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AUGUSTUS LOCKE
788 MILLS BUILDING
SAN FRANCISCO, CALIF.

Jan. 6, 1927

Mr. E. H. Wisser
Cia. Min. Real del Monte y Pachuca
Pachuca, Hgo., Mexico

Dear Mr. Wisser:

Inclosed is a copy of report on "Paleozoic Limestone Series" by one Mr. Edward Wisser. Sorry this has been so slow but "you know how it is". I am sending 5 copies to Mr. Irwin with notation that one copy was promised to Mr. Lindholm of the C. & A. One is in files of 788.

I hope that todos los hombres son buenos in your vicinity and that nothing prevents you and Mrs. Wisser from enjoying a happy and successful 1927.

Sincerely yours,

M. Jane Moore

p. 4. line 4 grains

p 9 3rd from bottom. add "...in color - (~~+~~ broken surfaces)"

Detailed section Largo

Bottom beds - many greenish bands

3rd series up crystalline splotches

5th series up ? after "fossil"

NOTES ON THE PALEOZOIC LIMESTONE SERIES AT BISBEE, ARIZONA

- A description of the most prominent markers in the Bisbee limestones.

By

E. H. Wisser

November, 1926

TABLE OF CONTENTS

ILLUSTRATIONS

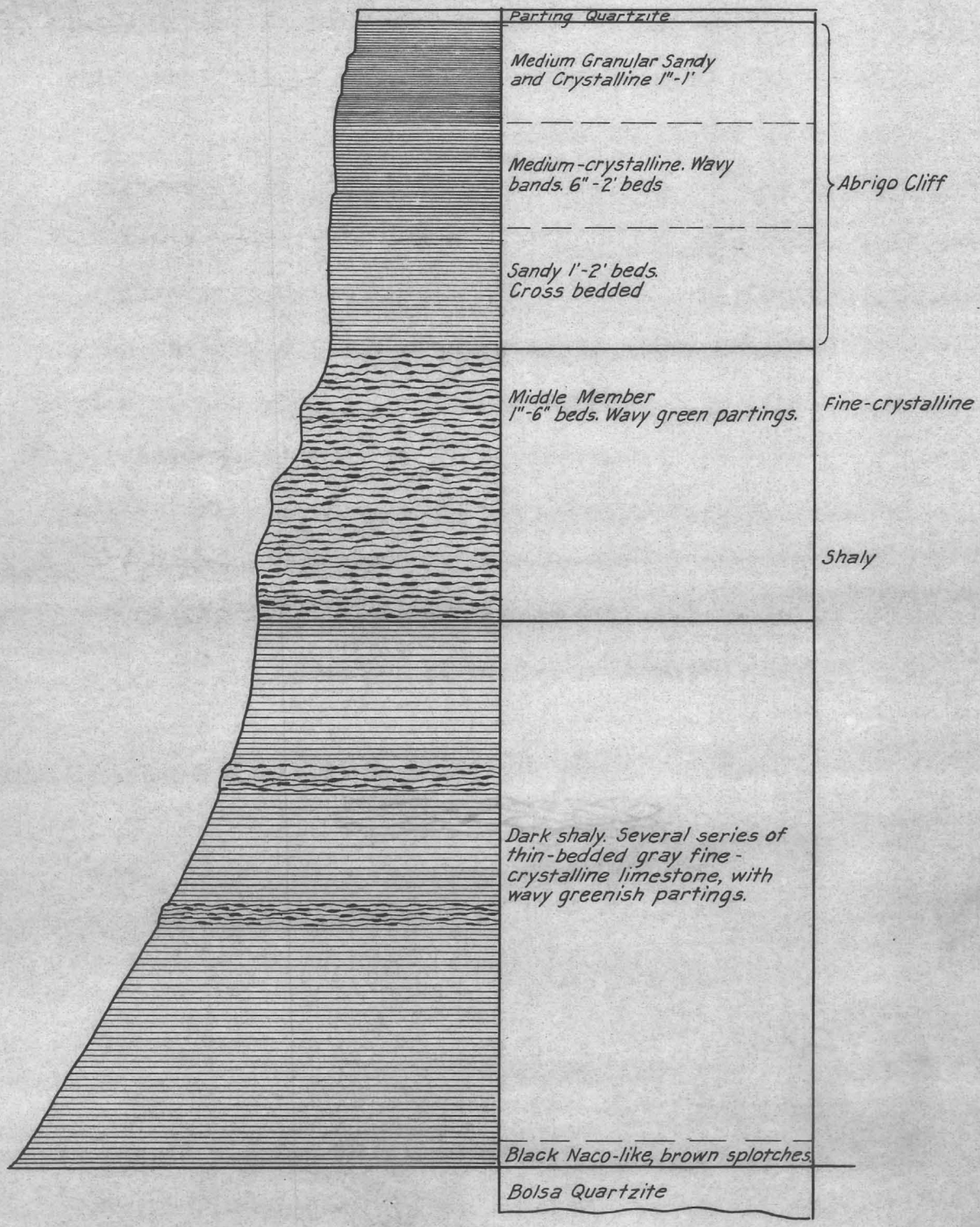
NOTES ON THE PALEOZOIC LIMESTONE SERIES AT BISBEE

The following notes cover a brief description of those markers in the limestone series at Bisbee proved by experience to be the best-defined and most consistent throughout the district.

Necessity for Markers

Markers in the beds at frequent intervals are necessary for finding the stratigraphic position in workings of limited extent, for finding the displacement of faults, and for working out the structure from the surface alone, especially where the beds are relatively flat-lying and the relief of the county is slight. As more and more work is done in the country lying outside the Sacramento Hill alteration halo, the necessity for accurate knowledge of the beds becomes more urgent, because the selective action of particular groups of beds upon ore deposition is far more marked in the outlying areas.

Bolsa Quartzite: No sections were taken of the Bolsa quartzite. Good markers appear absent. The top of the formation contains a number of shaly beds between quartzitic beds; coarsely conglomeratic beds occur near the bottom. There are few workings in the Bolsa, and as it is only a little over 400 feet thick, it has given little trouble in working out structure.



GENERALIZED SECTION
OF THE
ABRIGO LIMESTONE

SCALE 1 INCH = 100 FEET

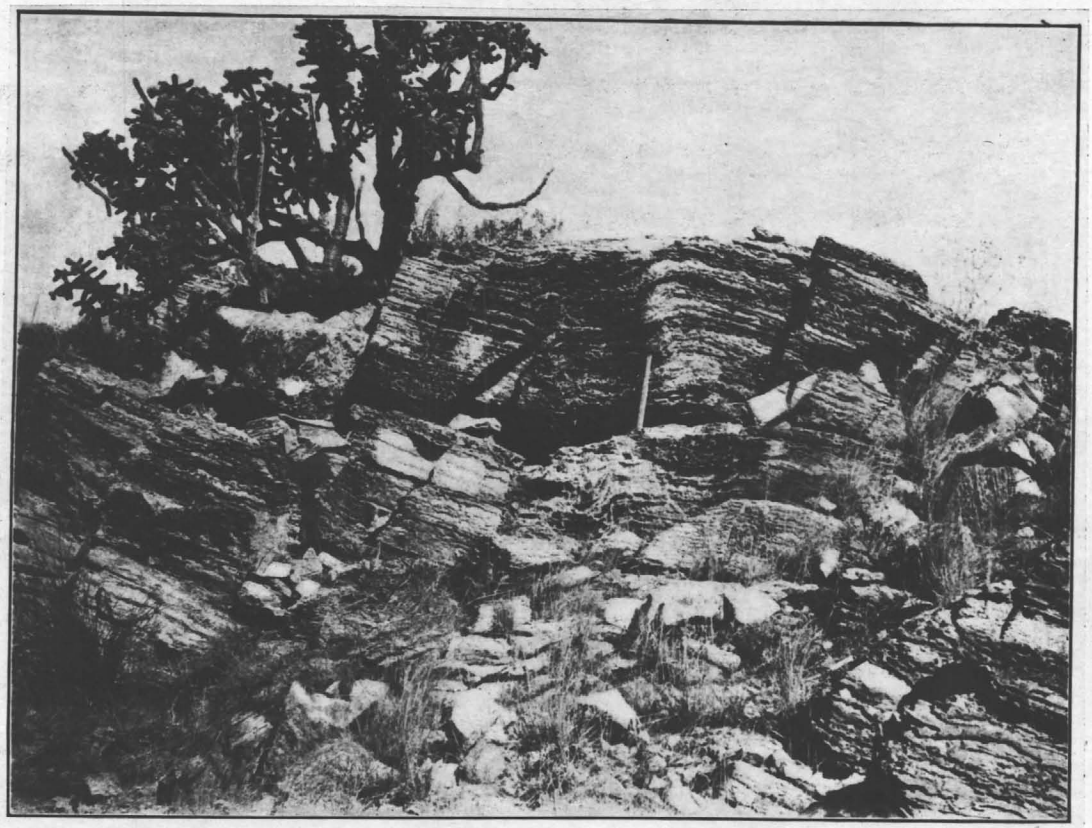
TO ACCOMPANY REPORT BY E. WISSER. NOV. 1926

J. H. Marion, Draftsman.

Abrigo: This formation is about 750 feet thick and is varied in character: the upper half is distinctly crystalline, the lower half preponderantly shaly.

At the bottom occur several series of beds, dark gray on the surface, dense black on breaking, with conchoidal fracture resembling the Naco, but carrying numerous small irregular brownish crystalline splotches which weather on the surface as small pits. Above these pitted beds occurs a thick series of dark shaly limestone, thin-to very thick-bedded, with several bands of very thin-bedded gray fine-crystalline limestone, with characteristic wavy, shaly parting between the beds, giving an unmistakable appearance, and indicating a position in the Abrigo well below the middle.

By far the best Abrigo marker is the so-called Middle Member, a series of remarkably evenly-bedded limestone, the beds averaging 2" in thickness. They are separated from each other by wavy greenish laminae (chiefly epidote). On the surface, these laminae weather more resistantly than the beds themselves, and stand out prominently in the outcrops, giving the whole exposure a green tinge, although the beds themselves are light bluish gray. Ransome has an excellent photograph



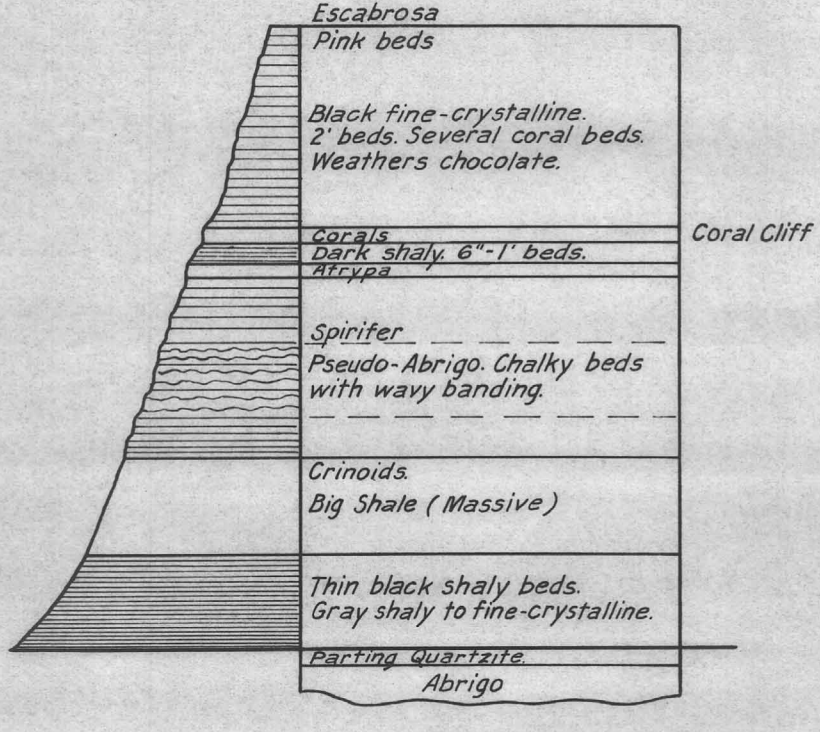
B. CHERTY BANDING OF ABRIGO LIMESTONE.

of this Middle Member in Fig. 5, Illustrations I, of the Bisbee Folio. (See opposite page.) Underground, the laminae or partings are much less conspicuous, and the series appears simply as thin and uniformly bedded fine-crystalline to shaly limestone. Typical of this series is its habit of breaking in the drift into large blocks, which look massive; upon close examination, the traces of the thin beds may be seen upon the fracture surface of the block. Another unmistakable characteristic is the fact that no beds thicker than 6" occur within the series; in the upper portion the beds are thicker, approaching 6", and distinctly crystalline, with the characteristic Abrigo appearance, namely, non-crinoidal, even-granular, with very shiny faces on the crystals. Toward the bottom of the Middle Member, the beds are thinner, around 1", and more shaly; the partings increase in relative importance and the series here resembles the thin-bedded bands in the lower Abrigo. (Sketch, page 2.) The bottom of the Middle Member is 350 feet above the bottom of the Abrigo, or 400 feet below the top; the series is 175 feet thick, and the top of the series is 530 feet above the bottom of the Abrigo and 220 feet below the top of the Abrigo. The top of the Middle Member is unmistakable, since the beds above it are the characteristic sandy or crystalline, medium granular, almost white 1-2 foot beds of the upper Abrigo. The transition from the thick sandy beds to the thin-bedded Middle Member is abrupt and easily recognized.

The beds immediately above the Middle Member are typically sandy, with strongly marked cross-bedding, especially noticeable on the surface, due to the removal of the lime matrix from around the grains of sand. Above this sandy series the beds are crystalline, white to gray, and have the peculiar faint wavy banding typical of the upper Abrigo.

Several quartzitic beds occur in the upper 150 feet of the Abrigo, below the Parting quartzite. Generally, they are easily differentiated from the Parting quartzite because they are aphanitic, apparently intensely silicified limestone rather than true quartzite; but as the Parting quartzite itself sometimes is aphanitic rather than gramular, care must be taken not to confuse these beds with the Parting quartzite.

The Abrigo, above the Middle Member, outcrops as a white cliff, often divided in two by a band of reddish beds. The Middle Member outcrops as occasional small cliffs showing the characteristic wavy green partings, the limestone breaking off as thin plates, bluish gray in color; the lower Abrigo being shaly, outcrops only occasionally as small ledges. An excellent exposure of the Abrigo above the Middle Member is in 2-375 drift, White Tailed Deer 200 level, where it can be seen from the Parting quartzite to the top of the Middle Member. For the Middle Member, the Boras 900 level, main drift, affords a good place for study. The bottom of the Member is about 360 feet north of the shaft and the top, about 680 feet north of the shaft. For the shaly lower Abrigo, the long NE drift on



GENERALIZED SECTION
OF THE
MARTIN LIMESTONE

SCALE 1 INCH = 100 FEET

TO ACCOMPANY REPORT BY E. WISSER, NOV. 1926

J. H. Marion, Draftsman.

the 300 level of the Wolverine No. 2 Shaft (White Tailed Deer 100 level) and the Wolverine No. 1 Shaft 500 level affords a complete section down to the Bolsa quartzite.

Parting Quartzite: This is usually composed of white quartz grains, fairly well rounded, in a matrix, generally of silica, but occasionally lime. Replacement of the matrix by hematite, pyrite and other minerals is not uncommon where the matrix was originally limy or shaly. Sometimes, as stated above, the quartzite is aphanitic, no grains being visible, and may be confused with the quartzitic beds in the upper Abrigo. There is, without doubt, an unconformity between the Parting quartzite and the Martin, so that the quartzite varies greatly in thickness, and has even been completely removed in places. Its maximum thickness is about 15 feet, and it averages about 8 feet.

The Parting quartzite outcrops as a white cliff, is brittle, and breaks off into the cube-shaped chunks characteristic of quartzite. Places for its study are numerous. Examples are the 200 level, White Tailed Deer Mine; the 600 and 700 Nighthawk, the 800 Boras, 1000 and 1100 Cole north of the Boras claim, and the 900 Cole, north of the Tuscarora claim.

Martin: This formation, with its abundance of excellent markers, is by far the most valuable series in the district for working out structure. The Martin varies from 300 to

375 feet in thickness; like the Abrigo, its upper part is, for the most part, crystalline, its lower part shaly. From 5 to 10 feet above the Parting quartzite there frequently occurs a small thickness of black paper shale; as this is unknown in the upper Abrigo, its presence will definitely determine the Parting quartzite where there is a chance that the latter is one of the quartzitic beds in the Abrigo.

The lower 30 to 40 feet of the Martin consist of crystalline to shaly beds, 2" to 1 foot thick, with some more coarsely crystalline and thicker beds near the bottom. All of the beds are gray to bluish gray; in some places, notably in the Don Luis area, the lower Martin beds surprisingly resemble those of the upper Abrigo, except that they are normally slightly darker in color; they are sometimes fully as crystalline for a short distance above the Parting quartzite as those of the Abrigo just below the quartzite. At 30-40 feet above the base of the Martin, occur about 20 feet of black shaly beds, from 2" to 4" in thickness. These form an excellent marker, as they are practically universal in the district. Above these beds is the "Big Shale", a striking and unmistakable feature of the lower Martin. The shale is perfectly massive, with no trace of bedding, is black to putty-colored, and has a pronounced conchoidal or occasionally blocky fracture. It is aphanitic in texture, with a very few scattered crinoids. Scattered through it also are occasional specimens of spirifer. Toward the top of the shale, a tendency toward rough bedding can sometimes

be seen, and the member is sometimes fine-crystalline here rather than shaly. A horizon of very large crinoids occurs near the top of the shale and in the beds immediately overlying the shale. In the Boras mine, on the 700, 800 and 900 levels, a quartzitic bed, with rounded black or white quartz pebbles in a shaly matrix, occurs at the top of the Big Shale, and this has been confused with the Parting quartzite.

Above the big shale occur dark to black shaly to fine-crystalline beds, 6" to 1 foot in thickness. This series is 10 to 15 feet thick. Above it lies the Pseudo-Abrigo, a series of fine-crystalline to shaly beds 2" to 1 foot thick, with wavy bands remarkably resembling those in the upper Abrigo, and easily confused with the latter. The Pseudo-Abrigo beds, however, are characteristically chalky rather than sandy or crystalline, and the bands are not quite as distinct as those in the upper Abrigo and somewhat less wavy. The color of the Pseudo-Abrigo is generally light gray and some brown beds occur. At the top of the Pseudo-Abrigo occurs a concentration of spirifer in brown shaly beds, 6" to 1 foot in thickness, with wavy bending. The entire Pseudo-Abrigo is 30 to 40 feet thick. Just above it are pinkish fine-crystalline to shaly 1" to 6" beds, with scattered spirifer, grading into gray to black fine-grained beds up to 2 feet in thickness. In this latter series occurs the concentration of of atrypa and spirifer which ranks next to the Parting quartzite as the easiest marker in the entire district. The atrypa occur about 200 feet above the Parting quartzite; the main concentration

Martin (Devonian)

Atrypa Reticularis.

Fig. 1. Dorsal view.
1a. Side view.

Fig. 2. Ventral view of larger specimen.

Spinifer Hungerfordi.

Fig. 3. Ventral view.
3a. Side view.

Fig. 4. Dorsal view of larger specimen.

Schizophoria Striatula.

Fig. 5. Dorsal view.
5a. Front view.
5b. Ventral view.

Fig. 6. Pachyphyllum Woodmani.

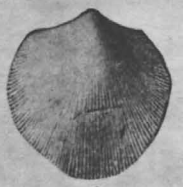
Fig. 7. Acervularia Davidsoni.

Fig. 8. Cladopora Prolifica.

Fig. 9. Diplophyllum Callawayensis Branson, from Missouri, which closely resembles Martin coral called in this paper "Diphyphyllum".


1


1^a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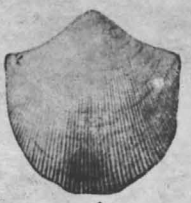
3^a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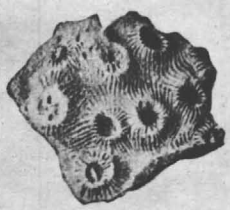
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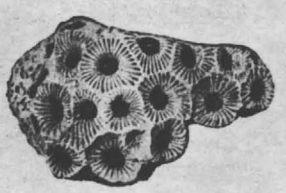
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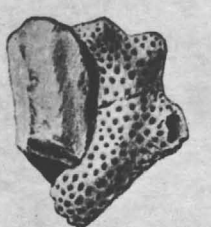
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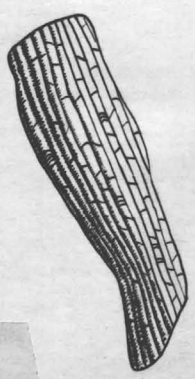

9

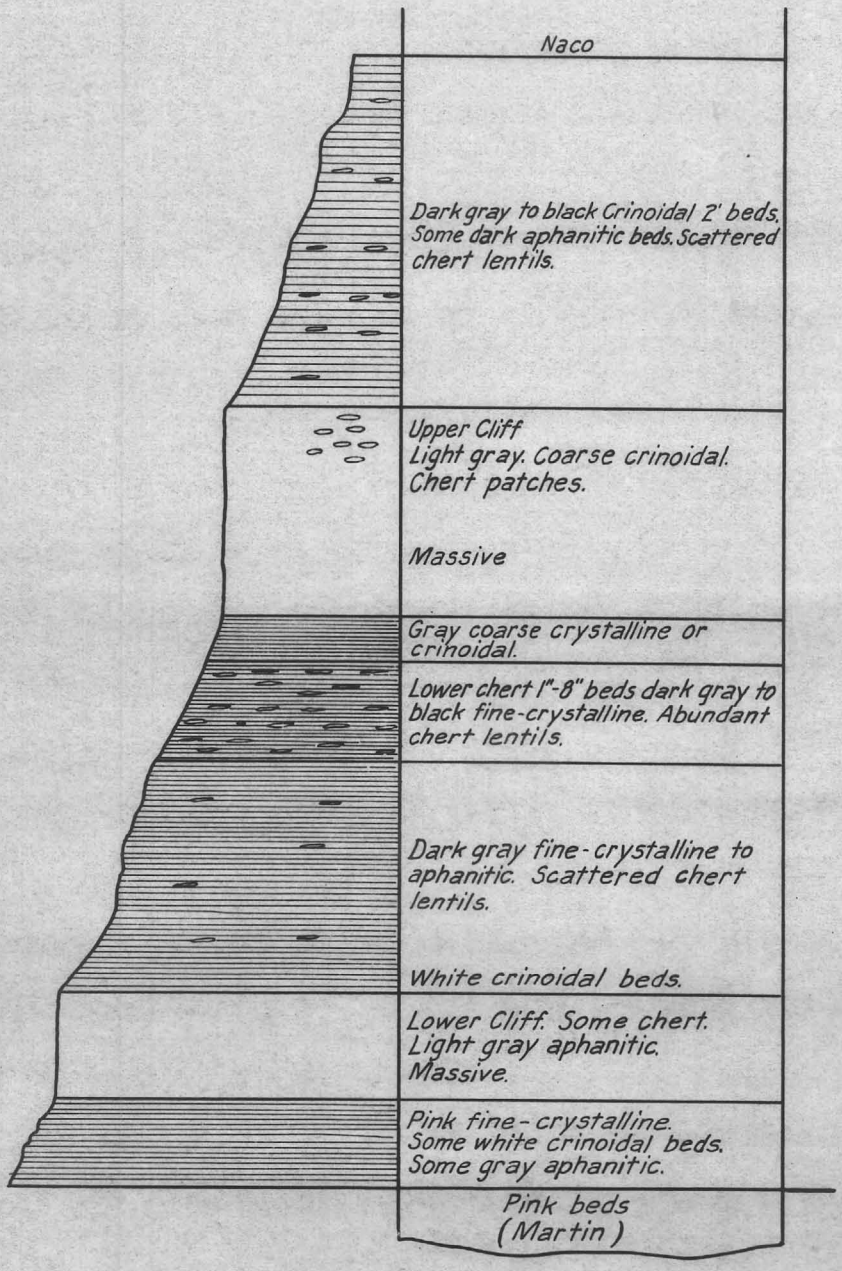
DEVONIAN FOSSILS CHARACTERISTIC OF THE MARTIN LIMESTONE IN THE BISBEE QUADRANGLE.

is about 15 feet thick and here the atrypa are extremely abundant, occurring in a matrix of nearly black, fine-crystalline limestone. Corals (acervularia and cladopora) occur with the atrypa, but sparingly. A useful thing to remember is that while occasional atrypa occur for 50 feet below this main concentration, none occur above it; and, while corals occur throughout the upper Martin, to within 20 feet of the top, none occur below the concentration of atrypa.

From 15 to 20 feet above the atrypa and separated from them by thin-bedded gray shaly limestone, occurs the main coral cliff of the Martin, a resistant massive bed about 15 feet thick, literally studded with corals, cladopora and diphyphylla, the acervularia being rare or absent. The corals occur in a matrix of black fine-crystalline limestone, and the cliff weathers as very dark chocolate to black.

Above the Coral Cliff, the Martin consists of dark gray to black fine-crystalline limestone in beds averaging 2 feet in thickness, weathering chocolate brown. Above and below the Escabrosa limestone contact, the beds are distinctly pinkish in hue, and at the contact occur the Pink Beds, shaly to fine-crystalline beds, 2" to 18" thick. Just below the Pink Beds occurs, in some areas, a bed of pure white, even-granular limestone resembling some beds in the upper Abrigo. Where present, this forms an excellent marker for the Martin-Escabrosa contact.

As described above, the upper Martin weathers chocolate colored; the lower Martin seldom outcrops, due to its shaly



GENERALIZED SECTION OF THE ESCABROSA LIMESTONE

SCALE 1 INCH = 100 FEET

TO ACCOMPANY REPORT BY E. WISSER, NOV. 1926

J. H. Marion, Draftsman.

nature; both the atrypa and main coral concentrations usually outcrop as small cliffs, due to the hard, crystalline character of their matrices. In general, the Martin limestone is less likely to form striking cliffs than either the Upper Abrigo or the Escabrosa.

Numerous good exposures of the Martin occur. An excellent surface exposure is on the hill east of the Cole No.3 Shaft.

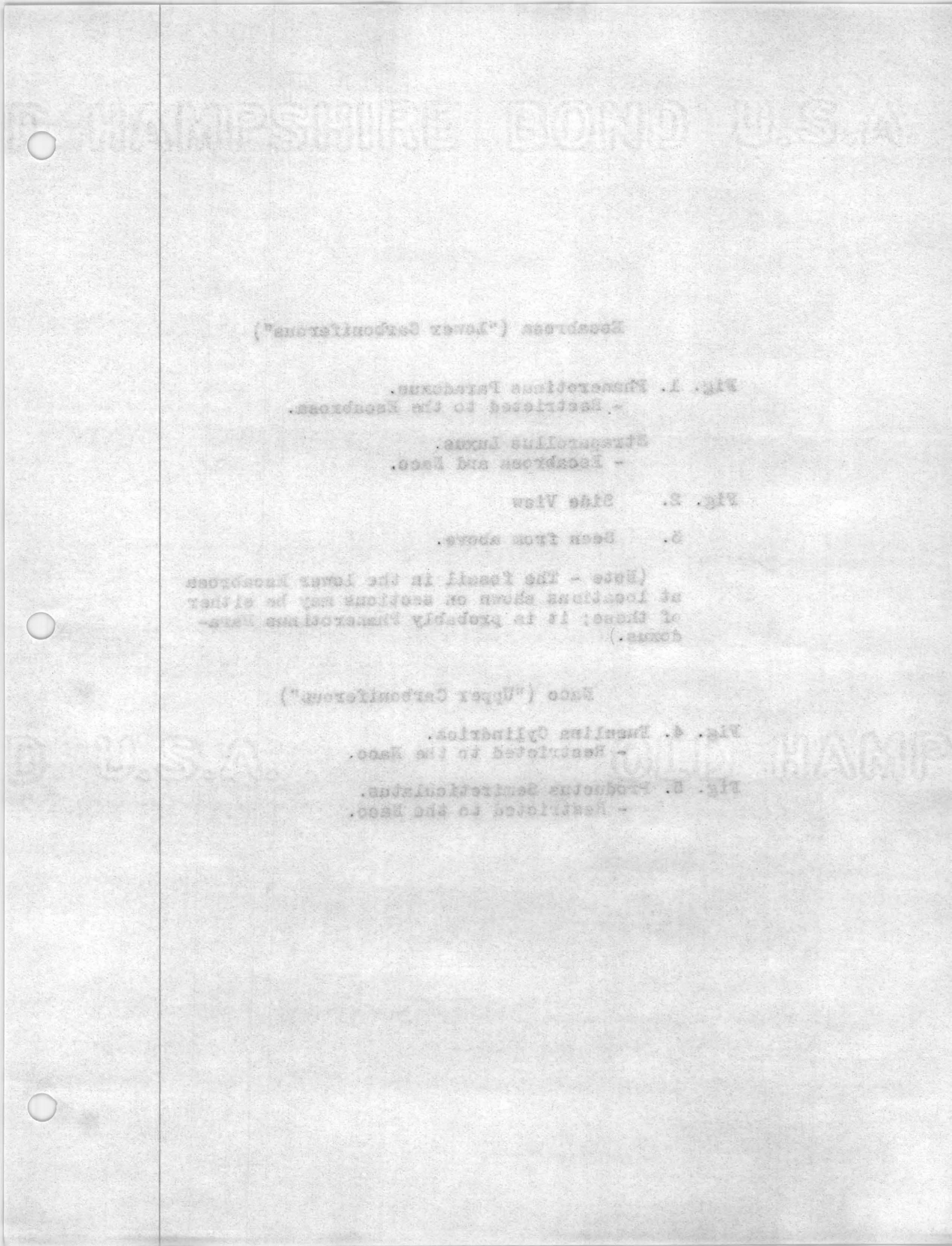
Escabrosa Limestone: This formation appears to vary greatly in thickness. In the Don Luis area, it is slightly less than 600 feet thick, while in the neighborhood of Gold Hill it is over 800 feet thick. It is predominantly the cliff-making formation of the Bisbee district, and any massive limestone cliff over 30 feet in thickness, with only very rough bedding, or none at all, is almost certainly Escabrosa.

The bottom 50 feet of the Escabrosa is characteristically pink in color; in places, even red; and consists, for the most part, of fine-crystalline beds up to 10 feet in thickness, with occasional white coarse-crinoidal beds, and some gray aphanitic beds with conchoidal fracture, resembling the lower Naco. Above these beds occurs the Lower Cliff, about 50 feet in thickness, generally massive, but with rough 2-foot bedding near the top. This cliff is characteristically aphanitic in texture, resembling Naco, but a lighter gray in color, (on broken surfaces) Occasional irregular areas of coarsely crinoidal limestone occur, and this is typical of the cliff. Chert is confined to the upper half, and

is rare here, and never in any considerable concentration. At the upper part of the cliff, the peculiar fossils, consisting of a mass of parallel tubes, giving a honeycomb appearance in cross-section, appear for the first time.

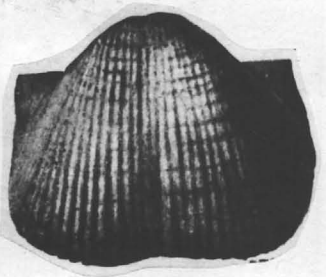
Above the Lower Cliff, one or more white coarse crinoidal beds, often of considerable thickness, occur. Above these, the beds become somewhat thinner and very much darker; for the most part, aphanitic, Naco-like, with occasional crinoidal or crystalline beds. Several weather chocolate colored. Scattered lentils of dark gray or black chert occur. At about 250 feet from the bottom of the Escabrosa, the Lower Chert beds, one of the best markers in the district, appear. This series is about 50 feet thick, and once recognized, can rarely be mistaken. The beds are 1" to 8" thick, dark gray to black, fine-crystalline in texture, and between them occur abundant thin dark gray, occasionally white, chert lentils. The thickness of this series, the thinness of its component beds, the characteristic dark color between the light gray or white lower and upper cliffs, all serve to identify this series.

Abruptly set off from the Lower Chert by its white color and coarsely crinoidal texture is the Upper Cliff, the main cliff of the Escabrosa, about 100 feet thick. Bedding is ill-defined or absent; the cliff can readily be distinguished from the Lower Cliff by its greater thickness, by its coarsely crinoidal texture, but particularly by the patches or concentrations of chert lentils which occur in its upper half. (The "Upper



1 2 3

Escabrosa ("Lower Carboniferous")



4 5

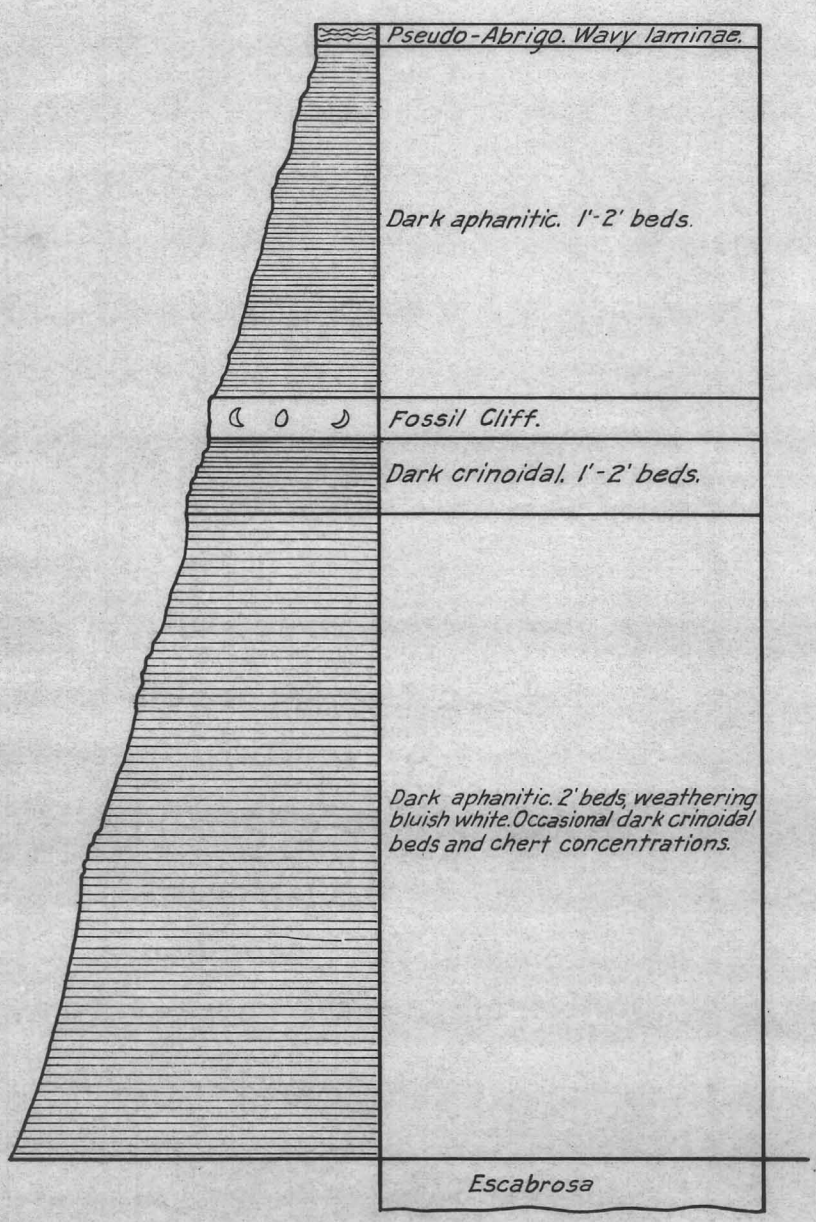
Naco ("Upper Carboniferous")

Chert") These patches are not continuous, like the Lower Chert, but, as their name (chert patches) implies, are simply local concentrations of chert lentils within the massive cliff. They may reach a length of over 150 feet, and are sometimes 50 feet in thickness.

Above the Upper Cliff, the Escabrosa makes another very abrupt and strking transition. From the top of the cliff to the base of the Naco, the Escabrosa consists of very dark to black, coarsely crinoidal beds with occasional dark aphanitic members, averaging about 2 feet in thickness, with scattered chert lentils, but with no such concentration of the latter as to lead to confusion with the Lower Chert beds, which at a distance greatly resemble this upper Escabrosa.

The series: white or light gray Lower Cliff, dark Lower Chert beds, white Upper Cliff, dark upper Escabrosa can never be confused with any other in the district, and the Escabrosa limestone, where enough of it can be seen, is quite easy to place in the correct stratigraphic horizon.

Naco: The Naco, at least the lower 1000 feet of it, is essentially a thin-bedded formation, the beds averaging about 2 feet in thickness. Cliffs are rare, and never over 25 feet thick; the surface color of the Naco is a distinct bluish gray. There is never a trace of blue in any of the Escabrosa, a slight buff or yellowish tinge being the only variant from the characteristic dirty light gray or dark gray of that formation. A lithologic



GENERALIZED SECTION
OF THE
NACO LIMESTONE
SCALE 1 INCH = 100 FEET

TO ACCOMPANY REPORT BY E. WISSER, NOV. 1926

J. H. Marion, Draftsman.

contact has been used by Blanchard and the writer in the Bisbee district, and this appears to be much more satisfactory than that based on fossils, hitherto used. The beds above the dark to black, crinoidal upper Escabrosa are very light bluish gray to nearly white on the surface, and are preponderantly dark gray to black, upon breaking, with the characteristic Naco aphanitic texture and conchoidal fracture. This makes an extremely easy field contact, and as there appears to be no measurable unconformity between the Escabrosa and Naco formations, it is recommended for field use.

Good markers in the Naco are rather scarce. About 380 feet up from the base occurs a conspicuous white cliff, highly fossiliferous, containing small brachyopods and crinoids, with long, horizontal, dark chert lentils. Directly below this cliff is a series, about 40 feet, of very dark, richly crinoidal beds resembling the crinoidal beds at the top of the Escabrosa. About 600 feet above the bottom of the Naco occurs the best marker of the formation, the Naco Pseudo-Abrigo. This series, 10-20 feet thick, consists of thin-bedded shaly limestone with wavy greenish cherty laminae, superficially resembling the Middle Member of the Abrigo. The limestone breaks off on the surface as thin plates, and the series is a very distinct and valuable marker.

The Naco, for the most part, is tough and resistant, and while it contains no prominent cliffs in its lower 1000 feet, it stands up well under erosion and forms such steep

features as Queen Hill, the Lucky Jack Ridge, etc. The Naco-Escabrosa contact described above may be seen on the southwest slope of Mt. Reilly; at the north and south ends of the Hedberg Area; and near the C & C shaft. The Pseudo-Abrigo is best seen in the Hedberg block; also on the Lucky Jack Ridge, on the Lucky Jack and Ilawara claims.

Parting Quartzite

Medium-granular sandy 1"-1'.

Quartzite bed.

Coarse to fine crystalline Ce-like Corals ?

Medium-granular Shiny crystalline faces

1" beds. Fine-cryst-aph. Thin resistant laminae.

2"-1' medium-granular. Wavy banded.

Unlaminated massive. White med. gran. Faint wavy banding.

Cliff. Massive blocky. Gray Sandy. Thin green resistant laminae.

Ce-like gray medium granular.
6"-2" beds. Some sandy beds.
Wavy banding.

Medium-granular Ce-like. Non-sandy.

Sandy medium-crystalline.

Medium cryst. Sandy 1'-2' beds. Cross-bedded.
Wavy bands. Thin. Shaly members.

Thin-laminated fine-crystalline to aphanitic.
1" to 6" beds.

Pink fine-crystalline.

Nearly black, mottled. Medium coarse-crystalline.
More finely laminated. Weather as 1"-4" plates.

Middle Member

Bluish gray semi-cryst. to fine-cryst. 1"-6" Resistant green lam.

Dark gray semi-crystalline. Unlaminated.
Brownish splotches, weathering as pits.

Well bedded 1"-3" beds, separated by resistant green laminae.

1"-1' well laminated.

1"-8" beds. Laminated.

6"-18" Beds.

Gray semi-crystalline to aphanitic.
Medium crystalline layers.

Some laminated 1" beds.
Lentils of gray fine-crystalline separated by
Interlacing green shaly partings. ½"-6" beds.

Lower thin bedded member
Beds average about 1" thick.

6"-2' dark gray fine-crystalline aphanitic green

Massive 1'-2' beds mixed fine-med. cryst. dark gray.

Fossils wavy streaks ⊖ ○ of black dots. Fossils weather to limonite.

2"-1' beds resistant wavy laminae. Light bluish-gray fine-crystalline to shaly

Black Cn.-like shaly. Green to brown crystalline spotches which weather to pits. 2"-1' beds.

1' beds. Wavy laminae 1" apart. Weathers as 1" plates.
Dark bluish gray is semi-cryst. Resist wavy.

Light gray shaly to sandy. On surface greenish yellow. Blocky 2"-1'. Weather pitted °°°°°
Wavy greenish bands but no resistant laminae.
Some very thin irregular shaly beds.

MT. MARTIN

ABRIGO LIMESTONE

UPPER CAMBRIAN

SCALE 1 INCH = 50 FEET

TO ACCOMPANY REPORT BY E. WISSER, NOV. 1926

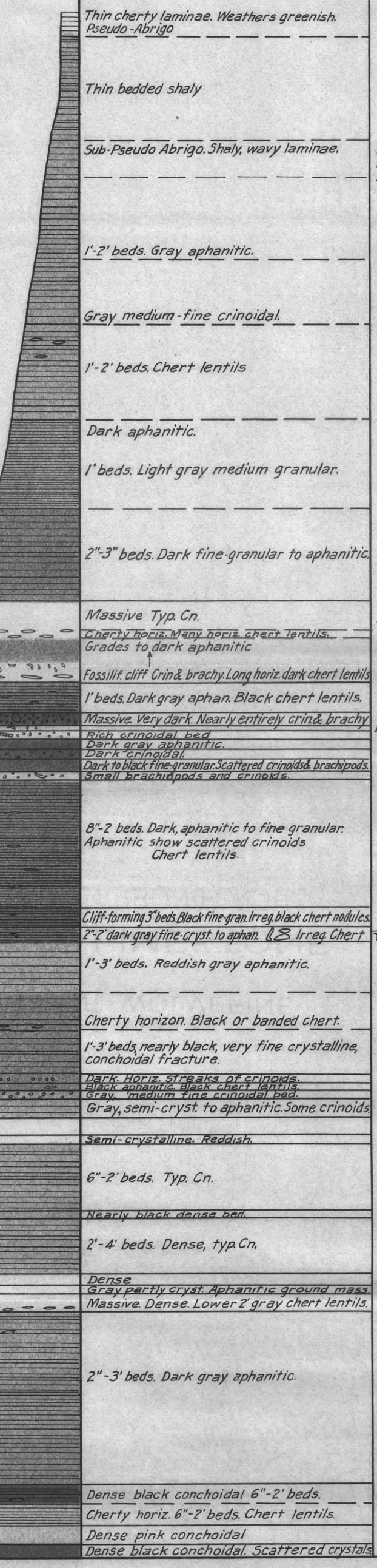
J. H. Marion, Draftsman.

LEGEND

Chert Lentils .....

Crinoids .....

Brachiopods .....



N. E. OF WOLVERINE

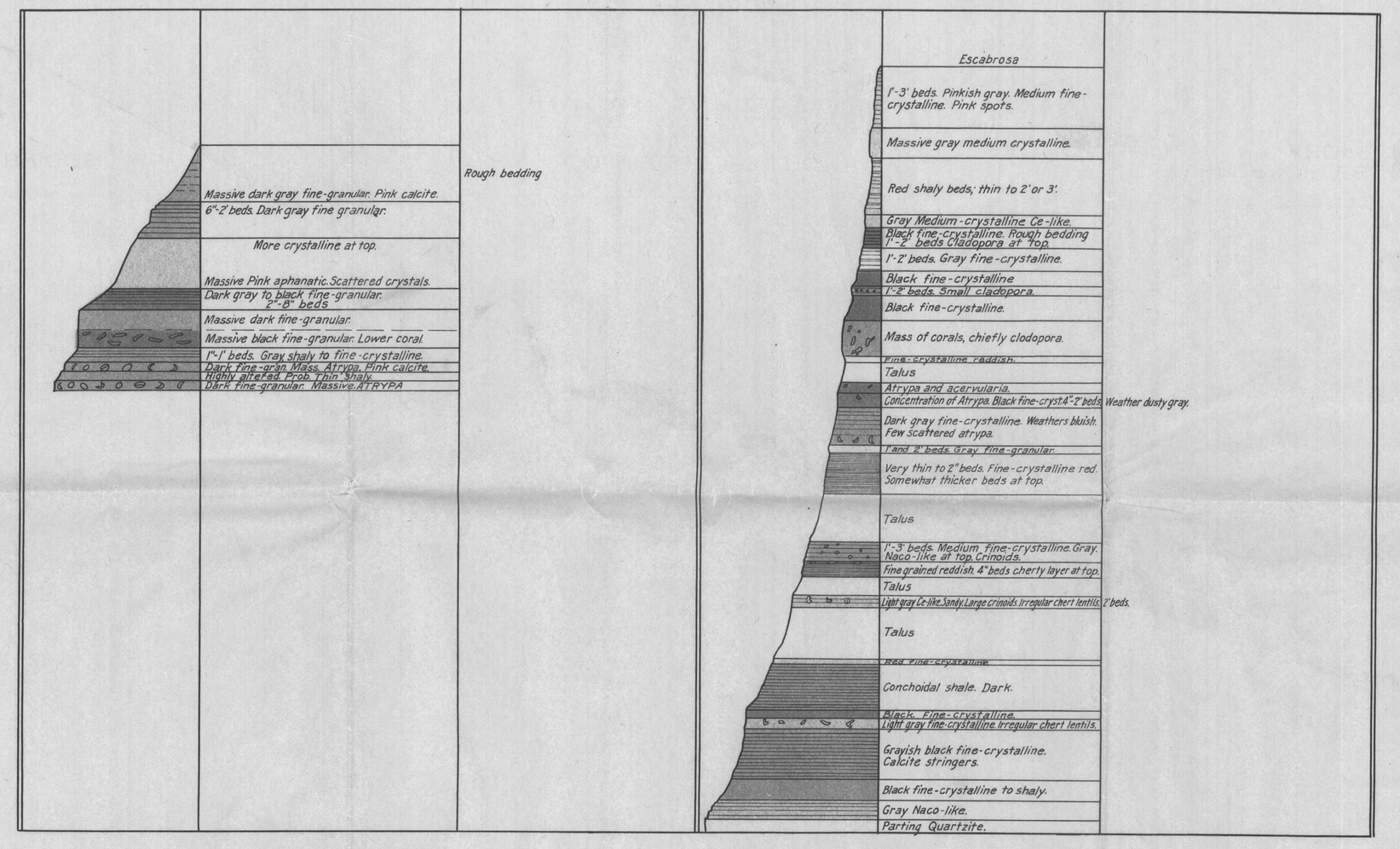
NACO LIMESTONE

UPPER CARBONIFEROUS

SCALE 1 INCH = 50 FEET

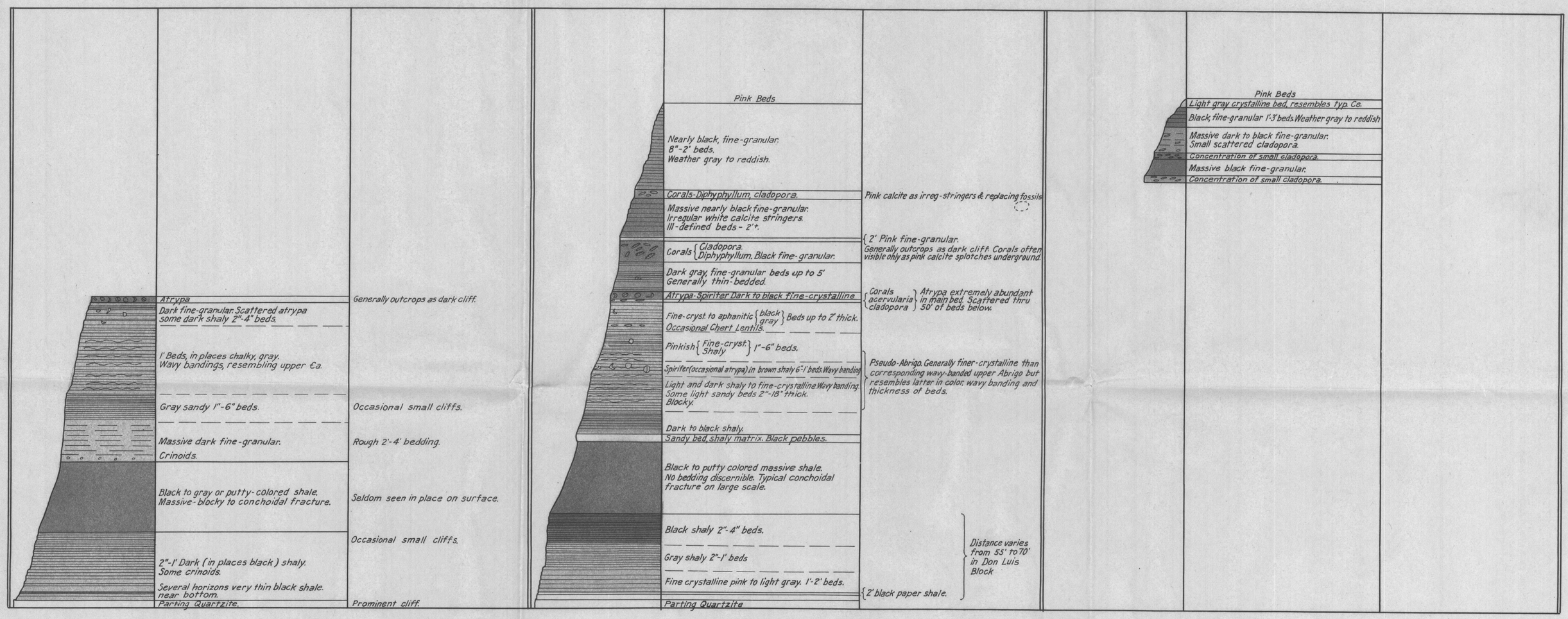
TO ACCOMPANY REPORT BY E. WISSER, NOV. 1926

J. H. Marion, Draftsman.



C & C TUNNEL

VICINITY OF GOLD GULCH



1300 BRIGGS

COMPOSITE SECTION
DON LUIS AREA

SPUR OF ESCABROSA RIDGE
ABOVE HIGGINS

MARTIN LIMESTONE

DEVONIAN

SCALE 1 INCH = 50 FEET

TO ACCOMPANY REPORT BY E. WISSER, NOV. 1926

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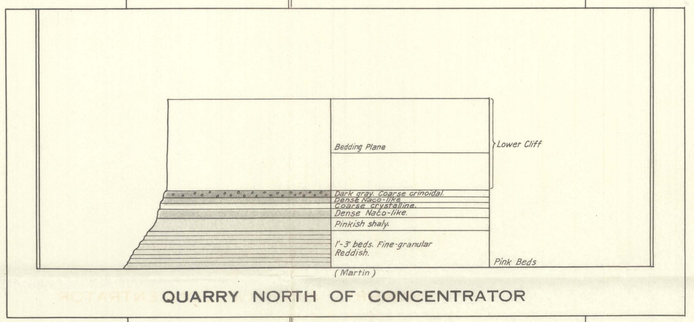


QUARRY NORTH OF CONCENTRATOR

LEGEND

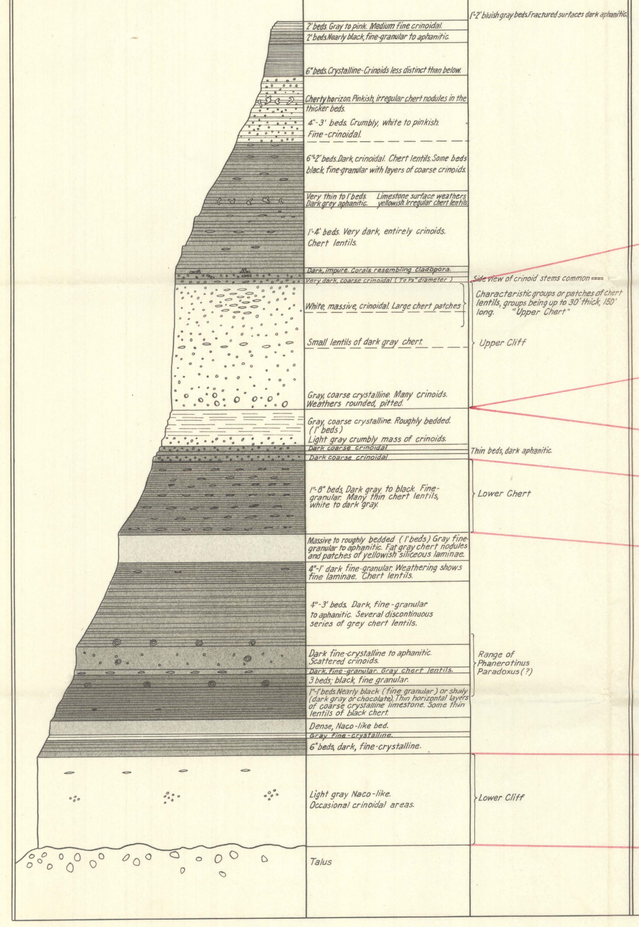
Crinoids

Chert Lentils

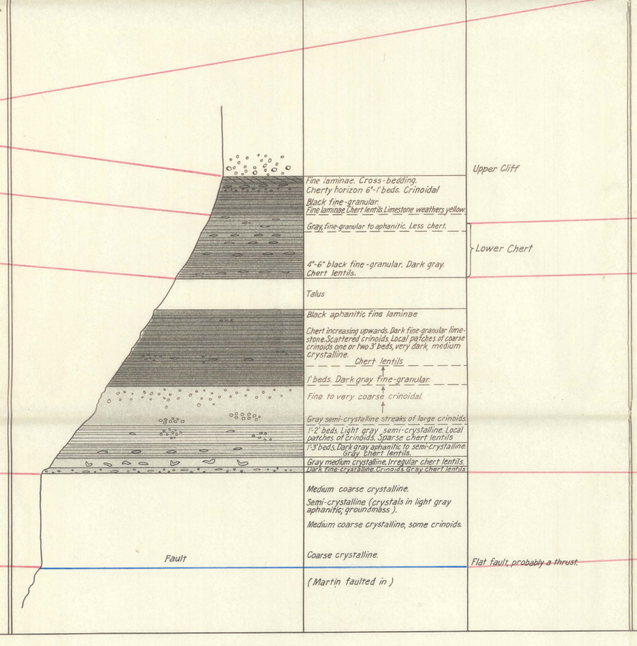
Pitted Weathering

Cross-bedding

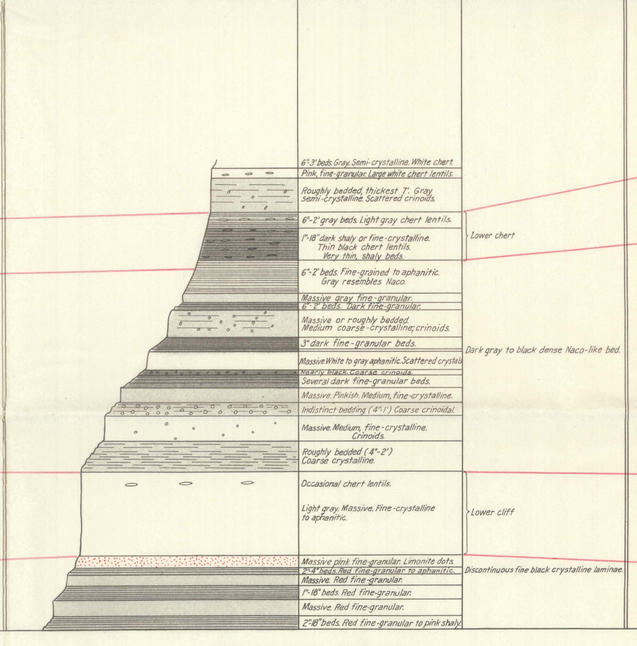
Phanerotinus Paradoxus (?)



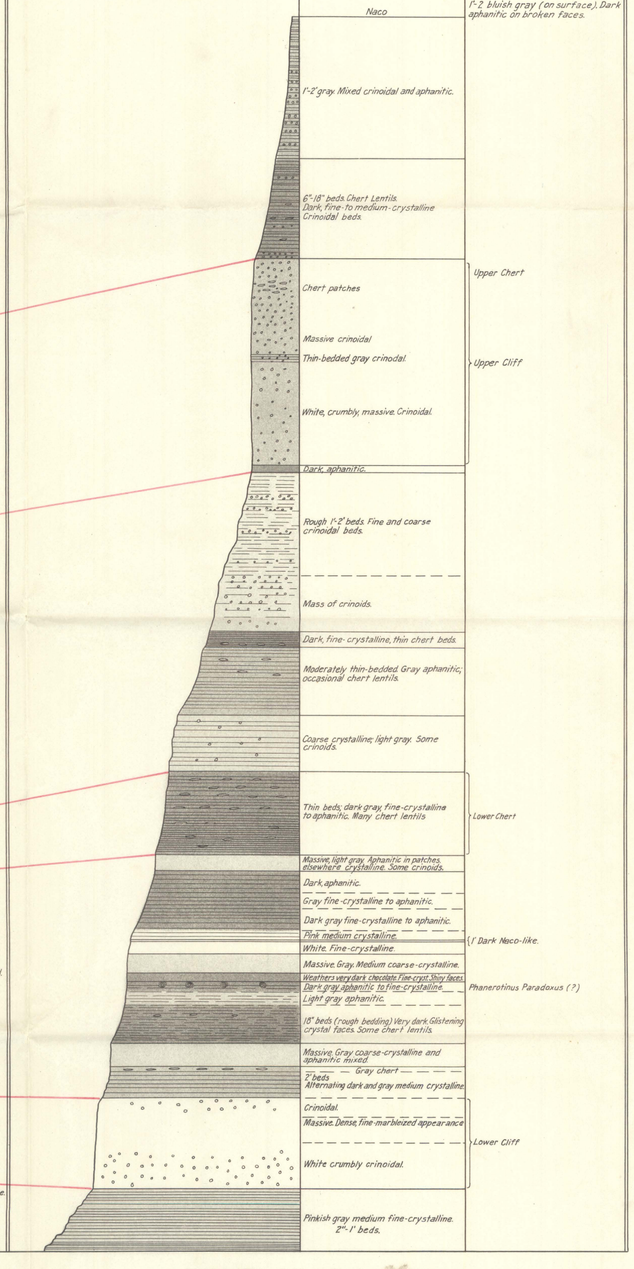
N. E. OF WOLVERINE No. 2 SHAFT



NORTH OF 10-1 TUNNEL



COE WATER TUNNEL



VICINITY OF GOLD GULCH

ESCABROSA LIMESTONE

LOWER CARBONIFEROUS

SCALE 1 INCH = 50 FEET

TO ACCOMPANY REPORT BY E. WISSER, NOV. 1926

J.H. Marion, Draftsman.

COCHISE COUNTY, ARIZONA

Charges to buy
100% 8304 miles 116,600
1/3 - 11,000
1/3 - 7900
1/4 - 6000
1/8 4000

Optically Pumped Helium Magnetometer:
Sensitivity: Approx. 0.02 (1/50) gamma
No "Heading" effects
No Temperature Sensitivity

Line Location: Radio Navigation (to ±25' Laterally)

Travel Along Line: Doppler Controlled (1 Data Pt./500')

Flight Level: +10,000' (Barometric & Radar Altimeters)

Line Pattern: (N-S @ 1 mi.) (E-W @ 3 mi.)

Statistics: 213 Profiles - 6225 square miles. - 8304 Flight Line Miles. (500' Data Pts.=10.6/mi.=87,700 Data Points)

Data Reduction: 35-mm strip photography used to confirm line and intersection positions. Intersections recorded in crystal clock times, plotted on topographic maps and transferred to base maps.

Simultaneous recording of crystal clock times, navigation data, Doppler data, airborne magnetics and identical ground monitor station magnetics.

Total Intensity profiles Cal-Comp plotted.

Diurnal changes removed by subtracting changes at monitor station from airborne total intensity readings.

Heading effects of plane removed by flat tying all lines at quadrant loop boundaries.

Data position X and Y coordinates established by digitizing all line intersection points, then inspecting final line ties (steep gradients, etc.).

Total Intensity Map is fully tied, no smoothing. Reflects the full precision of data acquired. Probable accuracy - 0.1 gamma - 50' location.

Residual Maps:

General: These remove deep "regional surfaces", thus bringing sedimentary anomalies into form for analysis. (98% or more of Total Intensity may be removed, as "regional").

PR3 (Third Order Polynomial Residual):

(1) Primarily relates to basement structure, in most areas.

(2) In Cochise County, is limited by the extreme susceptibility contrasts of intrusives, ranging from Pre-Cambrian to Tertiary in age.

PR5 (Fifth Order Polynomial Residual):

More "regional" is removed, stressing higher frequency anomalies (basement and intrusives near surface - or sedimentary contrasts).

Diff. from PR3 to PR5:

Helps construct tectonic history; locates uplifts and rejuvenations vs. dormant areas. Helps positively position faults and estimate fault displacements.

(PR7 or Higher may be needed for complete spectral analysis of anomalies present). (Would add to accuracy of fault analysis and location of probable areas of mineralization).

Profiles:

(1) Are distance-corrected, unsmoothed, unaltered.

(2) Show all magnetic anomalies.

(3) Include effects from surface into basement rocks. (Elevation above ground ranged from less than 100' to more than 6,000').

(4) Complete geologic section can be constructed from each profile, but might require years of work.

(5) For any local area, added value can be extracted from profiles.

Geological Evaluation:

General: Survey indicates probable repititions in outcrop sections and lesser sedimentary thicknesses than are assumed from measured dip, strike and outcrop surface patterns.

Individual Quad.

Discussions:

(1) Locate and establish age of intrusives and surface igneous flows.

(2) Define susceptibilities of intrusives (range from Pre-Cambrian through Paleozoic, Jurassic-Triassic, Cretaceous and Tertiary in age. (Many younger intrusives have much higher susceptibilities).

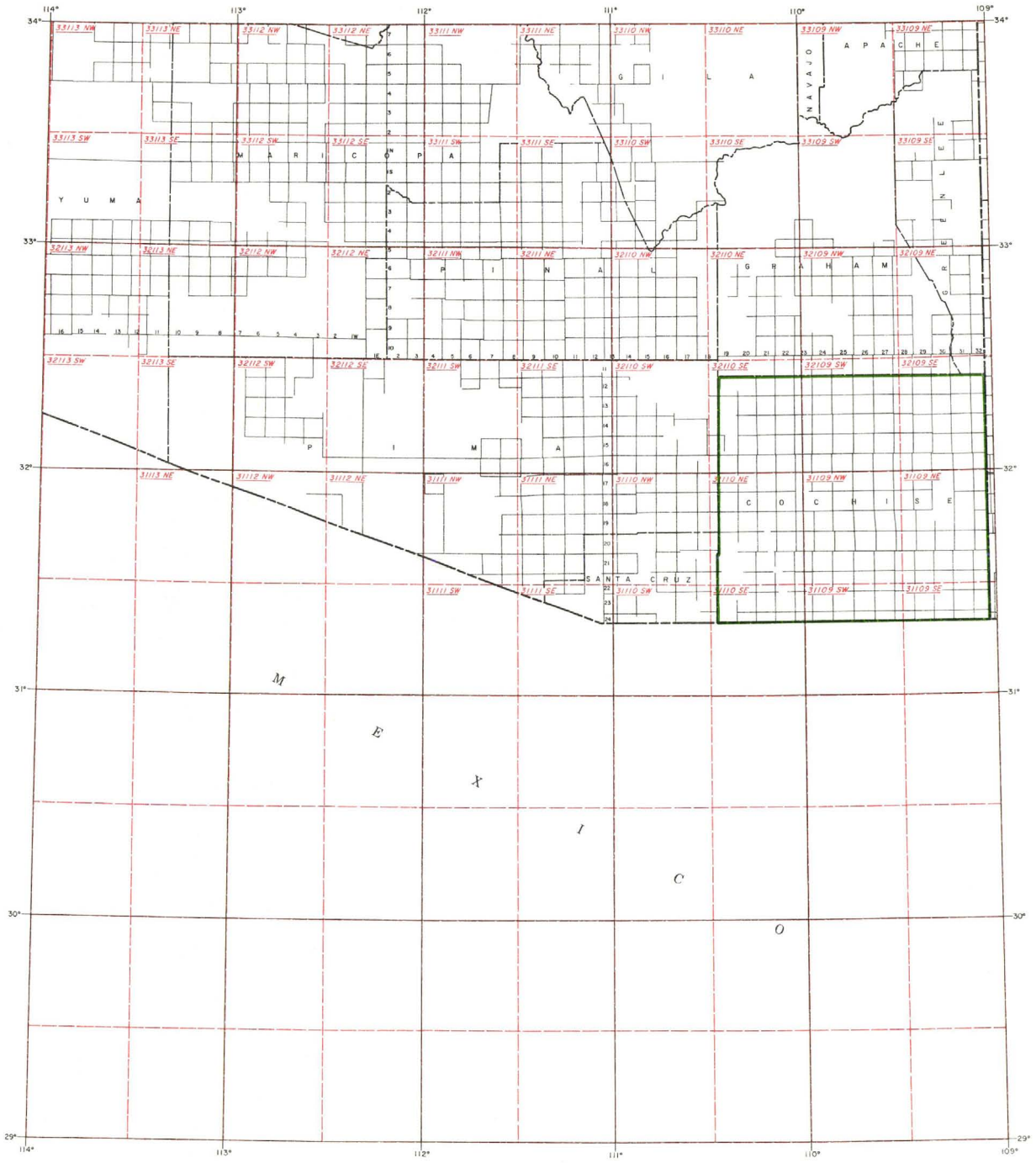
(3) Locate and estimate age and displacement of major faults.

(4) Extend known (surface) zones of mineralization, beneath Tertiary and Quatemary cover. Estimate depth of burial and define boundaries between intrusives and mineralized zones.

(5) Locate covered intrusives and mineralized zones (unknown from surface information). Estimate ages and depths of burial.
(6) Locate and outline sedimentary basins for possible oil and gas production, establishing probable ages and horizontal and vertical dimensions of sedimentary sections.
(7) Define areas of possible reef development and times of probable reef growth.
(8) Define areas of possible channel and bar sand development and probable ages of sands.

Conclusions:

Data are of adequate quantity and quality to support comprehensive depth and lithologic analyses, resulting in more complete recovery of full geologic history of area.



EXPLORATION SURVEYS INC.

6400 N. CENTRAL EXPRESSWAY DALLAS, TEXAS 75206 AC 214/361-6663

A SUBSIDIARY OF U.S. INDUSTRIES, INC.

COVERAGE MAP

D-10

PORTION OF ARIZONA

COMPLETED LAND GRAVITY

PRELIMINARY LAND GRAVITY

COMPLETED AEROMAGNETICS

10 0 10 20 30 40 50

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