

## **MINING IN THE FAIRBANKS DISTRICT.**

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By **HENRY M. EAKIN.**

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### **INTRODUCTION.**

The writer devoted about 10 days in the later part of August, 1914, to the investigation of the recent mining developments in the Fairbanks district. This time was insufficient to visit all the operating mines, but by supplementing the observations made with information furnished by the operators fairly complete data were obtained on the principal developments.

In the summer of 1914 about 125 placer mines were operated in this district, employing some 1,200 men. Statistics of winter operations are far from being complete, but it is probable that not over 50 mines were worked. The value of the placer gold produced in 1914 is estimated at \$2,500,000, compared with \$3,300,000 in 1913. During the summer of 1914 the most productive creeks were Cleary and Pedro. Important operations continued also on Ester, Dome, Vault, Little Eldorado, Goldstream, Engineer, and Fairbanks creeks. The falling off in output is to be interpreted as indicating the exhaustion of the bonanza deposits and the nondevelopment of the extensive bodies of auriferous gravels of lower gold tenor.

There was a relatively greater decline of lode mining in 1914. Only four lode mines were operated long enough to be considered regularly productive. There were, however, eight or nine lode properties that made some gold output; in 1913 there were thirteen such properties.

### **PLACER MINING.**

#### **GENERAL ACTIVITIES.**

The present placer-mining activities of the Fairbanks district are supported mainly by low-grade deposits, placers that yield \$1 or less a square foot, which have lain in reserve on the productive creeks pending the exhaustion of the more profitable concentrations. During 1914 deep placers yielding as little as 40 cents a square foot were worked by drifting, and shallow deposits of still lower grade were worked in open cuts by mechanical methods.

Mining costs in terms of the volume of material handled have remained about stationary during the last several years, as the general advance in the price of fuel and supplies has been offset by an increasing economy in their use and an increasing efficiency of mining methods, equipment, and employees. The improvement of deep-mining methods has been made mainly in the details of operation and in the organization of forces. In shallow mining a great advance is being made by the increasing use of mechanical equipment. The output of the district in 1914 was derived more largely from mechanically operated shallow placers than in any preceding year. Winter mining has suffered a greater decline than summer operations, being more expensive and hence less adapted to the exploitation of the remaining low-grade placers.

#### REVIEW OF OPERATIONS BY CREEKS.

##### CLEARY CREEK.

Cleary Creek and the section of Chatanika Valley adjacent to its lower course continue to form the most productive placer-mining center of the district. Upstream from the margin of Chatanika Valley most of the richest part of the Cleary Creek pay streak has been worked out, but there is still considerable activity devoted to cleaning up the so-called "side pay" and the weaker parts of the pay streak that were rejected in earlier operations. From claim No. 11, above Discovery, to "No. 10 below" in this section of the valley 13 claims were active during the summer of 1914. They were worked by 13 plants that employed a total of 138 men. Claims "No. 11 above" and "No. 1 below" were worked in open cuts; the others were drifted.

The open-cut mine on "No. 1 below" is of special interest, as it marks the first installation of heavy mechanical equipment for this type of mining on Cleary Creek. The work of preparing the ground for open cutting has been in progress since 1912. A bedrock drain, 1,900 feet long, timbered and lagged throughout, was put in to keep the works free from water. In this work and in opening the first cut on the lower end of the claim a large amount of tailings of earlier operations was reworked, and the expense of the new undertaking was largely repaid by the gold thus recovered. The alluvium in this part of the valley is 16 to 22 feet in depth and consists of 6 to 12 feet of muck underlain by gravel. It is mostly thawed, but small spots are frozen and require thawing with steam points. The equipment includes an 80-horsepower Scotch marine high-pressure boiler, a large American triple-drum hoisting engine, two Bagley scrapers, and an electric-light plant. The first cut worked out in 1914 was 250 feet square. The muck was first removed by ground-sluicing and scraping. The gravels were then worked by a rather complex but efficient

system. The scrapers delivered the material to a hopper at the side of the cut, which emptied into a 40 cubic-foot dump car. The dump car was hauled up a 200-foot incline, delivering the gravels to a dump box 82 feet long and 4 feet wide. The dump box and the sluice boxes, with the exception of two lengths of undercurrent, were floored with iron-shod wooden riffles. The system is reported to be very economical and capable of working low-grade ground profitably.

On Cleary Creek downstream from "No. 10 below" and on the adjacent section of the Chatanika Flats 16 plants operated during the summer of 1914 on 14 separate claims. About 200 men were employed. Much less activity was shown the previous winter. The alluvium in this area ranges from 34 to 140 feet in depth. It is perpetually frozen and consists chiefly of sands, gravels, and less worn rock materials. Locally, especially on the marginal slopes of Chatanika and Cleary valleys, the gravels are overlain by silts, in places of considerable depth. Elsewhere only a thin covering of muck is found.

The chief concentrations at this locality are the continuation of the Cleary Creek pay streak N. 65° W. for half a mile beyond the margin of the flats and the Chatanika pay streak, which runs S. 25° W. from the extremity of the Cleary streak. Other concentrations of less definite form parallel these west of Cleary Creek and south of the Chatanika pay streak. The information at hand indicates that the concentrations along the south side of Chatanika Valley appear to be on a series of benches that rise from the lowermost, 140 feet below the surface, to the uppermost, a quarter of a mile farther south, near the railroad and 56 feet below the surface. The surface rises southward, so that the progressive elevation of the benches is even more pronounced than the differences in depth indicate. Individual benches range from 10 to 30 feet in height. These benches are only partly revealed by the mine workings, but they appear to be cut in bedrock, and some of them, especially the higher ones, have steep fronts and flat tops. In some places the fronts are vertical; in others they are more or less gradual, and locally they are transected by narrow depressions that contain wash of a different sort than that overlying the adjacent terrace surface.

The distribution of gold on the benches has certain general characteristics. The higher gold content is found in zones near and parallel with the inner margins of the benches. The tenor of the bench placers is generally very moderate—40 to 80 cents a square foot—but in places there are local enrichments, especially in the vicinity of the transecting depressions mentioned above.

At a mine located just west of Chatanika village the shaft penetrated a rich placer at a depth of 56 feet, in gravel overlying a

stratum of unworn fragmental rock material that was long regarded as true bedrock. Later this stratum was penetrated and gravels beneath it were exposed. The shaft was then sunk to a depth of 75 feet and an equally rich concentration was discovered on the true bedrock surface. A short distance south of the shaft the lower concentration ends against a bedrock scarp, the front of a terrace, which rises to the level of the upper concentration and supports the southern part of it. The explanation of these facts must await much more exhaustive and detailed examination than has yet been attempted.

On Chatham Creek, tributary to Cleary Creek, two small plants worked a part of the summer. On Wolf Creek new discoveries were made during the summer that resulted in a marked stimulation of mining activity. Six claims were worked by 10 small outfits, employing about 50 men. The depth to bedrock on the upper part of the creek is slight, and open-cut methods are used. The ground deepens downstream to 30 feet on claims "No. 2 above" and "No. 3 above," and 60 feet on "No. 1 above," where drifting methods are required. The gold is not evenly distributed, and the gravels are said to range from those that are barely profitable to those yielding \$4 a square foot.

#### ELDORADO CREEK.

Seven claims were active on Eldorado Creek, from "No. 5 above" to "No. 9 below." Seven plants, employing 85 men, were operated. Although none of the plants were large, at least four of them were worked in a very substantial manner and made a creditable production.

The later developments on Eldorado Creek, as on all the productive tributaries of Chatanika River, are on the flats of the Chatanika. The ground is 110 to 150 feet deep, and prospecting is necessarily slow and expensive in the absence of drilling operations. Preparations are under way for a renewal of prospecting on the Chatanika Flats in the attempt to trace the Eldorado pay streak beyond its present known extremity.

#### DOMES CREEK.

Most of the mining on Domes Creek in 1914 was on the flats near its mouth. Two plants worked on the Shakespeare and two also on the Niggerhead association claims. "No. 14 below" and "No. 7 below" each had a single outfit operating. Only prospecting was done on the Dawdawn association. The seven outfits employed about 110 men. The ground deepens notably toward Chatanika River, and on the lower end of the Niggerhead association it is 170 feet to bedrock.

## VAULT CREEK.

Seven plants, employing 118 men, worked six separate claims on Vault Creek during the summer. Four of these were among the largest in the district; the others were much smaller.

Two or three small plants worked successfully the preceding winter. Here also the chief activity is in the lower part of the valley and on the Chatanika Flats, where extensions of the pay streak have been more recently traced.

## FAIRBANKS CREEK.

Summer operations on Fairbanks Creek were carried on from claim "No. 16 above" to "No. 15 below." Eighteen plants worked on 13 separate claims and their maximum force was about 180 men. The average number of employees for the season was considerably less. Only a little winter work was done.

The depth to bedrock on Fairbanks Creek ranges from a few feet near its head to 120 feet on "No. 15 below." In the headward section the mines are open cut; farther downstream drifting methods are employed. The open-cut mines are operated largely by manual methods, but a few are equipped with steam scrapers.

The only dredge in the district is that of the Alaska Exploration Co. on claim "No. 8 above," Fairbanks Creek. It has a close-connected line of  $3\frac{1}{2}$ -cubic-foot buckets and a 40-foot ladder. It is run by steam power, and wood is used for fuel. The ground is 10 to 12 feet in depth and is thawed. Mechanical troubles have prevented continuous operation of the dredge, and the lack of thorough prospecting before the earlier operations made necessary a great deal of dead work that otherwise might have been avoided. This defect in the plan of operation is being remedied by extensive drilling on the ground toward which the dredge is working.

## FISH CREEK.

A little mining was done on Fish Creek on claims "No. 1 above" and "No. 2 above." Other operations in the Fish Creek basin were those on First Chance Creek, Monte Cristo Pup, and Pearl Creek. These operations altogether included half a dozen outfits working separate claims and employing about 20 men.

## TWIN CREEK.

A single small ground-sluicing outfit worked on Twin Creek near its mouth a part of the summer. An attempt was made early in the season to operate on a larger scale farther upstream, but it was abandoned after a short trial.

## PEDRO CREEK.

All the claims on Pedro Creek from "No. 1 below" to "No. 10 below," except Nos. 7 and 9, were worked during the summer of 1914. Of the eleven plants operating, seven were equipped with steam scrapers and worked in open cuts. The other four plants drifted and used steam hoists. About 130 men were employed. During the preceding winter only two or three small drifting outfits were active. Open-cut mining was done in ground that ranged from 10 to 20 feet in depth. Most of the drift mines were in deeper ground nearer the margins of the valley.

The Pedro Creek open-cut operations probably represent the highest efficiency in handling yardage yet developed in the district. Their economy is strikingly apparent when it is remembered that the whole depth of alluvium is removed mechanically, and that the gold tenor, considered areally, is only moderate.

Some of the plants worked out of their ground during the summer. Others have from one to three seasons' work ahead before the available ground will become exhausted.

## GOLDSTREAM CREEK.

Thirteen separate claims were worked on Goldstream Creek for longer or shorter periods during the summer of 1914. Nineteen different outfits operated with a maximum force of about 160 men. A little work was done by several small plants during the winter.

A small plant operated both winter and summer on First Chance Creek, and another on Gilmore Creek, both tributaries of Goldstream Creek. Also three plants employing 50 men worked on Engineer Creek during the summer and a single small plant during the winter.

From claim "No. 3 below" to "No. 6 below," Goldstream, open-cut methods and scraper equipment were in use on three claims. Farther downstream and on the tributaries mentioned the ground is deeper and is drifted.

## ESTER CREEK.

Six plants, employing about 70 men, worked on Ester Creek in the summer of 1914, and seven plants, employing 50 men, in the preceding winter. The principal summer work was on Discovery claim and "No. 3 above." The center of winter activity was Gold Hill bench, near the mouth of Ester Creek, where five small outfits were employed.

Although the richer placers have long been exhausted at this locality, there are apparently considerable areas of "side pay" bordering

the old workings that are capable of supporting profitable mining with the exercise of rigid economy. Unexpected returns, it is said, were obtained from some of the new workings, on claims that were considered entirely worked out years ago.

#### EVA CREEK.

Prospecting only was done on Eva Creek during the year. Drill work on the Minnesota association is said to show good concentrations, but the ground is thawed, so that it can not be worked with present equipment.

A working shaft was sunk on the upper end of the Happy Home association on the strength of alleged determinations made with a divining rod. Without any other evidence of the existence of placers beneath the surface, this laborious and expensive piece of work was undertaken with complete confidence in its successful issue. It is interesting to note the persistence of this archaic idea, which, if at all trustworthy, must long ago have been universally adopted as a substitute for all other modes of prospecting.

#### READY BULLION CREEK.

Successful operations were carried on by a large plant in summer and a smaller one in winter on the Mihalcik bench on Ready Bullion Creek. The only other activity on the creek was desultory prospecting for "side pay" on some of the worked-out claims.

#### OTHER STREAMS.

Small plants were operated for a part of the season, one on St. Patricks Creek and one on Happy Creek, which are tributary to Cripple Creek. Only a little prospecting work is reported in the Smallwood Creek basin and little is known of the results obtained.

A little activity is reported on two or three claims on Chena River. Only a few persons worked in this section, and they produced only a few hundred dollars.

The Tenderfoot district includes a small area in the vicinity of Richardson post office and is drained by several small northerly tributaries of Tanana River. The productive creeks in 1914 were Tenderfoot Creek and Democrat Pup, a tributary of Banner Creek. On Tenderfoot Creek claims Nos. 4, 5, 6, and 16 were worked by three plants, employing about 55 men. The ground is 90 to 170 feet deep and is drifted. On Democrat Pup two outfits operated during the summer. The ground is shallow and is worked in open cuts by ground sluicing together with manual methods.

## LODE MINING.

### CAUSE OF THE DECLINE.

Although the decline in lode mining noted above is in part due to the failure of some of the properties to justify further development work, it is more largely the result of retrenchment on the part of operators who are unwilling to invest further in mine development or to exploit their proved reserves under the present cost of operating, and who hope for larger returns on their investments and larger operating profits when the projected Government railroad shall have given a new and lower schedule of costs. Present costs are not only prohibitive for mines whose ores yield \$20 or less to the ton, but they burden the richer mines as well by limiting operations to only the richer parts of lodes and curtailing the profits of their exploitation. Any reduction in costs would not only increase the net revenues from such ores as are now mined, but would also permit a marked enhancement in the value of lode properties. Because of this outlook some of the largest operators in 1914 were considering the advisability of shutting down until the railroad is completed.

### MINES WITH REDUCTION PLANTS.

The most important lode operations in the district in 1914 were those of the Rhoads-Hall mine, on Bedrock Creek; of the Soo Mining Co., near the head of Dome Creek; and of Crites & Feldman, on Moose Creek. Only these mines operated their own mills for much of the year.

The Rhoads-Hall mine was worked throughout the year, and the mill operated about 350 days. The mine furnished a practically continuous supply of ore, so that little or no shortage was felt. New ore was blocked out at about the same rate that the older workings were depleted. About 3,000 feet of development work was done, 1,800 feet in ore and 1,200 feet in waste. Of this work 2,000 feet was comprised in drifts, chiefly on the 70-foot and 100-foot levels. Connections driven between levels aggregated about 1,000 feet. About 50,000 feet of vein matter was stoped out. An average of about 23 men were employed, 18 in the mine, 3 in the mill, and the others at the mess.

The Soo Mining Co. was engaged during the year chiefly in mine development and prospecting. Six to ten men were employed. The mill was run at intervals as ore was provided by the development work.

The Crites & Feldman property on Moose Creek showed a marked development during the year. Five men were employed in the mine extending tunnels and opening out for stoping. The creek-level



tunnel was extended to a depth of 450 feet, and the main adit, 90 feet higher, to 550 feet, both in ore their whole extent. A little stoping was also done. The 4-stamp Hendy mill that was formerly located on Chatham Creek was moved to a new site on Moose Creek below the mine during the summer and began crushing about September 1.

#### MINES WITHOUT REDUCTION PLANTS.

A number of mines not equipped with reduction plants produced more or less ore, which was treated at the mill-equipped mines or by custom mills, of which there are several in the district. Three mines of this character operated in the Fairbanks Creek section, two in the Cleary Creek basin, and two at the head of St. Patricks Creek.

The active mines in the Fairbanks Creek section were on the Mayflower, Pioneer, and Roy Lode claims. The first two claims had been developed to some extent prior to 1914. The development of the Roy Lode claim followed the discovery of rich ore in July, 1914. A small test shipment was made late in the summer, and satisfactory returns were reported. In all about 40 tons of ore from the three mines was milled, from which \$3,000, or \$75 a ton, was recovered.

In the Cleary Creek basin the Tanana Quartz & Hydraulic Mining Co.'s holding on upper Bedrock Creek and the Homestake mine on Wolf Creek were worked in the same small way as in previous years. The work on the former property is said to aim chiefly at mine development, and the returns are derived from shipments made to test the various parts of the lode.

The Homestake mine is operated under lease. The ores produced are chiefly from a rich vein that averages only 5 inches in width. About 35 tons of ore milled from the two properties is said to have yielded well over \$100 a ton.

At the head of St. Patricks Creek the Mohawk and Fairchance properties were active. Over 50 tons of ore was produced, ranging in tenor from \$18 to \$50 a ton.

#### PROSPECTING.

A number of properties in the district are being actively prospected and developed, but are making no actual production of gold, as the ores produced are not milled. These operations vary widely in results attained, but altogether comprise a very encouraging aspect of the industry. Although some of the claims under investigation will probably be added to the long list of valueless properties, there are others that promise to become highly productive mines.

In the Fairbanks Creek section several properties are being prospected in a small way. The Nars-Anderson-Gibbs holdings are being slowly developed by Mr. Gibbs, who has purchased the interests of the other interested parties. A resumption of work on the Mizpah

claim was planned for the fall of 1914. The Ohio group, opposite placer claims "No. 13 above" and "No. 14 above," was prospected by two partners, who have sunk an 80-foot shaft on a vein that averages 2 to 2½ feet in width. They have 20 tons of selected ore on the dump. The American Eagle claim, farther upstream, has recently been released from litigation and prospecting under lease has begun.

In the Cleary Creek basin the Rexall mine has been leased by new operators and an early resumption of operations is planned. In the Chatham Creek valley the Chatham and Pioneer properties are idle, but an attempt to finance further development work is under way. On Willow Creek the Newsboy mine is idle, but it is planned to continue development and mining when costs reach a sufficiently low point to make it profitable. On the Emma claim, at the head of Willow Creek, a little work was done in 1914.

In the valley of Twin Creek the Rainbow mine is closed, but it has been recently let under a new lease and large-scale operations are contemplated in the near future. The Moonshine and Sunshine claims near by were prospected during the winter of 1913-14.

In the Ester district the most important prospecting work under way is that of Tyndall & Finn on the Bondholder and Yellow Jacket claims, near the head of St. Patricks Creek. The Bondholder discovery was made in 1912. In 1913 a little development work, chiefly surface open cuts, was done, and in 1914 the work was continued by a force of three to five men. Four inclined shafts, 20 to 140 feet deep, were sunk along the footwall of the main Bondholder lode. The shafts are 7 feet wide across the strike of the lode, and every 20 feet a test drill hole was driven into the hanging wall to a depth of 5 feet. At a depth of 55 feet in the main shaft a 50-foot drift was driven to the southwest on the strike of the lode. The ore was tested by crushing and panning, and samples that made a good showing in the pan were considered workable. By this test the main lode is said to have a determined minable width of 12 feet.

In June, 1914, an adit was started from the creek level on the Yellow Jacket claim, 250 feet lower than the collar of the main Bondholder shaft. In December it had been driven 175 feet, and the operators intended to drive it about 325 feet farther to undercut the Bondholder lode, and proposed to complete it by June, 1915. Three distinct lodes of smaller size on the Yellow Jacket will also be cut. The tunnel is 6½ feet high, has 6-foot sills and 4-foot caps, and is laid with an 18-inch gage track of 8-pound rails. Steel cars of 10 cubic feet capacity are in use. Tyndall & Finn are also developing the Mohawk claim and report the discovery of a 6-foot lode during the fall of 1914, on which they have sunk three shafts to a depth of 26 feet.

## **MINING IN THE HOT SPRINGS DISTRICT.**

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By **HENRY M. EAKIN.**

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### **GENERAL ACTIVITIES.**

The Hot Springs district had a highly prosperous season in 1914. The production is estimated at \$750,000, compared with \$400,000 in 1913. The Sullivan Valley continued to be the most productive center. Two areas of extremely rich placer ground have been located here, one in 1912 and the other in 1913. Both areas were worked on a large scale in 1914 and contributed the larger part of the production of the district.

Other sections of the district also showed a marked improvement over the previous year. American Creek, where gold was discovered in 1911, was better equipped with machinery and made a very creditable showing. In the Pioneer Creek basin new deposits favorably situated for hydraulic mining were discovered. Many older claims throughout the district were also operated with fair success.

### **THE PLACERS.**

The placers of the Hot Springs district are widely divergent in character, form, and manner of distribution. The types disclosed by operations include ordinary pay streaks, bench deposits, stream reconcentrations from bench deposits, and irregularly distributed discontinuous bodies that do not enter into the familiar classification of placers.

Placers of the ordinary pay-streak type occur only in relatively narrow and high-walled valleys, notably in those of American and Eureka creeks.

Bench deposits occur along the sides of valleys or skirt around the points of interstream features from one valley to another. They are as a rule essentially horizontal and some of them extend for long distances. Low-grade bench deposits of this type extend westward from Eureka Creek along the north side of the Baker Creek basin across the valleys of several small streams. A less extensive bench deposit skirts around the point of a ridge between Quartz Creek and its chief western tributary. A series of benches, the largest of which is What Cheer Bar, are developed on the north side of Pioneer

Creek valley. These extend far up toward the head of the valley and are crossed by a number of small northern tributaries of Pioneer Creek.

Reconcentrations from bench deposits are found in the northern tributaries of Pioneer Creek and in the streams that cross the extensive bench deposit west of Eureka Creek.

The placers of unusual type referred to above are fittingly described as "spots" by the local operators. The simplest forms are rudely elliptical in outline and have a relatively rich central area, away from which the gold tenor and the size of particles decrease out to the margin of profitable ground. Such placer spots are developed locally on the surface of bedrock terraces. Some of them appear upon a single terrace. More complex forms are in places developed upon several closely spaced terraces, and it is not uncommon to find a great variation in the elevation of bedrock in a single mine, the surface being everywhere sensibly flat except in the terrace scarps. Many of the central areas are of bonanza richness. In one mine \$200,000 is said to have been produced almost entirely from a space of 5,000 square feet. On higher terraces at the same locality several other small areas of but slightly lower tenor were mined. Still other mines have shown small areas containing \$10 to \$30 in each square foot. The minable area of individual spots ranges from a few thousand square feet to a few acres. The larger areas are usually more complex in form and include two or more terraces. In such areas the distribution of gold is also complex, a richer area usually appearing on each terrace. The placer spots are known to occur only in the Sullivan Creek basin. They have been developed on lower Cache Creek and in the Sullivan Creek valley a quarter of a mile above Tofty and at five localities from half a mile to 5 miles below Tofty.

The alluvium developed in these mines is 50 to 170 feet deep. Still greater depths are known to occur in the basin. The material is mostly light-colored stratified silt, but in places its upper part is dark colored and contains vegetable material and ground ice. The silts are generally underlain by gravels or less worn fragmental material. This material ranges in thickness from a few feet to 35 feet, as shown in the mine workings.

Large, well-worn boulders, measuring as much as 7 or 8 feet in diameter, have been found in the gravel deposits, on their surface beneath the silts, and in the silts above the top of the gravels. That they were not produced or transported in the same manner as the other deposits is clear. Some of them are apparently not of local origin.

The Sullivan Creek placers contain tin ore as well as gold. The character of concentration is the same, and the two minerals are prob-

ably closely allied as to their bedrock source. Hematite and pyrite are also associated with them in some of the placers.

### CONDITIONS THAT GOVERN MINING PROGRESS.

The variety and unusual types of placer deposits and the general lack of familiar topographic guidance has made prospecting unusually hazardous and expensive in the Hot Springs district. In the absence of large continuous deposits the fortunes of mining have been closely allied with those of prospecting, and the industry has progressed in an erratic and uncertain manner. Very little capital not produced within the district has been used, and the earnings of earlier operations have been largely reinvested in the attempted development of new deposits. Disappointments have been numerous, and the combination of confidence and funds has remained with but a few operators.

The production in 1914 exceeds that of any other year in the history of the district except 1911, when the output was considerably greater. The large production in 1914 is due chiefly to comparatively recent discoveries in the Sullivan Creek valley and on a tributary of Pioneer Creek in the older section of the district. The Pioneer Creek discovery was made wholly by accident and in a situation not considered favorable for prospecting by local operators. The other two discoveries are the result of one of the greatest financial ventures ever made in prospecting for placer ground in Alaska. A small fortune, the entire net production of one of the richest mines in the history of the district, was spent to the last dollar in drilling the deep ground of Sullivan Valley. Half the amount had been spent when the first strike was made in 1912 on Miller Gulch. Control of the ground was lost to the discoverer, and drilling was resumed. A year later the placer on Hokeley Gulch was struck, and the confidence of the operator was justified at the very time his capital was exhausted.

It must be confessed that the drilling operations of this venture were more or less haphazard and that their successful issue was due more to the large capital employed and to good fortune than to a sound hypothesis regarding the distribution of concentrations or any systematic scheme for carrying on the search. It is not at all certain that another similar venture following the same plan and method would be equally successful. It seems possible, however, that the hazard and expense of prospecting could be notably reduced by taking the probable origin of the placers more into account and by making a better use of the data furnished by mining operations and drilling regarding the surface features of bedrock beneath the alluvium and the relation of concentrations to such features.

### OPERATIONS IN 1914.

The Hot Springs district includes three rather distinct placer areas—the Baker Creek area, to the east; the Sullivan Creek basin, located centrally; and the American Creek area, to the west, near the junction of Yukon and Tanana rivers. These sections of the district will be taken up in order.

#### BAKER CREEK TRIBUTARIES.

Operations were carried on in the Baker Creek section of the district on Thanksgiving, Gold Run, Eureka, and Pioneer creeks, whose names have been familiar in the annals of placer mining for more than a decade. For the most part the present operations are conducted on a small scale and represent the lag end of the industry, as the rich placers have long been exhausted and only a few known spots rich enough to support mining remain. The deposits on Seattle Jr. Creek, a tributary of Pioneer Creek, are exceptional in being recently discovered and of relatively high grade. In addition to the creek placers two areas of bench placers were worked, each by a small outfit, one between Thanksgiving Creek and Gold Run and the other between Gold Run and Eureka Creek.

Two plants operated on Thanksgiving Creek and one on Gold Run by the familiar method of groundsluicing and shoveling in. On Eureka Creek a steam-scraper plant operated at a point half a mile above the mouth of Pioneer Creek. On the northern tributaries of Pioneer Creek three plants operated and a fourth was engaged in dead work preparatory to operating in 1915. Two of the active plants were small groundsluicing outfits. The third operated the newly discovered ground on Seattle Jr. Creek, using hydraulic equipment.

In all ten plants worked in this part of the district and employed a total of 60 men.

#### SULLIVAN CREEK BASIN.

Large scale operations were carried on throughout the summer on Hokeley and Miller gulches. Work was resumed on the Midnight Sun claim late in the summer with the intention of continuing through the winter. A little prospecting and mining was done on lower Cache Creek and on the high bench west of Quartz Creek.

#### HOKELEY GULCH.

Hokeley Gulch heads about 5 miles southwest of Tofty in a swampy flat and flows southwestward for  $1\frac{1}{2}$  miles into Woodchopper Creek, a tributary of Sullivan Creek. A large area of rich placer ground

was located on the Wild Goose claim, about a quarter of a mile east of the head of the stream, by Adolph Bock in March, 1913. Later in the same year the ground was explored by a shaft and drifts, and preparations were made for extensive operations the following season. During 1914 an average of over 50 men were employed. Day and night shifts were used throughout the season, and part of the time dirt was hoisted from two separate shafts by the same power plant. Power was generated by three 50-horsepower boilers using cordwood fuel. Water for the boilers and to replenish the sump from which the sluice boxes were supplied was pumped from a small lake half a mile south of the mine.

The shafts penetrate 130 feet to bedrock, most of the way through light-colored stratified and frozen silt. A stratum of gravel 6 to 8 feet thick lies on bedrock beneath the silts. The gold is well concentrated on bedrock and in the lowermost gravels. It is well worn and of fine, even texture, indicating considerable transportation and assortment prior to its deposition in the present placers.

Although the deposit has not been fully outlined, margins have been located which indicate that it is not part of a continuous pay streak but is irregularly terminated in all directions. The gravels vary in gold content from place to place, ranging from those that are barely workable near the margins to some of very high tenor, about the central shaft. There are considerable areas that yield \$4 to \$6 or more to the square foot, and the entire minable area is thought to extend over several acres. Stream tin occurs with the gold, but no special attempt was made to recover it.

There is considerable difference in depth between the two shafts, though they are only a few score feet apart. To the southeastward bedrock drops off to still lower levels.

#### MILLER GULCH.

High-grade placers were discovered by drilling on the United States Association claim, in lower Miller Gulch, in 1912. Later discoveries have developed areas of placer ground at intervals for about a mile northwestward toward the head of the gulch. The surface of the claim has a gentle eastward slope. However, depths to bedrock range from 85 to 120 feet within a horizontal distance of 500 feet, the difference in elevation of the bedrock being accounted for in bold scarps that stand between adjacent level-surfaced features. These features persist for a considerable distance toward the head of the gulch. Above the United States Association claim the first placer area is 65 feet below the surface and the next one 45 feet. The uppermost placers are at still less depth and are apparently of the ordinary pay-streak type.

Three mines were worked on Miller Gulch in 1914, one of which operated three plants most of the time. On an average a total of 112 men were employed.

Rich concentrations of tin occur with the gold, and some of the plants were equipped to recover all that they mined. About 30 tons of concentrates are reported as saved by one mine.

#### THE MIDNIGHT SUN CLAIM.

The Midnight Sun claim is about a quarter of a mile northwest of Tofty and 500 feet east of Sullivan Creek. The ground is 50 to 65 feet deep and for the most part is perpetually frozen. The pay streak lies on and near the bedrock surface, which has the form of a well-preserved series of low terraces both here and on the Abe Lincoln claim adjacent to the southeast.

Under the first management the Midnight Sun mine was developed in a very efficient manner and a large production was made. Later the control passed to other hands, and after a short season serious caving occurred and the mine was flooded by surface waters and by ground water from a body of thawed gravel that the workings penetrated. The mine was closed and laid idle until the summer of 1914, when the original management regained control. It was planned to reopen the mine by sinking a new shaft in barren frozen ground near the placer area and driving tunnels to tap the known bodies of pay gravel adjacent to the old workings. This work was to be done mainly in winter, in order to avoid the surface waters that enter the old workings through a caved-in sump. Pumping apparatus was to be installed to handle the ground water.

#### CACHE CREEK.

A great deal of mining has been done on Cache Creek, mostly on small areas of rich ground that have supported but short-lived mines. Productive years have alternated with nonproductive, when the efforts of operators were directed entirely to the search for new placer areas. This was the situation during most of 1914, but toward the end of the season operations were begun on a newly discovered area of low-grade ground.

#### QUARTZ CREEK.

The deposit in the Quartz Creek basin known as Homestake Bar is situated on a gentle slope about a quarter of a mile west of the stream and at an elevation 60 to 75 feet higher. It is the shallowest placer of the Sullivan Creek basin, consisting of only 3 to 4 feet of gravel and coarse fragmental materials overlain by 3 feet of yellow silt. The deposit continues horizontally around the point of the low



ridge that separates Quartz Creek from its chief western tributary for about a quarter of a mile, but it is at present workable as placer ground for only a part of this distance.

Small-scale operations carried on by manual methods have been in progress on Homestake Bar since 1910, and in 1914 four men were so engaged during the summer.

#### AMERICAN CREEK.

American Creek is about 15 miles west of Tofty. The headward part of its valley for about 2 miles is in the high bedrock area that borders Sullivan Creek farther east. This part of the valley is deep, steep-sided, and relatively narrow. Beyond the margin of the bedrock area the stream flows for about 3 miles over a broad flat that is continuous with the floor of the lower Sullivan Creek basin and enters the east side of Fish Lake.

The grade of American Creek in the reach where prospecting has been done is 70 to 85 feet to the mile. In the upper narrow part of the valley the alluvium ranges between 12 and 18 feet in depth. Out on the flats beyond the margin of the hills the depths increase rapidly, indicating that the bedrock surface has here a much steeper slope than in the headward part of the valley.

The placers of American Creek, so far as known, occur within the more constricted part of the valley. They have the form of a well-defined continuous pay streak, 40 to 100 feet wide, within which the gold content ranges from that of barely workable gravels up to \$1.35 a square foot.

Three steam hoists and two hand-windlass outfits worked the five productive claims of the creek in 1914. A small outfit was also engaged in prospecting in deeper ground near the margin of the flats. Thirty men in all were employed in this part of the district.

