



CONTACT INFORMATION  
Mining Records Curator  
Arizona Geological Survey  
3550 N. Central Ave, 2nd floor  
Phoenix, AZ, 85012  
602-771-1601  
<http://www.azgs.az.gov>  
[inquiries@azgs.az.gov](mailto:inquiries@azgs.az.gov)

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Note for Dave Moss re -

*file*  
May 21, 1948

Cody Dyer Claims

also known as Southern Belle

Located in Old Hat Mining District, Pinal County, Arizona about five to six miles southeast of Oracle.

Three groups of claims:

Southern Belle  
Cody Dyer  
Camp Bonito

Developed at intervals since 1880 and said to have produced about \$250,000.00 in gold (at old price) prior to 1913. Also some tungsten (scheelite).

At one time was promoted and worked by a relative (nephew?) of William F. Cody (Buffalo Bill).

I have lengthy reports on this property by William B. Blake (then Territorial Geologist of Arizona) made in 1906 and by Carter and Smith, - a firm of Canadian Engineers who examined the workings in 1913 and a record of a conference with a man named Ewing who informed me in 1921 that the property was then owned by Mrs. Julia Caddington of New York but was under option to John W. <sup>W.</sup>Hight of Tucson.

These engineers speak well of the chances for developing and working the scheelite ore which was mined and milled in small quantity about 1912 and is at present in great demand for war purposes. Recent operations have been carried on by the Riviera Bros. (Mexicans) who have mined some ore and made several shipments of ore and concentrates. The interest of Hess in this project I could not learn but locally he is known as a promoter rather than an Engineer.

May 21, 1943

One of the Engineers of a large Mining Company recently examined this property and reported that there were some good showings of scheelite ore but the extent of these seemed to be limited and he made no estimate of the value of the mine or of its future prospects all of which could only be determined by a careful investigation which should certainly be made by anyone who was considering an investment.

A man named Wells is operating a copper mine in this district known as the Control and he also is reported to have opened up some good scheelite deposits but of small tonnage.

*B. H. C.*

CARTER & SMITH  
Consulting Mining Engineers  
448-449 Confederation Life Building  
TORONTO

July 15th, 1913.

George M. Colvocoresses, Esq.,  
#43 Exchange Place,  
NEW YORK CITY.

Dear Sir:-

In reply to your favor of the 9th of July, I have this further information to give you re the Cody-Dyer Group of Mines, Arizona.

You are quite correct in surmising that in its present state, the Cody-Dyer is a prospect, but it is a very good prospect-one of the best I have seen in years and one that I am sure would turn into a valuable property if opened up intelligently.

The samples were taken from points very far apart and in each case, the width is given, but not in every case the full width of the vein; it would not do to take the average of these widths as the average of the vein sampled. However, the late Professor Blake, Territorial Geologist for Arizona, made a thorough examination of the Southern Belle vein and gave an average width of 5 feet. He at the same time, gave an ore tonnage of over 300,000 tons and his average value at better than \$9.00. I do not concur with Prof. Blake's tonnage, but think his average width would be correct.

As the vein is fairly flat and outcrops on the side of the Southern Belle ridge, the deposit can be developed as mentioned

in the report, by a series of adits and connecting upraises or winzes. Again, the report indicates on page 5, that cheap and rapid work can be done. It is also indicated that lack of data prevented the giving of exact costs of work done in the past. I know this is a very important point, but am sure that if you run over page 5 again, you will get some idea as to what to expect in this respect and will see that costs will be very low. This explanation holds good in regard to the Scheelite deposits.

I am of the opinion that the ore would be easily treated by cyanidation and that a good margin of profit on \$10.00 ore could be got. Again you see, for lack of data, as to past working costs and milling results, I cannot possibly put in figures, but would venture to say \$5.00 per ton, would cover everything.

The Scheelite deposits are exceedingly interesting, but need more development work done to determine size and nature of deposits as indicated the milling of the ore would I believe pay for same, and as the two mill runs show, the ore is of good grade, other mines working on a  $1\frac{1}{2}\%$  ore with success.

I am sure you will find this one of the most promising prospects in the South-West and will, if you examine it, agree with me in this respect. Hoping I have answered your questions to a certain extent, I am,

Yours very truly,

(Signed) Alexander H. Smith

SOUTHERN BELLE

Cody Dyer

Notes by G. M. Colvocoresses after conference with Ewing in February, 1921.

Title to some of this property now is name of Cody-Dyer Mining and Milling Company.

Values in gold and tungsten and the latter metal is found mostly in the Campo Bonito Group which is 5 miles southeast of Oracle in the Catalina Mts. Mine was reported on by Ewing and also by E. F. Pelton of Tyrone, New Mexico. Old production of gold ore from Southern Belle Group which adjoins the Cody-Dyer proper has amounted to over \$250,000 in gold ore with average value of \$8.00 per ton (gold @ \$20.00 per oz.) This was free-milling ore but the old workings have been gutted and the balance of the claims are only prospects but Ewing considers that they are most promising.

Owned by Mrs. Julia Coddington of New York but under option to John W. Wright of Tucson.

There are some good scheelite showings on the Southern Belle property and on the Cody-Dyer where there is a shaft 175' deep from which good tungsten ore was taken and one picked lot assayed 7.5% W.O.<sub>3</sub>

All three groups, - Southern Belle, Camp Bonito and Cody-Dyer should be combined and developed for both gold and tungsten and Ewing thinks the outlook is very favorable and confirms statements of Prof. Blake and Carter and Smith.

*Southern Belle*

2/16/13

Report of the CODY-DYER Group of Mines.

- - - - -

A full and exhaustive report on the holdings of the Cody-Dyer Mining Company, without the proper maps and plans would be a very lengthy affair as so many claims (52) would have to be covered which is not possible in the scope of this report. The two deposits, the Southern Belle gold silver vein and the Scheelite deposits on the Maudina and Morning Star claims being gone into in detail, also the present equipment and description of values as shown by the assay returns and past history of the mines and estimated costs of developing the properties being featured.

The examination seems to show that the property is a valuable one and with proper development would be quickly proved.

On account of the Southern Belle <sup>having been</sup> ~~being~~ leased, very few faces of good ore were found. This is not to be wondered at as development and exploration work was neglected and all good ore extracted.

The scheelite deposit has been explored and the surface of the Morning Star claim and the Maudina, by a 176-foot shaft and drifts from four levels.

Enough information is given in this report to show the property shows great promise. The gold samples were taken from different faces along the Southern Belle vein at great distances apart. The result of the two mill tests on the scheelite ore are also very encouraging.

The Cody-Dyer group of mines consist of the following claims.

- Southern Belle Group -

1. General Hancock. full.
2. Gold Bug. "
3. Morning Star. "
4. Happy Thot. "
5. Humming Bird (100 x 849)
6. Lewis. full.
7. Southern Belle. "
8. Dolphin. "
9. Apache Girl. "
10. Lewis Mill Site. (5 acres).

Two small fractions not patented. All these claims are patented. The Company also have options on the following additional claims that round out the group.

11. Careless.	full.	not patented.
12. Cross Town.	"	patented.
13. Mischief.	"	not patented.
14. Tom Cat.	"	" "
15. Senator.	"	" "
16. Alto.	"	" "

Campo Bonito Group.

17. Leyner.	full.
18. Gold Mill.	"
19. Don Pedro.	"
20. Fresnel.	"
21. Pagaora.	"
22. Pirate.	"
23. Scheelite.	"
24. Rocker.	"
25. Conglomerate.	"
26. Maudina.	"
27. Ora Fins.	"
28. Merrall.	"
29. Carbonate.	"
30. Sulphide.	"
31. Mogul. No. 1.	"
32. Mogul No. 2.	"
33. Detroit.	"
34. Omaha.	"
35. El Plomo.	"
36. Pure Gold.	"
37. Summit.	"
38. Copper Glance.	"
39. Live Oak.-	"
40. Juniper.	"
41. Gold Thistle.	"
42. Summer Home.	"
43. Poso Bueno.	"
44. Aurexa.	"
45. Swastika.	"
46. Black Hat.	"

- American Flag Group -

47. Gideon.	full.	not patented.
48. Emily.	"	" "
49. Pinchot.	"	" "

Alexander Group.

50. Alexander.	full.	not patented.
51. Dane.	"	" "

LOCATION & ACCESSIBILITY:

The Southern Belle and Campo Bonito Claims form a solid group and cover the numerous gold and silver veins and Scheelite deposits while the American Flag and Alexander groups lie to the North-East and East and cover promising veins.

The property is situated in the Old Hat mining district, Pinal County State of Arizona. The nearest railroad station is Tucson about 45 miles

from which the property is reached by a good waggon road, suitable for motors which can cover the distance in two hours. The nearest town is Oracle P. O., 5-1/2 miles on the road to Tucson.

HISTORY OF THE PROPERTY & OTHER MINES IN THE DISTRICT:

The Southern Belle mine according to Mr. Chas. Brajovitch, of Oracle, Arizona, was discovered in 1880 by Mrs. Gillett and staked by her husband, and Capt. John Young. Apache Girl was discovered by Sam Parker and Jack Zimmerman in 1880. Placer operations have been carried out in the gulches and canons of Southern Belle and Campo Bonito for years.

A few years ago tungsten ores in the form of scheelite or lime tungstate was discovered on the Maudina claim and in September 1912, scheelite was discovered on the Morning Star and considerable prospecting done in that section. To date, considerable scheelite ore has been mined and concentrated but the records are missing. As near as can be ascertained the Southern Belle has produced about 20,000 tons of ore that averaged \$10. a ton on the plates. All tailings have been washed down the canon. This ore was treated in the present 10-stamp mill on the Southern Belle canon and in another small mill that was built a few miles away in Pepper Sauce Canon. About 14 miles due north, lies the Mammoth Mine, a big producer. South on Mount Rice, about six miles away, the Copper Queen people have bought copper claims

TOPOGRAPHY:

The Southern Belle, Campo Bonito, American Flag and Alexander group of claims, lie on the North-East slope of the Santa Catalina Mountains. The country is rugged and cut by deep canons, The Campo Bonito, Southern Belle and Pepper Sauce canons all roughly paralleling each other and running down to the east to the San Pedro Valley. The ridges between these canons are sometimes high, seven to eight hundred feet. Of the three canons, the Pepper Sauce is the largest and as it starts from the foot of Mt. Rice, that is fairly well timbered and also gives a large catchment basin, the largest water supply will be obtained from this canon. The elevation of the present mill in the Campo Bonito canon is 4700 feet above sea level.

GEOLOGY:

A cross-section of the country from north to south and cutting across the three canons mentioned, would show grey porphyritic granite to

the north on top of which lie a series of sedimentaries of early paleozoic age; the Campo Bonito canon roughly forms the contact between these two series. Both the granites and sedimentaries have been cut by a series of north and south diorite dikes. Considerable diorite is found at different points in the Southern Belle canon and apparently represent a considerable mass covering a large area. Gold and silver values have been found in veins and along the contacts of the dikes in the granites, but the most important veins, those carrying gold and silver values and tungsten have been found in the sedimentaries or in a vein that forms the contact between the granite and the sedimentaries. These sedimentaries consist of a series of soft red and grey slates, and sand stones, blue limestones, quartzites and conglomerates.

Two sets of veins occur in this district and maybe more, but they were not observed. A series running east and west in the Granites and nearly vertical and a north-east by south-west series with a dip to the north east, at from 20 to 40° from the horizontal in the sedimentaries. These last are the most important and the Southern Belle veins are of this series. Two parallel veins, one above the other, have been extensively prospected and worked. They have a general trend of N.E. and S.W. with a dip to the S.E. of from 20 to 40° from the horizontal. The width is from a few inches to 20 feet. The outcroppings have been traced for long distances on the Campo Bonito and Southern Belle canons. Where observed, the vein filling is quartz very much leached and oxidized near the surface; containing gold and silver, a little iron and lead sulphides and lead carbonate. The hanging and foot walls are well defined, the strike of the formation conforming with the veins.

The American Flag and Alexander group of veins are in the porphyry formation. A number of veins with a strike N.20° W. (mag) and a dip of 45° to the east have been located and considerable sinking on same in numerous places. Here, numerous diorite dikes paralleling the veins, cut the formation; the veins forming a contact between the granites and diorite dikes.

#### MINING FACILITIES:

Water for domestic purposes may be secured in the Campo

Bonito and Southern Belle canons, within a few feet of the buildings. Shallow wells in both canons would almost supply enough water for a 10-stamp mill and power plants. For milling purposes, a spring on the side of Mount Rice, Pepper Sauce canon can supply by gravity 6,000 U.S. gallons per 24 hours. By putting down shallow wells in the Pepper Sauce canon on the Lewis Mill Site and pumping the water over the divide to Southern Belle canon, enough water for milling purposes on as large a scale as the mine will require, can be got; in fact, the water supply is ample for all requirements.

Fuel for power purposes can be cut on the surrounding mountains and put at a power plant for from \$4. to \$5. per cord. Crude oil in Tucson would cost about \$1.50 per bbl. Mining timber and lumber (rough) \$40. F.O.B. Tucson. Freighting from Tucson to mine \$14.50 per ton.

The wage rates paid different classes of labor are as follows:

Mine Foreman	\$5.00 per day.
Shift Boss.	4.00 " "
Machine Drillers.	3.75 " "
Machine Helpers.	3.00 " "
Mine labor. (Max).	2.50 " "
(White).	3.50 " "
Blacksmiths.	5.00 " "
Machinists.	4.00 " "
Helpers.-	3.00 " "
Teamsters.	3.00 " "
Top labor.	2.50 " "

On contract work, a rough estimate would be as follows:-

Shaft sinking 6' x 10". 1st. 100 ft. \$10. and up.

Drifting. Southern Belle \$2.50 to \$5.00 per foot.

Cross-cut tunnels and Raises. \$2.50 per day to \$5.00.

It is estimated that by running a general store in connection with the property and using Mexican labor, 50% of the pay roll would go to the store and the profits would be better than 30%. This information was supplied by the present manager on the property.

#### SURFACE EQUIPMENT:

At present, there are two mills on the property - one for treating the gold ores in the Southern Belle canon and the other for treating the scheelite ores in Campo Bonito canon.

Southern Belle Mills This frame mill is in fair shape having had new mortar blocks put in a short time ago. With a very little expense the mill could be put into fair working order.

10 stamps. 750 lbs. Pacific Iron. Works (1885) one mortar slightly cracked, but not at a dangerous point, wide mortars for inside amalgamatic

2 sets outside plates, badly scoured; 17 feet long by 4 ft. wide.

1-50 H.P. boiler (1880)

1-30 H.P. Atlantic Steam Engine Works (1878).

1 shafting and pulleys for crusher.

2 roller ore feeders (1882 model).

Although the mill is old fashioned, it is suitable for amalgamating these ores and can be looked upon as an asset.

Scheelite Mill: This mill is a frame structure sheeted with corrugated iron and with a few alterations and additions could treat 25 tons of scheelite ore in 24 hours. It will serve its purpose as a testing mill. In fact, think it would do good work on a commercial basis.

The equipment is as follows:

1 10" x 18" Blake Crusher.

3. Pan elevators.

2 14" x 18" Standard Rolls.

1 6' x 4' trommel.

1 3 cone hydraulic classifier.

2 Standard Wilfley concentrators.

1 Johnson Vanner.

Pulleys shafting and belts.

1 70 H.P. Chandler & Taylor Boiler. 90 lbs. working pressure.

1 35 H.P. #8 Oswego horizontal engine.

1 Vertical 10 H.P. engine.

1 American Well Wks. 30 H.P. air compressor.

2 Feed water pumps 3" x 2" x 4".

2 Well Pumps 5½" x 3½" x 5"

1 Air Receiver. 8' x 3'6".

1 small gasoline engine for blowing purposes.

1 3 stamp quadrupal discharge. Merralls mill and equipment at present discarded but in fair shape 100 lb. stamps.

The mines are well supplied with quantities of 3" and other sized pipe, rails and seven 1 ton ore cars all in good shape. Three machine drills, tools, pipe cutters and other supplies.

THE ASSAY OFFICE:

A two-roomed corrugated iron building, cement floor containing the following equipment.

1 Voland & Van Zilm button balance (old).

1 Becker Sores. analytical balance.

1 Bosworth crusher.

1 Buck board.

1 Brune combination gasoline furnace. 8. 30 q.m. crucible capacity.

Screens, tongs, reagents, chemicals and glass-ware.

1 Keaffel & Essex 5" transit with solar attachment, stadia rod, chains, etc.

MAUDINA SHAFT:

1 30 H.P. Boiler.

1 7" x 8" low gear hoist.

1 10 cu-ft. iron bucket.

1 one-ton car rails, etc.

CAMP BUILDINGS.

In the Silver Belle canon a good foreman's house (frame) is built, together with other frame buildings in a fair state of preservation.

In the Campo Bonito canon, where the main camp is situated, a number of tents with corrugated iron roofs and board floors, make very comfortable quarters for a climate such as is to be found in this district.

SOUTHERN BELLE DEVELOPMENT.

The Southern Belle vein has been opened up by a great number of short and long drifts and extensive stopes both on the Campo Bonito and Southern Belle canons. 28 samples were taken representative of the vein at points very far apart, also considerable panning was done. Values were found in every case. Of the 28 samples,

17 - trace to \$5.  
6 - \$5. to \$10.  
2 - \$10. to \$15.  
1 - \$15. to \$20.  
2 - \$20. and up.

Of these, 11 samples below \$5. were taken in the old Nos. 1, 2 and 3 workings of the Southern Belle where the leasers had removed all the good ore. These No. 1, 2 and 3 workings are extensive (see blueprint)

and the bulk of the 20,000 tons mined came from there. The other drifts, as a rule were short, and represented assessment work on the different claims.

The whole vein can be explored by a series of adits placed at suitable places and as the vein foot and hanging walls are soft, quick and cheap work can be done, very little timbering being required and no water to contend with. Although the hanging is soft it stands well and very little timber will be required in stoping operations.

THE MAUDINA SCHEELITE. DEVELOPMENT:

Some drifting and stoping on the surface and a shaft 178 feet sunk on the deposit, levels at 46, 89, 142 and 167 feet, have been run. No record of the amount of ore mined was to hand. The accompanying blue print shows the workings and formation which is impure limestone, with quartz stringers running through it.

MORNING STAR SCHEELITE.

As mentioned before, only surface development work has been done on this promising deposit and a small tonnage milled with good results. This work is not far enough ahead to determine the size of the deposit which is in blue limestone and quartzite.

ORE TESTS ON MAUDINA & MORNING STAR. SCHEELITE ORE.

On account of the brittleness of the scheelite the ore is very difficult to sample so two tests of roughly 12 tons each, of the run of the mine were made with the following results:-

Maudina Ore.

Tonnage.	12 tons	180 lbs.	
crude concentrate No. 1 & 2, Wilfley's.			562 lbs.
" " Johnson Vanner.			26 "
			<u>588 lbs.</u>
Crude concentrate.	2.43%		
W O <sub>3</sub> in concentrate.	47.2%		
" " " tailings.	.22%		
588 lbs. 47.2% concentrate =	277.5 lbs.	100% Ore =	1.36% W O <sub>3</sub>

Morning Star Ore.

Tonnage	11 tons	1871 lbs.	
Crude concentrate No. 1 & 2, Wilfley's			404.5 lbs.
" " Johnson Vanner.			19.2
			<u>423.7 lbs.</u>
Crude concentrate.	1.77%		
W O <sub>3</sub> in concentrate	52.12%		
" " " tailings.	.47%		
423.7 lbs. 52.12% concentrates =	202.8 lbs.	100% Ore =	1.38% W O <sub>3</sub> .

As the prices F. O. B. Tucson, for 60% W.O<sub>3</sub> concentrate average \$400 per ton, the gross value per ton would be for both runs \$9. per ton. Each run took about 10 hours as the ore is easily crushed.

CONCLUSION:

It is to be deplored that for the purpose of this report, the examiner was unable to collect any data as to the exact amount of ore mined and treated from the Southern Belle gold mine and the Scheelite deposits. A production of 20,000 tons that produced \$200,000. or \$10. per ton, is fairly accurate as to the amount from the Southern Belle. The palcers also have produced considerable amounts. The American Flag group has also been a good producer in its day. However, an examination of the vein in its present condition gives enough evidence to prove that under proper management it has every chance of turning out to be a valuable property and well worth attention from those looking for a good mining investment.

ASSAYS.

1. Apache Girl. 35 feet. Incline shaft. Vein 3 ft. wide.-----	\$1.60
2. Apache Girl. Width at least 10 ft. Sample 5½ ft. White quartz. .30	
3. Grab sample dump. Apache Girl 250 ft. from E.end Vein 5 ft. wide. Drift in 25 ft. Diorite dike cutting faces considerable galena.	6.30
4. Drift on Cross Town & Apache Girl. vein 3 ft. quartz.	8.65
5. Trab. sample from dump on Cross Town & Apache Girl.	2.50
6. Dolphin. - Cross Town. 40" inches wide. soft ore. footwall diorite. hanging shale. drift in 40 ft.	6.30
7. Lower vein. Cross Town. 18" wide. 65 ft. drift. vein broken.	1.75
8. Lower vein at portal. Cross Town drift vein 15 inches.	20.15.
9. East end of Cross Town, middle vein S.W.face of drift vein	
	45" 12.75
10. E.end of Cross-Town.right hand side portal 36"	6.30
11. N.drift East end of Cross Town. 3 feet.	4.40
12. Trab. good ore from Cross Town dump.	10.60
13. Trab. of poor ore from Cross Town dump.	2.35
14. Dolphin Point.	7.10
15. Southern Belle workings (Calaboose) broken vein 40".	2.75
16. Southern Belle (Calaboose) 6 ft. at end of stoping to S.W. Trace.	
17. Southern Belle (Calaboose) 27" S.W. of connection with #3 drift	3.75

18. Southern Belle. S.W. from Calaboose. 4 ft.	\$2.35.
19. Southern Belle. N.E. side main stope under surface shaft. 15 inches. considerable lead carbonate.	3.45
20. Southern Belle. Main stope. sample of horse between 2 veins.	8.65
21. Southern Belle. lower vein 15" below horse sampled in #20.	22.05
22. Southern Belle. last upraise from #1. 36".	1.90
23. Southern Belle. north end of vein 2 feet.	1.50
24. Southern Belle. grab filling between workings #3 & 2.	.60
25. Southern Belle. face stope between Nos. 2 & 3. 1½ feet.	.45
26. Southern Belle. No. 2 workings furthest in upraise between #1 & 2.	2.35
27. Southern Belle. upper vein above portal to #1. 2 ft. wide.	18.90
28. Southern Belle. #2 workings.	.35
29. American Flag. Mine. Gold \$2.60 per ton. Silver 21.7 ozs. per ton.	
30. American Flag Mine. Gold \$1.40 per ton; Silver 10.66 ozs. per ton.	
31. Cody Tunnel. upraise. Gold \$1.50 per ton. Silver 2.6 ozs. per ton.	
32. Cody Tunnel below upraise. Gold trace; Silver trace.	
33. Cody Tunnel. sample of dump. Gold \$1.20 per ton. Silver 2.3 oz. per ton.	
34. Maudina. tungsten ore. Gold 50¢ per ton.	
35. Morning Star. tungsten ore. Gold 90¢ per ton.	

SUGGESTIONS:

The most imperative work to be done in connection with the Cody-Dyer mine is the immediate exploration and development of the Southe Belle vein. As pointed out, this work can be done quickly and cheaply by a number of adits. It would be easy to start at least ten adits or drift immediately at points where the vein is promising looking. In the meanti proper surveys of the workings could be made and a plan of campaign worke out. This is necessary as the ore would have to be transported to the mill and from appearances this can be done by aerial tramway.

Development work and the blocking out of ore would be the deciding factor in the length and location of this tramway, which at the most would not be more than 3,000 feet long, at an estimated cost of \$2500. to \$3,000. per 1000 feet. The blocking out of ore will decide another question, that is location and character of mill suitable for the treatment of the Southern Belle ores. From their appearance amalgamation will extract a good percentage of the values. This has been proved by former work but it seems that a higher extraction is necessary.

From the appearance of the ore, a higher extraction seems possible by cyanidation, but before settling this question, some experiments would have to be made that give every promise of being successful. There is an alternative; that is concentration. The site for a mill woul have to be located that would be centrally placed so as to be as near the mine and water supply and ground for storing of tailings if necessary.

Again, it must be remembered that other promising veins occur that may be good producers and the ore treated at this mill. It would be disastrous if this mill were so located that the delivery of ore from these places put a heavy charge per ton for this. Questions of this kind can only be solved by surveys and proper maps drawn.

These arguments hold good in respect to the scheelite deposits. More work on the surface is required on the Morning Star before a short cross cut tunnel driven in the side of the slope on which it is located and which would cut at a considerable depth under the present surface showing. Both the Maudina and Morning Star deposits appear rich

enough to furnish the present mill with enough ore to pay for development work on these claims. At the same time, work on re-modelling the present mill, which seems unnecessarily complicated, could be done. The two mill tests show that the extraction of values can be made higher without increasing the cost of treatment per ton.

What is known as the Contact vein - or Free Gold vein contains, at depth a sulphide ore carrying gold and silver dissimilar to the Southern Belle and perhaps not suitable for amalgamation and cyanidation, if so, it is a concentrating proposition and as the scheelite mill is practically a concentrating plant, the treatment of these ores might be done with a few modifications, in the same mill.

It will be seen that various questions have to be solved, but the great one is first of all to block out a good tonnage of payable ore.

This report from start to finish points out that there are bright possibilities of doing this.

*Carter & Smith,*

Toronto, June 16th, 1913.

R E P O R T  
Upon the  
SOUTHERN BELLE GOLD PROPERTY

OLD HAT DISTRICT  
P I N A L C O U N T Y  
A R I Z O N A

By  
WILLIAM B. BLAKE  
Geologist and Mining Engineer  
(Former Territorial Geologist of Arizona)

April, 1906.

SOUTHERN BELLE GOLD PROPERTY

LOCATION

The Southern Belle Gold Mines are situated at the head of the Southern Belle Canon Gulch or Arroyo, descending from the high ridges of the Santa Catalina Mountains on the north-eastern end of the range, in Pinal County, Arizona. They are in the Mining District known as the "Old Hat" and are accessible by wagon road or automobile from Tucson by way of Oracle, a distance of about forty-eight miles. This may be lessened by the construction of a few miles of road through a low gap in the mountains.

The altitude is from 5,000 to 6,000 feet above the sea, and the climate is extremely favorable to all mining operations.

EXTENT OF PROPERTY

The property consists of ten or more mining locations, some of which are secured by patent from the United States, and a ten-stamp gold mill, and office and other buildings, besides a pumping plant and pipe line for the supply of water and mill site.

One of the claims has been considerably worked in a desultory way without adequate equipment or capital, and has been lying idle for some years past, owing to the death of their owner and delays in the settlement of the estate.

There are two groups of locations of claims, the Southern Belle Group and the Morning Star Group, on the opposite or northern side of the Southern Belle Ridge.

SOUTHERN BELLE GROUP OF CLAIMS

Apache Girl	14.83	acres.
Dolphin	19.37	"
Humming Bird	2.18	"
Lewis	26.61	"
Southern Belle	19.77	"

THE MORNING STAR GROUP

Morning Star	20.35	acres.
Happy Thot	20.35	"
Gold Bug	15.11	"
General Hancock	15.11	"
	<hr/>	
	153.68	"

The position of these several claims is shown upon the accompanying map, carefully made by Mr. Edward Dietrich from the surveys

and notes upon the ground. It is upon a scale of \_\_\_\_\_ feet to the inch, and shows the form and extent of the lode mined out, the position of the Company's mill and other buildings.

#### NATURE OF THE VEIN

The claims of the Southern Belle Group cover the larger part of the gold-bearing quartz vein of the same name, from which a large amount of gold has been taken from one claim alone. It is a flat or "blanket" vein cutting through the hills in a nearly horizontal plane, and cropping out in the hill sides in such a way as to be readily reached and opened by tunnels and drifts from the surface, without the need of shafts, pumps and other hoisting appliances. The slight dip or inclination of the vein, about 20 to 30 degrees in a north-easterly direction towards the mill, facilitates the extraction of ore and invites the mining by a succession of tunnels.

Three tunnels have been run in from the Southern Belle Canon and upwards of 18,666 tons of quartz have been extracted from this claim and worked at the Company's mill in the canon below, averaging, so far as can be ascertained, about ten dollars a ton. It is a simple free milling quartz without injurious element, and the gold is easily amalgamated on plates.

#### THE UPPER VEIN

In the main stope of the Southern Belle Mine, extending into the Careless claim ground, the mining has revealed the existence of an upper layer, or vein of quartz separated from the lower vein by a few inches, or feet, in thickness of slate or shale. It is particularly evident in the highest stope, but has not been much mined. It is particularly evident in the highest stope, but has not been much mined. It is again well shown at the surface in a shallow cuttin or pit above the entrance to tunnel #1, where it is five feet or more in thickness. Sample #10 was taken there, over two feet of the thickness, and showed a value of \$15.00 per ton.

In many places the quartz of the lode is more or less mingled with the slaty wall rocks, and as the included layers of slate thin down, the layers of quartz are united and the upper and lower veins be-

come blended or merged in one.

The general structure of the vein and the presence of a layer of shale are well shown by the photograph of the face of the lode where it is exposed to view on the Cross Town at the South End.

The total thickness is over six feet, about four feet of quartz below and two feet above a parting layer of red shale.

In the estimate of the total thickness of the vein the general existence of an upper and lower layer is considered in averaging the thickness at five feet.

#### AMOUNT OF ORE MINED

The extent of the extraction of ore is ascertained, approximately by the measurement of the space left by the removed ore. This space or stope extends northerly and easterly through the Southern Belle Claim and into an adjoining claim known as the "Careless". The total length of the stope across the two claims is about 500 feet, and its width is 160 feet in its widest part. Computing the area by squares of forty feet each and taking the average thickness of the quartz taken out at five feet, and its weight at twelve cubic feet to a ton, we reach a total tonnage of 18,666 tons.

#### AMOUNT OF VEIN STANDING

By a similar method of measurement the horizontal area and the tonnage upon all the claims is ascertained. It amounts to 637,500 tons. Subtracting the 18,666 tons mined, leaves 618,800 tons in round numbers as the amount standing in the vein within the present ascertained limits. There is reason to believe that the vein has greater extension and area in the Dolphin Claim, not yet developed. It may extend southwards through the main ridge under the great thickness of quartzite, which there forms the summit between the head of the Southern Belle Canon and the upper tributaries of the Pepper Sauce Gulch.

#### VALUE AND EXTENT OF THE ORE

The value of the ore has already been indicated in a general way as shown by the working of the mill. It is regrettable that no record has been kept of the full number of tons worked and of the yield in gold per ton or is kept, in any form such records have been lost or destroyed. From W. Brajovitch I learn that 713 tons of the quartz of

this lode, packed over to a five stamp mill in Pepper Sauce Gulch, in 1884, averaged \$15.75 per ton. This was no doubt selected quartz and above the average in value. The gold values at \$15.75 per ounce.

I am also informed that a trial run of 1,200 tons of quartz from the lode was made in the Southern Belle Mill by Wm. Brajovitch. Of this lot 1,000 tons was first class selected ore and 200 tons were from the low grade portions. The 1,200 tons averaged \$9.53 per ton of gold saved.

Sampling upon such a vein is eminently unsatisfactory, inasmuch as large quantities of the quartz are required to gain an average. Mill tests of fifty or one hundred tons are far more reliable as regards an average.

Numerous tests by panning portions of the loose, broken ore were made, especially along the outcroppings upon the Apache Girl and the Crosstown at the higher croppings. Such tests were very satisfactory in showing the general presence of the metal in paying quantities at each of the openings. The gold is generally fine and free, any pyrites which formerly existed having been fully oxidized.

The heavy white powder which is formed with the gold by panning is the carbonate of lead resulting from the oxidization of the galena. It has been observed that when the traces of lead are most abundant the quartz is richer in gold than when there is no lead.

It is evident that in this mine and vein, as in all other gold bearing veins, the gold is most uniformly spread. It is not found in equal quantities everywhere in all portions of the lode. There are portions of the vein in streaks and patches consisting of high grade quartz, together with low grade portions which will not pay to extract. Consequently in mining and milling attention is given to the selection of the ore, such portions only as will pay being stoped and sent to the mill, while the barren quartz and any rock is used as filling.

As a rule, in the Southern Belle Mine, with but few exceptions the hard parts of the lode left standing in the tunnels and in some places in the stopes are low grade, and for this reason were not mined out.

The higher values were found in the upper stopes and upon the

upper vein and at the croppings of the unworked vein on the Cross Town and the Apache Girl Claim.

In the upper stope on the Careless, the samples showed a value of \$11.40 per ton for thirty inches of quartz; at another point five feet of quartz was found to be worth \$4.40 per ton.

The croppings of the upper vein on the Hill above tunnel #1 was samples for a thickness of two feet and yielded at the rate of \$15.00 per ton. This quartz also showed good value, indicating from \$15.00 to \$20.00 by the panning test. It is well to note that the average of the four assays above given is \$9.70.

Samples from the croppings of the eastern end of the Cross Town claim gave high results. At the north opening a thickness of two and a half feet of quartz, where free gold was seen, yielded at the rate of \$30.40 per ton. A sample from the central opening (a photograph of which was taken) yielded at the rate of \$164.20 per ton. This is exceptional and above the working average. Another sample of the Southern opening, where the quartz is very hard and not much mineralized, gave only a trace. The average of the twenty-three samples from the ore ground is \$10.80 per ton. I prefer, however, not to estimate the value at a higher figure than \$8.00 per ton for the milling ore, a figure which I believe to be moderate and conservative and likely to be more than realized with proper working.

#### ORE OUT

A large amount of ore is available for immediate working, not along the stopes above the old mine, but in the upper vein near tunnel #1 and at the open cuts at the lower end of the Cross Town Claim and around other workings.

It is believed to be possible to open into the lower portions of the vein on the Careless Claim by a short tunnel run in from the ravine north of the mill, a distance of only ninety-five feet, and part of this through the rotten diorite rock, easily excavated. The position of this suggested tunnel and tramway or chute, to the crusher floor of the mill is indicated by the red lines upon the map. It will not only provide a shorter and more economical and convenient outlet for the mine

but will also have the great advantage of being put below the mouth of the tunnels upon the claim known as the Humming Bird, where good quartz is exposed.

It is not possible to exactly compute the value of the large area of unworked vein in the two claims extending up the hill to the croppings to the Westward (the Crosstown Claim and the Apache Girl). The vein at the croppings at both ends and where exposed along the hillside prospects assays well, and it is fair to assume that the pay is continuous from one end to the other of these exposures. Not, however, limiting the estimate to these two claims, but including the whole of the unworked area of 618,800 tons and allowing one-half of it for barren ground, we have approximately 309,400 tons gross, @ \$8.00 per ton, - \$2,475,200.

#### COST OF MINING AND MILLING

In the future working of the property I strongly advise beginning the mining at the lowest point and the extension of the mining upwards and backwards from the main outlet, much in the manner of coal mining or drifting, piling the waste quartz and rock behind, thus largely avoiding the use of timbers, while the roof is well supported by the filling.

Transportation to the Mill may be by tramway or by an aerial tramway or wire rope transmission. With these and other labor saving adjuncts and the complete equipment of the mill, the cost of mining and milling should not exceed \$4.00 per ton.

#### THE MILL

The Company's mill of ten stamps of modern construction is conveniently located below the chief part of the mines on the main arroyo or gulch of the Southern Belle. It is so placed that ore from the lowest tunnel can be delivered by a chute to the top of the mill, high enough for a rock breaker ore crusher and the required grizzlies and a bin above the self-feeders of which there are two.

There is no rock breaker, but one is essential to successful economical work. The needed pulleys are there and a counter shaft and breaker can be readily installed.

The mo

The mortars appear to be in good order. The amalgamated aprons are in good condition. These are two at each end of the battery. Each twelve feet long.

The power is supplied by a 40 H. P. steam engine. The boiler is tubular, of locomotive type, and is set in adobe. Wood, which can be had in abundance at from \$4.00 to \$5.00 per cord, is used for fuel. The boiler should be inspected and tested before using.

There are many tools and adjuncts of the mill, amongst them a differential pulley, dies for cutting threads on pipes, blacksmith's tools, some carpenter's tools and many striking hammers, drills, bars, picks and gads for mining.

The general arrangement of the interior of the mill and its appearance is well shown by the annexed photograph taken by Mr. Frank Dietrich, by the aid of the magnesium flash light.

It will be necessary to renew the battery blocks, which are badly decayed. I suggest that a substantial concrete grouting block can be made to take the place of the wood without the necessity of moving the mortars from the place; all the decayed wood being removed while the mortars are blocked up or otherwise supported by the frame during the making of the cement block.

#### WATER SUPPLY

The water for the mill is obtained at the Southern Belle Millsite from a well and underground flow in the gulch known as Pepper Sauce, about a mile Northeast, where there is a good flow throughout the year. The location is picturesquely chosen in a dense grove of Sycamore, Ash, Walnut, Mulberry, Cottonwood and other trees, which by their size and luxuriant growth, bear witness to an abundant and continuous water supply.

Pepper Sauce Creek drains the extensive watershed between Mt. Rice and Apache Peak, opposite the sources of the Canada Del Oro. The amount of water flowing at the time of my visit, visibly, was two feet wide and the depth of one inch. This of course did not show

the amount of the underground flow. The well sunk at one side of the channel, is cribbed and planked, but requires repairs and cleaning. I believe that there is water sufficient for the ten stamp mill.

The pump, a Worthington Duplex, No. 18,760, is  $7\frac{1}{2}$  inches by three by ten inches. It is in fair condition but needs to be taken apart and cleaned and oiled. It rests upon a timber foundation a few feet higher than the top of the well and is operated by steam from a wood burning locomotive boiler. There are twenty to twenty-five cords of seasoned wood on hand.

The barometer at the well and pump indicates a difference of 600 feet below the mill. The summit point on the pipe is said to be 750 feet above the pump. From that point the water descends to the mill by gravity.

The three inch wrought iron pipe is, in part, in poor condition, and requires renewing. There are some twenty five lengths of unused pipe on hand.

#### GEOLOGY OF THE SOUTHERN BELLE

The geological structure of the ridge cut by the Southern Belle gold ledge is extremely interesting and taken in connection with the adjoining areas, forms a very interesting chapter in the history of the earth.

From the testimony of the fossils found by me near the Southern Belle, (chiefly corals of marine growth) it appears that the stratified rocks in which the vein occurs are Devonian or Silurian. Two of the older formations of the globe. These rocks in the Southern Belle Canon consist of a series of shales, red sandstone, grey sandstone, quartzite and limestone, overlaid and apparently uplifted by an intrusion of diorite. This rock rising from the depths of the earth has hardened and altered the softer formation with which it came in contact, and appears to have caused the quartz vein and its impregnations with gold.

The existing conditions warrant the conclusion that the Southern Belle lode formerly had a much wider extension than we now find, that it extended over a large part of the region drained by the present canon, following generally the plains of contact of the lower shales with the diorite, and that it has been cut through, eroded and denuded by the drainage of the main canon and its branches, leaving the edges of the blanket ledge exposed as we find them, while the portions of the ledge cut away have been carried to lower levels, broken up and the gold dislodged to form the placer deposits which line the canon from the summit of the vein to the mess, two miles away.

This cutting out by the canon forms a fine section of the rock formation from one end of it to the other, showing the edges of the uplifted strata, below and above the vein, all dipping regularly eastward at from 15 to 25°. This is best illustrated by a section from the summit of the mountain to the mesa, a reduced copy of which is here presented.

#### SECTION OF THE FORMATION AS SHOWN IN THE SOUTHERN BELLE CANON

I also append a geological map of the Old Hat District from my own exploration and observation, made during my recent and former visits.

This shows the topographical distribution of the formations and their relation to the Southern Belle and other groups of mines.

The lowest substratum or foundation for the strata is the coarse grey, porphyritic granite of <sup>Or</sup>Boacle - the "Oracle Granite", which covers a wide area in the northern and central parts of the Old Hat District. This is traversed by heavy intrusive masses or dykes of diorite, by which the stratified formations have been uplifted, and to a varying degree, altered by hardening and by the flow of the silicized water forming the quartz veins.

#### THE MORNING STAR GROUP

This group of several claims is north and west of the Southern Belle Lode, and the claims cover a different system of

lodes. I find there is a series of massive croppings of quartz resembling reefs of quartzite at and near the contact of the older limestone and granite.

These claims have but little development and in in condition of "Prospects".

(Signed) "W. P. Blake."

Report of the CODY-DYER Group of Mines.  
(Southern Belle)

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A full and exhaustive report on the holdings of the Cody-Dyer Mining Company, without the proper maps and plans would be a very lengthy affair as so many claims (52) would have to be covered which is not possible in the scope of this report. The two deposits, the Southern Belle gold silver vein and the Scheelite deposits on the Maudina and Morning Star claims being gone into in detail, also the present equipment and description of values as shown by the assay returns and past history of the mines and estimated costs of developing the properties being featured.

The examination seems to show that the property is a valuable one and with proper development would be quickly proved.

On account of the Southern Belle having been leased, very few faces of good ore were found. This is not to be wondered at as development and exploration work was neglected and all good ore extracted.

The Scheelite deposit has been explored and the surface of the Morning Star claim and the Maudina, by a 178-foot shaft and drifts from four levels.

Enough information is given in this report to show the property shows promise. The gold samples were taken from different faces along the Southern Belle vein at great distances apart. The result of the two mill tests on the Scheelite ore are also very encouraging.

The Cody-Dyer group of mines consist of the following claims.

- Southern Belle Group -

1. General Hancock. full.
2. Gold Bug. "
3. Morning Star. "
4. Happy Thot. "
5. Humming Bird (100 x 849)
6. Lewis. full.
7. Southern Belle "
8. Dolphin. "
9. Apache Girl. "
10. Lewis Mill Site. (5 acres).

Two small fractions not patented. All these claims are patented. The Company also have options on the following additional claims that round out the group.

11. Careless. Full. not patented.
12. Cross Town. " patented.
13. Mischief. " Not patented.
14. Tom Cat. " " "
15. Senator. " " "
16. Alto. " " "

Camp Bonito Group.

17. Leyner full.
18. Gold Mill "
19. Don Pedro. "
20. Fresnel. "
21. Pagaora. "
22. Pirate. "
23. Scheelite. "
24. Rocker. "
25. Conglomerate. "
26. Maudina. "
27. Ora Fina. "
28. Merrall. "
29. Carbonate. "
30. Sulphide. "
31. Mogul. No. 1. "
32. Mogul No. 2 "
33. Detroit. "
34. Omaha. "
35. El Plomo. "
36. Pure Gold. "
37. Summitt. "

38.	Copper Glance	full
39.	Live Oak.	"
40.	Juniper.	"
41.	Gold Thistle.	"
42.	Summer Home.	"
43.	Poso Bueno.	"
44.	Aurera.	"
45.	Swastika.	"
46.	Black Hat.	

- American Flag Group -

47.	Gideon.	full.	not patented.
48.	Emily.	"	" "
49.	Pinchot.	"	" "

- Alexander Group -

50.	Alexander.	full.	not patented.
51.	Dane.	"	" "

LOCATION & ACCESSIBILITY:

The Southern Belle and Camp Bonito Claims form a solid group and cover the numerous gold and silver veins and Scheelite deposits while the American Flag and Alexander groups lie to the North-East and East and cover promising veins.

The property is situated in the Old Hat mining district, Pinal County, State of Arizona. The nearest railroad station is Tucson about 45 miles from which the property is reached by a good wagon road, suitable for motors which can cover the distance in two hours. The nearest town is Oracle P. O., 5½ miles on the road to Tucson.

HISTORY OF THE PROPERTY & OTHER MINES IN THE DISTRICT:

The Southern Belle mine according to Mr. Chas. Brajovitch, of Oracle, Arizona, was discovered in 1880 by Mrs. Gillett and staked by her husband, and Capt. John Young. Apache Girl was dis-

covered by Sam Parker and Jack Zimmerman in 1880. Placer operations have been carried out in the gulches and canyons of Southern Belle and Campo Bonito for years.

A few years ago tungsten ores in the form of Scheelite or lime tungstate was discovered on the Maudina claim and in September 1912, scheelite was discovered on the Morning Star and considerable prospecting done in that section. To date, considerable scheelite ore has been mined and concentrated but the records are missing. As near as can be ascertained the Southern Belle has produced about 20,000 tons of ore that averaged \$10 a ton on the plates. All tailings have been washed down the canyon. This ore was treated in the present 10-stamp mill on the Southern Belle canyon and in another small mill that was built a few miles away in Pepper Sauce Canyon. About 14 miles due north, lies the Mammoth Mine, a big producer. South on Mount Rice, about six miles away, the Copper Queen people have bought copper claims.

#### TOPOGRAPHY:

The Southern Belle, Campo Bonito, American Flag and Alexander group of claims, lie on the North-East slope of the Santa Catalina Mountains. The country is rugged and cut by deep canyons, The Campo Bonito, Southern Belle and Pepper Sauce canyons all roughly paralleling each other and running down to the east to the San Pedro Valley. The ridges between these canyons are sometimes high, seven to eight hundred feet. Of the three canyons, the Pepper Sauce is the largest and as it starts from the

foot of Mt. Rice, that is fairly well timbered and also gives a large catchment basin, the largest water supply will be obtained from this canyon. The elevation of the present mill in the Campo Bonito Canyon is 4700 feet above sea level.

#### GEOLOGY:

A cross-section of the country from north to south and cutting across the three canyons mentioned, would show grey porphyritic granite to the north on top of which lie a series of sedimentaries of early paleozoic age; the Campo Bonito Canyon roughly forms the contact between these two series. Both the granites and sedimentaries have been cut by a series of north and south diorite dikes. Considerable diorite is found at different points in the Southern Belle Canyon and apparently represent a considerable mass covering a large area. Gold and silver values have been found in veins and along the contacts of the dikes in the granites, but the most important veins, those carrying gold and silver values and tungsten have been found in the sedimentaries or in a vein that forms the contact between the granite and the sedimentaries. These sedimentaries consist of a series of soft red and grey slates, and sand stones, blue limestones, quartzites and conglomerates.

Two sets of veins occur in this district and maybe more, but they were not observed. A series running east and west in the Granites and nearly vertical and a north-east by south-west series with a dip to the north east, at from 20 to 40° from the horizontal in the sedimentaries. These last are the most important and the Southern Belle veins are of this series. Two

parallel veins, one above the other, have been extensively prospected and worked. They have a general trend of N.E. and S.W. with a dip to the S.E. of from 20 to 40° from the horizontal. The width is from a few inches to 20 feet. The outcroppings have been traced for long distances on the Campo Bonito and Southern Belle Canyons. Where observed, the vein filling is quartz very much leached and oxidized near the surface; containing gold and silver, a little iron and lead sulphides and lead carbonate. The hanging and foot walls are well defined, the strike of the formation conforming with the veins.

The American Flag and Alexander group of veins are in the porphyry formation. A number of veins with a strike N. 20° W. (mag) and a dip of 45° to the east have been located and considerable sinking on same in numerous places. Here, numerous diorite dikes paralleling the veins, cut the formation; the veins forming a contact between the granites and diorite dikes.

#### MINING FACILITIES:

Water for domestic purposes may be secured in the Campo Bonito and Southern Belle Canyons, within a few feet of the buildings. Shallow wells in both canyons would almost supply enough water for a 10-stamp mill and power plants. For milling purposes, a spring on the side of Mount Rice, Pepper Sauce canyon can supply by gravity 6,000 U.S. gallons per 24 hours. By putting down shallow wells in the Pepper Sauce Canyon on the Lewis Mill Site and pumping the water over the divide to Southern Belle canyon, enough water for milling purposes on as large a

scale as the mine will require, can be got; in fact, the water supply is ample for all requirements.

Fuel for power purposes can be cut on the surrounding mountains and put at a power plant for from \$4 to \$5 per cord. Crude oil in Tucson would cost about \$1.50 per bbl. Mining timber and lumber (rough) \$40 f.o.b. Tucson. Freight from Tucson to mine \$14.50 per ton.

The wage rates paid different classes of labor are as follows:

Mine Foreman	\$5.00	per	day
Shift Boss.	4.00	"	"
Machine Drillers.	3.75	"	"
Machine Helpers.	3.00	"	"
Mine Labor (Mex.)	2.50	"	"
(White)	3.50	"	"
Blacksmiths.	5.00	"	"
Machinists.	4.00	"	"
Helpers.	3.00	"	"
Teamsters.	3.00	"	"
Top Labor.	2.50	"	"

On contract work, a rough estimate would be as follows:-

Shaft sinking 6' x 10" lst. 100 ft. \$10 and up.

Drifting. Southern Belle \$2.50 to \$5.00 per foot.

Cross-cut tunnels and Raises. \$2.50 per day to \$5.00.

It is estimated that by running a general store in connection with the property and using Mexican labor, 50% of the pay roll would go to the store and the profits would be better than 30%. This information was supplied by the present manager of the property.

SURFACE EQUIPMENT:

At present, there are two mills on the property - one for treating the gold ores in the Southern Belle canyon and the other for treating the scheelite ores in Campo Bonito Canyon.

Southern Belle Mill - This frame mill is in fair shape having had new mortar blocks put in a short time ago. With a very little expense the mill could be put into fair working order.

10 stamps. 750 lbs. Pacific Iron, Works (1885) one mortar slightly cracked, but not at a dangerous point, wide mortars for inside amalgamatic.

2 sets outside plates, badly scoured; 17 ft. long by 4 ft. wide

1 - 50 H.P. boiler (1880)

1 - 30 H.P. Atlantic Steam Engine Works (1878)

2 roller ore feeders (1882 model.)

Although the mill is old fashioned, it is suitable for amalgamating these ores and can be looked upon as an asset.

Scheelite Mill: This mill is a frame structure sheeted with corriagated iron and with a few alterations and additions could treat 25 tons of scheelite ore in 24 hours. It will serve its purpose as a testing mill. In fact, think it would do good work on a commercial basis.

The equipment is as follows:

1 10" x 18" Blake Crusher.

3. Pan elevators.

2 14" x 18" Standard Rolls

1 6' x 4' trommel.

1 3 cone hydraulic classifier.

2 Standard Wilfley concentrators.

- 1 Johnson Vanner.
- Pulley shafting and belts.
- 1 70 H.P. Chandler & Taylor Boiler. 90 lbs. working pressure.
- 1 35 H.P. #8 Oswego horizontal engine.
- 1 Vertical 10 H.P. engine.
- 1 American Well Wks. 30 H.P. air compressor.
- 2 Feed water pumps 3" x 2" x 4".
- 2 Well Pumps 5½" x 3½" x 5"
- 1 Air Receiver. 8' x 3'6".
- 1 Small gasoline engine for blowing purposes.
- 1 3 stamp quadruple discharge. Merralls mill and equipment at present discarded but in fair shape 1050 lb. stamps.

The mines are well supplied with quantities of 3" and other sized pipe, rails and seven 1 ton ore cars all in good shape. Three machine drills, tools, pipe cutters and other supplies.

THE ASSAY OFFICE:

A two-roomed corrugated iron building, cement floor containing the following equipment:

- 1 Voland & Van Zilm button balance (old)
- 1 Becker Sores. analytical Balance.
- 1 Bosworth crusher.
- 1 Buck board.
- 1 Brune combination gasoline furnace. 8. 30 q.m. crucible capacity.
- Screens, tongs, reagents, chemicals and glass-ware.
- 1 Keaffel & Essex 5" transit with solar attachment, stadia rod and chains, etc.

MAUDINA SHAFT:

- 1 30 H.P. Boiler.
- 1 7" x 8" low gear hoist.
- 1 10 cu. ft. iron bucket.
- 1 one ton car rails, etc.

CAMP BUILDINGS.

In the Siver Belle Canyon a good foreman's house (frame) is built, together with other frame buildings in a fair state of preservation.

In the Campo Bonito Canyon, where the main camp is situated, a number of tents with corriagated iron roofs and board floors, make very comfortable quarters for a climate such as is to be found in this district.

SOUTHERN BELLE DEVELOPMENT.

The Southern Belle vein has been opened up by a great number of short and long drifts and extensive stopes both on the Campo Bonito and Southern Belle Canhons. 28 samples were taken representative of the vein at points very far apart, also considerable panning was done. Values were found in every case. Of the 28 samples,

- 17 - trace to \$5.
- 6 - \$5. to \$10.
- 2 - \$10 to \$15.
- 1 - \$15 to \$20.
- 2 - \$20 and up.

Of these, 11 samples below \$5 were taken in the old Nos. 1, 2 and 3 workings of the Southern Belle where the leasers had removed all the good ore. These No. 1, 2 and 3 workings

of the Southern Belle are extensive (see blueprint) and the bulk of the 20,000 tons mined came from there. The other drifts as a rule were short, and represented assessment work on the different claims.

The whole vein can be explored by a series of adits placed at suitable places and as the vein foot and hanging walls are soft, quick and cheap work can be done, very little timbering being required and no water to contend with. Although the hanging is soft it stands well and very little timber will be required in stoping operations.

#### THE MAUDINA SCHEELITE DEVELOPMENT.

Some drifting and stoping on the surface and a shaft 178 feet sunk on the deposit, levels at 46, 89, 142 and 167 feet have been run. No record of the amount of ore mined was to hand. The accompanying blueprint shows the workings and formation which is impure limestone, with quartz stringers running through it.

#### MORNING STAR SCHEELITE

As mentioned before, only surface development work has been done on this promising deposit and a small tonnage milled with good results. This work is not far enough ahead to determine the size of the deposit which is in blue limestone and quartzite.

#### ORE TESTS ON MAUDINA AND MORNING STAR. SCHEELITE ORE.

On account of the brittleness of the scheelite the ore is very difficult to sample so two tests of roughly 12 tons each, of the run of the mine were made with the following results:-

Maudina Ore.

Tonnage.	12 tons 180 lbs.	
Crude concentrate No. 1 & 2, Wilfley's.		562 lbs.
" " Johnson Vanner.		26 "
		<u>588 lbs.</u>

Crude concentrate	2.43%	
W O <sub>3</sub> in concentrate.	47.2 %	
" " " tailings.	.22%	
588 lbs. 47.2% concentrate =	277.5 lbs. 100% ore =	1.36% W O <sub>3</sub>

Morning Star Ore.

Tonnage	11 tons 1871 lbs.	
Crude concentrate No. 1 & 2. Wilfley's		404.5 lbs.
" " Johnson Vanner.		19.2
		<u>423.7 lbs.</u>

Crude concentrate.	1.77%	
W O <sub>3</sub> in concentrate	52.12%	
" " " tailings.	.47%	
423.7 lbs. 52.12% concentrates =	202.8 lbs. 100%.	
Ore =	1.38% W O <sub>3</sub>	

As the prices f.o.b. Tucson, for 60% W O<sub>3</sub> concentrate average \$400 per ton, the gross value per ton would be for both runs \$9 per ton. Each run took about 10 hours as the ore is easily crushed.

CONCLUSION:

It is to be deplored that for the purpose of this report, the examiner was unable to collect any data as to the exact amount of ore mined and treated from the Southern Belle gold mine and the Scheelite deposits. A production of 20,000 tons that produced \$200,000 or \$10 per ton, is fairly accurate as to the amount from the Southern Belle. The placers also have produced considerable amounts. The American Flag group has also been a good producer in its day. However, an examination of the vein in its present condition gives enough evidence to prove that

under proper management it has every chance of turning out to be a valuable property and well worth attention from those looking for a good mining investment.

ASSAYS.

1.	Apache Girl. 35 feet. Incline shaft. Vein 3 ft. wide	\$1.60
2.	Apache Girl. Width at least 10 ft. Sample 5½ ft. White Quartz.	.30
3.	Grab sample dump. Apache Girl 250 ft. from E. end Vein 5 ft. wide. Drift in 25 ft. Diorite dike cutting faces considerable galena.	6.30
4.	Drift on Cross Town & Apache Girl. Vein 3 ft. quartz.	8.65
5.	Grab sample from dump on Croww Town & Apache Girl.	2.50
6.	Dolphin: - Cross Town. 40" wide. soft ore. footwall diorite, hanging shale. drift in 40 ft.	6.30
7.	Lower Vein. Cross Town. 18" wide. 65 ft. drift. vein broken.	1.75
8.	Lower vein at portal. Cross Town drift vein 15".	20.15
9.	East end of Cross Town, middle vein S.W. face of drift vein 45"	12.75
10.	E. end of Cross Town right hand side portal 36"	6.30
11.	N. drift East end of CrossTown 3 feet	4.40
12.	Grab. good ore from Cross Town dump.	10.60
13.	Grab. of poor ore from Cross Town dump.	2.35
14.	Dolphin Point.	7.10
15.	Southern Belle workings (Calaboose) broken vein 40"	2.75
16.	Southern Belle (Calaboose) 6 ft. at end of stoping to S.W. (Trace)	Trace
17.	Southern Belle (Calaboose) 27" S.W. of connection with #3 drift	3.75
18.	Southern Belle S.W. from Calaboose - 4 ft.	2.35

19.	Southern Belle N.E. side main stope under surface shaft. 15 inches. considerable lead carbonate	3.45
20.	Southern Belle. Main stope. sample of horse between 2 veins.	8.65
21.	Southern Belle. lower vein 15" below horse sampled in #20.	22.05
22.	Southern Belle. last upraise from #1. 36".	1.90
23.	Southern Belle. North end of vein 2 feet.	1.50
24.	Southern Belle, grab filling between workings #3 & 2	.60
25.	Southern Belle. face stope between Nos. 2 & 3 1½ feet.	.45
26.	Southern Belle. No. 2 workings furthest in upraise between #1 & 2	2.35
27.	Southern Belle. upper vein above portal to #1. 2 ft. wide.	18.90
28.	Southern Belle. #2 workings.	.35
29.	American Flag. Mine. Gold \$2.60 per ton. Silver 21.7 ozs. per ton.	
30.	American Flag Mine. Gold \$1.40 per ton; Silver 10.66 ozs. per ton.	
31.	Cody Tunnel. upraise. Gold \$1.50 per ton. Silver 2.6 ozs. per ton.	
32.	Cody Tunnel below upraise. Gold trace; Silver trace.	
33.	Cody Tunnel. sample of dump. Gold \$1.200 per ton; Silver 2.3 ozs. per ton.	
34.	Maudana. tungsten ore. Gold 50¢ per ton.	
35.	Morning Star. tungsten ore. Gold 90¢ per ton.	

## SUGGESTIONS:

The most imperative work to be done in connection with the Cody-Dyer mine is the immediate exploration and development of the Southern Belle vein. As pointed out, this work can be done quickly and cheaply by a number of adits. It would be easy to start at least ~~ten~~ adits or drift immediately at points where the vein is promising looking. In the meantime proper surveys of the workings could be made and a plan of campaign worked out. This is necessary as the ore would have to be transported to the mill and from appearances this can be done by aerial tramway.

Development work and the blocking out of ore would be the deciding factor in the length and location of this tramway, which at the most would not be more than 3,000 feet long, at an estimated cost of \$2500. to \$3000 per 1000 feet. The blocking out of ore will decide another question, that is location and character of mill suitable for the treatment of the Southern Belle ores. From their appearance amalgamation will extract a good percentage of the values. This has been proved by former work but it seems that a higher extraction is necessary.

From the appearance of the ore, a higher extraction seems possible by cyanidation, but before settling this question, some experiments would have to be made that give every promise of being successful. There is an alternative; that is concentration. The site for a mill would have to be located that would be centrally placed so as to be as near the mine and water supply and ground for storing of tailings if necessary.

Again, it must be remembered that other promising veins occur that may be good producers and the ore treated at this mill. It would be disastrous if this mill were so located that the delivery of ore from these places put a heavy charge per ton for this. Questions of this kind can only be solved by surveys and proper maps drawn.

These arguments hold good in respect to the scheelite deposits. More work on the surface is required on the Morning Star before a short cross cut tunnel driven in the side of the slope on which it is located and which would cut at a considerable depth under the present surface showing. Both the Maudina and Morning Star deposits appear rich enough to furnish the present mill with enough ore to pay for development work on these claims. At the same time, work on re-modelling the present mill, which seems unnecessarily complicated, could be done. The two mill tests show that the extraction of values can be made higher without increasing the cost of treatment per ton.

What is known as the Contact vein - or Free Gold vein contains, at depth a sulphide ore carrying gold and silver dissimilar to the Southern Belle and perhaps not suitable for amalgamation and cyanidation, if so, it is a concentrating plant, the treatment of these ores might be done with a few moderations, in the same mill.

It will be seen that various questions have to be solved, but the great one is first of all to block out a good tonnage of payable ore.

This report from start to finish points out that there are bright possibilities of doing this.

(Signed) Carter & Smith

TORONTO, June 16th, 1913.

*Cody-Dyer, Ind & Jungsten*

*Carter & Smith,*

*W.E.H. Carter, B.S. Sc.  
Alexander H. Smith, M. Sc. M. E.*

*Consulting Mining Engineers,*

*Cable Address "Consulting" Toronto  
Codes A.P.C. 5th Ed. Western Union, Liebers*

*Judson  
Pinal*

*448-449 Confederation Life Building.*

*Toronto July 15th, 1913.*

George M. Colvocoresses Esq.,

*See other letter  
in this folder*

#43 Exchange Place,

NEW YORK CITY.

RECEIVED  
JUL 17 1913  
ANSWERED

*7/17/13*

Dear Sir:-

In reply to your favor of the 9th of July, I have this further information to give you re the Cody-Dyer Group of Mines, Arizona.

You are quite correct in surmising that in its present state, the Cody-Dyer is a prospect, but it is a very good prospect - one of the best I have seen in years and one that I am sure would turn into a valuable property if opened up intelligently.

The samples were taken from points very far apart and in each case, the width is given, but not in every case the full width of the vein; it would not do to take the average of these widths as the average of the vein sampled. However, the late Professor Blake, Territorial Geologist for Arizona, made a thorough examination of the Southern Belle vein and gave an average width of 5 feet. He at the same time, gave an ore tonnage of over 300,000 tons and his average value at better than \$9.00. I do not concur with Prof. Blake's tonnage, but think his average width would be correct.

As the vein is fairly flat and outcrops on the side of

W. E. H. Carter, B. A. Sc.  
Alexander H. Smith, M. I. M. M.

*Carter & Smith,*  
*Consulting Mining Engineers,*

*Cable Address "Consulting Toronto"*  
*Codes A. P. C. 5th Ed. Western Union,ickers*

*448-449 Confederation Life Building.*  
*Toronto.*

- 2 -

the Southern Belle ridge, the deposit can be developed as mentioned in the report, by a series of adits and connecting upraises or winzes. Again, the report indicates on page 5, that cheap and rapid work can be done. It is also indicated that lack of data prevented the giving of exact costs of work done in the past. I know this is a very important point, but am sure that if you run over page 5 again, you will get some idea as to what to expect in this respect and will see that costs will be very low. This explanation holds good in regard to the Scheelite deposits.

I am of the opinion that the ore would be easily treated by cyanidation and that a good margin of profit on \$10. ore could be got. Again you see, for lack of data, as to past working costs and milling results, I cannot possibly put in figures, but would venture to say \$5. per ton, would cover everything.

The Scheelite deposits are exceedingly interesting, but need more development work done to determine size and nature of deposits as indicated the milling of the ore would I believe pay for same, and as the two mill runs show, the ore is of good grade, other mines working on a  $1\frac{1}{2}\%$  ore with success.

I am sure you will find this one of the most promising prospects in the South-West and will, if you examine it, agree with me

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*448-449 Confederation Life Building,  
Toronto.*

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in this respect. Hoping I have answered your questions to ascertain extent, I am,

Yours very truly,

*Alexander H. Smith.*

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has listed

copied

R E P O R T  
Upon the  
SOUTHERN BELLE GOLD PROPERTY.

OLD HAT DISTRICT,  
P I N A L C O U N T Y,  
A R I Z O N A.

By  
WILLIAM B. BLAKE.  
Geologist and Mining Engineer,  
(Former Territorial Geologist of Arizona).

April, 1906.

## SOUTHERN BELLE GOLD PROPERTY.

### LOCATION.

The Southern Belle Gold Mines are situated at the head of the Southern Belle Canon Gulch or Arroyo, descending from the high ridges of the Santa Catalina Mountains on the north-eastern end of the range, in Pinal County, Arizona. They are in the Mining District known as the "Old Hat" and are accessible by wagon road or automobile from Tucson by way of Oracle, a distance of about forty-eight miles. This may be lessened by the construction of a few miles of road through a low gap in the mountains.

The altitude is from 5,000 to 6,000 feet above the sea, and the climate is extremely favorable to all mining operations.

### EXTENT OF PROPERTY.

The property consists of ten or more mining locations, some of which are secured by patent from the United States, and a ten-stamp gold mill, and office and other buildings, besides a pumping plant and pipe line for the supply of water and mill site.

One of the claims has been considerably worked in a desultory way without adequate equipment or capital, and has been lying idle for some years past, owing to the death of their owner and delays in the settlement of the estate.

There are two groups of locations of claims, the Southern Belle Group and the Morning Star Group, on the opposite or northern side of the Southern Belle Ridge.

### SOUTHERN BELLE GROUP OF CLAIMS.

Apache Girl	14.83	acres.
Dolphin	19.37	"
Humming Bird	2.18	"
Southern Belle	19.77	"
Lewis	26.61	"

### The MORNING STAR GROUP.

Morning Star	20.35	acres.
Happy Thot	20.35	"
Gold Bug	15.11	"
General Hancock	15.11	"
	-----	
	153.68	"

The position of these several claims is shown upon the accompanying map, carefully made by Mr. Edward Dietrich from the surveys and notes upon the ground. It is upon a scale of \_\_\_\_\_ feet to the inch, and shows the form and extent of the lode mined out, the position of the Company's mill and other buildings.

### NATURE OF THE VEIN:

The claims of the Southern Belle Group cover the larger part of the gold-bearing quartz vein of the same name, from which a large amount of gold has been taken from one claim alone. It is a flat or "blanket" vein cutting through the hills in a nearly horizontal plane, and cropping out in the hill sides in such a way as to be readily reached and opened by tunnels and drifts from the surface, without the need of shafts, pumps and other hoisting appliances. The slight dip or inclination of the vein, about 20 to 30 degrees in a north-easterly direction towards the mill, facilitates the extraction of ore and invites the mining by a succession of tunnels.

Three tunnels have been run in from the Southern Belle Canon and upwards of 18,666 tons of quartz have been extracted from this claim and worked at the Company's mill in the canon below, averaging, so far as can be

ascertained, about ten dollars a ton. It is a simple free milling quartz without injurious element, and the gold is easily amalgamated on plates.

#### THE UPPER VEIN.

In the main stope of the Southern Belle Mine, extending into the Careless claim ground, the mining has revealed the existence of an upper layer, or vein of quartz separated from the lower vein by a few inches, or feet, in thickness of slate or shale. It is particularly evident in the highest stope, but has not been much mined. It is again well shown at the surface in a shallow cutting or pit above the entrance to tunnel #1, where it is five feet or more in thickness. Sample #10 was taken there, over two feet of the thickness, and showed a value of \$15.00 per ton.

In many places the quartz of the lode is more or less mingled with the slaty wall rocks, and as the included layers of slate thin down, the layers of quartz are united and the upper and lower veins become blended or merged in one.

The general structure of the vein and the presence of a layer of shale are well shown by the photograph of the face of the lode where it is exposed to view on the Cross Town at the South End.

The total thickness is over six feet, about four feet of quartz below and two feet above a parting layer of red shale.

In the estimate of the total thickness of the vein the general existence of an upper and lower layer is considered in averaging the thickness at five feet.

#### AMOUNT OF ORE MINED.

This extent of the extraction of ore is ascertained, approximately by the measurement of the space left by the removed ore. This space or stope extends northerly and easterly through the Southern Belle Claim and into an adjoining claim known as the "Careless". The total length of the stope across the two claims is about 500 feet, and its width is 160 feet in its widest part. Computing the area by squares of forty feet each and taking the average thickness of the quartz taken out at five feet, and its weight at twelve cubic feet to a ton, we reach a total tonnage of 18,666 tons.

#### AMOUNT OF VEIN STANDING.

By a similar method of measurement the horizontal area and the tonnage upon all the claims is ascertained. It amounts to 637,500 tons. Subtracting the 18,666 tons mined, leaves 618,800 tons in round numbers as the amount standing in the vein within the present ascertained limits. There is reason to believe that the vein has greater extension and area in the Dolphin Claim, not yet developed. It may extend southwards through the main ridge under the great thickness of quartzite, which there forms the summit between the head of the Southern Belle Canon and the upper tributaries of the Pepper Sauce Gulch.

#### VALUE AND EXTENT OF THE ORE:

The value of the ore has already been indicated in a general way as shown by the working of the mill. It is regrettable that no record has been kept of the full number of tons worked and of the yield in gold per ton or is kept, in any form such records have been lost or destroyed. From W. Brajovitch I learn that 713 tons of the quartz of this lode, packed over to a five stamp mill in Pepper Sauce Gulch, in 1884, averaged \$15.75 per ton. This was no doubt selected quartz and above the average in value. The gold values at \$15.75 per ounce.

I am also informed that a trial run of 1,200 tons of quartz from the lode was made in the Southern Belle Mill by Wm. Brajovitch. Of this lot 1,000 tons was first class selected ore and 200 tons were from the low grade portions. The 1,200 tons averaged \$9.53 per ton of gold saved.

Sampling upon such a vein is eminently unsatisfactory, inasmuch as large quantities of the quartz are required to gain an average. Mill tests of fifty or one hundred tons are far more reliable as regards an average.

Numerous tests by panning portions of the loose, broken ore were made, especially along the outcroppings upon the Apache Girl and the Cross-town at the higher croppings. Such tests were very satisfactory in showing the general presence of the metal in paying quantities at each of the openings. The gold is generally fine and free, any pyrites which formerly existed having been fully oxidized.

The heavy white powder which is formed with the gold by panning is the carbonate of lead resulting from the oxidization of the galena. It has been observed that when the traces of lead are most abundant the quartz is richer in gold than when there is no lead.

It is evident that in this mine and vein, as in all other gold bearing veins, the gold is most uniformly spread. It is not found in equal quantities everywhere in all portions of the lode. There are portions of the vein in streaks and patches consisting of high grade quartz, together with low grade portions which will not pay to extract. Consequently in mining and milling attention is given to the selection of the ore, such portions only as will pay being stoped and sent to the mill, while the barren quartz and any rock is used as filling.

As a rule, in the Southern Belle Mine, with but few exceptions the hard parts of the lode left standing in the tunnels and in some places in the stopes are low grade, and for this reason were not mined out.

The higher values were found in the upper stopes and upon the upper vein and at the croppings of the unworked vein on the Cross Town and the Apache Girl Claims.

In the upper stope on the Careless, the samples showed a value of \$11.40 per ton for thirty inches of quartz; at another point five feet of quartz was found to be worth \$4.40 per ton.

The croppings of the upper vein on the Hill above tunnel #1 was samples for a thickness of two feet and yielded at the rate of \$15.00 per ton. This quartz also showed good value, indicating from \$15.00 to \$20.00 by the panning test. It is well to note that the average of the four assays above given is \$9.70.

Samples from the croppings of the eastern end of the Cross Town claim gave high results. At the north opening a thickness of two and a half feet of quartz, where free gold was seen, yielded at the rate of \$30.40 per ton. A sample from the central opening (a photograph of which was taken) yielded at the rate of \$164.20 per ton. This is exceptional and above the working average. Another sample of the Southern opening, where the quartz is very hard and not much mineralized, gave only a trace. The average of the twenty-three samples from the ore ground is \$10.80 per ton. I prefer, however, not to estimate the value at a higher figure than \$8.00 per ton for the milling ore, a figure which I believe to be moderate and conservative and likely to be more than realized with proper working.

#### ORE OUT.

A large amount of ore is available for immediate working, not along the stopes above the old mine, but in the upper vein near tunnel #1 and at the open cuts at the lower end of the Crosstown Claim and around other workings.

It is believed to be possible to open into the lower portions of the vein on the Careless Claim by a short tunnel run in from the ravine north of the mill, a distance of only ninety-five feet, and part of this through the rotten diorite rock, easily excavated. The position of this suggested tunnel and tramway or chute, to the crusher floor of the mill is indicated by the red lines upon the map. It will not only provide a shorter

and more economical and convenient outlet for the mine, but will also have the great advantage of being put below the mouth of the tunnels upon the claim known as the Humming Bird, where good quartz is exposed.

It is not possible to exactly compute the value of the large area of unworked vein in the two claims extending up the hill to the croppings to the Westward (the Crosstown Claim and the Apache Girl). The vein at the croppings at both ends and where exposed along the hillside prospects assays well, and it is fair to assume that the pay is continuous from one end to the other of these exposures. Not, however, limiting the estimate to these two claims, but including the whole of the unworked area of 618,800 tons and allowing one-half of it for barren ground, we have approximately 309,400 tons gross, @ \$8.00 per ton, - \$2,475,200.

#### COST OF MINING AND MILLING.

In the future working of the property I strongly advise beginning the mining at the lowest point and the extension of the mining upwards and backwards from the main outlet, much in the manner of coal mining or drifting, piling the waste quartz and rock behind, thus largely avoiding the use of timbers, while the roof is well supported by the filling.

Transportation to the Mill may be by tramway or by an aerial tramway or wire rope transmission. With these and other labor saving adjuncts and the complete equipment of the mill, the cost of mining and milling should not exceed \$4.00 per ton.

#### THE MILL.

The Company's mill of ten stamps of modern construction is conveniently located below the chief part of the mines on the main arroyo or gulch of the Southern Belle. It is so placed that ore from the lowest tunnel can be delivered by a chute to the top of the mill, high enough for a rock breaker ore crusher and the required grizzlies and a bin above the self-feeders of which there are two.

There is no rock breaker, but one is essential to successful economical work. The needed pulleys are there and a counter shaft and breaker can be readily installed.

The mortars appear to be in good order. The amalgamated aprons are in good condition. These are two at each end of the battery. Each twelve feet long.

The power is supplied by a 40 H.P. steam engine. The boiler is tubular, of locomotive type, and is set in adobe. Wood, which can be had in abundance at from \$4.00 to \$5.00 per cord, is used for fuel. The boiler should be inspected and tested before using.

There are many tools and adjuncts of the mill, amongst them a differential pulley, dies for cutting threads on pipes, blacksmith's tools, some carpenter's tools and many striking hammers, drills, bars, picks and gads for mining.

Additional belting will be required for the mill when the rock breaker is added. And when a breaker is added the capacity per stamp per day of 24 hours should be at least three tons.

The general arrangement of the interior of the mill and its appearance is well shown by the annexed photograph taken by Mr. Frank Dietrich, by the aid of the magnesium flash light.

It will be necessary to renew the battery blocks, which are badly decayed. I suggest that a substantial concrete grouting block can be made to take the place of the wood without the necessity of moving the mortars from the place; all the decayed wood being removed while the mortars are blocked up or otherwise supported by the frame during the making of the cement block.

## WATER SUPPLY.

The water for the mill is obtained at the Southern Belle Millsite from a well and underground flow in the gulch known as Pepper Sauce, about a mile North-east, where there is a good flow throughout the year. The location is picturesquely chosen in a dense grove of Sycamore, Ash, Walnut Mulberry, Cottonwood and other trees, which by their size and luxuriant growth, bear witness to an abundant and continuous water supply.

Pepper Sauce Creek drains the extensive water shed between Mt. Rice and Apache Peak, opposite the sources of the Canada Del Oro. The amount of water flowing at the time of my visit, visibly, was two feet wide and the depth of one inch. This of course did not show the amount of the underground flow. The well sunk at one side of the channel, is cribbed and planked, but requires repairs and cleansing. I believe that there is water sufficient for the ten stamp mill.

The pump, a Worthington Duplex, No. 18,760, is  $7\frac{1}{2}$  inches by three by ten inches. It is in fair condition but needs to be taken apart and cleaned and oiled. It rests upon a timber foundation a few feet higher than the top of the well and is operated by steam from a wood burning locomotive boiler. There are twenty to twenty five cords of seasoned wood on hand.

The barometer at the well and pump indicates a difference of 600 feet below the mill. The summit point on the pipe is said to be 750 feet above the pump. From that point the water descends to the mill by gravity.

The three inch wrought iron pipe is, in part, in poor condition, and requires renewing. There are some twenty five lengths of unused pipe on hand.

## GEOLOGY OF THE SOUTHERN BELLE.

The geological structure of the ridge cut by the Southern Belle gold ledge is extremely interesting and taken in connection with the adjoining areas, forms a very interesting chapter in the history of the earth.

From the testimony of the fossils found by me near the Southern Belle, (chiefly corals of marine growth) it appears that the stratified rocks in which the vein occurs are Devonian or Silurian. Two of the older formations of the globe. These rocks in the Southern Belle Canon consist of a series of shales, red sandstone, grey sandstone, quartzite and limestone, underlain and apparently uplifted by an intrusion of diorite. This rock rising from the depths of the earth has hardened and altered the softer formation with which it came in contact, and appears to have caused the quartz vein and its impregnations with gold.

The existing conditions warrant the conclusion that the Southern Belle lode formerly had a much wider extension than we now find, that it extended over a large part of the region drained by the present canon, following generally the plains of contact of the lower shales with the diorite, and that it has been cut through, eroded and denuded by the drainage of the main canon and its branches, leaving the edges of the blanket ledge exposed as we find them, while the portions of the ledge cut away have been carried to lower levels, broken up and the gold dislodged to form the placer deposits which line the canon from the summit of the vein to the mess, two miles away.

This cutting out by the canon forms a fine section of the rock formation from one end of it to the other, showing the edges of the uplifted strata, below and above the vein, all dipping regularly eastward at from 15 to 25°. This is best illustrated by a section from the summit of the mountain to the mesa, a reduced copy of which is here presented.

## SECTION OF THE FORMATION AS SHOWN IN THE SOUTHERN BELLE CANON.

I also append a geological map of the Old Hat District from my own exploration and observation, made during my recent and former visits.

This shows the topographical distribution of the formations and their relation to the Southern Belle and other groups of mines.

The lowest substratum or foundation for the strata is the coarse grey, porphyritic granite of Roacle - the "Oracle Granite", which covers a wide area in the northern and central parts of the Old Hat District. This is traversed by heavy intrusive masses or dykes of diorite, by which the stratified formations have been uplifted, and to a varying degree, altered by hardening and by the flow of the silicized water forming the quartz veins.

#### THE MORNING STAR GROUP.

This group of several claims is north and west of the Southern Belle Lode, and the claims cover a different system of lodes. I find there is a series of massive croppings of quartz resembling reefs of quartzite at and near the contact of the older limestone and granite.

These claims have but little development and are in condition of "Prospects".

(Signed). "W.P. Blake"