EXPLANATION

QUATERNARY

Recent

Qal — Alluvium
In general, narrow and thin deposits bordering streams at the lower altitudes

Qt — Talus
Occurs locally along most valleys having steep sides. Only larger areas delineated

Ql — Landslide
Typical hummocky topography. Result of slippage along steep slopes formed locally by alpine glaciers

Pleistocene

Qgf — Glaciofluvial
Chiefly rounded to oval pebbles and cobbles and some sand and silt. Deposited by streams fed by former glaciers

Qm — Glacial moraine
Subangular fragments of the various rocks along the course of each glacier. Mostly ground moraine but locally remnants of lateral moraines. Thickness generally less than 30 feet

Pliocene(?)

Twt — Water-laid tuff
Poorly consolidated, dull-white to light-gray, fine-grained, thin- and well-bedded rock. Contains many fresh-water gastropods of probable Pliocene age

Miocene(?)

Tf — Flow breccia
Pinkish-gray rock composed of many small angular particles of rock and minerals in a streaky aphanitic matrix. The pronounced flow structure, pinkish color, and small size of fragment distinguish it from the volcanic breccia

Tvb — Volcanic breccia
Angular to subangular fragments of many rock types in a dense, light to medium greenish-gray matrix. Fragments generally ½ to 2 inches long, but some are huge blocks

Tap — Mt. Aetna quartz monzonite prophyry
Abundant large pink orthoclase and smaller white plagioclase phenocrysts in a fine- to medium-grained gray groundmass

Tqlp — Quartz latite porphyry
Typically a dark-gray porphyritic rock having abundant plagioclase phenocrysts in an aphanitic groundmass. The darkest of all the Tertiary intrusive rocks

Tg — Mt. Antero granite
Medium-grained, light-gray to white rock having pegmatite facies locally

Tk — Kersantite dikes
Dark-green to black dikes composed chiefly of plagioclase and biotite

Trd — Rhyolitic dikes
Includes dikes of rhyolite, rhyolite porphyry, and pitchstone porphyry. Most are porphyritic having phenocrysts of quartz or feldspar or both

Tmr — Monzonitic and latitic dikes
Includes dikes of monzonite, quartz monzonite, latite, quartz latite, and their porphyritic equivalents. Most are porphyritic having phenocrysts of quartz or feldspar or both

Tas — Granite aplite dikes
White, fine-grained, sugary-textured dikes. Mostly short and narrow; only larger dikes shown

Pulocene(?) to Oligocene(?)

Tpm — Mt. Princeton quartz monzonite
Typically a medium-grained, gray rock containing visible feldspar, quartz, biotite, hornblende, and a few cinnamon-brown crystals of sphene. Locally porphyritic

Ta — Andesite
Fine-grained, grayish-green to dark greenish-gray rock having small phenocrysts of white or light greenish-gray feldspar. Altered to propylite and commonly contains small grains of pyrite. Weathers to shades of brown, red, and yellow

Tmp — Mt. Pomeroy quartz monzonite
Medium-grained, pinkish-gray rock containing visible white, pink, or gray feldspar, quartz, and chloritized hornblende and biotite. Pinkish tone and chlorite are especially characteristic

Tgm — Gneissic quartz monzonite
Coarse-grained, light- to medium-gray rock having conspicuous elongated phenocrysts of feldspar and lenses of feldspar and quartz separated by wavy shreds, lenses, and bands of biotite. Weathered surfaces are buff to reddish brown

Tq — Quartz diorite
Typically a fine- and even-grained, greenish-gray rock containing visible feldspar, biotite, and some quartz. Weathered surfaces are dull brown or brownish gray

Tr — Rhyolite
White to light-gray aphanitic rock having a few scattered phenocrysts of quartz and less commonly, biotite and feldspar. At most exposures highly silicified and iron stained

Ttp — Tincup quartz monzonite porphyry
Conspicuous phenocrysts of white feldspar, colorless to slightly smoky quartz, and hornblende in a greenish-gray aphanitic groundmass

Tdp — Quartz diorite porphyry
Medium-gray to greenish-gray porphyry having conspicuous phenocrysts of hornblende and white feldspar in a fine-grained groundmass

CRETACEOUS

Upper Cretaceous

Km — Mancos shale
Light- to medium-gray shale and limy shale. Very poorly exposed

Lower and Upper Cretaceous

Kd — Dakota sandstone
Chiefly light-gray, crossbedded quartzose sandstone and quartzite. Conglomerate lenses locally at base. A few thin gray shale layers in upper part of formation

JURASSIC

Upper Jurassic

Jm — Morrison formation
Interbedded sandstones, shales, and limestones. Sandstones: dirty white, fine- to medium-grained. Shales: greenish or reddish. Limestones: Yellowish or gray

UNCONFORMITY

PENNSYLVANIAN AND PERMIAN(?)

PIPm — Belden shale and Minturn formations, undifferentiated
Belden shale: dark carbonaceous argillite or shale, thin beds of dark limestone, and a few beds of quartzite. Minturn formation: chiefly gray, greenish-gray, and coarse-grained quartzite and less abundant beds of gray or black argillite or shale. Limestone, conglomerate, and gradational rock types occur locally

UNCONFORMITY

MISSISSIPPIAN — CARBONIFEROUS

Ml — Leadville limestone
Chiefly gray or bluish-gray limestone and dolomite with sandy or shaly beds present locally at base

UNCONFORMITY

DEVONIAN

Upper Devonian

Dc — Chaffee formation
Parting quartzite member (lower member): light-gray dolomitic limestone with subordinate dolomite, limestone, shale, and quartzite beds. Dyer dolomite member (upper member): gray dolomitic limestone with subordinate limestone or dolomite beds and rare sandy or shaly beds and lenses

UNCONFORMITY

Middle and Upper Devonian

Df — Fremont dolomite
Bluish-gray, somewhat mottled, massive crystalline dolomite. Some beds are limy dolomite or dolomitic limestone and locally the basal few feet are sandy

UNCONFORMITY

ORDOVICIAN

Middle Ordovician

Oh — Harding quartzite
Chiefly medium-grained, white, pink, brown, gray, or bluish-black quartzite. Locally contains thin beds of sandstone or greenish-gray shale

UNCONFORMITY

Lower Ordovician

Om — Manitou dolomite
Chiefly bluish-gray, crystalline, well-bedded dolomite that locally contains abundant chert nodules or lenses

UNCONFORMITY

CAMBRIAN

Upper Cambrian

Cs — Sawatch quartzite
Three main lithologic units recognized. The lower unit consists chiefly of white, vitreous, medium-grained quartzite, locally micaceous, feldspathic, or conglomeratic; the middle unit is mostly glauconitic sandstone and quartzite, and limy sandstone; and the upper unit is a white, vitreous, medium-grained quartzite

UNCONFORMITY

PRE-CAMBRIAN

pCs — Silver Plume(?) granite
Mostly pink to light-gray, medium-grained granite. Rock has distinctive porphyritic and nonporphyritic facies that intergrade. Porphyritic facies characterized by many tabular feldspar phenocrysts in parallel or subparallel orientation

pCd — Hornblende diorite
Massive, greenish-black, medium-grained rock containing hornblende and plagioclase (andesine), with quartz, orthoclase, and biotite in minor amounts

pCp — Pikes Peak granite
Pink, medium- to coarse-grained granite with many pink feldspar phenocrysts and conspicuous small grains of fresh black biotite

pCg — Gneissic granite
Gray to brownish-gray, fine-grained granite. Foliation faint but generally distinct, and defined chiefly by narrow streaks, bands, or lenses of biotite

pCgn — Granite gneiss
Chiefly medium-grained, gray to pinkish-gray injection gneiss and migmatite. Small bodies of schist, pegmatite, and granite are included in this unit

pCh — Quartz-hornblende gneiss
Fine-grained, light greenish-gray to black banded gneiss consisting mostly of quartz and hornblende. Locally some quartz-hornblende schist is included in this unit

pChs — Quartz-hornblende schist
Dark grayish-green to greenish-black, fine-grained, strongly foliated schist. Locally includes beds and lenses of quartzite and quartz-biotite schist

pCs — Quartz-mica schist
Typically a fine-grained, gray or brownish-gray schist consisting chiefly of quartz, biotite, and muscovite

PAL — Paleozoic sedimentary rocks, undifferentiated
Rocks cannot be distinguished because metamorphosed; chiefly marble

CAMBRIAN TO PERMIAN

Contact, showing dip
Dashed where approximately located

Indefinite contact
Includes gradational contacts and indefinite boundaries of surficial deposits

Fault, showing dip
Dashed where approximately located, dotted where concealed; U, upthrown side; D, downthrown side

Thrust or low-angle reverse fault
T, upper plate

Syncline
Showing trace of axial plane; dashed where approximately located

Strike and dip of beds

Strike and dip of overturned beds

Strike of vertical beds

Strike and dip of foliation

Strike of vertical foliation

Vein, regardless of class, showing dip
Dashed where approximately located

Vertical vein

Doubtful or probable extension of vein

CLASSES OF VEINS

Pyritic quartz

Hubnerite-molybdenite

Quartz-fluorite

Quartz-beryl-pyrite

Vertical shaft

Inclined shaft

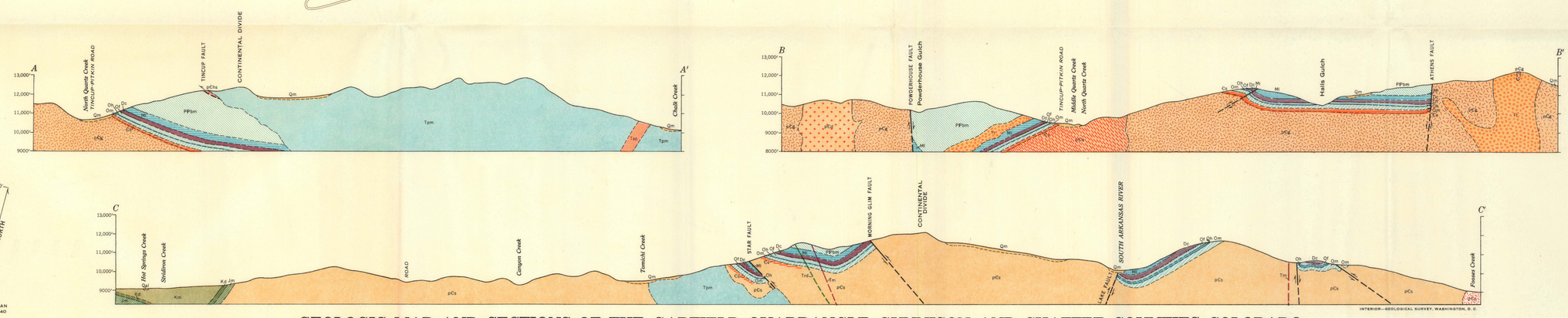
Portal of tunnel or adit

Small prospect pit or opencut

Quarry
Numbers by symbols refer to list of mines, prospects, and quarries

LIST OF MINES, PROSPECTS, AND QUARRIES

1	Akron	C-9
2	Alaska	G-8
3	Allie Belle	D-4
4	Alpha	F-8
5	Alwilda tunnel	D-8
6	Annie Hudson	D-9
7	April Fool	F-9
8	Ben Bolt	C-9
9	Ben Franklin	A-4
10	Ben Hill	F-8
11	Beta	F-9
12	Big Bonanza	E-4
13	Bill Short	D-8
14	Black Tiger	F-9
15	Blackhawk	E-3
16	Bilstered Horn tunnel	A-2
17	Bon Ton	A-3
18	Bonnie Belle	F-8
19	Breadwinner	D-9
20	Brighton	F-7
21	California	G-5
22	Citizen	A-4
23	Clinton	G-7
24	Columbus	F-9
25	Columbus	F-7
26	Compleg	A-4
27	Congress tunnel	D-9
28	Cumberland	A-3
29	D'Byron	E-7
30	Darling	F-7
31	David H.	D-9
32	Day Star	D-6
33	Deacon	A-2
34	Defiance	E-9
35	Delaware	F-9
36	Denver City tunnel	D-9
37	Denver City shaft	D-9
38	Desdemona	F-8
39	Drew	A-2
40	Eclipse discovery shaft	F-9
41	Eclipse No. 1	F-9
42	Eclipse No. 2	F-9
43	Eclipse No. 3	F-9
44	Eclipse No. 4	F-9
45	El Capitan	A-2
46	Emma H.	A-3
47	Ensign tunnel	D-9
48	Erie tunnel	D-9
49	Erie shaft	D-9
50	Eureka-Nest Egg	D-9
51	Eureka-Nest Egg No. 3	D-9
52	Eureka-Nest Egg No. 7	D-9
53	Evening Star	F-9
54	Exchequer	F-8
55	Flora Belle	D-4
56	Fluorspar Lode	B-7
57	Fort Scott	E-7
58	Garfield quarry	G-8
59	Garfield south adit	F-8
60	Garfield north adit	F-8
61	Gold Cup shaft	A-2
62	Gold Cup-Willow Creek adit	A-2
63	Golden Age	F-8
64	Golf tunnel	E-3
65	Graphite mine	B-3
66	Graphite mine	B-3
67	Gulch	E-7
68	Hawkeye	F-9
69	Hawkeye No. 3	F-9
70	Hercules	F-7
71	Hiawatha	D-7
72	Hubnerite Lode	A-3
73	Ida May	A-3
74	Indiana	A-2
75	Indianapolis	F-7
76	Ingersoll	G-9
77	Iron Chest	E-4
78	Iron Duke	F-7
79	Iron King	D-8
80	Isabel	D-9
81	Jewell tunnel	F-8
82	Jimmy Mack	A-2
83	Kentucky	D-5
84	Kickapoo	E-2
85	Lady Catherine	E-4
86	Lady Franklin	A-4
87	Lady Murphy	E-4
88	Last Chance	F-7
89	Legal Tender	E-8
90	Lewiston-Pet	D-8
91	Lilly (Tomichi district)	C-9
92	Lilly (Monarch district)	G-8
93	Lilly shaft (Monarch district)	G-8
94	Little Bonanza	E-4
95	Little Jessie	E-4
96	Little Orphan Annie	E-6
97	Macedonian	E-7
98	Madonna No. 0	F-9
99	Madonna No. 1	F-9
100	Madonna No. 2	F-9
101	Madonna No. 3	F-9
102	Madonna No. 4	F-9
103	Madonna No. 5	F-9
104	Madonna No. 6	F-9
105	Magna Charta tunnel	D-8
106	Maid of Athens	A-4
107	Maid of Erin-Silver Pick	D-9
108	Major	G-8
109	Mammoth	A-3
110	Marble quarry	F-8
111	Mary Murphy No. 4	E-4
112	Mary Murphy No. 7	E-4
113	Mary Murphy No. 14	E-4
114	Marshall tunnel	F-9
115	Mason	E-7
116	Matilda	E-2
117	Maverick tunnel	F-8
118	May	D-9
119	May Queen	E-5
120	Mazeppa	D-9
121	Michigan Group	E-5
122	Missouri Boy	G-8
123	Molybdenite	A-3
124	Mohammed	E-7
125	Monarch Contact	F-9
126	Monarch quarry	F-9
127	Moose	E-7
128	Morning Glim tunnel	D-9
129	Morning Glory	A-3
130	Morning Star shaft	D-9
131	Morning Star, upper tunnel	D-9
132	Morning Star, lower tunnel	D-9
133	Moss Flower (Half Moon)	F-8
134	Mountain Chief	F-7
135	Napoleon	A-3
136	National	A-3
137	Neglected	F-7
138	New York	F-7
139	North Pole	F-5
140	North Star	D-9
141	North Star-Dividend shaft	D-9
142	Occident	A-3
143	Ohio and Colorado quarry	F-8
144	Overland shaft	F-2
145	Overland No. 1	F-2
146	Overland No. 2	F-2
147	Overland No. 3	F-2
148	Overland No. 4	F-2
149	Page	F-8
150	Parole tunnel	D-8
151	Paymaster	F-9
152	Porcupine	A-3
153	Portland	E-4
154	Pride of the West tunnel	E-5
155	Princeton tunnel	C-8
156	Rainbow-Eagle Bird	G-7
157	Robert E. Lee	A-2
158	Robert E. Lee No. 2	A-2
159	Shamrock	G-8
160	Silent Friend (Quartz Creek district)	A-5
161	Silent Friend No. 1 (Monarch district)	F-9
162	Silent Friend No. 2 (Monarch district)	F-9
163	Silent Friend No. 3 (Monarch district)	F-9
164	Silent Friend No. 4 (Monarch district)	F-9
165	Silver Cord	C-9
166	Silver Cup	A-2
167	Silver Dollar (Alice)	C-8
168	Song Bird	G-7
169	St. Elmo Queen	E-3
170	Stanley	E-4
171	Stemwinder	F-7
172	Stonewall shaft	D-5
173	Stonewall tunnel	D-5
174	Sylvan Dell	A-2
175	Tenderfoot	D-9
176	Thirty-Six-Thirty	G-9
177	Tilden	F-3
178	Tincup	A-2
179	Tom Cat	G-5
180	Tom Payne	F-5
181	Tressa C.	E-4
182	Tweed	E-8
183	Uncle Sam (Hoffman Park)	F-7
184	Uncle Sam (Cyclone Creek)	F-5
185	Victor shaft	D-9
186	Victor tunnel	D-9
187	W. and A. incline	D-9
188	West Gold Hill	A-2
189	West Point	D-9



GEOLOGIC MAP AND SECTIONS OF THE GARFIELD QUADRANGLE, GUNNISON AND CHAFFEE COUNTIES, COLORADO

Scale 1:31,680

Contour interval 50 feet
Datum is mean sea level

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.