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1913

REPORT

UPON

Proposed Exploration on the Upper Levels of Con-Virginia

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Proposed Exploration on the Upper Levels of Con-Virginia

SAN FRANCISCO
SHANNON-CONMY PRINTING COMPANY
509 SANSOME STREET
1913

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CONTENTS.

PAGE

I. Sources of Information 3
II. Statement of the Nature of the Problem..... 3
1. Description of the Great Bonanza 3
2. Importance of East Vein Production from the Bonanza 4
3. Former Neglect of the East Vein in Exploration.... 5
4. Apparent Close Relation of North Comstock Ores to the East Vein 5
5. Was the Great Bonanza a Phenomena of the East Vein? 6
6. Discussion as to the Probable Genesis of North Comstock Ores 6
7. Summarization of the Problem 8
III. Resume of Mine Work in California and Consolidated Virginia 9
1. The Period of the Great Bonanza, 1873 to 1881, inclusive 9
Year 1875 Con-Virginia 9
Year 1875 California 10
Year 1876 Con-Virginia 10
Year 1876 California 11
Year 1877 Con-Virginia 12
Year 1877 California 13
Year 1878 Con-Virginia 15
Year 1878 California 16
Year 1879 Con-Virginia 17
Year 1879 California 18
Year 1880 Con-Virginia 19
Year 1880 California 20
Year 1881 Con-Virginia 21
Year 1881 California 21
Summarization of the Period, 1873 to 1881, inclusive.. 21
Table of Operations, Production and Dividends, Years 1873-1881 22

that the ore there discovered lay somewhat east of the great zone of Comstock quartz, from which it was separated by solid country rock, and that its course was northeast, instead of north, as in the case of the Comstock quartz. It was also nearly vertical, dipping to the east at a steep angle, while the dip of the Comstock had averaged about 45 degrees. The level on which these things were observed, afterward became known as the 1200 level from the Con-Virginia shaft. On the 1300 level, a hundred feet below it, the ore occurred in a similar manner, and again on the 1400 level. However, on that level a second body of ore was discovered. It lay in the Comstock itself north and west of the body first discovered. This second body of ore formed an irregularly-shaped dome rising from below within the great mass of barren Comstock quartz. On the 1500 level the body striking northeast was found to have extended itself to a point 560 feet northeast of its most southerly point on the 1200, and it had widened to 160 feet, spreading out to the west through the zone which had been filled by country rock above and merging into an irregular mass of ore in the Comstock proper, where its upper extension was traced to a junction with the dome of ore already discovered on the 1400 level. Later work on the 1500 level showed that one-third of the sill floor area of this body was in the Comstock proper. Still later developments to the north, past what proved to be a pinch in the ore, exposed another mass of ore which had a sill floor area about half as great as that of the whole southerly mass. All of this can be plainly seen by reference to the accompanying map. The stopes of the levels below are almost hidden on the map by those of the 1500, but the cross-section of the ore on a horizontal plane may be conceived as conforming roughly to that of the 1500 level until the 1750 level was reached. Below this the ore was extended only in irregular masses and ceased at the 1850 level excepting some unimportant stringers.

It will be seen that though the Great Bonanza was a single mass of ore in the sense that all its parts were connected, it nevertheless consisted, structurally, of two distinct parts, one of which lay in a northeast fissure nearly vertical and within the hanging wall of the Comstock, while the other part rose in the Comstock from the line in which it intersected the hanging wall fissure. For convenience we will refer to the northeast fissure as the East Vein, a designation which has been accepted in later times, though the importance of distinguishing it at all was not recognized when the Great Bonanza was being mined.

Importance of East Vein Production From the Bonanza.

By reference to the map, you will note that that part of the Bonanza which is in the old Con-Virginia ground lay principally

in the East Vein, while that part of it which extended into California ground to the north was in the Comstock proper. In general it may be taken as a rough approximation to the truth that fully one-half of the total production of the two companies from the Great Bonanza was derived from the East Vein.

Former Neglect of the East Vein in Exploration.

In spite of this important production from the East Vein, probably amounting in all to over sixty-five millions of dollars, it does not seem to have been recognized as a distinct and separate fissure in the planning of exploration until long after the exhaustion of the Great Bonanza. Had it been so recognized, exploration would have been carried on in two directions. There would have been north and south drifts in the Comstock quartz and also northeast drifts on every level, following the course of the East Vein to the north. The maps show nothing of the sort. The north and south drifts are to be seen and the Comstock quartz appears to have been thoroughly prospected by crosscuts, but the northeast drifts are notably lacking beyond the end of the stope. As a matter of fact, the recognition of the East Vein as a distinct and important phenomenon is largely due to what we may regard as a series of accidents, for in the lower levels discoveries of ore were made upon it from time to time in running crosscuts and connections through its course, and, bit by bit, the resulting stopes related themselves upon the mine maps until it became obvious that they defined a vein striking northeast, dipping steeply, and so located that it must represent an extension from the southern part of the Big Bonanza. With the tardy recognition of this fissure as a singularly persistent ore channel, its exploration became more systematic. It has now yielded valuable stopes not only in our ground, but in Ophir and Mexican as well. It has shown values in Union and is now exposing some good ore in Sierra Nevada, 3600 feet northeast of the Great Bonanza.

Apparent Close Relation of North Comstock Ores to East Vein.

It is notable that though the miners of the Great Bonanza paid little attention to the East Vein, while riddling the Comstock with crosscuts in the search for more ore, important values in the north Comstock seem to have resided only in parts of it close to the East Vein, and they were never found in the Comstock below its intersection with the East Vein. In striking contrast with this, the East Vein has steadily yielded good stopes in its northerly course from the Great Bonanza, though it has rapidly diverged from the Comstock, and presumably has passed away from its direct influence.

WAS THE GREAT BONANZA A PHENOMENON OF THE EAST VEIN?

Is it, then, a necessary inference, as was formerly supposed, that the Great Bonanza was made by the Comstock, which extended its ore up into the East Vein in a rather accidental fashion? In view of the facts recited there is at least as much justification for an assumption that the East Vein, being a well mineralized fissure, made at its intersection with the Comstock a great deposit which was extended into that lode.

DISCUSSION AS TO THE PROBABLE GENESIS OF NORTH COMSTOCK ORES.

Such a supposition is not alone supported by the striking facts already shown; for it leads to a hypothesis as to the genesis of the North Comstock ores which seems to account without flaw or exception for all the phenomena observed in regard to them; while, in contrast with this, the accepted conception of the Great Bonanza as a deposit derived from the Comstock involves a serious inconsistency.

Thus, if it be supposed that the East Vein was older than the Comstock, and that it was already a well mineralized fissure when the Comstock was formed, it must have been faulted by the Comstock, and its upper part would be found to terminate at the Comstock hanging wall, just as it would if the East Vein were merely a hanging wall fissure of the Lode, as claimed. If, then, the vein contained ores in considerable quantities at any point near its abutment upon the Comstock, the hot waters, which must have always circulated through the Comstock since its occurrence, would have dissolved these ores and redeposited them in a more or less concentrated form as rich secondary ores. Such ores were an important characteristic of the Great Bonanza. Moreover, the redeposition would not have been necessarily confined to the limits of the parent fissure. Indeed, the circulation of waters would have inevitably carried some of the rich solutions into the crushed zone of the Comstock, and we would therefore expect the Lode to be enriched in the vicinity of the East Vein wherever that vein had originally held important deposits.

Suppose, on the other hand, that the East Vein was made by a fracturing of the Comstock hanging wall and was effectively contemporaneous with the Comstock. It would then be assumed that the East Vein ore was introduced into the hanging wall fissure by solutions rising upon the plane of the Comstock. This theory is commonly accepted. It is plausible, but involves a grave inconsistency in that solutions which could have created the Great Bonanza should be expected to have enriched other hanging wall fissures and the Comstock itself, at some points in the upper levels; but nothing of the sort is known. By what selective process could the Comstock waters enter the East Vein alone and there deposit the metals held in solution, without, at the

same time, entering other fissures and depositing ore? Is it conceivable that these valuable solutions would have failed to rise through every fissure which they encountered? It is not. Yet the only other mineralized fissure known to exist in the hanging wall is the Hardy Vein in Ophir; but this cannot be considered an exception to the general barrenness of the Comstock hanging wall, as it starts at the East Vein and diverges from it only as a split from the East Vein might be expected to do. It may have been contemporaneous with the East Vein or, if later, may have derived its values from the East Vein as the Comstock seems to have done.

It has been suggested that the rocks enclosing the East Vein contained precipitants which were peculiarly adapted to a reduction of metals from the Comstock solutions; but the wall rocks of the vein are known to be in no way different from those found elsewhere in the hanging wall of the Comstock.

Again it has been proposed that the waters circulating in the East Vein differed chemically from those of the Comstock and that the mingling of the two solutions caused precipitation at the intersection. This is very simple, but it involves a large assumption to begin with, and, if we accept the assumption, it leads to expectations unfulfilled by the observed facts. Thus the hanging wall country is greatly shattered and was permeated by Comstock water under great pressure when the Bonanza was being formed. From this, we would expect no great differentiation in the character of its waters, and it is not easy to conceive of an East Vein water channel carrying solutions which would differ materially from those pressing upon it from every direction. If, however, such a difference in the water did exist, can we suppose the East Vein waters were so tightly enclosed by the vein walls that they found no escape above through the broken hanging wall country to a mingling with the Comstock waters about the Bonanza? If they did find such outlets to the Comstock, each outlet should be marked by deposits of ore. If we further assume that the East Vein solutions were in some way tightly held from outlet to the Comstock except at the intersection, it would yet be impossible to imagine all the values in the great flow of Comstock water being intercepted and precipitated at the East Vein. If they were not, they would have made other deposits about the Bonanza where precipitants of some sort must have existed. It will be seen that though from its very nature the supposition of deposition due to the mingling of waters of different chemical composition can never be positively disproved, it requires support by further assumptions so improbable that we must welcome a simpler explanation if it can be found.

Reverting to a supposition that the East Vein already had ore before the Comstock was formed, all known facts in regard to

Hypotheses

Read Carefully

see pp. 168, 272, 287 Hist. of Comstock.

the ore deposits become consistent. In that case the hot, barren Comstock waters would have made bodies of secondary ore from the ore already in the East Vein. They would have carried values into the Comstock near the intersection, and we need not be surprised that the upper Comstock and its hanging wall fissures were barren. Nor would this fail to account for other phenomena far distant from the Great Bonanza and of utmost importance to the Comstock mining industry; for if the East Vein were indeed a great mineralized fissure before the Comstock occurred, its lower extension must lie within the Comstock footwall, against which it should abut in the vicinity of the Ophir outcrops, which returned the only surface deposits of great value in the north end of the Lode. Moreover, the Union stopes from the 2300 to the 2600 levels of the Comstock, occur in about the line through which the lower abutment of the East Vein upon the Comstock footwall should lie; but that is, of course, another problem to be solved in due time and is of interest here only in illustration of the fact that there is a startling and far-reaching consistency in all the geological phenomena of the North Comstock when viewed in the light of the stated hypothesis as to the East Vein.

SUMMARIZATION OF THE PROBLEM.

It is certain that the East Vein is to be credited with a great production of ore, that it is persistent and that the continuity of values in it is much more pronounced than in the case of the Comstock. It is also more probable that it made the great Bonanza than that this great deposit was created by the Comstock. It is easy to understand the reason for the little attention paid the East Vein by the Bonanza miners, though they actually derived many millions from it, for they had their minds centered upon the Comstock itself and they very naturally considered the East Vein part of the Bonanza as an erratic offshoot of the Lode. This very fact furnishes an a priori supposition that they may not have thoroughly prospected the East Vein on the upper levels; men who have long worked in the mine assert that this was the case. The maps show nothing to the contrary.

It thus becomes our problem to ascertain where the old work stopped, where we may hope to find virgin ground and how to gain access to it; to consider also the merits of this exploration and the possibility of profits from it.

RESUME OF MINE WORK

IN

CALIFORNIA AND CON-VIRGINIA.

Persistent rumors exist that a great footage of exploratory drifts was run without being mapped, and, as a result of this, it is commonly believed that the whole region of the Bonanza must have been examined by crosscuts. If this were the case the northern extension of the East Vein on the upper levels must have been barren or it would have been followed up. It is found, however, that the Becker map, supposed to be complete through the year 1880, shows practically every working mentioned in the annual reports up to that time; and the reports are so full and consistent that it is not to be believed the mention of any important work was omitted from them. Subsequent reports also appear to be full enough for a good conception of the work done and a reconstruction of the policies which occasioned it. But, in view of the rumors mentioned above, I believe it advisable to preface my inferences by a presentation of the fundamental data from which they are derived; and this I do in the form of a resume of the old reports year by year, in order that you may, yourselves, be able to pass upon the merit of my conclusions. It is, of course, necessary to greatly condense the reports, but this I have done in such manner that all essential facts are preserved.

THE PERIOD OF THE GREAT BONANZA, 1873 TO 1881, INC.

YEAR 1875. CON-VIRGINIA.

Report of December 31st, 1875, by Superintendent Fair.

Production, 169,094 tons; average recovery, $98.95.

Total bullion, $16,731,653.43, which appears to have been not more than 74% of the gross value of the ore.

Up to this time it is obvious that no work had been done which could bear upon our inquiry, as only between five and six millions had been produced, all of which came from the first drifts in ore.

"On the 1200 and 1300 levels the ore bodies have not been developed as far as they extend north." However, much of the tonnage of the year appears to have come from them. All this must have been East Vein ore.

1400 LEVEL.

The ore appears to have been opened up from north line to a point 450 feet south of it. Nearly all must have been East Vein ore,

1500 LEVEL.

Ore exposed for 480 feet south of north line. Width of body shown to be 150 to 320 feet. Most of this must have been in the East Vein, though near the north line the western part of the ore was in the Comstock.

1550 LEVEL.

Partially developed. "None of the crosscuts have yet reached the eastern boundary of ore." East Vein except at north end.

YEAR 1875. CALIFORNIA.

Report of January 15, 1876, by Superintendent Fair.
Production, 5,123 tons; average recovery, $88.43.
Total bullion, $453,060.46.

1300 LEVEL.

Drift to Ophir mine west of vein. Crosscut No. 1 run east 213 feet on south boundary to intersection with vein. A north drift from its end was in ore and a winze was sunk in ore to 1400 from this. "The ore found thus far on this level (1300) has been of moderate quality, but that found in sinking winze has been good." Probable that this work did not quite reach the East Vein and was west of it.

1400 LEVEL.

Drift to Ophir west of Lode. East crosscuts 1, 2 and 3 cut vein. Another drift toward Ophir was run in the Lode.

1500 LEVEL.

North drift west of Lode. Six east crosscuts reach Lode. None can have reached the East Vein. Also drift in ore toward Ophir.

1550 LEVEL.

Drift north in the ore with crosscut east and west.

YEAR 1876. CON-VIRGINIA.

Report of December 31, 1876, by Superintendent Fair.
Production, 142,678 tons; average recovery, $114.50.
Total bullion, $16,661,940.70.

EXTRACTION OF ORE FROM 1300, 1400, 1500 AND 1550.

"On the 1400 level on the south end of the ore body, a large quantity of ore yet remains in place, but *its grade is too low to meet our present requirements and high dividends.*" This ore, presumably, was of a grade which could have been worked at a profit even then, and it was probably extracted later, but the remark is significant in view of the fact that extensions of the East Vein beyond the Bonanza must have shown comparatively

small width; and values which we could work at a profit would have been entirely disregarded at that time.

1500 LEVEL.

"The southern portion remains unexplored."

1550 LEVEL.

"On the 1550 level ore is of better quality than on any of the levels above, and the width is quite as great as on the 1500 level. These facts give us assurance that the 1650 foot level, now about to be opened, will prove to be of great value, quite as much so as the 1550 foot level." This is one of many indications from the reports that there was always a feverish desire to get down, down, down, in the hope of finding higher values and bigger deposits. This policy ultimately resulted in the existence of immense openings from which all prospects had not been followed up before severe caving commenced; and so, much ore was lost, at least temporarily. Years after this Patton and Lyman recovered, at heavy expense, great quantities of "stope filling" which was, in fact, caved ore.

YEAR 1876. CALIFORNIA.

Report of January 12, 1877, by Superintendent Fair.
Production, 128,800 tons; average recovery, $105.07.
Total bullion, $13,400,841.40.

1300 LEVEL.

"On the 1300 level no work has been done during the past year in the way of developing this portion of the mine, but all the winzes and drifts have been kept in repair." We should recall that previous report states the ore was of "moderate quality," so a year has passed without its being touched. The East Vein lay east of it. No east crosscut so far in California ground above the 1400 level.

1400 LEVEL.

Drift in ore extended to Ophir. No ore in last 250 feet. "Yet ore may exist to right or left of this drift." That is to say, no east crosscut on this level could possibly have reached East Vein country at this time.

1500 LEVEL.

Much ore extracted. "Crosscuts 4, 5 and 6 have not yet been extended to the east wall" (of Lode). Of course, then, the East Vein country had not been reached on this level.

1550 LEVEL.

North drift in ore extended to Ophir, all in excellent ore. "As the three crosscuts in the center of the mine have not been

extended entirely across the ore body on this level, the whole width has not been ascertained." Of course, the East Vein lay far east of the crosscut headings.

1600 LEVEL.

Work done developing ore through Ophir shaft.

YEAR 1877. CON-VIRGINIA.

Report of December 31, 1877, by Superintendent Fair.
Production, 144,400 tons; average recovery, $95,90.
Total bullion, $13,734,019.07.

1200 LEVEL.

An air connection was run south from the Con-Virginia shaft to the Gould & Curry shaft. This appears to have cut more ore in a line southwest from the old stopes which were in the East Vein. Thereupon the new ore was developed and proved to be an extension from the ore of the Bonanza which was first discovered. "The ore breasts on this level are very extensive, and as we rise above the sill floor, the ore widens to the east" (northeast). "The ore body has been followed south from the old stopes more than 175 feet and the breast in that direction continues in good ore. At present the reserves of ore on this level are very valuable." This discovery constitutes in itself an eloquent commentary upon the thoroughness of the exploration work of previous years.

1300 LEVEL.

The discovery of rich ore on the 1200 caused a reopening of a south drift from the shaft to a winze from the 1200 level ore. "This drift is run on the west side of the ore to avoid swelling clays. . . . . Considerable work has been done crosscutting the ore body and much ore of fair quality has been developed. Much more exploration will have to be made to obtain a definite knowledge of the extent and value of the ore." Obviously, while actual ore still remained undeveloped, no time was being spent driving north on barren quartz which the East Vein may be supposed to have shown to the north of the ore body.

1400 LEVEL.

Large tonnage of high grade ore recovered and "a vast quantity yet remains in place." Work of extracting ore attended with difficulty "owing to the crushing of ore stopes by the pressure from the east and from the water accumulated in rock cavities east of the ore body. This water has frequently broken in through the east clay." We may infer from this and other passages that the Bonanza miners were always fearful of the east country and had little inclination to penetrate it.

1500 LEVEL.

"A drift was run south from the shaft (Con-Virginia shaft) and new ore was found." This must have been a further extension of ore south on the East Vein.

1550 LEVEL.

Much ore extracted from southern part.

1650 LEVEL.

Developed ore for 200 feet south of north boundary.

1750 LEVEL.

Drift carried from south to north boundary and crosscuts extended to walls of Lode. Greater portion of ore is of low grade. The good ore is confined to the east wall, "where its maximum width is 28 feet."

"Crosscut No. 3" (near northern boundary) "has been extended eastward beyond the regular ore body 67 feet, at which point it cut an ore seam 7 feet in width and assaying from $12 to $70. We are now drifting north and south on this seam and will sink upon it to ascertain its depth. Indications justify this outlay, as the seam has regular walls, which look as if they would be continuous." This statement is peculiarly interesting in several ways. Thus, it cannot be doubted that the seam of ore "cut in the East Vein"; and though it was 7 feet wide, with values between $12 and $70, the existence of regular walls appears to have been a principal justification for development work. It will be seen from later reports that this part of the East Vein must have returned a considerable sum of money before the ore was exhausted.

YEAR 1877. CALIFORNIA.

Report of January 12, 1878, by Superintendent Fair.
Production, 217,432 tons; average recovery, $88.49.
Total bullion, $18,924,850.27.

1300 LEVEL.

No work reported except as below. Let us not forget the ore of "moderate quality" shown here and so far untouched.

1400 LEVEL.

"Considerable work has been done on this level and on the levels above it, but not enough to determine whether ore exists or not in either of them. The drifts and crosscuts heretofore run are badly crushed and require much labor to place them in order. This should be done and the ore vein thoroughly crosscutted." This is a very inconsistent statement and seems to mean that this ground was practically neglected in favor of extraction from lower levels.

1500 LEVEL.

Much ore recovered and much low grade remaining on east side of stopes. "In the northern 200 feet of the mine, on this level and the level above" (which means all above) "our drifts and crosscuts have not been extended to the east boundary of the ore, but have terminated in a vast body of poor quartz of too low grade to justify extraction. These drifts should be extended to the east wall and a thorough knowledge of this locality be obtained."

May we not infer that if the crosscuts were stopped in "a vast body of poor quartz," those directing operations would not trouble themselves to pierce mere country rock of the dreaded east country, which must have been passed through in order to reach the East Vein.

1550 LEVEL.

Vast quantity of high grade ore recovered. "To the east of this ore body, there is a very large body of low grade quartz similar to that on the levels above, which has not been developed, the crosscuts not having been extended to the east wall of the ore vein. From all appearances the largest portion of the bulk of ore on this level has been taken out. There still remains considerable ore of good quality and a large quantity of medium grade." It is significant that though the largest portion of the ore had been extracted, no crosscut had yet been carried to the east wall.

1600 LEVEL.

Nearly half the total production came from this level in its northern part. "The east wall has not been reached in any of our crosscuts in the northern 400 feet of the mine on this level. These crosscuts all terminated in a solid body of poor quartz."

1650 LEVEL.

Main north south drift run in ore. "Crosscuts have been extended across the ore vein, each one touching, as we suppose, the east clay and west clay." Note that still we have no mention of crosscuts penetrating the East Vein country.

1700 LEVEL.

Sundry development work in progress.

1750 LEVEL.

Sundry development work.

1840 LEVEL.

Development work from Ophir shaft.

YEAR 1878. CON-VIRGINIA.

Report of December 31, 1878, by Superintendent Patton, who had succeeded Fair, though the latter remained in practical control of operations until 1881. Production 122,831 tons; average recovery, $64.68. Total bullion, $7,996,753.11.

1200 LEVEL.

"The ore body has been followed south and east" (meaning northeast) "connecting with the old stopes and up for a distance of 114 feet, at which point the cap rock of the ore body was reached, and here the extraction of ore was discontinued." A most astonishing statement! What is this cap rock against which the ore so suddenly terminates? Surely this is not the sort of evidence to establish a claim that the East Vein, being a hanging wall gash widest at the bottom, pinched out as it rose from the Comstock. There is in this statement no expression of astonishment or of interest as to what happened above the "cap rock"; no question as to its nature. It is to be inferred that the ore went up to a sudden stoppage against a wall of rock "capping" it. We may also justly infer that the vein was cut off either by a dike or a fault. A very similar condition exists in an Ophir stope 60 feet above the 1700 level (of Ophir, equivalent to the 1850 of the old Con-Virginia); and there is in this case collateral evidence suggesting a fault which dipped 45 degrees east on which the hanging wall went down. Possibly these phenomena are related. This subject will be further discussed in a subsequent paragraph.

1300 LEVEL.

Drifts became crushed and were repaired "and in addition thereto crosscuts have been run easterly. By this work some low grade ore has been developed, but the known existence of large bodies of water to the east of the ore body has prevented us from doing the full amount of prospecting in this direction which is desirable." Again we see the hesitation to drive east crosscuts even when it is recognized as promising exploration.

1400 AND 1500 LEVELS.

Returned some tonnage and then became badly crushed while Con-Virginia shaft was closed for repairs.

1650 LEVEL.

Produced large tonnage of high grade ore.

1750 LEVEL.

Exploration of ore body continued. Good ore shown to extend 50 feet down from the 1650 level. "From this point, although the ore body retained its width, the quality rapidly de-

teriorated."

The ore found east of the supposed east wall (in the East Vein) rose 30 feet above the sill floor and extended below to the 1850, the winze "passing through ore of good quality about 3 feet wide."

1850 LEVEL.

Various development work was done but without important results in the Lode. However, the East Vein ore followed down from the level above is thus referred to: "A drift was run in a southwesterly direction . . . . . in which drift ore of good quality was found, evidently being the same ore body which was developed to the east of the main vein on the 1750 foot level, but much wider, the sill floor being 20 feet wide." Winze No. 3 was continued down in this ore below the 1850 "passing vertically through the ore for a distance of 40 feet." It thus appears that this East Vein stope extended from a point 30 feet above the 1750 level, down to the 1850, and that on the 1850 it was 20 feet wide in what was considered "ore of good quality" in 1878. For clearness, I will continue the history of this ore body for the next year. Under the head 1950 level, Patton says in his next report: "This level has yielded 8,399 tons of ore during the year, all of it having been extracted from and around the winze sunk from the 1850 level. Explorations during the year have demonstrated that the west ore body" (in the Comstock) "does not reach down to this level." That is to say, the East Vein was ultimately mined in these stopes a vertical distance of 230 feet, by Patton. Many years later it was found that rising from the top of these stopes, more ore existed to a point above the 1500 level.

YEAR 1878. CALIFORNIA.

Report of December 31, 1878, by Superintendent Patton.
Production, 134,877 tons; average recovery, $78.89.
Total bullion, $10,949,078.93.

ABOVE 1500 LEVELS.

No mention made of any work done, from which it appears that up to this time the East Vein country can hardly have been penetrated above the 1500.

1500 LEVEL.

"All the ore has been extracted that would be profitable to take out."

1550 LEVEL.

Further prospecting. "There are no reserves of productive ore remaining on this level."

1600 LEVEL.

Large production. "It has been thoroughly prospected by means of drifts and crosscuts to the south, west and east. . . . . On the east side the pay ore did not extend to the east clay." From this it is probable that the east prospecting did not reach the East Vein country.

1650 LEVEL.

Large production. Not yet exhausted.

1700 LEVEL.

Development work. "The mass of ore is low grade, carrying small streaks of good ore, but not of sufficient value to make it profitable to extract at the present time."

1750 LEVEL.

Development work. Shows some ore of better grade than on 1700.

1840 LEVEL.

Development work without important results.

1950 LEVEL.

Various development work. 350 feet west of C. & C. shaft, "an ore seam 5 feet wide, giving good assays, was cut in this drift and passes across and out of the drift in a northeasterly direction." This proved to be the East Vein which is now mentioned for the first time in California ground, and in the following year is shown to be very productive.

BELOW 1950 LEVEL.

Exploration on 2150.

In concluding the report Patton says: "So far as we have advanced on the lower levels, the formation appears favorable, and already a seam of ore, yielding fine assays, has been reached in the main drift on the 1950 foot level. This seam . . . . lies fully 60 feet east of the main ore vein."

YEAR 1879. CON-VIRGINIA.

Report of December 31, 1879, by Superintendent Patton.
Production, 60,227 tons; average returns, $41.20.
Total bullion, $2,481,358.83.

850 LEVEL.

West crosscut from Con-Virginia shaft to west wall of Lode. No values.

1400 AND 1500 LEVELS.

33,600 tons of fair grade ore recovered, "thoroughly exploring the ground lying to the south and west of old stopes." Nothing

said of work to north and east. "There are no known reserves of ore above the 1500 level." It is probable, however, that the ground referred to has since produced a number of millions.

1650 LEVEL.

Produced 3,500 tons. Some still remains.

1750 LEVEL.

Produced 13,800 tons. Some still remains.

1850 LEVEL.

Produced 2,005 tons from the East Vein stope. "There yet remains some ore north and east of the stope."

1950 LEVEL.

Produced 8,399 tons from the East Vein.

BELOW 1950 LEVEL.

Some exploration work.

YEAR 1879. CALIFORNIA.

Report of December 31, 1879, by Superintendent Patton.
Production, 64,152 tons; average returns, $40.24.
Total bullion, $2,577,495.17.

850 LEVEL.

Exploration near Lode footwall. No ore.

1650 LEVEL.

Produced 3,157 tons. Some low grade left in north end.

1750 LEVEL.

Produced 47,000 tons. Some low grade left in north end.

1840 LEVEL.

Produced 4,000 tons. Repair work. West crosscut.

1950 LEVEL.

10,000 tons from East Vein, "all of it having been extracted from the 5 foot seam cut during the previous year." "There are no known reserves of ore on this level." I may say, as a matter of information, that 23 years later I accidentally discovered some ore in a cave of this drift while acting as shift boss; and, as a result, Superintendent Ryan cleaned out the drift to its end where a decayed corduroy bulkhead was found erected against the north face of the drift, which was in rich ore. This bulkhead has always been inexplicable to me. The concealment of such a showing as a sole basis for operation at some future time seems too childish to account for it. Yet there was the bulkhead, and its obvious purpose can only have been the prevention of an inspection of the north face of the drift. If it had any large significance, it may have been this:

The East Vein had produced in 1879, 10,000 tons on the 1950 of California, and "all the ore extracted from" the 2150; while "some ore remains in place." In Con-Virginia 2,005 tons came from the 1850 stope of the East Vein, and 8,399 tons from the 1950. The total East Vein production was thus 20,404 tons plus an unknown tonnage from the 2150 level of California. Perhaps the year's total from this vein was 25,000 tons from the two mines. It is probable that its grade was far above the average, as the ore came from virgin ground, while the Comstock stopes were producing only from remnants of ore left by earlier operations. It is reasonable to suppose the East Vein ore must have averaged $60 or better, on which assumption the East Vein bullion must have amounted to about a million and a half. It is known to me by personal observation that this East Vein ore was exceedingly rich and it may well have averaged $100 instead of $60, in which case one-half the year's bullion from the two mines may have been derived from the East Vein. Is it not possible that this production may have caused those in control of the companies to anticipate important extensions of ore to the northeast in this vein; and that such recognition may account for the enormous subsequent expenditures for east crosscutting from the Union shaft? A desire to secure the northern properties at a low figure may then explain the apparent neglect of further exploration of the East Vein northeast from this stope in California, a neglect which has always seemed inconsistent with the known intelligence of those who were responsible for it.

2150 LEVEL.

Main north lateral drift 300 feet north of C. & C. shaft, "cut an ore seam four feet in width, having a northeast and southwest course, from which all the ore extracted from this level has come. and some ore remains in place." This again was the East Vein.

2250 LEVEL.

Drift 192 feet from shaft cut East Vein in ore below that in level above.

2350 AND 2450 LEVELS.

Stations and connections being made.

YEAR 1880. CON-VIRGINIA.

Report of December 31, 1880, by Superintendent Patton.
Production 55,562 tons; average recovery $31.76.
Total bullion, $1.756,536.49.

850 LEVEL.
Abandoned.

1650 LEVEL.
7,415 tons low grade extracted. More remaining.

1750 LEVEL.
48,000 tons low grade extracted. More remaining.

2150 LEVEL.
Exploration work to Best & Belcher line. No discoveries of ore.

2350 LEVEL.
Exploration work east of C. & C. shaft. Only encountered hot water.

2450 LEVEL.
Exploration work.

YEAR 1880. CALIFORNIA.
Report of January 15, 1880, by Superintendent Patton.
Production, 37,454 tons; average recovery, $23.21.

850 LEVEL.
Abandoned.

1500 LEVEL.
Reopened a drift and extracted 786 tons from west crosscut.

1650 LEVEL.
22,000 tons low grade extracted. More remains.

1750 LEVEL.
Produced 13,000 tons low grade.

2150 LEVEL.
1,413 tons good grade ore produced, completing the extraction from East Vein. Ore extends below.

2350 LEVEL.
Exploration east of shaft.

2450 LEVEL.
Connections to Ophir.

2650 LEVEL (now 2500).
Connections started.

NOTE: The United States Geological Survey map accompanying report of G. F. Becker is supposed to present the workings up to this time. A copy of said map accompanies this report.

YEAR 1881. CON-VIRGINIA.
Report of December 31, 1881, by Superintendent Patton.
Production, 6,443 tons; average recovery, $21.13.
Total bullion, $144,064.10.
May to September spent in smothering stope fires.

1650 AND 1750 LEVELS.
Produced 6,435 tons low grade.

2450 LEVEL.
Exploration south to Best & Belcher.

2650 LEVEL.
Connections.

YEAR 1881. CALIFORNIA.
Report of January 15, 1882, by Superintendent Patton.
Production, 6,175 tons; average recovery, $19.77.
Total bullion, $122,107.26.

1650 AND 1750 LEVELS.
5,487 tons extracted.

2250 LEVEL.
687 tons from East Vein.

2450 LEVEL AND 2650 LEVEL.
Exploration.

SUMMARIZATION OF THE PERIOD 1873 TO 1881 (INCLUSIVE).

It may be said that, with the close of 1881, the period of the Great Bonanza terminated, though the Bonanza stopes were reopened subsequently and more ore was recovered, as will be shown later. However, you will probably be able to understand the history of the mine best by viewing it in parts.

Summarizing this most important period it will be noted, as shown in detail upon the accompanying Table of Operations, Production and Dividends, that the following results were obtained:

Table of Operations, Production and Dividends for the Years 1873 to 1881 inclusive

Year	Date of Report	Supt.	TONNAGE			% Extraction		AVERAGE RECOVERY			BULLION PRODUCTION			DIVIDENDS		
			Con-V.	Calif.	Combined	Con-V.	Calif.	Con-V.	Calif.	Comb.	Con-Virginia	California	Combined	Con-Virginia	California	Combined
1873			(8,608)	.....	(8,608)	....	....	($75.)	.....	.....	$ 645,582.17	.....	$ 645,582.17	.....	.....	.....
1874			(66,420)	.....	(66,420)	....	....	(75.)	.....	.....	4,981,484.05	.....	4,981,484.05	$ 2,592,000	.....	$ 2,592,000
1875	Dec. 31, 1875	Fair	169,094	.....	.....	....	....	$ 99.00	.....	.....	16,731,653.43	.....	.....	11,448,000	.....	.....
	Jan. 15, 1876	Fair	.....	5,123	.....	....	....	.....	$ 88.40	.....	.....	$ 453,060.46	.....	.....	.....	.....
			.....	.....	174,217	....	....	.....	.....	98.60	.....	.....	17,184,713.89	.....	.....	11,448,000
1876	Dec. 31, 1876	Fair	142,678	.....	.....	73.25	....	114.50	.....	.....	16,661,940.70	.....	.....	12,960,000	.....	.....
	Jan. 12, 1877	Fair	.....	128,800	.....	....	73.37	.....	105.07	.....	.....	13,400,841.40	.....	.....	8,640,000	.....
			.....	.....	271,478	....	....	.....	.....	110.70	.....	.....	30,062,782.10	.....	.....	21,600,000
1877	Dec. 31, 1877	Fair	144,400	.....	.....	72.3	....	95.90	.....	.....	13,734,019.07	.....	.....	8,640,000	.....	.....
	Jan. 12, 1878	Fair	.....	217,432	.....	....	73.3	.....	88.49	.....	.....	18,924,850.27	.....	.....	14,040,000	.....
			.....	.....	361,832	....	....	.....	.....	90.40	.....	.....	32,658,869.34	.....	.....	22,680,000
1878	Dec. 31, 1878	Patton	122,831	.....	.....	73.1	....	64.68	.....	.....	7,996,753.11	.....	.....	5,400,000	.....	.....
	Dec. 31, 1878	Patton	.....	134,877	.....	....	72.5	.....	78.89	.....	.....	10,949,078.93	.....	.....	7,020,000	.....
			.....	.....	257,708	....	....	.....	.....	73.60	.....	.....	18,945,832.04	.....	.....	12,420,000
1879	Dec. 31, 1879	Patton	60,227	.....	.....	74.2	....	41.20	.....	.....	2,481,358.83	.....	.....	1,350,000	.....	.....
	Dec. 31, 1879	Patton	.....	64,152	.....	....	74.6	.....	40.24	.....	.....	2,577,495.17	.....	.....	1,620,000	.....
			.....	.....	124,379	....	....	.....	.....	40.65	.....	.....	5,058,854.00	.....	.....	2,970,000
1880	Dec. 31, 1880	Patton	55,562	.....	.....	75.	....	31.76	.....	.....	1,756,536.40	.....	.....	540,000	.....	.....
	Jan. 15, 1881	Patton	.....	37,454	.....	....	75.	.....	23.21	.....	.....	890,515.33	.....	.....	.....	.....
			.....	.....	93,016	....	....	.....	.....	28.50	.....	.....	2,647,051.82	.....	.....	540,000
1881	Dec. 31, 1881	Patton	6,443	.....	.....	81.	....	22.40	.....	.....	144,064.10	.....	.....	.....	.....	.....
	Jan. 15, 1882	Patton	.....	6,175	.....	....	79.	.....	19.77	.....	.....	122,107.26	.....	.....	.....	.....
			.....	.....	12,618	....	....	.....	.....	21.10	.....	.....	266,171.36	.....	.....	.....
1873 to 1881			776,265	594,013	1,370,276	73.77%		$ 83.91	$ 79.66	$82.07	$65,133,391.95	$47,317,948.82	$112,451,340.77	$42,930,000	$31,320,000	$74,250,000

REMARKS.

1873—Bullion production for 1873-74 is official, but not having the average recovery, have assumed $75 and derived an approximate tonnage by division.
1874—Previous to 1875 the production had come from the 1200 and 1300 levels and from exploration work on the 1400.
1875—Con-Virginia: Ore from 1200, 1300, 1400 and 1500; partial development of 1550. California: Development on 1300, 1400, 1500 and 1550.
1876—Con-Virginia: Ore extracted from 1300, 1400, 1500 and 1550. California: Exploration 14 and 16; principal extraction from 1500 and 1550.
1877—Con-Virginia: More ore encountered on 1200 and 1300; stoping on 1400, 1500 and 1550; development work on 1650 and 1750. California: Exploration on 1400, 1650, 1700, 1750, 1840; production from 1500, 1550 and 1600.
1878—Con-Virginia: Production from 1200,1400, 1500, 1600; exploration, 1750, 1850. California: 1500 and 1550 about exhausted; main production from 1600 and 1650; development on 1700, 1750 and 1840; exploration on 1950 and 2150.
1879—Con-Virginia: Production from 1400, 1500, 1650, 1750, 1850 and 1950; exploration, 850 and 2150. California: Production from 1650, 1750, 1840, 1950 2150; exploration, 850, 2250 and 2350.
1880—Con-Virginia: Production from 1650 and 1750; exploration on 2150, 2350 and 2450. California: Production from 1500, 1650, 1750, 2150; exploration on 2350, 2450 and 2650.
1881—Con-Virginia: Production from 1650 and 1750; exploration, 2450 and 2650; stope fires interferred seriously with operation. California: Production from 1650, 1750 and 2250; exploration on 2456 and 2650; stope fires.

From 1873 to 1881 inclusive, Consolidated Virginia produced 776,265 tons of ore, from which bullion recovery averaged $83.91 per ton and totaled $65,133,391.95, from which dividends amounting to $42,930,000.00 were paid.

In the same period California produced 594,013 tons of ore from which the bullion recovery averaged $76.66 per ton and totaled $47,317,948.82, from which dividends amounting to $31,320,000.00 were paid.

From the two mines together, the total production was 1,370,276 tons, from which the average bullion recovery was $82.07 and the total recovery $112,451,340.17, from which dividends amounting in all to $74,250,000.00 were paid.

It should be noted in passing, however, that the stated bullion production is extremely misleading, as it gives much less than full credit to the Bonanza; for the average extraction reported in the last six years of the period is less than 74%, and it is not probable that there was as high an extraction in the three previous years, during which Consolidated Virginia produced $22,000,000.00. If for a rough estimation we call the extraction 75%, it appears that one-third as much as the value of the bullion produced, or $37,483,700.00, fell to the milling company as a tailings perquisite; and a large proportion of this was recovered by that company in further treatment of the tailings.

The tailings thus appear to have averaged at least $27.00 and, after being worked by the original milling company to a grade of perhaps $7.00, they were reworked. It may be assumed with safety that there are none of them left with an average value in excess of $4.00. On this assumption, the ultimate bullion production from the ore under consideration was probably $31,500,000.00 more than appears in the tables. It can, in short, hardly be doubted that the ore produced in the Bonanza period has yielded bullion to a value of $144,000,000.00, instead of $112,000,000.00, as commonly supposed, and the total production of bullion from the mine to date has thus been about $165,000,000.00, instead of $133,500,000.00, popularly attributed to it. A just conception of these figures can best be had by comparison; and so I may mention that while the 1310 feet of the Lode belonging to us have yielded $165,000,000.00 and paid over $78,000,000.00 in dividends, a recent publication attributes to the whole camp of Tonopah since 1901 a production of but $51,000,000 and dividends somewhat in excess of $15,000,000.00.

As to the mining operations themselves, they may be briefly summarized as follows:

Primary access to the ore was obtained by two vertical shafts known as the Con-Virginia and the C. & C. The former stood from 200 to 400 feet west of the ore bodies which existed within the 1000 feet intervening between the two shafts. Each of these was

close to the boundary line between California and Con-Virginia and this boundary roughly coincides with two parts of the Bonanza which merged into each other but differed structurally. That part lying south of the boundary line in Con-Virginia had a northeast-southwest course, was nearly vertical, was more narrow and somewhat richer. It yielded ore from a point 114 feet above the 1200 level down to the 1950 level through a vertical distance of about 864 feet. That part of the Bonanza lying north of the boundary line had a northerly course, dipped less steeply, was the widest part of the deposit, and of lower average grade. It appears to have yielded practically no ore from the 1400 level or above it, though the 1500 stopes may have nearly reached it. In depth the ore appears to have ceased at about the 1750 level. The vertical extent of this part of the deposit was thus approximately but 350 feet.

Main galleries for access to the ore were run north and south from the Con-Virginia shaft in the footwall of the Lode, on the several levels. Those to the south intersected the ore body directly in its southwest course; and from those north of the shaft, in California, crosscuts were carried to the east to pierce the ore body. Longitudinal drifts were then established in the ore itself and from them secondary crosscuts were driven east and west to define the limits of ore. Vertical communications were effected within the ore body for purposes of drainage and ventilation.

From the 1500 level down, main galleries were also driven to connect the two shafts, thus relieving the Con-Virginia of much of its haulage; but it will be well to bear in mind that the plan of exploration and development was designed with direct reference to the Con-Virginia, which was the older shaft; and as the main haulage galleries were invariably maintained from it in the Lode footwall, the west side of the deposit was well crosscut on every level, while the east side was penetrated only occasionally.

This expresses the meaning of great masses of data which may now be dismissed without further consideration.

Passing to a study of the exploration, it is found that after the first discovery of ore this was strongly confused with development. In fact, it is obvious that it was hardly recognized as a distinct operation until the fall in tonnage of rich ore gave warning of the approaching exhaustion of the deposit.

It appears that an increase in width and values for a time, as greater depth was reached, created a frenzy of desire to penetrate the lower extensions of the ore, in a search for new marvels with which the stockholding public might be astounded; and the resulting discoveries of highly enriched zones were accompanied by the temptation to mine them to the disadvantage of legitimate

development and thorough exploration; for, subsequent to the completion of the Sutro Tunnel, a tunnel royalty of four per cent of the gross annual production must be paid. Thus in 1876 the entire production of $30,000,000.00 appears to have been derived from ore of an average gross value in excess of $150.00 per ton; and it is obvious from the records that the limited hoisting capacity was used only for getting out high grade, to which all drifts of exploration were confined as far as possible. It is found in the California report for 1878 that the east crosscuts on the 1550 level had not yet been extended through the low grade quartz to an exposure of the Comstock hanging wall. It is probable that, before the end of the period, crosscuts were extended through the low grade quartz to the east wall, from the 1500 level down, but frequent references are made to the flows of water from the hanging wall country, and there is no definite reference to any crosscutting from the stopes beyond the east wall. This refers, of course, to California ground, where we hope to find the East Vein unexplored; for in Con-Virginia, the vein being in direct extension of the stopes from the northern part of which it had diverged but slightly, it was recovered by an east crosscut on the 1750 level.

Above the 1500 stopes of California, there cannot have been any crosscuts which could have possibly reached the East Vein, as very casual work on the 1300 and 1400 had shown nothing but low grade quartz which was entirely neglected, and it was not mined at all in this period. Indeed, as late as 1886, Patton says: "This portion of the mine above the 1400 level is virgin ground."

The work in Consolidated Virginia frequently offers internal evidence of the same cursory exploration which characterized the California work. The stopes on the 1200 and 1300 levels had been abandoned when rich ore in extension from them to the south was found accidentally by the driving of an air connection to the Best & Belcher mine. It appears to have continued north to a direct connection with the old stopes. We may fairly infer that the old stopes had been stopped to the south merely because of a fall in the grade of ore. The lack of northeast drifts from these old stopes cannot then be taken as evidence that the East Vein did not continue north from them. It is more probable that it existed and was neglected only because it contained barren quartz in its most northerly exposure. If this were the case, its northern extension on these levels would most obviously deserve thorough investigation at the present time.

The 1200 stopes were ultimately raised 114 feet above the level in rich ore. At that elevation the ore terminated against a "cap rock," which strongly suggests a fault or a dike. The former is most probable, as the stresses which produced the

Comstock certainly expressed themselves by parallel fissures in the hanging wall of the Lode; and on all of them the hanging wall moved down to the east. It would thus be very reasonable to suppose that further investigation of the country above the "cap rock" would show the upper extension of the East Vein to have suffered a displacement to the east by a Comstock fissure.

From the point where the bonanza deposit of the East Vein merged into the stopes of the Comstock, the northern extension of the East Vein was generally ignored, and this neglect was not remedied as far as the upper levels were concerned, even after an almost accidental rediscovery of the vein on the 1750. Here it was found by a crosscut 65 feet east of the stopes, about 100 feet south of the California line. It returned rich ore from a point 30 feet above the level down to a point a few feet above the 1950 level, a vertical distance of about 230 feet. It is impossible to ascertain the value of the production from these stopes; but it must have amounted to a number of millions, as I recall that much of the ore was exceedingly rich and it was 20 feet wide in places.

It might be supposed that this body of ore would have been immediately recognized as an extension from the vein which contained the great stopes to the south, thus leading to a recognition of the true structure of the southern part of the bonanza; but this was not the case.

No definite exploration of the northern extension of the vein was attempted beyond the points at which the ore gave place to barren quartz. However, in California a west crosscut from the C. & C. shaft on the 1950 level chanced to cut the vein in ore once more; and this was at last recognized as an extension from the lower East Vein ore in Con-Virginia. This again returned a great deal of ore, some of which was very rich. It extended to the 2200 level. It is probable that then, at last, the true nature of the East Vein was strongly suspected, and that further exploration upon it to the north was avoided pending the extensions of crosscuts from the Union shaft through its supposed course far to the north. One of these passed within about a hundred feet of the Mexican ore body and cut the vein in low grade quartz, but the failure to discover good ore discouraged careful exploration at the north end and left the Mexican and Ophir ore bodies for the support of recent operations.

THE PERIOD OF THE REWORKING OF THE OLD STOPES—1882-1897 (INCLUSIVE).

YEARS 1882 AND 1883. CON-VIRGINIA AND CALIFORNIA.

No work above the 2450 level, as all the old stopes were sealed up in an attempt to smother fires. No ore was produced, though exploration was conducted upon the deep levels.

YEAR 1884.

In May work was started by Jones Lease on the 1200 and 1300 levels of Con-Virginia.

Lower level exploration reached the 2900 level.

November 1, 1884. Con-Virginia and California were consolidated. No further ore production to this date.

YEAR 1885.

Report of November 1, 1885, by Superintendent Patton.

Production, 38,929 tons; bullion, $640,463.97.

1200 AND 1300 LEVELS.

Produced 18,487 tons, averaging $16.77 per ton, from the Jones Lease. As we have no detailed report of this work there is some possibility that these leasers may have explored the East Vein northeast from the old stopes; but this is not probable, as their attention seems to have been directed toward the cheap extraction of low grade ore left on the rims of the stopes.

1750 LEVEL.

Produced 20,442 tons, averaging $16.78, principally from the old California stopes.

JANUARY, 1885.

All work was suspended below 2000 level and water was allowed to rise.

YEAR 1886.

Report of October 1, 1886, by Superintendent Patton.

Production, 109,205 tons; bullion, $1,482,624.88.

The Jones Lease expired after producing an additional 10,369 tons, from which the bullion averaged $17.81 per ton. "Since the surrender of the Jones contract and the resumption of work through the old Con-Virginia shaft, exploration has been carried on vigorously on the 1200, 1300, 1400 and 1500 levels recently in the discovery and extraction of large quantities of low grade ore, being principally from that portion of the old ore body left behind in former workings lying south of the old Con-Virginia shaft." Here again it is possible that northeast drifting may have been resumed upon the East Vein, but it does not seem probable that much was attempted except the extraction of low grade ore around the stopes.

1400 LEVEL.

West crosscut 364 feet from C. & C. shaft. Thence southwesterly branch 851 feet and northwest branch 380 feet to east wall of Comstock, together with other work of access to the old stopes.

1650 LEVEL.

Work of access similar to that on the 1400 level.

1750 LEVEL.

Extraction of ore from old California stopes and connection made to 1850 Con-Virginia stopes on the East Vein from which extraction of ore was resumed.

1950 LEVEL.

Connection established with the old East Vein stopes from the 1850 level in Con-Virginia.

YEAR 1887.

Report of October 1, 1887, by Superintendent Patton.
Production 125,876 tons; bullion, $3,523,930.04.
Average bullion, $27.09 per ton.

1200 LEVEL.

Some work south from Ophir line.

1300 LEVEL.

Crosscutting, principally west, from north and south drifts from Con-Virginia shaft. No east crosscuts described can have reached the locus of the East Vein.

1400 LEVEL.

Some fine ore recovered around the old Con-Virginia stope. Very important discoveries of ore near south boundary of old California. The ore clearly lay east of the old stopes and may have been in the East Vein, but the description of its location is too confused to permit any great assurance as to this. It may be well to quote the description.

"The north drift which diverges from the main northwest drift from the C. & C. shaft on this level and which at the date of my last annual report had been advanced 183 feet, has been extended 17 feet. At a point in this drift 125 feet from that connection, an upraise (No. 1) was started and carried up to a point 50 feet above the 1300 level, passing through ore of fine quality. . . . . In the direction of the line of the main north and south drifts on this level, from a point 200 feet north from the C. & C. connection to a point 200 feet south from that connection, a total length in ground of 400 feet, the mine from the 1300 foot level down to at least the 1500 foot level, as far as has been developed, shows almost continuous ore which will average, by assay, $25.00 per ton. To this may be added chutes of richer ore at intervals. This ore development varies from five to fifty feet in width, and lies east and independent of the old stopes, and has furnished a portion of the ore extracted from the mine during the past year, and a large quantity still remains in place."

We may infer from this account that we may find the East Vein mined out for 200 feet north of the south line of California and as high as 50 feet above the 1300 level; but it is by no means certain that this is indeed the East Vein.

1435 LEVEL.

Southeast drift from south drift from Ophir was driven to cut ore referred to above, which it did. A winze was sunk 65 feet "and a drift running southwesterly from the bottom shows 30 feet in width of fine ore." We now note that the course of this ore was southwest (and northeast) which, together with the fact that it is described as a distinct ore body east of the old stopes, adds somewhat to the possibility that this was East Vein ore; but if this is the case, there are some rather indefinite references to its position which would appear to place it farther west than would be expected from the known position from the vein on lower levels.

1500 LEVEL.

Connections made south from Con-Virginia shaft and ore extracted.

North drift connected with the east ore described above.

1600 LEVEL.

Good ore developed west of old stopes in California ground.

1650 LEVEL.

Connections made from C. & C. shaft to old Con-Virginia stopes and to the good ore on west side of California stopes.

1750 LEVEL.

A raise above the old East Vein stope in northern part of Con-Virginia "has cut into fine ore four feet in width."

1850 AND 1950 LEVELS.

Continued extraction from the old East Vein stope in Con-Virginia.

YEAR 1888.

Report of October 1, 1888, by Superintendent Lyman.
Production 148,303 tons, averaging $27.24 per ton.
Bullion, $4,060,978.78.

1300 LEVEL.

Connections north from Con-Virginia shaft. A south lateral drift from the same shaft was extended to the Bonner shaft. "In this south lateral drift, 525 feet from the Con-Virginia shaft a body of ore 10 feet wide was passed through." As will be seen later, this proved to have a southwest course and was undoubtedly

a new exposure of the East Vein. It is almost incredible that the discovery of this ore had not been made before, as it would have been found by drifting on the vein from stopes of rich ore a distance which could not have exceeded 300 feet.

1400 LEVEL.

Southwest drift from crosscut west from C. & C. shaft connected to old Con-Virginia stopes. "This drift . . . . has developed quantities of good ore in places."

Old stopes of Con-Virginia furnished much ore.

1435 LEVEL.

Produced considerable ore. Further developments of ore west of old stopes.

1500 LEVEL.

Connection to Best & Belcher from Con-Virginia shaft. Connections north to old stopes and extraction of ore.

1600 LEVEL.

Connections from Ophir to old stopes and discoveries of ore on Comstock footwall.

1650 LEVEL.

Connection to old California stopes from C. & C. shaft. Also drifts and raises in margins of ore in old Con-Virginia stopes.

1750 LEVEL.

East Vein ore from raise. The four feet of fine ore reported the previous year "has continued up to the 1650 level, thence upraised 60 feet above that level."

1850 AND 1950 LEVELS.

Small production from East Vein stopes.

YEAR 1889.

Report of October 1, 1889, by Superintendent Lyman.

Production, 136,189 tons; average returns, $24.43.

Total bullion, $3,327,281.90.

1300 LEVEL.

Development of East Vein ore 525 feet south of Con-Virginia shaft.

1400 LEVEL.

Further production from about old Con-Virginia stopes.

1435 LEVEL.

Continued production from about old Con-Virginia stopes.

1500 LEVEL.

Production from old California stopes.

1600 LEVEL.

Production from old California stopes. "We find valuable ore, as well as filling, in working over that part of the stopes which was originally worked in the years 1875 and 1876." There is good reason to suppose from later records that in those years no attempt was made to mine ore falling below a grade of $50.

1650 LEVEL.

Extraction of ore from old stopes.

1950 LEVEL.

Discovery of good but narrow ore north of old East Vein stopes apparently. Followed up 100 feet it encountered 1850 stope timbers. Followed down 99 feet until stopped by water. "This ore streak is 3 feet wide and 40 feet long."

YEAR 1890.

Report of October 1, 1890, by Superintendent Lyman.

Production, 119,315 tons; average returns, $18.90.

Total bullion, $2,255,946.24.

1200 LEVEL.

Reopened Con-Virginia shaft station and connected it to the mines to the south. Prospecting on east side of old stopes.

"From the shaft station a north lateral drift and crosscuts therefrom should be run at some future time, as there has never been any prospecting work done on this level in that direction." This is a direct reference to the ground, the possible exploration of which is being considered.

1300 LEVEL.

The East Vein ore 525 feet south of Con-Virginia shaft was further developed. "This upraise was started in an ore streak which was worked on the sill floors in the years 1888 and 1889. From this raise and the ground adjoining it a good many tons of ore have been extracted from the sill floor up to its connection with the 1200 foot level. At the present time we are working from this raise southwesterly, 70 feet above the sill floor, and are following ore which assays $20 per ton, carrying a width of five feet, with indications that it will increase in width as we follow its course; and our opening here shows ore above and below."

This is very significant as showing the persistence of values in the East Vein, as this ore must have been within 200 feet of the Best & Belcher line. It cannot be doubted that the East Vein will ultimately be shown to extend into the Best & Belcher, though it must terminate against the Comstock at no greater depth that the 1200 at the Best & Belcher north line, and it

may not extend below the 1000 level at that point. I am aware of no facts which suggest that the locus of this supposed extension into Best & Belcher has ever been explored, as the work in that mine was done in the Comstock rather near to the surface, or in the Comstock below the probable position of the East Vein intersection.

1400 LEVEL.

Work south of Con-Virginia shaft abandoned.

1435, 1500, 1600 AND 1650 LEVELS.

Extraction of ore from old stope rims, but no eastern developments.

1750 LEVEL.

Being reopened.

1950 LEVEL.

Abandoned and allowed to fill with water.

YEAR 1891.

Report of October 1, 1891, by Superintendent Lyman.
Production, 86,443 tons; average yield, $20.23.
Total bullion, $1,749,305.02.

1100 LEVEL.

Cut station. South connection to Best & Belcher. 333 south of Con-Virginia shaft "ore of fair quality was cut, stoping was commenced, and ore extracted for a space of 30 feet long, 30 feet in width, and 18 feet deep below the sill floor. At this depth the ore decreased in value and changed into quartz of low assay value." There appears to have been no thought of following up this quartz beyond a poor showing. "The ore above is mixed with clay and porphyry and the average samples taken therefrom indicate that the ore in that direction is not of good quality." It is possible that this again was the East Vein, though it is said the ore had a westerly dip; but in several other places the East Vein has become vertical and even dipped west through short distances.

1200 LEVEL.

Some ore produced from old stopes. "In carrying an upraise above these old stopes we passed through porphyry and clay into ore of fair quality, which we followed upward a distance of 13 feet." It would be interesting to know if this "porphyry and clay" referred to the "cap rock" at which these stopes were stopped years before.

1300 LEVEL.

Some tonnage from south of Con-Virginia shaft. From shaft an east crosscut 230 feet and northerly drift therefrom 185 feet long. This may have been on the East Vein.

1500 AND 1600 LEVELS.

Extraction of ore from old California stopes.

1650 LEVEL.

Extraction of ore throughout the entire level.

1750 LEVEL.

Exploration east of Con-Virginia shaft. Some ore produced.

1800 LEVEL.

East crosscut from a winze in old California near south boundary appears to have cut the East Vein in ore. Some production in spite of difficulties due to water.

YEAR 1892.

Report of October 6, 1892, by Superintendent Lyman.
Production, 53,421 tons; average value, $18.23.
Total bullion, $974,341.89.

1100 LEVEL.

Long west crosscut 100 feet south of shaft. Also 310 feet south of shaft an east crosscut from a raise 73 feet above the level was driven 60 feet and very probably cut the East Vein; but only low assay values were reported. 315 feet north of the shaft an east crosscut was driven 328 feet, "cutting the East clay and wall rock." This crosscut probably stopped within 100 feet of the East Vein.

1500 LEVEL.

Extraction of ore from south end of old Con-Virginia stopes.

1600 AND 1650 LEVELS.

Further recovery of ore from old California stope margins.

1750 AND 1800 LEVELS.

Exploration directed principally toward the East Vein country. Considerable production of ore.

YEAR 1893.

Report of October 7, 1893, by Superintendent Lyman.
Production, 25,613 tons; average yield, $20.46.
Total bullion, $524,196.74.

1100 LEVEL.

West crosscutting north of the shaft.

1500, 1600, 1650, 1750 AND 1800 LEVELS.

Continued extraction of ore about the old stopes, with several interruptions due to stope fires.

YEAR 1894.

Report of October 4, 1894, by Superintendent Lyman.
Production, 7,100 tons; average yield, $51.09.
Total bullion, $362,793.66.

1000 LEVEL.

Con-Virginia shaft reopened for explorations directed by Mr. Rule. Southwest drift 644 feet. East and west crosscuts from it. 353 feet from shaft a little ore was cut, but values did not continue, though the quartz appears to have done so. "There was a good exposure of quartz formation north and south from the foot of the raise. . . . . All this formation showed a low assay value, but no ore that would pay for extraction."

These operations constitute the only attempt to investigate the upper extensions of the East Vein, which was undoubtedly barren in the region explored. However, in view of our present knowledge of the vein, this would hardly appear to be sufficient evidence to justify an assumption that it is barren as a whole in its upper extensions. In the lower levels this vein has been extremely valuable in spite of the fact that by far the greater part of its area is barren and that the occurrence of ore deposits is relatively infrequent. It is unfortunate that the exploration directed by Mr. Rule was put upon a false basis by his claims of positive knowledge as to the position of an ore body, the failure to find which, resulting in disappointment to the stockholders, may have contributed toward an unwarranted conclusion that the upper part of the vein deserved no further consideration.

In view of the splendid record of production from the East Vein, it would certainly seem to be a reasonable risk to systematically trace the vein from our northern to our southern boundary on at least one level of its upper extension.

1600, 1650 AND 1700 LEVELS.

Further discoveries of good ore about the old California stopes.

YEAR 1895.

Report of October 1, 1895, by Superintendent Lyman.
Production, 10,255 tons; average yield, $47.96.
Total bullion, $491,807.64.

1000 AND 1100 LEVELS.

Some exploration north of Con-Virginia shaft.

1650, 1700 AND 1750 LEVELS.

Continued extraction from old California stopes.

YEAR 1896.

Report of October 1, 1896, by Superintendent Lyman.
Production, 7,059 tons; average yield, $29.93.
Total bullion, $211,333.49.

1000 LEVEL.

Exploration in Comstock north of shaft.

1600, 1650 AND 1750 LEVELS.

Continued exploration and production from about the old California stopes.

YEAR 1897.

Report of October 1, 1897, by Superintendent Lyman.
Production, 3,234 tons; average yield, $32.80.
Total bullion, $106,332.95.

1000 LEVEL.

Further prospecting in the Comstock north of the Con-Virginia shaft; but the East Vein country was not penetrated.

1550, 1650 AND 1750 LEVELS.

Further production from the region of the old California stopes.

SUMMARIZATION OF THE PERIOD 1882 TO 1897 (INCLUSIVE).

It will be seen from the above detailed account of operations in this period that in general, all efforts were directed to the recovery of the ore left about the margins of the old stopes, as a result of which over $19,000,000 worth of bullion was produced and $3,898,000 were paid in dividends.

It is probable that all ore of material value adjacent to the old stopes, was mined; and there appears to remain little possibility that any part of the East Vein remains unexplored in the old Con-Virginia north of its principal development in the bonanza stopes and up to the 1100 level. It is practically certain that the Comstock proper has been thoroughly prospected all through the region of the stopes. It is certain that the lower levels of the East Vein in old California ground have been mined with more or less thoroughness. It is possible, but not certain, that at one point in this region the East Vein has been explored to an elevation of 50 feet above the 1300 level. However, there is hardly any possibility that, in the old California ground, the locus of the East Vein has ever been penetrated as high as the 1200 level. In the old Con-Virginia ground to the south, the vein was certainly productive to a point some feet above the 1100 level and some ore appears to have been shown in it for a few feet above the 1000.

PERIOD SUBSEQUENT TO 1897.

This period requires for our purpose no detailed statement of the work done, as it was all conducted on levels far below those which are the subject of our inquiry. The 1400 was the highest level touched in later years and the work done there was designed solely for the flooding of old stopes.

CONCLUSIONS AS TO UNPROSPECTED EAST VEIN.

The facts presented appear to justify a conclusion that the East Vein, if it extends above its known exposures, is entirely unprospected on the 1200 level of the old California ground; and that in the old Con-Virginia ground it has had little exploration above the 1100, though some exposures have probably been made on the 1000.

It is the opinion of many that the East Vein exists in the upper region above its known exposures; and this opinion seems to deserve serious consideration. It can hardly be doubted that, if the vein exists above, it should be expected to preserve there the characteristics with which we have all become so familiar from our work in its northern extension, and that the nearness of the stopes of the Great Bonanza would justify a hope that we might find some increase in the tendency to the formation of ore bodies observed to the north.

I therefore believe that if access to the locus of the vein can be obtained at reasonable cost, it should be done.

PROJECT FOR OBTAINING ACCESS TO UPPER LEVELS OF THE VEIN.

The following may be regarded as controlling factors in a project for access to the vein for exploration:

1. Communications must be established from the C. & C. shaft, as the Con-Virginia shaft is no longer open.

2. All old stopes must be avoided, if possible, in order that the stope fires may not be started up again.

3. As the 1400 is the highest level on which a crosscut from the shaft now exists and at this level stopes may exist on the East Vein, it will be advisable to start a new crosscut higher up.

4. In driving the crosscut, a course perpendicular to the supposed course of the vein would naturally be taken if this would reach the vein in ground known to be unexplored.

It is found that a small station now exists on the west side of the C. & C. shaft 997 feet below its collar, or 1347 feet below the Gould & Curry croppings datum point. This was a wheel pit station for the old power transmission system. It is estimated that it could be cleaned out, repaired and remodeled, to make a

useful base for driving, at a moderate cost, in a period of about three weeks.

The old 1200 level of Con-Virginia is at a depth of about 1336 feet below the datum point and thus about 11 feet above the 1000 station of the C. & C. Allowing for the increase in elevation we would obtain by the grade in driving, this would bring a level driven to the vein to about the same elevation as that of the old 1200, thus permitting connections if it should at any time be desired.

It is found that a crosscut from the 1000 station having a course north 42 degrees west, which is about perpendicular to the course of the vein, would enter its lower locus in ground which I believe to be virgin at a point about 240 feet south of our north line, and about 320 feet from the line on the course of the vein. Such a crosscut measured from the west side of the station should be expected to enter the locus of the vein in 468 feet and to cut the vein within a total distance of 600 feet, no allowance being made for possible faults. The stated locus, from 468 feet to 600 feet from the start of the drive, has been figured by referring different known dips of the vein farther south to the known positions of the vein on the lower levels. Some displacement by a fault is suspected, and if this is the case, it would tend to slightly shorten the distance.

Upon intersecting the vein by the crosscut, it seems probable that a south drift would extend something over 700 feet before old workings would be encountered.

RECOMMENDATIONS.

As it is apparent that the possible exploration which you have instructed me to study, as above, is of very great promise, and that it can be undertaken under very favorable conditions and at moderate cost, I desire to recommend its immediate prosecution as outlined under the topic, "Project for Obtaining Access," etc.

However, in doing this I believe it to be my duty to counsel you against entertaining any misconception as to the nature of our reasonable expectations. While we may properly expect to find the vein existing at the 1000 level, it is not at all probable that we will cut it in ore, as it is characteristic of the vein elsewhere that it has only occasional ore deposits, separated by considerable distances in which barren quartz is found; and indeed, the quartz itself is very limited in quantity at times, as on the 1950 of Con-Virginia, where, within forty feet of highly productive stopes, the vein is no more than a foot in width and shows only two inches of quartz. We must certainly expect to explore the vein for some feet after it is found before a reasonable judgment can be formed of its possibilities; and a failure to recognize this

from the start would tend to cause discouragement and prevent a thorough test of the upper extension of the vein, which may be far more valuable than has ever been suspected. We must remember that on the lower levels, where the vein has produced many millions, its exploration was repeatedly abandoned by men who had mined rich ore from it, and the failure to follow up the vein past its weaker parts again and again left ore for later discovery by accident.

I must also state that my recommendation to take up this work at the present time is in no way due to a failure to fully appreciate the greater chance for finding bonanza ore near the intersection of the East Vein and the Comstock, the unexplored portions of which lie at lower levels. However, there now remains unexplored in Con-Virginia only a very limited amount of this important locus of ore above the present water level, and, pending the reduction of the water below the 2500 level, where it now stands, we are in a position to investigate these other possibilities, which may greatly broaden the scope of our operations. If we find ore on the 1000 level, it will be almost inevitable that the neighboring mines of the north end will also find deposits in the upper extensions of the East Vein, and our problem of financing an adequate pumping system to permit the continued exploration of the deep intersection, will be quickly solved. In the reasonable hope of finding at some point of the intersection below the present water level a repetition of the Great Bonanza, our minds are centered. Those of us who know the Comstock, who have witnessed its prodigal bounty following after periods of dearth and depression, have no doubt that the Great Bonanza is but the prototype of other great ore deposits which must exist at points along the intersection of the East Vein and the Comstock, where the conditions which made the Bonanza must be duplicated. This splendid quest must be deferred for a time, as its cost is too great for our present resources. Let us not neglect, however, a single opportunity which may furnish us the means to continue it.

Respectfully submitted,

THOS. F. McCORMICK,
Supt. Con-Virginia Mng. Co.

In the spirit and recommendations of the above report, I concur.

CARL EDWARD JULIHN, E. M.
Consultant.