 25 N., R. 3 E. At this place, the water table was apparently lowered during old placer work by means of accelerated drainage through a placer cut about 30 feet from the test pit.

Surface

Ft. In.
--- ---
8 9 Peat with large amount of wood. Some logs up to one foot in diameter. Peat dried and checked on top. Some layers of diatomaceous material interbedded in peat.
6 Yellow clay and sand.
2 Carbonaceous material.
1 1 Gray, quartz diorite sand with quartz diorite blocks up to 2 feet across near top.
2 2 Bright red, quartz diorite sand. Marks present water table.
1 4 Gray, quartz diorite sand.

Bedrock not found, but hole could not be dug deeper because of water.

A few hundred feet down White Sand Creek from the NW corner of Sec. 24, T. 25 N., R. 3 E., a hole dug through old tailings revealed the following section:

Ft. In.
--- ---
4 1 Fine sand with many angular to slightly rounded fragments of quartz pegmatite, and quartz diorite. Sand also contains a few lumps of soft, gray clay.
8 Angular gravel stained red by limonite.
3 4 Arkosic sand with small pieces of peat.

Bedrock was not reached as the hole was dug only 6 inches below the water table, which stands at 7-1/2 feet.

Two test pits were dug about 20 feet apart along White Sand Creek near the mouth of Six Ounce Gulch, which is the first small gulch that enters White Sand Creek from the north below the mouth of Bealy Creek. The measured sections in these closely-spaced holes show little similarity.

Hole A

Ft. In.
--- ---
4 6 Old tailings.
1 Peat with local sand lenses.
6 Gray, diatomaceous material.
11 Gray, quartz diorite sand with much vegetable material.
1 Yellow clay. Water table at top.
1 10 Gray, quartz diorite sand with small pieces of quartz and pegmatite; some coated with clay.

Bedrock not reached.
Nole B

<table>
<thead>
<tr>
<th>Ft.</th>
<th>In.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Loose, peaty soil.</td>
<td></td>
</tr>
</tbody>
</table>

1 1
Gray and black peaty clay.

4
Yellow, clayey sand.

3
Fleet.

5 9
Quartz diorite sand with a few quartz diorite blocks up to at least 3 feet in diameter. This layer locally stained red with limonite on one side of hole. Other side harder and not stained; may be bedrock. Water table at 6-1/2 feet.

A 4-foot test pit was dug in old tailings along Miller Creek about 350 feet above the point where the creek crosses the line between Secs. 13 and 14, T. 25 N., R. 3 E. The water table stands at 3-1/2 feet. The tailings of arkosic sand contain fragments of quartz diorite, quartz, and feldspar up to about 1-1/2 inches in diameter. About 4 inches of the material is stained yellow at the water table.

At the edge of the mapped area, about 100 feet downstream from where Miller Creek crosses the line between Secs. 14 and 11, T. 25 N., R. 3 E., the stream cuts deeply into placer tailings. Water level stands 13 feet, 6 inches, below the top of the tailings. The upper 6 feet, 10 inches, is largely bedded arkosic sand with a few angular pebbles. From there to a depth of 15 feet, no bedding in the sand is apparent. The lower material carries many angular blocks of quartz diorite up to 2 feet across, a few well-rounded pebbles and boulders, a little clay, and occasional logs.

Along Meadow Creek and its west fork, and the lower parts of Imperial and Sand creeks, a thick peat layer overlaid well-rounded gravel before the material was disturbed by placer mining. At some places, the gravel in the valleys is at least 10 feet thick.

Origin and age of younger sediments and peat

It is apparent that the sources of the younger sediments are not far from their present positions. This is shown by the facts that the rounded pebbles and boulders of the older gravel are found in the younger sediments only in the vicinity of remnants of older gravel on the hill slopes; by the absence of rounding of sand grains and fragments of quartz; by the absence of sorting in the materials that make up the arkosic sands; by the presence of large, angular quartz diorite blocks where the valley floors are relatively narrow and the slopes relatively steep; and by the similarity of the arkosic sand and the adjacent bedrock.

Before placer mining began, the present streams had very little power to transport any but the finest material. Their grades were flat and their peat-floored valleys wide. Even today, after the removal of much of the peat, the streams carry little detritus. At one time, however, these same streams had a slightly greater eroding power and flowed in slightly deeper valleys than they now do. This must have been so, for the streams cut their valleys to the depth of the bottom of the present valley fill. Also, the Florence surface, as now recognized, must have been lowered by the present streams some unknown, but probably not very great, amount to remove all but remnants of a once more widespread sheet of older gravel.

At some time during this slight dissection and lowering of the Florence surface, conditions changed enough to cause the stream valleys to receive and retain their present fill of arkosic sand and associated materials. This time cannot be definitely fixed nor can the reason or reasons for the changed conditions resulting in sedimentation instead of slight erosion be definitely recognized.

14.
It is believed that the sedimentation took place after the pre-Wisconsin glaciation, mentioned in the section on "older gravel", because the quartz diorite blocks in the sediments still retain their form and shape, and are no softer than many outcrops on the few steeper slopes. Very possibly the material may be younger than the Wisconsin glaciation during which glaciers moved down many youthful valleys, such as those of Hanover Creek and Wind River, which had already been cut thousands of feet below the Florence surface. Possibly the sediments were deposited because there was a drier climate at some time after the Wisconsin glaciation. Less rainfall would decrease the effectiveness of the streams.

Such a climate grading into a warm and progressively wetter climate might result in the start of the accumulation of peat over the sediments because of the more vigorous growth of vegetation. At this time, ponderosa pine thrived at an altitude above that at which it grows today. According to Lohman, the diatomaceous material that he studied (p. 111) may be of late Pleistocene to early Recent age, as is suggested by the fact that all the species seen are living today and are widely distributed.

Finally, for a time preceding the advent of placer mining in the region, the climate may have become cold enough to eliminate the ponderosa pine and other trees in the peat bogs, for the vegetation in the bogs now is typically without trees, and the present surface layer of peat began to accumulate.

Capps has suggested the possibility that beaver dams, built when the beavers moved into the area after the Wisconsin glaciation, may have been a factor in causing deposition of the younger sediments and peat. This suggestion was made regarding the Dixie district, farther east, which has been studied by Capps, but it would be equally applicable at Florence. There are several beaver colonies now on Slate Creek and some of its tributaries.

STRUCTURE

Pre-Tertiary structure

The pre-Tertiary rocks of central Idaho generally show a northerly trend and steep dips. In some large areas the regional strike is northeast, but in others it is northwest. Furthermore, in certain areas, the steep dip is generally east, but in others it is west.

At most places where they have been observed, the rocks of the Idaho batholith possess a foliation or banding marked by the more or less parallel orientation of grains of certain minerals and by different proportions of certain minerals in different bands. This foliation is locally very pronounced, but over large areas it is distinct though not conspicuous.

Concordant contacts between older rocks and batholithic rocks are the rule, but at some places folds in the metamorphic rocks are transgressed by batholithic rocks. Such transgression of folds shows that the folds existed in the older rocks prior to the final consolidation of the batholith.

The general trend of the rocks on the Florence surface is about N. 10° E., but there are many local deviations from that direction. The general dip ranges between 45° and 85° southeast. Locally, the rocks are vertical and in a very few places they dip northwest.

1/Lohman, E. E., personal communication.
The foliation of the quartz diorite in the mapped area is distinct, but not very pronounced. The lack of outcrops over considerable areas makes a detailed study of the foliation difficult. The general trend is about north in the mapped area, but locally it was observed to range from about N. 20° W. to about N. 20° E. All the observed dips are between 45° and 75° toward the east.

Numerous joints cut the rocks of the Idaho batholith. In the vicinity of Florence the joints in the quartz diorite intersect the foliation planes at angles approaching 90°, and most joints, therefore, trend easterly. The common range of strikes is between N. 60° E. and N. 60° W. Most of the joints dip steeply south, but some dip north (see figs. 17 and 18).

Mine workings in the mapped area are not extensive, and many of the older openings are now inaccessible. The few accessible workings reveal that joint fractures have become fault planes during post-fracture movements. The incomplete evidence indicates that the fractures were favored channels for the solutions that brought in the materials for the quartz veins and the ore minerals. Rock alteration also appears to have progressed from the fractures.

The fractures are commonly not well exposed at the surface, but the large number of fractures seen underground along which faulting has taken place indicates that such fault movements are probably much more common than would be suspected from the study of the surface alone.

Tertiary structure and development of topographic features

One of the most striking physiographic features of central and north-central Idaho is the high plateau, now greatly dissected, that stretches all the way across the Clearwater and Salmon River mountains. This surface was described on pages 3 and 4, and it was there pointed out that the altitude of the surface increases from about 7,000 feet in the northwest part of the Clearwater Mountains eastward to 9,000 feet or more in eastern Idaho.

This surface is the so-called "summit", or Idaho peneplain, but it should be emphasized that, since it has a local relief of at least 500 feet within a mile, it is not a true peneplain. Its age, extent, and manner of development are somewhat controversial and have been discussed by several authors.

This widespread, high surface was formed by stream erosion and reached its maximum development at a time when central Idaho lay at a much lower altitude than at present. This erosion cycle cut deeply into the batholith and its enclosing rocks. Coarse-grained rocks, which must have crystallized at a considerable depth, crop out extensively on it. Erosion, however, did not pare deeply enough into the rocks to destroy the batholithic roof completely as is witnessed by the presence of large masses of older rocks, some of which are presumably roof pendants which are still preserved on the high surface.

Obviously, the development of the surface was completed after the consolidation of the batholith, which probably took place in Upper Cretaceous time (p. 9). There is evidence that erosion of this surface continued until after lower Miocene time. Near Thunder Mountain, in the Idaho National Forest south of the Salmon River, the surface truncates rocks of the Challis volcanics, which are probably

2/Shannon, P. J., and Ross, C. P., personal communications.
of upper Oligocene or lower Miocene age.\(^1\)

Little is known of the Tertiary drainage system on this old erosion surface. The relatively gentle relief indicates that the whole area did not stand much above base level. The predominant northward trend of the rocks in central Idaho leads to the inference that the stream courses and the divides in general probably trended north or south. The stream valleys must have been broad and the gradients gentle, and no doubt contained considerable deposits of detrital material.

A lower erosion surface, less widespread than the one just described, has been recognized by Capps \(^2\) and Reed \(^3\) in the Nespece National Forest, and probably is present also in other areas. The lower surface lies in general between 500 and 1,500 feet below the higher one. Capps has recognized that the lower surface is well developed in an east-west belt across the Buffalo Hump quadrangle roughly parallel to, and on both sides of, the South Fork of the Clearwater River.

As recorded by the presence and pattern of the lower erosion surface, the sequence of events appears to be roughly as follows: After the formation of the high surface, and while it still lay near base level, the whole area began to be uplifted. The east and southeast parts were raised higher than the rest, thus imparting a general northwesterly tilt to the old surface. Tributary streams flowing west had their gradients steepened. Those flowing east had their gradients lowered. The northward-trending divides were lowered in places by the steepened westward-flowing streams. Possibly some ponding took place in the broad northward or southward-trending valleys so that overflow from the east across some of the lowered divides took place. Thus the major streams found courses toward the northwest, initiated and controlled by the northwestern tilt of the old surface, and the present courses of such rivers as the South Fork of the Clearwater and the Salmon were determined. With continued uplift, the erosive power of these major streams became stronger and they began to lower and broaden their valleys from downstream headward. A sufficiently long pause in the uplift allowed erosion to go far enough to develop the lower surface nearly to base level, but not far enough to remove large remnants of the higher surface. The areas east and southeast of the Buffalo Hump quadrangle appear to have lain so near the heads of the streams that the lower surface was not well developed in them. This may account for the fact that the lower surface has not been recognized elsewhere.

The Florence surface, as defined on pages 4 and 5, is believed to be part of the lower erosion surface. \(^2\) The suggestion is offered here that the Salmon River once turned north at about the present location of Florence and joined the South Fork of the Clearwater near Castle Creek Ranger Station, and so developed the Florence surface. The present northward-flowing part of Salmon River from Riggins to below Whitebird might develop just such a surface if a local base level below Whitebird were present for a long enough time.

Columbia River lava is present on the Florence surface at several places, such as Hungry Ridge, near McConnell Ranch on Mill Creek, in the vicinity of Adams Ranger Station, on Royal Creek in the Bungalow district, and elsewhere. Although later disturbed, as discussed below, the flows that spread out on the Florence surface have been very nearly the highest, youngest flows of the great lava

\(^2\) Capps, C. R., personal communication.
\(^4\) Reed, J. C., op. cit., p. 10.

17.
sequence. But at several places Latah sediments, identified by good Latah floras, are interbedded with these flows and fix their age as middle Miocene. Thus, the younger surface was developed before the middle Miocene.

After the development of the younger erosion surface, central Idaho was again uplifted in a series of repetitive steps to its present altitude. The base level of erosion was thereby greatly lowered, the rejuvenated streams began to cut actively, and the present system of deep and steep canyons, as impressive as any in the United States, was formed. The streams now flow in the canyons far below even the lower erosion surface, and are still cutting rapidly.

During this uplift, the crustal block that comprises central Idaho was broken in many places by long normal faults of considerable displacement. Crustal warping probably took place also. The normal faults without exception, so far as is known, trend northward about parallel to the strike of the bedrocks. In most of them, the east side is the downthrown side.

The faulting and warping resulted in the formation of the many basins within the mountains from which has come much of central Idaho's placer gold.1/

More of the normal faults are known near the western border of the mountains against the Columbia Plateau than elsewhere. They are generally recognized by the scarps that are still conspicuous features of the landscape and by the observable displacement of the younger erosion surface, as marked by the base of the Columbia River lava flows. The faults may be more numerous far within the mountains than is generally recognized, because the lava flows are not present there and the faults are much more difficult to identify.

The Columbia Plateau itself has been depressed as a unit relative to the crustal block embracing the mountains. How much of the observable displacement is due to actual depression of the plateau, and how much to the elevation of the mountains, is not known. This major displacement of the two large crustal units in the Nezperse country amounted to 2,000 or 3,000 feet and was accomplished by normal faulting and by steep monoclinal warping. The west side is the downthrown side in the displacement of the plateau and mountain blocks.

The essential points of evidence of the displacement are as follows:

(1) The lava surface of the plateau is everywhere essentially parallel to the flows and the plateau has probably not been lowered greatly by erosion.

(2) The general altitude of the Columbia Plateau against the Clearwater Mountains is between 3,000 feet and 4,000 feet.

(3) Many remnants of lava on the lower erosion surface near the border of the mountains lie at an altitude of 6,000 feet or more.

(4) Faults and monoclinal folds showing the displacement can be identified along the mountain front.

(5) Wherever observed the basal lava flows appear to have poured out on a land surface. The lava sequence of the Columbia Plateau has now been depressed so

1/ Shenon, F. J., and Reed, J. C., op. cit., (Circ. 9) pp. 22-23.
Reed, J. C., op. cit., (Pamphlet 40) pp. 11-12.

18.
that over large areas at least 1,000 feet of the sequence is below sea level. 7

The Florence surface is one of the best examples known of a depressed part of the mountain block. Normal faults can be traced along its western edge almost continuously from north of the South Fork of the Clearwater into the Salmon River Canyon, a distance of more than 30 miles, by means of their scars and by down-faulted lava remnants. At some places, the total displacement, which is as much as 1,000 feet, appears to be along one fault. At other places, at least two faults are present.

There is no apparent fault on the east side of the Florence surface, and there the relatively steep rise to the higher erosion surface may be due entirely to the erosional break between the two surfaces or it may be accentuated by warping. It appears significant that the eastern edge of the Florence surface is relatively sinuous and that the surface makes broad indentations eastward up both the Salmon and the South Fork of the Clearwater.

The displacement of Columbia River lava flows along the faults at the western edge of the Florence surface must have followed the consolidation of some of the highest of the flows. The movements apparently ceased before a pre-Wisconsin glacial stage. Much of the eastern part of the Florence surface is deeply covered by a mantle of detrital material that appears to be in part at least of glacial origin and this mantle is not disturbed.

The pre-Wisconsin glaciation took place after the uplift of the mountain block and before the youthful cycle of erosion, which was caused by the uplift and which resulted in the present deep canyons, for the mantle of detritus on the eastern part of the Florence surface bears no relation to the present canyons that dissect the surface.

The Wisconsin glaciers, on the other hand, pushed down the valleys carved in the Florence surface and their moraines are found in some of them hundreds of feet below the surface, for example, in the canyon of the main eastward tributary of Slate Creek south of Adams Ranger Station.

ORE DEPOSITS

HISTORY AND PRODUCTION

Fierce, founded in 1860, was the first of the central Idaho gold camps. The next year a wave of prospectors swept south and east from Pierce and discovered the gold deposits near Newsome, Elk City, and Dixie.

In July, 1861, a party of twenty-three men left Orofino on the Clearwater River near Pierce and prospected during the summer along Salmon River. Nine men from this party discovered gold in the Florence district in September. 6 The deposits proved rich, and within two months nearly 1,000 men were prospecting and mining in the new district. The following spring, after those in the camp had passed a winter of hardship owing to deep snows and lack of food, the rush was renewed and soon several thousand people were at Florence or in the vicinity.


19.
The richer ground was exhausted within a few years and the white miners were replaced by Chinese, who worked over old tailings and some ground considered by the white miners not rich enough to wash. Before 1890, the Florence district was practically deserted.

Some of the quartz veins at Florence were worked as early as 1872. In 1896, quartz mining received a great impetus and several of the Florence veins were worked for about three years. With few exceptions, quartz mining was not very successful in the district, and the Buffalo Jump rush that started in 1898 caused the practical cessation of lode mining at Florence.

Gold mining revived again in central Idaho and elsewhere about 1931, partly because of the depression. Further energy was given this revival by the increase in the price of gold in 1933. The Florence district, however, has not shared in the latest revival as much as many other old districts of central Idaho. Activity has increased there to a limited degree, but, except during the few years following the district's discovery, the production from the district has never been large.

The total amount of gold recovered from the Florence district is not known. Much of the ground worked there in the early sixties was truly bonanza ground. Bancroft cites numerous claims that yielded hundreds of dollars a day to their owners. When he visited it, Lindgren estimated that the district had produced between $15,000,000 and $30,000,000 worth of precious metals, mostly gold. Thomson, F. A., and Ballard estimate the value of the Florence production at $22,500,000, the mean of the limits set by Lindgren.

Production since Lindgren's visit to the district in 1896 has been relatively insignificant, but a few hundred to a few thousand dollars worth of gold still comes from Florence each year. Bureau of Mines records for the year 1901 through 1936 show a total production from the district of about $30,000 worth of gold and silver, mostly gold. About half of this came from placers and half from lodes.

MINING METHODS

It has already been pointed out that much of the placer ground at Florence was very rich. Lean ground could not be profitably worked in this isolated area because of the high cost of food supplies and materials. During its most productive years, Florence was accessible only by trail and even the trails were closed for several months each year because of deep snows.

Much of the production was recovered by gold pan. A large proportion of the metal was obtained by the use of rockers and long toms. Commonly, the rocker or long tom was set up at a promising place. A small area of pay was then stripped and piled to one side and the material under it was shoveled in from a hole small enough so that one or two men could shovel to the rocker or long tom from the hole. The tailings were then thrown on the pay pile. Over most of the area the water table was close to the surface and many of the holes had to be kept dry by bailing. Commonly, after the ground was washed, it was not profitable to throw the discarded material back into the hole and sink a new hole beside the old one. At many places also bailing could not keep the water level down in the hole and bedrock was not reached. As a result of this method, many small areas have not yet been worked.

2/Bancroft, H. E., op. cit., pp. 246, 266, 1890.
At some places in the area, but particularly near its edges, where the stream grades are steeper, it was possible to set longer sluice boxes and shovel into them. At the places to which water could be brought by ditches, the hillside placers were worked extensively in this manner.

Locally, even very rich ground could not be worked because the peat cover was unusually thick, but some of this was mined by tunneling under the peat (see fig. 11). In places, a long narrow trench was dug through a peat bog to serve as a drainage trench, and mining was carried on under the peat as far as possible from the trench. The material was carried out and washed in sluice boxes, rockers, or long toms set in the trench.

Mining by hydraulic giants was practiced to a limited extent in the few places where water under a sufficient head could be made available and where the ground was steep enough to permit the disposal of the tailings. The Florence area is almost surrounded by lower areas and at first no water was available above the swampy streams.

Eventually, water was brought to Florence through a large ditch that tapped the head of Boulder Creek several miles north of the district, and distributed as high as possible in a complicated system of smaller ditches. This ditch reached Florence along the same loc div line followed in part by the road from Adams Ranger Station. There never was a sufficient supply of ditch water to meet the maximum demand either for sluice boxes or hydraulic giants and the water company that owned the feeder ditch is reported to have prospered greatly because high prices were charged and there was a ready market for the water.

Some time after 1900 a drag line was operated for a short time on Sand Creek, but no large amount of ground was mined. In 1935 and 1936, a small drag line and a washing plant on a small saw were used to work a little ground on Sand Creek near the mouth of White Sand Creek (see p. 35), and in the summer of 1937 a drag line was operated on White Sand Creek near the mouth of Healy Creek.

Some of the most serious problems to be faced by those interested in installing modern placer-mining machinery, such as a drag line or a dredge, at Florence are summarized briefly below:

1. A means to dispose of the large amount of thick peat over large areas. The peat is locally full of undecayed logs, stumps, and roots. It has been suggested that large areas could be drained and after drying the peat could be burned and the ash floated off before mining.

2. The development of a machine capable of working large volumes of the younger sediments cheaply. Much of the Florence ground is shallow, and in many places a large dredge would have difficulty in digging a pond deep enough in which to float. If the peat problem could be solved, a drag line, small floating dredge or a dry-land dredge might be used successfully.

3. The necessity of obtaining control of large blocks of ground. Practically the whole district is covered by small and overlapping claims. Much of the claimed ground is in dispute. This situation is not particularly important while the district is inactive, but, if large-scale operations once started, it would become very important.

No large quartz veins were seen in the Florence district. Some relatively thick veins have been mined in places, but none of these was open to observation during this survey. Lindgren 1 mentions several veins ranging up to 3 feet in

thickness and one vein 12 feet thick. Most of the lode gold is believed to lie in tiny veinlets in the altered zones. Where these veinlets are closely spaced a whole zone might be rich enough to mine locally. If such zones are reasonably continuous, as they may be, the weathered parts to depths of up to about 50 feet might be suitable for mining on a large scale by surface methods. Some zones may even be rich enough to support large-scale mining below the weathered zone. Detailed investigation and a large amount of sampling would be necessary to prove both the extent of the altered zones and their precious metal content.

Except in rare instances, the laborious exploration of individual veinlets, even very rich ones, has not proved profitable.

**PLACER DEPOSITS**

All the placer gold in the vicinity of Florence has been derived from quartz veins or veinlets that cut the quartz diorite bedrock, or from granites that were disseminated through the bedrock. The proportions of the total gold that is found in the veins and veinlets, and that which is disseminated in the bedrock, are not known, but it is thought that the amount of disseminated gold is relatively insignificant.

During the long and involved erosion history since the quartz veins and veinlets and their accompanying gold were deposited, a great thickness of rock has been removed. The coarse-grained fabric of the rock now exposed shows that it originally lay far below the surface. Much gold-bearing material was removed during the erosion. As the area approached base level during the development of the lower erosion surface, it became deeply weathered and the streams lost much of their transporting power. Some of the gold and other heavy minerals were selectively left behind as the lighter minerals were carried away and placer concentrations began.

Evidence has been cited to show that at some time after its formation the lower surface was covered by larger accumulations of older gravel than are now present. The source of this older gravel lay outside the Florence district and it contained a little gold, also from a remote source. For a time, the part of the Florence surface covered with older gravel was protected from further erosion. Subsequent erosion and deposition have removed large quantities of the gravel, cut the present shallow valleys, and filled them with the younger sediments. These events accompanied by deep weathering resulted in the further concentration of the gold, thereby enriching the placer deposits.

The placer deposits are divided into three types, each of which will be briefly discussed. The types are as follows: Deposits in weathered bedrock, deposits in older gravel, and deposits in younger sediments. All these types are mutually gradational and at many places no sharp separation of one type from another can be made.

**Deposits in weathered bedrock**

A significant amount of weathered bedrock has been mined on the low hills above the younger sediments in the valleys of the Florence area. At several places, the bedrock was mined to a depth of 10 feet or more on drainage divides.

The gradual lowering of the Florence surface and its slight dissection by streams of gentle gradient permitted the surficial material to be weathered more rapidly than it was removed. Hillside creep and rill wash on the gentle slopes caused the removal from the slopes of much of the lighter material, while a part of the gold remained essentially where it was liberated by the weathering. As the weathered rock was removed, more gold accumulated on the slopes.
This process was important and probably explains a large proportion of deposits in weathered bedrock. It is not, however, the whole story. As rock in place on the divides, softened by weathering, was mined to depths of 10 feet or more, gold must have persisted below the thin surface layer of concentrated material. In the mined areas the bedrock on some of the divides shows thousands of tiny quartz veins. It appears that some of these were so rich that the weathered rock, without any concentration, formed workable placer ground.

The gold-bearing weathered bedrock on the lower hill slopes can not be sharply differentiated from the younger sediments. Some of it is coextensive with areas of older gravel and merges with them.

The deposits of this group are most common near the Slate Creek-Meadow Creek divide, which traverses the mapped area in a very crooked line that extends in a southwest direction from the vicinity of the White cabin in the NW. part of Sec. 7, T. 25 N., R. 4 E., to near the Red Bird prospect in the northern part of Sec. 26, T. 25 N., R. 3 E.

**Deposits in older gravel**

When the older gravel from outside the mapped area was brought in and deposited on the Florence surface, a little gold was laid down with it. In most places, without further concentration, this older gravel is too lean to be mined profitably. Within the mapped area, only two small placer pits have yielded gold from the undisturbed older gravel alone. These two pits lie about one-third of a mile east of the Adley and the Pape cabins, in Sec. 7, T. 25 N., R. 4 E.

At the several other placered areas shown on the map (pl. 1) in older gravel, it has been moved from its original position down the present hill slopes and the gold in it further concentrated. Also, at all of these places, the placer pits have penetrated beneath the gravel into the weathered bedrock, which no doubt contributed a considerable but unknown proportion of the metal recovered.

The older gravel has been of much less economic importance than either the weathered bedrock or the younger sediments.

**Deposits in younger sediments**

While the Florence surface in the mapped area was being dissected by the present streams, all of the gold did not remain behind on the hillsides to form the deposits in weathered rock. A great deal of it reached the stream valleys and was deposited there with the younger sediments.

Before the deposition of the younger sediments, while the present streams were more active and were cutting their channels, large quantities of material were removed entirely from the mapped area. This material, with gold, was carried in part beyond the mapped area into the steeper, swifter streams flowing in canyons of the youthful erosion cycle. Some of this gold was concentrated in the small placer deposits along Slate Creek as far as its mouth and the larger deposits along Salmon River. As might be expected, the gold of these deposits is progressively finer downstream, but a sizeable proportion of it is flake gold that also is transported with relative ease by running water.

The younger sediments contain the most extensive deposits of the Florence district and are reported to have been the most productive. Each stream valley has been placered and has contributed its share of gold. Baboon Gulch, at the head of Miller Creek, and Pioneer "ulch, a tributary of Czar Creek, are reported to have been extraordinarily rich.
Locally, rich deposits in the younger sediments can be traced directly to a zone of quartz stringers, which must have yielded much of the gold. Good examples are the deposits in two small gulches that join White Sand Creek from the north in the SW part of Sec. 13, T. 25 N., R. 3 E. These rich spots apparently derived most of their gold from the Waverly system of veinlets. The deposits along the east side of Pioneer Gulch were enriched by gold from the system of veinlets at and near the Golden Dike property.

Too little is known both of the areal distribution in values in the old placers and of the extent and location of the systems of veinlets to indicate whether or not the richer ground at Florence was in general closely associated with such systems.

**The placer concentrates**

In most placer-mining operations, it is possible to save the particles of the material sought, because its particles are heavier than most of the associated valueless particles. Seldom, however, is the gold, or other valuable mineral, the only relatively heavy mineral present, but it is only one of a group of heavier minerals that ordinarily accumulate behind the riffles. Together, these minerals constitute the placer concentrates.

Thus far, only gold and the small amount of silver alloyed with it have been recovered by mining in the Florence district. As a part of the survey of the district, the heavier minerals have been studied in an attempt to answer the following questions: (1) Has the mining to date recovered as large a proportion of the gold as could be expected, or has an unnecessarily large proportion been lost in the tailings? (2) Are valuable minerals other than gold present in quantities that might be profitably saved in future operations?

The following discussion indicates that in the early placer work considerable gold was probably lost because the gold-saving machines used were inefficient. Ordinary, modern, gold-saving machines, carefully operated, should be capable of recovering most of the values in the gold-bearing material of the Florence district.

Regarding the second question, in the samples studied the quantity of the minerals other than gold was not large enough to indicate that commercial deposits exist under present industrial and economic conditions. Zircon is present in quantities that conceivably might become commercial with a greatly increased demand for zirconium. Such a demand would depend on the development of new uses for that metal.

Altogether, 37 samples were studied. These came from localities widely distributed within the mapped area and from a few places in the district outside the mapped area. Eighteen of the samples were derived from a small area in the SW 1/4 of Sec. 13, the NW 1/4 of Sec. 24, and the NE 1/4 of Sec. 23, T. 25 N., R. 3 E. The samples were collected from younger sediments in place, from old placer tailings, and from weathered bedrock. They were collected in a variety of ways by a number of different persons. Some are average samples of younger sediments in place, some are channel samples across zones of quartz veinlets, some are panned concentrates, and some are sluice-box or rocker concentrates.

Each sample was weighed and then passed through bromoform, a liquid with the specific gravity 2.62. There was thus obtained, for each sample, a fraction made up of minerals with specific gravities greater than 2.62 and a fraction made up of minerals with specific gravities less than 2.62. Each fraction of each sample was weighed, but these figures are not significant except for average samples not concentrated by panning or otherwise. (See fig. 4.)
Next, the heavy fraction of each sample was passed under a small horseshoe magnet that removed the strongly magnetic materials. The part not strongly magnetic was passed under a powerful electromagnet and the weakly magnetic subfraction separated. A final, heavy, non-magnetic subfraction remained. The relative volumetric percentages of each subfraction were estimated.

None of these separatory processes is completely effective, but it is believed that fairly complete separations were made of most minerals in most samples; for example, allanite, though very weakly magnetic in most of the samples, is not entirely removed from the non-magnetic subfraction, and titanite, though commonly attracted to the electromagnet, remained largely in the non-magnetic subfraction.

After being separated, each subfraction of each sample was studied microscopically or chemically, to determine the minerals present and their relative abundance.

The following table summarizes the results of the study of the heavy minerals. The samples are arranged in the order of decreasing percentages of the heavy fraction composed of the combined weakly magnetic and strongly magnetic subfractions (fig. 4).

**Strongly magnetic subfractions**

The strongly magnetic subfractions range up to 90 per cent by volume of the heavy fractions of the samples. The strongly magnetic subfractions of the samples represent unconcentrated material (Nos. 5, 14, 15, 16, 19, 20, and 21), for they are notably small, the largest being 5 per cent of the heavy fraction in No. 20. Metallic iron and magnetite are the only materials included in this subfraction. In a few samples, the horseshoe magnet attracted a little biotite, but nevertheless all the biotite was included in the weakly magnetic subfraction.

**Iron**

Metallic iron was recognized in four samples. All of these were iron rock in place that had been ground, either in a mill or a mortar, and concentrated. The iron represents contamination of the sample during grinding. The amount of such contamination is surprising. For example, iron is the only strongly magnetic material in the heavy fraction of sample No. 27 and constitutes 40 per cent of that fraction. The iron appears as a fine, fluffy, dark-brown powder. The brown color is caused by films of oxide that coat the iron particles.

**Magnetite**

Magnetite (FeO.Fe2O4) ranges widely and forms as much as 90 per cent in the heavy fraction of sample 2. It appears in the sands as a black, granular mineral. Many of the grains show crystal faces or parting planes which reflect light brilliantly. In very large quantities, magnetite is a valuable iron ore, but the magnetite sand of the Florence district has no economic significance.

**Weakly magnetic subfractions**

The weakly magnetic subfractions, like those strongly magnetic, range widely and form as much as 90 per cent of the heavy fractions. All of these subfractions of the unconcentrated samples are large, the smallest being 76 per cent of the heavy fraction in sample 20. The minerals included in the weakly magnetic subfractions are ilmenite, biotite, garnet, allanite, and limonite. Of these, one or both of the first two are by far the most abundant in most samples.

25.
<table>
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<tr>
<th>Sample Site</th>
<th>Locality</th>
<th>Degree of samples yet collected by Norton, 1878</th>
<th>Type of sample</th>
<th>Number of samples</th>
<th>Per cent of samples</th>
<th>Magnetic and nonmagnetic separation</th>
<th>Percentage of heavy minerals</th>
<th>Heavy minerals</th>
<th>Nonmagnetic minerals</th>
<th>Distribution</th>
<th>Material from the Florence District, Idaho</th>
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</table>
Ilmenite.

Ilmenite (FeTiO₃) is present in most samples. It ranges from less than 1 per cent of the heavy fractions of some samples to about 14 per cent in sample 6. The ilmenite sand is very similar in appearance to the magnetite sand, but the two minerals may be readily separated with a small magnet. The ilmenite of the Florence district has no commercial importance.

Biotite.

Biotite (K₂(Fe,Mg)₃(Al,Fe)₄Si₃O₁₀(OH)₂) is abundant in all of the unconcentrated samples and is present also in several other samples. It is not as widespread, however, as either magnetite or ilmenite. Biotite is a member of the mica group and has the perfect platy cleavage characteristic of the micas. Because of its perfect cleavage, biotite in the concentrates forms thin, flat plates that resemble fish scales. The plates are dark brown or green.

Biotite has a specific gravity of about 3.12. Most minerals with a specific gravity as high as 3.12 would be readily caught in the sluice box. The thin plates of biotite, however, are very easily moved by running water and most concentrates are therefore notably deficient in that mineral.

Garnet.

The garnets form a large and complex mineral group that shows a wide range of chemical compositions and optical properties. They are orthosilicates of such elements as Ca, Mg, Fe, Mn, Al, Cr, and Ti. The composition of the Florence garnets has not been determined.

Garnet was recognized in fourteen of the thirty-seven samples, but it is abundant in none and rare in most of the samples. The color ranges from pink to deep red. Some small perfect crystals were observed in the concentrates. Much of the garnet of the concentrates is present as sharp, irregular fracture pieces, but many of these pieces have one or more crystal faces that aid in their identification.

Figure 6 shows a characteristic group of garnet crystals and fragments. This mineral, as found at Florence, has no commercial value.

Allanite.

Allanite ((Ca,Fe)₂(Al,Cr,Fe,Di)₃Si₃O₁₀(OH)) was recognized in fourteen of the samples. It is present in flat, bluish crystals whose shape somewhat resembles shoe nails (fig. 6). Some of these are as much as one-fourth inch long, but most are much shorter. Small irregular fragments are present also. There is no market for allanite.

Limonite.

Limonite (Fe₂O₃·nH₂O) was noted as abundant in three samples. In sample 9, it appears to be the result of oxidation of metallic iron. In samples 18 and 25, it probably represents the decomposition of magnetite and ilmenite.

Nonmagnetic subfractions

The nonmagnetic subfractions range up to 09 per cent of the heavy fractions, but in thirty-two of the thirty-seven samples the nonmagnetic subfraction is 50 per cent or less of the heavy fraction. Titanite, zircon, apatite, gold, monazite amphiboles, muscovite, were recognized in these subfractions; epidote and clinozoic-
Figure 5. Garnets from the Florence district, Idaho.

Figure 6. Allanite crystals from the Florence district, Idaho.
site were also present. Some other minerals are probably present in very small quantities. Of the minerals listed, titanite, zircon, and apatite are by far the most abundant and the most widely distributed.

**Titanite.**

Titanite (CaO, TiO₂, SiO₂) is known to be present in thirty-three of the thirty-seven samples. Of the thirty-three, it is abundant in the nonmagnetic subfract ions of sixteen samples, and is uncommon or rare in only five. Most of the titanite grains are irregular fracture fragments, but some are well formed, ax-shaped crystals with bright faces and sharp edges and as much as one-fourth inch long. The mineral has a bright, waxy luster and the color commonly is yellow or light olive green, but in some grains it varies in different parts.

**Zircon.**

Zircon (ZrO₂, SiO₂) is one of the principal constituents of the so-called "white sand" of the Florence district. Only two of the thirty-seven samples did not reveal its presence. It is abundant or common in the nonmagnetic subfractions of thirty-four samples. In sample 2, it is rare. Almost all of the zircon grains are perfectly formed prismatic crystals (fig. 7). These crystals have a consider able size range, but those shown in figure 7 are typical. The crystals commonly are clear and colorless under the microscope. Some are slightly yellow and a few contain unidentified inclusions. As seen in the concentrate with the aid of a hand lens, they are white and have a very brilliant luster. Zircon sand is available in considerable quantities in the Florence district, but, unfortunately, it has no commercial value at the present time.

**Apatite.**

Apatite (essentially calcium phosphate) is nearly as widespread and abundant as zircon. Well formed crystals (fig. 8) are common, but they are generally larger than the zircon crystals and lack their sharp edges and smooth bright faces. Many of the apatite crystals contain a central dark, cloudy, pleochroic zone. Some of these zones are intensely dark and form nearly the whole crystal, so that this normally light-colored mineral appears nearly black in the concentrates.

**Gold.**

Gold was observed in sixteen of the nonmagnetic subfractions. It appears typically as very irregular, ragged grains (see fig. 9), but few are slightly rounded. The gold is bright yellow. Quartz fragments containing much visible gold have been found at several places in the placers of the district. Some of these were seen on the Paul property on Hi-Yu Creek.

**Monazite.**

Monazite (Ce₄, Laₓ, Di₁₋ₓ)₄O₇-₄P₂O₇ with some ThO₂, SiO₂) was recognized in only one sample from the Florence district, but it is abundant in that sample. The monazite-rich sample came from a locality on Grouse Creek, a short distance east of the mapped part of the district. This sample resembles some of the concentrates from the Warren district much more closely than it does any other samples from the Florence district.

Figure 7. Zircon crystals from the Florence district, Idaho.

Figure 8. Apatite crystals from the Florence district, Idaho.
Figure 9. Typical gold grains from the Florence district, Idaho.

Figure 10. Monazite grains from Grouse Creek, Florence district, Idaho.
Under a hand lens, the monazite resembles the titanite, but it may be distinguished by its dull luster and dull yellow color. Figure 10 shows typical monazite from the Grouse Creek sample.

The Grouse Creek monazite probably has no commercial value at the present time.

Amphibole.

Fragments of a light-green amphibole were seen under the microscope in the nonmagnetic subfractions of twelve samples. The mineral is common in all but two of the twelve samples, but is rare in those two. By its optical properties the mineral appears to be perovskite-hastingsite.¹

Muscovite.

Muscovite (K₂Al₂Si₅O₁₀(OH)₂), like biotite, is a member of the mica group. It is light-colored, but otherwise similar to biotite. It was noted in seven of the samples, but is probably present also in a number of others.

Epidote and clinozoisite.

These two members of the large and complex epidote group were recognized in one of the samples, No. 30. Very small quantities may be present in others, but it is distinguishable only by means of the petrographic microscope.

Lode Deposits

The lodes of the Florence district have not been very productive and have accounted for probably less than $225,000 out of the millions of dollars worth of precious metals that have come from the district. Underground workings are not extensive and they are now largely inaccessible. Information on the lode deposits in this report, therefore, is taken mainly from the earlier report of Lindgren, who was in the district at the height of the activity in lode mining.

Most of the lodes described herein lie in the mapped part of the district within which the placer deposits are found. About half a dozen lie on the slopes of the Salmon River Canyon, south of the mapped area, and are remote from placer deposits. The known lodes are widely distributed over the mapped area and do not appear to lie in definite belts or other areas.

Most of the lodes trend nearly east, between about S. 75° E. and N. 80° E. Those of another conspicuous group trend between about N. 45° E. and N. 65° E. Lodes belonging to both groups are present at some prospects. Most of the known lodes dip south at angles ranging between 40° and 60°.

Most of the lodes are sheeted zones, made up of alternating layers of altered quartz diorite and quartz veinlets. Some of the sheeted zones are at least 50 feet wide, but most of them are much narrower. A wide but otherwise typical sheeted zone, exposed near the mouth of Six Ounce Gulch in the SW 1/4 of Sec. 13, T. 25 N., R. 3 E., contains more than 40 quartz veinlets that may average one-fourth inch in individual thickness.

Some lodes are simple quartz veins. Lindgren reports several veins more than a foot thick and notes that the Banner vein is glassy, pure quartz as much as vugular.

¹Optical properties determined by Jewell Glass, Geological Survey.
as 6 feet thick.\textsuperscript{2} The thickest individual vein seen during the present survey is a little more than a foot thick.

None of the lodes has been actually traced for more than a few hundred feet, but some of them may be much longer.

The quartz of the veins and veinlets is white or translucent gray and contains numerous vugs, lined with comb quartz. Many of the veinlets have a central zone of comb quartz. The quartz locally carries a little sericite, which in many places is concentrated in and near the vugs. Most of the quartz is coarse-grained and uncrushed. Locally, the microscope reveals a little crushing.

The vein walls are ordinarily sharp and the quartz may be broken cleanly from the altered quartz diorite walls. Little if any gouge is present in most places. The walls of some quartz veins show striae caused by movements between vein and wall, but these are not common.

The wall rock alteration in the sheeted zones has already been described on pages 7 and 8.

The only ore minerals recognized in the veins are gold, pyrite, and arsenopyrite, but the last two are rare. Lindgren states that tellurides, ruby silver, and horn silver are reported to be sparingly present in certain veins, but that they were not identified. \textsuperscript{2}

Most of the gold grains are coarse and irregularly shaped. Many pieces one-eighth inch in diameter were observed. Many of the individual veinlets are exceedingly rich and carry hundreds of dollars worth of gold to the ton; others appear completely barren. An assay of a channel sample cut across the sheeted zone near the mouth of Six Ounce Gulch indicated more than $20.00 worth of gold to the ton. According to Lindgren, the assay value of the ores is said to range from $10.00 to $50.00, \textsuperscript{3} on the basis of the old price of gold - $20.67 an ounce. Lindgren also gives the fineness of the gold as 650. Gold from the sluice box of the rod mill at the Liberty mine was analyzed \textsuperscript{4} and found to be 700 fine, about two-thirds of the rest being silver. Lindgren notes that at some places the altered granite in the sheeted zones carries free gold. \textsuperscript{5}

The veins are partially oxidized to a depth of about 100 feet below the surface, for limonite pseudomorphs after pyrite were collected from that depth at several places. No unoxidized sulphides were seen at the surface.

The veins are clearly younger than the Idaho batholith, which is believed to be of Upper Cretaceous age (see page 9). They are probably older than the Florence erosion surface, which is older than middle Miocene (see page 18). The coarse-grained, vuggy quartz apparently indicates that the veins were formed at no very great depth below the surface.

\textsuperscript{1} Lindgren, Waldemar, op. cit., p. 236, 1900.
\textsuperscript{2} Ibid., pp. 235-237, 1900.
\textsuperscript{3} Ibid., p. 235.
\textsuperscript{4} Analyst, E. T. Erickson
\textsuperscript{5} Lindgren, Waldemar, op. cit., pp. 236, 237.
DESCRIPTIONS OF PLACERS AND LODES

PLACERS

The streams of the mapped part of the Florence district are all tributary either to Miller Creek, which flows northwest into Slate Creek, or to Meadow Creek, which flows southeast into Wind River. In the following descriptions of the placered areas of the mapped part of the district the placers tributary to Miller Creek are described first and then those tributary to Meadow Creek. In each case, the order is from the northeast toward the southwest. A placer on Little Cow Creek that flows directly south into Salmon River, outside the mapped area, is also described.

No attempt was made in this investigation to determine the boundaries of the numerous individual claims that cover practically the whole of the mapped area. Certain claims and operations are discussed by name for convenience, but no responsibility is assumed for the determination of their extent or ownership.

Placers tributary to Miller Creek

Gold Lake Creek

Gold Lake Creek joins Miller Creek in the southern part of Sec. 2, T. 25 N., R. 3 E., about 1-1/2 miles northwest of the edge of the mapped area. With the exception of two short intervals, it has been extensively placered all the way from its mouth to the mouth of Osark Creek, a short distance northwest of the edge of the mapped area, in the NE 1/4 of Sec. 12, T. 25 N., R. 3 E. The stream's gradient is steep for a short distance about one mile above its mouth and over that stretch there has been no accumulation of sand and therefore no placering. Above the steep stretch the grade is flat for a long distance. To facilitate drainage and the disposal of tailings, a tunnel several hundred feet long was driven through the ridge near a point where the stream's grade increases markedly and Gold Lake Creek now flows through the diversion tunnel.

The placered area along the stream from the upstream end of the tunnel to the mouth of Osark Creek, a distance of about one-half mile, averages several hundred feet in width. The high tailings piles indicate that the ground mined was probably 8 to 10 feet deep. The tailings are largely sand, but contain an unusually high proportion of rounded quartzite and quartz pebbles and boulders. Unplacered remnants along the edges of the valley floor show as much as 6 feet of peat over the younger sediments and testify that the original meadow was deeply covered with peat.

There has been a small amount of placer mining on Gold Lake Creek above the mouth of Osark Creek. The mined area includes a narrow placer from the mouth of Osark Creek almost to the edge of the mapped area; a narrow cut, probably for drainage and the disposal of tailings, to the line between Secs. 12, T. 25 N., R. 3 E. and 7, T. 25 N., R. 4 E.; a placer 300 feet long and up to about 150 feet wide in the NW 1/4 Sec. 7, T. 25 N., R. 4 E.; and a small mined area in a small gulch near the head of the stream north of the mapped area in Sec. 6, T. 25 N., R. 4 E.

The part of Gold Lake Creek above the mouth of Osark Creek was in places covered with peat at least 15 feet thick and much unworked ground still remains where the peat has not been removed. It is locally reported that much of this ground is very rich but can not be worked by methods so far used because of the peat and the lack of drainage. Some material has been mined under the peat as far
back as possible from the edges of the old placer cuts, but such work is necessar-
ily slow, dangerous, and unsatisfactory. Figure 11 shows a recently operated mine
that obtained younger sediments from under about 10 feet of post by drifting from
the head of the placer on Gold Lake Creek in the NW 1/4 of Sec. 7, T. 25 N., R. 4 E.

Osark Creek

Osark Creek has been placered continuously from its mouth in Gold Lake Creek
to its head, and very little unworked ground remains along it or any of its trib-
utaries. The ground is reported to have been rich and the amount of gold still
remaining in the old tailings is not known.

Near the mouth of Pioneer Gulch the worked ground is nearly 500 feet wide. A
little unworked ground remains beneath a thick peat cover along the east side of
the first tributary of Osark Creek from the east above the mouth of Pioneer Gulch,
along both sides of the main stream from about 900 feet to about 1,900 feet above
the mouth of Pioneer Gulch, and principally along the west side of the first trib-
utary from the west above the mouth of Pioneer Gulch.

Near the southwest corner of Sec. 7, T. 25 N., R. 4 E., and at two places in
the NE 1/4 of Sec. 13, T. 25 N., R. 3 E., headward tributaries of Osark Creek
have been mined to and over the divide between the Miller Creek and Meadow Creek
drainage basins. Similarly, a small placer extends across a local divide in the
northern part of the NE 1/4 of Sec. 12.

Older gravel has been mapped at three places along Osark Creek. The most ex-
tensive deposit is a terrace, which has been mined, on the low point between
Pioneer Gulch and Osark Creek. Areas of older gravel too small to map and indi-
vidual boulders and pebbles are scattered over much of the drainage basin of Osark
Creek and indicate an earlier more continuous gravel cover. Material from the
older gravel is abundantly mixed with the arkosic sand of the younger sediments
in the tailings piles along these creeks.

The placers that extend over the drainage divides are largely in weathered
bedrock.

Pioneer Gulch

Pioneer Gulch is tributary to Osark Creek. It lies principally in the west-
ern part of Sec. 7, T. 25 N., R. 4 E. It is one of the most famous and is report-
ed to have been one of the most productive gulches in the district. It has been
mined throughout and its eastern side has been worked at several places to and
over the Meadow Creek-Miller Creek divide.

The tailings in Pioneer Gulch contain, like those of Osark Creek and its
tributaries, a considerable admixture of boulders and pebbles of older gravel.
Pioneer Gulch is characterized also by a large proportion of angular quartzite
fragments. One of the small outcrops of quartzite that was seen in the district
lies at the head of this gulch a few hundred feet north of the Adley cabin.

Much of the work near the head of Pioneer Gulch explored weathered bedrock.
Northward from the Adley cabin (fig. 12), and near the Golden Dike, claim of
Albert Adley, this old work includes the outcrop of an extensive altered zone
containing many very rich quartz veinlets (see pages 30 and 40).

Miller Creek

Miller Creek has been mined extensively from its mouth in Slate Creek, in
Sec. 54, T. 26 N., R. 3 E., about 4 miles northwest of the edge of the mapped
31.
Figure 11. Drift mine under 10 feet of peat on Gold Lake Creek near Florence, Idaho.

Figure 12. Extensive old placers on the east side of Pioneer Gulch near the Adley cabin, Florence, Idaho. (Photo by Wm. L. Pape.)
area, almost to, and in several places over, the Miller Creek-Meadow Creek divide.

Locally, where the gradient was steep, the creek was not worked, partly because of the lack of sufficient quantities of younger sediments and partly because of the presence in those places of many large quartz diorite blocks that have fallen in from the valley walls. All of the tributaries of Miller Creek within the mapped area have been mined throughout nearly their entire lengths.

Miller Creek drains an area in the heart of the district that includes many of the known sheeted zones of altered rock in which lie the auriferous quartz veinlets. Among those are the zones at the Waverly, Morning Sun, Montrose, and Mikado properties.

Angular fragments and large blocks of bedrock appear more abundant along Miller Creek than along most streams of the district.

It is reported that a considerable number of claims along Miller Creek are owned by Eva Canfield and Jack Martin.

Baboon Gulch

Baboon Gulch joins Miller Creek in the NW 1/4 of Sec. 13, T. 25 N., R. 3 E. It rises just west of the older settlement of Florence, which was located near the Ward cabin. Baboon Gulch ranks with Pioneer Gulch as a large producer. It is said to have contained some fabulously rich ground. The entire course of Baboon Gulch has been mined and large areas of weathered bedrock around it have been washed also (see fig. 13).

Some claims in Baboon Gulch are reported to be the property of James Ward and associates.

French Creek

French Creek flows into Miller Creek in the NW 1/4 of Sec. 11, T. 25 N., R. 3 E., about a mile down Miller Creek from the edge of the mapped area.

Its lower half is an extensive peat-covered meadow which has not been mined. If the ground carries values, a fact which has not been established, it may be worthy of exploitation. Apparently the ground was not rich enough to work by the small-scale methods of the early days, since the conditions for placer mining are similar to those on many mined streams in the district.

Except for a short distance at the very head and a stretch of less than one-fourth mile in the southern part of Sec. 14, T. 25 N., R. 3 E., the upper half of the stream has been mined extensively. The short stretch in Sec. 14 is unusually steep and is full of huge blocks of bedrock. Very little sediment, other than the big blocks, is present there. In Sec. 23, the small tributary streams and locally some strips along the edges of the main valley floor were not mined and considerable untouched ground remains under peat.

In 1936, Cha. Chamberlin was working a small placer near his cabin in the southern part of Sec. 23.

The placer tailings along French Creek are characterized by an extraordinarily large proportion of partly rounded quartz fragments in the usual arkosic sand. These probably are derived from the numerous quartz veinlets that are present in the creek's drainage area. A number of these have been prospected and the locations of some are shown on Plate 1.
Figure 13. Old placer work in weather bed rock near the head of Baboon Gulch, Florence district, Idaho. (Photo by U. S. Forest Service.)

Figure 14. Peat meadow, looking downstream toward mouth of White Sand Creek from the forks of Sand Creek in SE1, sec. 19, T. 25 N., R. 4 E. Note dragline of Homestake Placers in background.
California Creek

California Creek is a small tributary of French Creek and the part of its course included in the mapped area is principally in the NW 1/4 of Sec. 23, T. 25 N., R. 3 E. California Creek is bordered by a narrow peat meadow and the sediments under the peat have not been mined. A part of the peat-covered valley floor supports a dense forest growth. The gold content of the younger sediments along California Creek is unknown, but is apparently too small to have attracted the early-day placer miners.

Placers tributary to Meadow Creek

Meadow Creek

In the early days, a large amount of placer mining was done along Meadow Creek from the mouth of Sand Creek in the NE 1/4 of Sec. 18, T. 25 N., R. 4 E., northward for a little less than a mile to a short distance above the mouth of the West Fork of Meadow Creek. A long, and in many places wide, peat-covered meadow extends from there upstream for about 3 miles to near the center of Sec. 32, T. 26 N., R. 4 E. This long meadow has never been mined, although many prospect pits have been dug in it, some of them since 1895.

No information as to the gold content of the ground under the meadow was available. A large volume of material that could be mined easily by large-scale, modern methods is available here if the ground is rich enough to support such an operation. For about a mile up Meadow Creek from the mouth of its west fork, the stream has cut a narrow trench through the peat cover, thus exposing the material beneath, which consists largely of well-rounded quartz and quartzite gravel as well as considerable arkosic sand. Meadow Creek flows through an area in which the older gravel is widely distributed and the older gravel contributed the pebbles to the younger sediments. Remnants of gravel terraces are present at several places along Meadow Creek, largely north of the mapped area.

The extensive placer tailings below the mouth of the West Fork of Meadow Creek also contain a large proportion of well-rounded pebbles and boulders. The fact that only a very small amount of the older gravel in place on the hillsides has been mined seems to indicate that most of the gold in the material along Meadow Creek was contributed by the veinlets in the decomposed bedrock of the watershed and not from the older gravel.

West Fork of Meadow Creek

The West Fork of Meadow Creek rises in Sec. 30, T. 26 N., R. 4 E., and flows southward to near the center of Sec. 7, T. 25 N., R. 4 E., where it enters the mapped area and flows thence southeast to join Meadow Creek in the southeastern part of the same section.

The part of this creek within the mapped area and for about 1,000 feet north of it, has been mined incompletely. Considerable areas of the valley floor and some low gravel terraces along the creek in this part of its course remain untouched. The tailings, like those along Meadow Creek, contain large quantities of well-rounded, quartzite gravel.

Northward from the mined ground a large peat meadow stretches to the head of the creek and to the heads of most of the tributaries. A few test pits were noted in this meadow, but the gold content of the ground is unknown. The peat appears to be several feet thick in most places and the grade of the stream is very flat. The meadow could be mined by some modern placer-mining method, if it contains enough gold.
The tributary to the West Fork of Meadow Creek that joins the creek from the west at the edge of the mapped area near the center of Sec. 7 has been completely mined. Near the heads of the two principal branches of this tributary large quantities of weathered bedrock in place were also washed. Northward from the Pape cabin, an area, principally of bedrock in place, has been mined across a local divide a short distance east of the Adams Ranger Station-Florence road. Near the Pape cabin a large number of rich quartz veinlets are known to be present. These are the eastward extensions of the veinlets on and near the Golden Dike claim at the head of Pioneer Gulch.

Two small placer pits have been opened in older gravel in place in the NW 1/4 SE 1/4 Sec. 7, T. 25 N., R. 4 E., south of the West Fork of Meadow Creek. These constitute the Shamrock placer that has been operated by Jack Hardin since 1930. The pits expose well-rounded, coarse gravel containing boulders up to a foot in diameter. This is the only known placer that lies entirely in older gravel.

Imperial Creek and its tributaries

Imperial Creek rises west of the center of Sec. 18, T. 25 N., R. 4 E., and flows north and east into Meadow Creek in the SE 1/4 of Sec. 7. It collects several branching tributaries from the west that drain a considerable area principally in the SW 1/4 of Sec. 7 and the NW 1/4 of Sec. 18.

Imperial Creek and practically all of its tributaries have been mined completely. At several places, the old workings extend over local divides and, at the heads of Pioneer Gulch and Ozark Creek, over the main Miller Creek-Meadow Creek divide.

The tailings along the lower parts of Imperial Creek and its tributaries are characterized by a large proportion of well-rounded, quartzite gravel. Pebbles and boulders are rare near the stream heads where large quantities of weathered bedrock have been mined.

The Mippy placer of Wm. Pape, Herr. Rothwell, and Emil Von Berg was operated as recently as 1935 on the north side of Imperial Creek near its mouth. The area mined is too small to show on Plate 1. At the Mippy placer, a few feet of older gravel overlies weathered bedrock. The placer was operated by shoveling into a sluice set well into the weathered rock. A layer of weathered bedrock was washed along with the older gravel.

Sand Creek

Sand Creek is a northward-flowing stream that joins Meadow Creek in the NE 1/4 of Sec. 18, T. 25 N., R. 4 E. Some of its tributaries have produced considerable placer gold and they will be discussed under separate headings. Sand Creek has been mined extensively from its mouth to the mouth of White Sand Creek near the center of the west line of Sec. 19, T. 25 N., R. 4 E., a distance of about 1-1/2 miles.

Locally, along the lower mile of the creek's course, a few gravel terraces flank the valley floor. Well rounded pebbles are abundant in the tailings, but they decrease in abundance upstream and above the mouth of Summit Creek are not common.

Many years ago, a drag line operated by steam mined a relatively small amount of ground from near the mouth of Summit Creek upstream to a point a short distance above the road that leads southeast from the new settlement of Florence. The work is reported to have been done by the Submarine Company. It is probably the operation mentioned by Lindgren [1], who says - "In 1899, a steam dredging enterprise

\cite{Lindgren1923}

Waldemar, op. cit., p. 235

34.
was inaugurated by means of which it was proposed to wash some areas of low-grade gravels.

In 1936, the Lily of the Valley claim was being operated by shoveling into a small sluice. The claim, owned by Wm., Clarence, and Luella Hibbert, and Alice Whiteham, lies on a small unnamed gulch tributary to Sand Creek from the east and just outside the mapped area. The gold is said to lie in irregular streaks in weathered bedrock beneath about 3 feet of peaty overburden. Practically no gravel is present. Mr. Wm. Hibbert claims to have taken about one-half ounce of gold from about 4 yards of material.

From the mouth of White Sand Creek upstream, Sand Creek and its tributaries have been placered only locally. Large peat meadows underlain by younger sediments still remain (fig. 14). An old placer nearly one-third mile long extends along Sand Creek from near the southwest corner of Sec. 19 northward to the mouth of a tributary to the creek from the east. Several of the gulches at the heads of the creek above the meadows have been mined on a small scale.

The younger sediments under the peat are said to be gold-bearing, but the tenor is not known. A large volume of material could be mined here if the gold content is high enough.

J. F., R. S., D. E., and Mrs. E. M. Jones, according to a report, own a two-thirds interest in six claims, the Homestake group, that extend up Sand Creek and its tributaries from near the mouth of White Sand Creek. The other one-third interest is reported to belong to Eva Canfield and Jack Martin. The claims were staked in 1935.

J. F. Jones and Leo Sitar, in 1935, formed the Homestake Placers Company for the purpose of working the Homestake and Buttercup groups of claims. The company has, according to reports, a verbal lease with R. Auger, trustee for Jim Ward and Messrs. Hinckson and Bishop, who own the Buttercup group, which extends down Sand Creek from the mouth of White Sand Creek.

The mining equipment of the Homestake Placers Company included the old steam shovel, reported to have belonged to the Submarine Company, refitted with a log boom and drag line, a locally-constructed, floating washing plant, and a small caterpillar tractor.

With this equipment, the company, in the summers of 1935 and 1936, mined a piece of ground at the lower end of the Homestake group of claims 210 feet long, 40 feet wide, and 8 feet deep (fig. 15). Of the 8-foot depth, about 3-1/2 feet were peat. According to reports, the work yielded about $1,200. Thus, the ground, including the peat, averaged about $0.16 a yard, and, without the peat, about $0.285 a yard.

In 1937, most of the equipment had been taken from the Florence district and was in use at Ruby Meadows, near Burgdorf, on the south side of the Salmon River.

**Summit Creek**

The principal head of Summit Creek lies north of the Hileman Cabin in the NE 1/4 of Sec. 13, T. 25 N., R. 3 E. The creek flows south and east past the location of the old town of Florence, gathers numerous tributaries, including Florence Creek, which rises near the new town and joins Sand Creek in the NW 1/4 of Sec. 19, T. 25 N., R. 4 E. Summit Creek and all of its tributaries have been almost completely mined. The stream has a very gentle gradient and in its entire course falls less than 100 feet.
Near the heads of the stream much of the mined material was weathered bedrock. The new town was built on worked ground near the head of Florence Creek. At several places the placers extend to and over the Miller Creek-Meadow Creek divide. The heads of some of the small streams that flow into Summit Creek show remnants of older gravel. In 1936, Theo. Holt and associates were ground-sluicing at the site of the old town of Florence (fig. 16).

White Sand Creek

White Sand Creek rises in the NE 1/4 of Sec. 23, T. 26 N., R. 3 E., southwest of the Egloff cabin and flows in general south of east to join Sand Creek near the center of the east line of Sec. 24, T. 25 N., R. 3 E. The valley and its tributaries have been mined extensively, but some small areas of unworked ground remain under peat at the heads of some of its smaller branches.

This stream is reported to have produced considerable gold and the tailings and unworked areas along it are said to still contain enough gold to justify prospecting with the view to inaugurating large-scale operations.

In the summer of 1936, a drag line started operations on White Sand Creek near the mouth of Healy Creek on ground belonging to Otto Egloff and Jack Hardin, but the success of the venture is not known.

Healy Creek

Healy Creek flows north and a little east from the NE 1/4 of Sec. 26, T. 25 N., R. 3 E., and joins White Sand Creek near the Egloff cabin in the NW 1/4 of Sec. 24, T. 26 N., R. 3 E. Most of the ground along it has been mined, but a few large areas and many small areas of peat-covered sediments have not been mined.

Much of the ground along Healy Creek is said to belong to Otto Egloff and Jack Hardin. During the present survey some very rich pans were obtained at several places on Healy Creek.

For several years before 1936, Otto Egloff recovered gold in a small rocker on Healy Creek where it crosses the line between Secs. 23 and 24.

Black Sand Creek

Black Sand Creek is a short, northward-flowing stream that rises north of the Gold Bug mine and flows into White Sand Creek east of the center of Sec. 24, T. 25 N., R. 3 E. Black Sand Creek and most of the streams that flow into it have been mined, but a few large areas are overlain by peat and are unworked. The gold content of the unworked ground and of the old tailings is unknown, but the known presence of many veinlets and some larger veins in this drainage basin suggest that the unworked ground deserves prospecting.

Hi Yu Creek

Hi Yu Creek is a small stream that rises in the western part of Sec. 25, T. 25 N., R. 3 E., and joins Black Sand Creek in the SW 1/4 of Sec. 24. It has been placered extensively upstream to a short distance south of the mapped area.

Mr. A. Paul is reported to own 12 placer claims along Hi Yu Creek and these constitute the Lost Meadows group (eight claims) and the Bitterroot group (four claims). Mr. Paul has recovered gold by small-scale placer operations on these claims for several years.
Figure 15. Placer cut made in 1935 and 1936 on the lower end of the Homestake group of claims.

Figure 16. Site of the old town of Florence. All the old buildings are gone and the ground under them has been washed for gold. The area shown lies just east of the Ward cabin (see pl. 1). (Photo by U. S. Forest Service.)
In 1935, A. L. Lewis and J. A. Bystor were shoveling into a small sluice on Paul's ground near the mouth of Hi Yu Creek. The two men were recovering about $3.00 worth of gold per day. Many pieces of quartz float, partly rounded, presumably from the Hi Yu group of veins, are found along Hi Yu Creek and some of them contain much visible gold. Some very rich float has recently been found by Mr. Paul a short distance upstream from his cabin.

Little Cow Creek

Little Cow Creek rises outside the mapped area near the Florence-Nut Basin road in Sec. 26, T. 25 N., R. 3 E. It flows south and east to join Cow Creek (sometimes called Robbins Creek), which plunges directly southward down the canyon into Salmon River. The canyon cycle of erosion has not yet reached a part of the headward course of Little Cow Creek in Secs. 26 and 35, and there, where the stream has a gentle gradient, are located the eight placer claims of August Holmgren.

In the old placer days, about 1,500 feet along Little Cow Creek were mined. The tributaries have not been mined and much virgin ground remains. Mr. Holmgren estimates about 48 acres of workable ground on his claims. In 1934, Mr. Holmgren recovered 5 ounces of gold by small-scale mining.

The past overburden is from 1 to 6 feet thick. The gold-bearing ground under the past is reported to be about 1 foot thick along the small branches of Little Cow Creek and considerably thicker along the main stream. The younger sediments contain many angular to partly rounded fragments of vein quartz. Some quartz pebbles containing visible gold have been found, and some of the gold has attached quartz. Locally, considerable clay is present, which is difficult to wash in the sluices. The sediments are commonly stained and locally cemented with hydrated iron oxides.

LODGES

The following notes on the lodes of the Florence district are admittedly very incomplete, principally because the lodes are poorly exposed and the few small mine openings are largely inaccessible. The lodes are described alphabetically by name, but undoubtedly some of the lodes of the district are omitted because they are not known to the author.

Banner

The Banner mine is on the east side of Black Sand Creek in the northern part of Sec. 26, T. 25 N., R. 3 E. The several tunnels and the shaft are completely inaccessible and the mill is dismantled. According to reports in 1936, the property, consisting of four patented claims, is held by the Gold Cross Mining Company. This company is said to have obtained it from the Old National Bank of Spokane. It is also reported that the Banner ore averaged $11.00 to the ton.

The following description on the Banner lode is quoted from Lindgren:

"location on South Branch of Sand Creek, one-fourth mile southeast of Hi Yu mine. Strike, N. 43° E.; dip, 56° SE. Vein of glassy, pure quartz up to 6 feet thick, though ordinarily much less; said to go $50 per ton and to contain 2-1/2 ounces gold, 6 to 7 ounces silver; very little pyrite. Some of the altered granite is also said to be as rich as the quartz. Several minor faults cross the vein, causing it to locally diverge from its course. In the tunnel

Lindgren, Wadsworth, op. cit., p. 236.
12 feet of sheeted granite are exposed, showing quartz seams at intervals; the main seam is 10 inches thick, with excellent comb structure. Several smaller seams, up to 4 inches thick, were also noted. The vein is at one place faulted by a seam (strike N. 70° W., dip 70° S.), showing one foot of decomposed granite between two firm walls, with indications of movement in a horizontal direction. The mine is opened by means of a short crosscut and a drift 300 feet long. A Huntington mill was in course of erection on the Banner in 1897."

Lindgren notes also on Page 233 of the same publication that the Banner was active with reported success in 1898.

**Bear Track**

The Bear Track mine is in Sec. 6, T. 25 N., R. 4 E., at the head of a placer at the eastern edge of the mapped area. During dry weather, the property is accessible by automobile over a poor road from the old town of Florence. The property is said to belong to Frank McGrain of Orangeville. The workings are now inaccessible. The dumps indicate that several hundred feet of workings were opened from a shaft and a tunnel. An old mill is located near the tunnel and shaft. Several quartz veinlets in weathered bedrock were noted near the mine openings in exposures at the head of the placer out.

**Black Bear**

The Black Bear prospect consists of several small prospect pits and tunnels near the center of the west line of Sec. 28, T. 25 N., R. 3 E. This is at the head of one of the branches of Creek Creek, which flows west into Slate Creek. The size of the dumps indicates that the tunnels aggregate several hundred feet in length. No work appears to have been done at the prospect for five or more years, and the ownership is not known.

**Blossom**

The old Blossom claim, according to a sketch map by Lindgren, lies across the divide between the heads of Baboon Gulch and the west branch of Osark Creek. The following is quoted from Lindgren (same reference, page 236):

"This vein is located one-half mile in a westerly direction from the 'old town' on the road leading to the Poorman vein. The vein strikes N. 85° E. and dips 70° S. It consists of altered granite containing quartz veins from 1 to 10 inches in thickness. This ledge is confined between thin sheets of soft clayey material, separating it from the hard country rock. Free milling gold is said to occur in the altered granite and the clay--talc, so-called--as well as in the quartz. A considerable amount of gold was obtained from this mine in early days by means of crushing in mortars. The Blossom is said to be one of the most persistent veins of the camp, and it can be followed for a considerable distance. The vein is developed by a shaft following it and reaching a depth of 110 feet from the surface. The shaft extends 56 feet below the tunnel, which is 220 feet in length."

**Bullion**

The Bullion mine was not visited during this survey. It lies in the Salmon
River Canyon at an altitude of about 4,200 feet in the southern part of Sec. 33, T. 25 N., R. 4 E. The Bullion vein is reported to strike about east and to dip south at about 60°. Its thickness differs at different places, but reaches a maximum of about 5 feet. The property is reported to consist of one patented claim belonging to Mrs. John B. Cook.

Bull Run

The Bull Run claim lies in the SW 1/4 of Sec. 13, T. 25 N., R. 3 E., on the north side of Miller Creek. In 1936, it was being prospected by Fred Jonson and associates. In a prospect pit on the hillside, a very thin veinlet containing a pod of quartz 3 inches thick is exposed. The veinlet trends N. 80° W. A tunnel is being driven to intersect the veinlet at about 150 feet at a depth of about 60 feet.

On the same claim, in the valley of Miller Creek, a 12-inch vein that strikes N. 65° E. crops out.

Elkhorn

The Elkhorn prospect lies east of the Black Bear prospect and is on the divide between French Creek and California Creek. A small inaccessible shaft was noted near the trail.

Gilt Edge

The Gilt Edge prospect on Summit Creek in the SW 1/4 of Sec. 16, T. 25 N., R. 4 E., is reported to be the property of Messrs. James Ward, Hinckson, and Bishop. The prospect is developed by a shaft and short tunnel. An old stamp mill is now in disrepair.

Gold Bug

The Gold Bug mine is in the NW 1/4 of Sec. 25, T. 25 N., R. 3 E., at the head of Black Sand Creek. It consists of several patented claims, and is said to be now owned by the Gold Cross Mining Company, which also holds the Banner group. According to local reports, this mine has produced about $100,000 worth of gold. The ore is said to have yielded about $90,000 to the ton. The vein was formerly opened by a crosscut tunnel that is now inaccessible. In 1936, a new tunnel at nearly the same level as the old one was being driven southward into the hill toward the vein. When the property was visited the new tunnel was 210 feet long and the operators estimated that the vein was about 160 feet farther.

According to Lindgren, "This vein strikes N. 50° E. and dips 65° SE. It is opened by means of a tunnel and shows in places up to 3 feet of quartz. Tellurides are reported to have been found in the ore from this mine".

Golden Dike

The Golden Dike claim, a fraction, lies near the head of Pioneer Gulch, on the west side of the Headen Creek-Miller Creek divide and extends along the road for a considerable distance between the Adley and the Pape cabins. The claim is owned by Albert Adley, who has worked it on a small scale for many years. Development work consists of several very short tunnels and many prospect cuts in bedrock, well exposed by the old placer work in the vicinity. The ore is crushed in a small home-made rod mill on Pioneer Creek and the crushed material is run over a

1Lindgren, Waldemar, op. cit., p. 238.
short sluice that recovers much of the gold. The ore is very rich, and, in spite of the hand methods of mining and of transporting the ore to the primitive mill, considerable gold has been recovered.

Hundreds of veinlets are exposed on the claim and some of these have been mined at several places. Figure 17 is a sketch of one of the cuts on the claim that exposes a typical group of quartz veinlets. Most of the veinlets strike northwest, but a few strike northeast. Some dip northeast and others southwest, mostly at angles greater than 70°.

Careful sampling on this claim and on the east side of the divide in the vicinity of the Pape cabin on and near the Laborde claim of Wm. Pape may reveal ground that contains enough gold-bearing veinlets to support larger-scale operations, such as could be accomplished with power shovels.

Hinckson and Bishop

An old prospect now reported to be the property of Messrs. Hinckson and Bishop lies near the center of the west line of Sec. 24, T. 25 N., R. 3 E., and is partly in Sec. 24 and partly in Sec. 23. The underground openings, consisting of a shaft and a tunnel, were inaccessible. Several open cuts have been made nearby. There is no record of production from this property.

Hi Yu

The Hi Yu mine is one of the oldest of the district. It is on Hi Yu Creek near the northwest corner of Sec. 26, T. 25 N., R. 3 E., and is now reported to be the property of Wm. A. Paul, who owns in addition the adjacent Wm. Lee claim.

In 1936, Paul discovered some very rich veinlets that show considerable gold along Hi Yu Creek a short distance west of the old mine. The veinlets trend N. 85° E. and dip steeply south. Several veinlets were exposed in a zone about 20 feet wide and the thickest was 4 inches.

The following quotation is from Lindgren:

"Strike, N. 45° E.; dip, 68° SE. The ledge is 2 to 4 feet wide, consisting of several quartz seams separated by soft, altered granite. The greatest thickness of quartz at one place is 30 inches. The average value of the ore is said to be $18.00. There are scarcely any sulphurous; free gold is often seen. Value of the gold, $14 per ounce; fineness 650. This vein was worked as early as 1872. In 1897, the developments consisted chiefly of a drift 176 feet long. There is a small 3-stamp mill. A new mill was erected in 1899 and is said to be worked continuously with good success."

Holmadge

The exact location of the lode prospect of August Holmadge is not known, but the principal opening is probably in the southern part of Sec. 26, T. 25 N., R. 3 E. A small tunnel lies a few feet north of the Nut Basin-Florence road, probably in the SW 1/4 NW 1/4 of Sec. 26. The Holmadge prospect is a short distance south of the mapped area.

A tunnel about 70 feet long exposes two veinlets that strike about N. 65° W.

Lindgren, Waldamar, op. cit., p. 236.
Figure 17. Sketch plan of cut on group of veinlets on the Golden Dike claim.
A veinlet, which may be one of those shown in the tunnel, was seen in a small prospect above the tunnel face. The veinlets in the tunnel trend toward an old, caved shaft higher on the hill and about 100 feet from the tunnel face. The tunnel level is about 35 feet below the collar of the shaft. The shaft was accessible for a few sets and in it is exposed a vein up to 3 inches thick that strikes about N. 66° W. Mr. Holmdag says that vein matter as much as 18 inches thick was found a little farther down the shaft.

Liberty

The Liberty mine, formerly the Big 3, is owned by James G. Irvin. The property includes seven claims, but most of the work has been done on the Victor and Liberty claims. The Liberty mine lies in the northern part of Sec. 5, T. 24 N., R. 4 E., in the Salmon River Canyon at an altitude of about 4,800 feet. The mine is accessible by automobile over a steep road from Florence.

Development consists of five tunnels, aggregating less than 1,000 feet, of which three are on the west side of Witsher Creek and two on the east side. There are also a cabin and a road mill capable of handling about 20 tons per day. Ordinarily, water power is used, but during dry seasons it is operated by a gasoline engine. The gold is recovered on an amalgamating plate followed by a sluice box.

The country rock of the vicinity is granitic and is traversed by many fractures parallel to the veins, which strike N. 80° W. and dip 40° to 70° S.

The two higher tunnels on the west side of the creek, one 40 feet long, the other 125 feet long, are about 37 feet apart vertically and are connected by three raises. The intervening ground has been stopped, but the stope is inaccessible. The vein there is said to have averaged about one foot thick. At the face of the 125-foot tunnel below the stope the vein is 1-1/2 feet thick. The ore from the stope is reported to have been worth about $4.00 per ton, with gold figured at $20.67 per ounce.

The lowest tunnel on the west side of the creek is 70 feet long and is 87 feet below the highest. It appears to explore a different vein than those known in the upper tunnels. The vein is 4 inches thick.

The larger tunnel on the east side of the creek is reported to be about 500 feet long, but only about 300 feet were accessible at the time of this survey. The smaller tunnel is about 50 feet up the dip from the larger one. About 180 feet from the portal of the lower tunnel the vein is offset about 20 feet to the left along a northward-trending, vertical fault. The vein was picked up again farther in the tunnel.

Where seen in the Liberty mine, the main vein is largely crushed bedrock and gouge, with some crushed quartz veinlets. Locally, up to 1-1/2 feet of vein quartz was seen. In places, the vein is reported to be several feet thick and in other places only a few inches.

Mikado

The Mikado prospect is one of the old lode prospects of the district. The property is reported to consist of one patented claim. The principal evidence of former development at the Mikado is an inaccessible shaft in the NW 1/4 of Sec. 13, T. 25 N., R. 3 E., on a branch of Miller Creek.
Montrose

The Montrose, like the Mikado, is one of the old lode prospects of the district. It lies in the NW 1/4 of Sec. 13, T. 25 N., R. 3 E., near the head of a tributary to Baboom Gulch and a short distance east and a little south of the Mikado. The old workings are inaccessible. The locations of a shaft and tunnel indicate that the strike of the lode is about N. 84° E.

Morning Sun

Considerable prospecting has been done on the Morning Sun claim of James Ward and associates, near the head of Baboom Gulch in the NE 1/4 of Sec. 13, T. 25 N., R. 3 E. In 1934, a small shaft was being sunk on a small veinlet by the two Peterson brothers. Several veinlets were seen on this claim. The veinlets trend nearly east and reach a maximum thickness of a few inches.

Ozark (Black Hawk)

A location notice seen at a prospect on the south side of Ozark Creek in the SE 1/4 of Sec. 12, T. 25 N., R. 3 E., identifies it as being on the Ozark claim. This is reported to have been called formerly the Black Hawk. The locator is W. R. Grim.

A tunnel and shaft, both inaccessible, indicate that the lode trends N. 85° W. and dips 65° S. Pieces of vein quartz as much as 6 inches thick were seen on the tunnel dump.

Ozark (Bald Eagle)

The Ozark mine, now reported to be called the Bald Eagle, lies near the head of Ozark Creek near the SE corner of Sec. 12, T. 25 N., R. 3 E. The workings are now inaccessible, but the dumps indicate that considerable work has been done. An old stamp mill along the creek is in ruins. A small shaft, three sets deep, was seen along the north-south section line a few hundred feet north of the NE corner of Sec. 13.

The following is quoted from Lindgren:

"The deposit consists of one principal vein averaging 18 inches in thickness and striking S. 84° E. A smaller vein averaging a foot in width joins the former vein at an acute angle, having a strike N. 88° E. A number of smaller stringers run parallel to the latter. The largest vein cuts off the second as well as its parallel stringers. In all, these stringers form a zone up to 50 feet wide, which is said to contain enough to be milled with profit. The quartz is of the ordinary glassy kind, seemingly characteristic of this camp. It contains but little sulphures and shows excellent comb structure. Some of the altered granite along the stringers carries free gold and is crushed with the quartz. The mine is developed by two tunnels 600 feet long, cutting the seam obliquely and striking about N. 62° E. A 5-stamp mill reduces the ore. The Ozark was in 1897 the only producing mine, with the exception of a small quantity milled at the Hi Yu."

Pooorman

The Pooorman mine lies outside the mapped area near the top of the Salmon River Canyon. It is probably in Sec. 34 or 35, T. 25 N., R. 3 E., and lies at the

1/Lindgren, Waldemar, op. cit., p. 237.
head of a tributary of Looking Glass Creek. It is one of the old mines of the Florence district. Large dump testify to a large amount of underground work. The mine has been inactive for many years and is now inaccessible.

According to Lindgren, the mine is "developed by a shaft 120 feet deep and a tunnel. The ore contains equal parts of gold and silver by value. The quartz is similar to that of other veins, but is said to contain, in addition, some ruby silver and horn silver".

Red Bird

Many veinlets have been prospected along French Creek, particularly south of the Chamberlin cabin. The dumps indicate that considerable work was done on some of them. A group of openings near the head of the creek in the northern part of Sec. 26, T. 25 N., R. 3 E., are said to constitute the Red Bird prospect.

Taft

The old Taft prospect, reported to be owned by Mrs. Ada Cyr, lies just north of the mapped area near the West Fork of Meadow Creek between the White and Page cabins. This is in Sec. 7, T. 25 N., R. 4 E. In 1935, the Taft was being prospected by J. R. Chenault and R. J. Broek, who called the claim the Lloy. These men were using a small mill driven by a Ford engine. The mill had a rated capacity of one ton per hour.

The lode consists of a group of small veinlets in a zone about 30 feet wide exposed at the head of an old placer cut.

U. S.

The U. S. prospect of Jack Hardin is on the east side of Black Sand Creek near the Hardin cabin. Development consists of two small tunnels, one 60 feet and the other 70 feet long. Mr. Hardin, in 1934, was starting a crosscut tunnel to the lode. The property is said to have produced a little gold many years ago from ore reported to run about $10.00 per ton.

The lode strikes N. 54° E. and dips 70° to 80° S.E. At the surface, the vein is 3-1/2 inches thick, but is reported to be considerably thicker in the old workings at a depth of about 70 feet.

Waverly

The Waverly mine is on the patented Waverly claim in the SW 1/4 of Sec. 13, T. 25 N., R. 3 E. The property is owned by the Monte Crisco Mining Company, of which Fred G. Jonson is president. According to local reports, the Waverly was found many years ago by Chinese miners who were placer mining in the vicinity. When acquired by the present owners in 1932, the old workings consisted of a 120-foot shaft and 145 feet of stopes. According to Jonson, the old stope yielded about $30,000 worth of metal.

When visited in 1934, the old workings were inaccessible except for short distances underground where they were encountered by new tunnels. In 1934, about 1,100 feet of tunnel work were accessible and were mapped in detail because the mine illustrates well the type of lode found in the district (fig. 18). Workings on a lower level, formerly accessible through a winze, were completely flooded.

1/Lindgren, Waldemar, op cit., p. 237.
Figure 18. Geologic map of the Waverly mine, Florence, Idaho
The lode is very poorly defined and consists of groups of small veinlets. According to Lindgren, the Waverly "vein has the usual E.-W. strike and southerly dip; its width is about 12 feet". A 12-foot lode, such as mentioned by Lindgren, is not apparent in the workings accessible in 1934.

Near the mouth of Six Ounce Gulch, a small tributary to White Sand Creek from the north in the SW 1/4 of Sec. 13, T. 25 N., R. 3 E., on ground belonging to Otto Egloff and only a few feet from one of the Waverly claim's corner posts, a veinlet-zone about 40 feet thick that contains more than 40 veinlets is exposed. An assay of a channel sample across this zone indicated more than $9.00 to the ton in gold.

Wie

Near the mouth of Baboon Gulch is the Wie claim of Chas. F. Donnelly and associates, who staked it in 1934. Two old caved drifts were noted on the property. One group of small veinlets strikes N. 45° E. and dips 60° SE. Another strikes N. 75° W. and dips 85° NE.

Yakima

The Yakima mine lies in the Salmon River Canyon near Cow, or Robbins, Creek, in the southern part of Sec. 29, T. 25 N., R. 3 E. This is south of the mapped area and is at an altitude of about 5,000 feet. The mine is reported to be claimed now by Eva Canfield and Jack Martin. The property was not visited during this survey.

One inaccessible tunnel several hundred feet long is reported to be present on the property and the mine is locally supposed to have produced some gold. The vein is said to trend east and to locally reach a thickness of about two feet.

/ Lindgren, Waldemar, op. cit., p. 237.