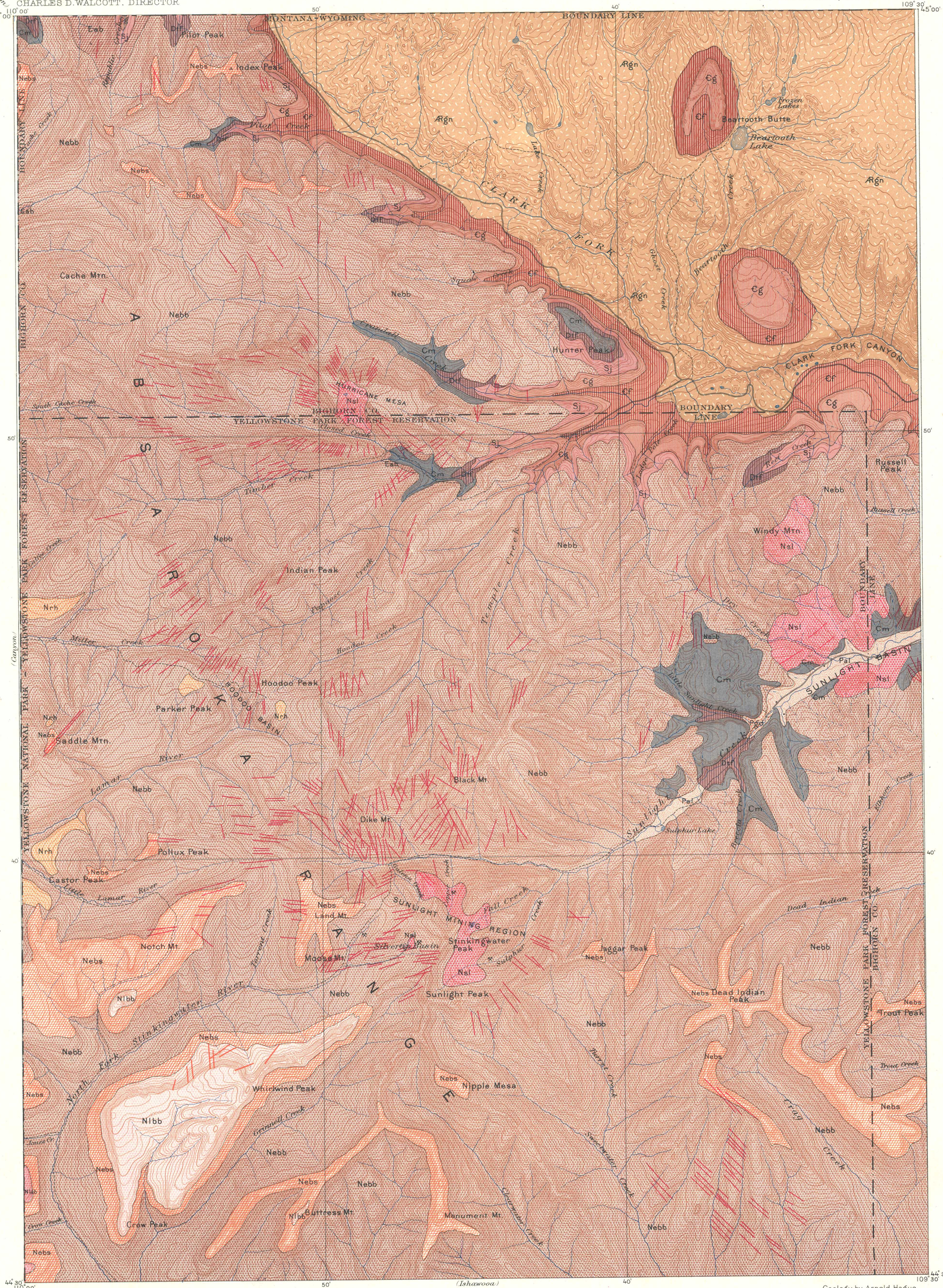
U.S. GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

HISTORICAL GEOLOGY SHEET

WYOMING
CRANDALL QUADRANGLE



(Livingston) 250000

A.H. Thompson, Geographer.
Triangulation and Topography by Frank Tweedy.
Surveyed in 1893.

Scale $\frac{1}{125000}$

1 ½ 0 1 2 3 4 5 Miles

1 ½ 0 1 2 3 4 5 Kilometers

Contour interval 100 feet.
Datum is mean sea level.

Edition of May 1899.

Geology by Arnold Hague.
Assisted by Joseph P. Iddings
and Thomas A. Jaggar, Jr.
Surveyed in 1893 and 1897.

LEGEND

SURFICIAL ROCKS

(Areas of Surficial rocks are shown by patterns of dots and circles.)

PLEISTOCENE

- **Pal** — Alluvium *(gravel and clay forming the stream bottoms and terraces along the valleys)*
- **Pgd** — Glacial drift *(gravels, clays, and sands, distributed by glaciers of local origin.)*

SEDIMENTARY ROCKS

(Areas of Sedimentary rocks are shown by patterns of parallel lines.)

CARBONIFEROUS

- **Cm** — Madison limestone *(massive cream-colored limestone above, thinly bedded blue-gray limestone below)*

DEVONIAN

- **Dtf** — Threeforks limestone *(massive gray limestone, frequently shaly and argillaceous)*

SILURIAN

- **Sj** — Jefferson limestone *(light-colored limestone, forming a persistent cliff, with black or brown limestone above)*

CAMBRIAN

- **Ꞓg** — Gallatin limestone *(massive, mottled limestone overlain by thin-bedded limestone)*
- **Ꞓf** — Flathead formation *(limestone, shale, and quartzite)*

IGNEOUS ROCKS

(Areas of Igneous rocks are shown by patterns of triangles and rhombs.)

NEOCENE

- **Nrh** — Rhyolite *(massive flows of acid lava, carrying crystals of quartz and sanidine)*
- Ishawooa dikes *(basic and acid dikes cutting the late basic breccia)*
- **Nlbb** — Late basic breccia *(rocks of similar mineral composition to the early basic breccia, but of later age)*
- **Nlab** — Late acid breccia *(similar in composition to the early acid breccia and containing fragments similar to the Ishawooa intrusives of the Ishawooa quadrangle.)*
- Sunlight dikes *(pyroxene-andesite, basalt, absarokite, and related rocks cutting the early basic breccia)*
- **Nsl** — Sunlight intrusives *(massive gabbro-diorite and syenite bodies cutting the early basic breccia.)*
- **Nebs** — Early basalt flows *(dark-gray or black rocks separating the earlier series of breccias from the later series)*
- **Nebb** — Early basic breccia *(fragments of pyroxene-andesite, hornblende-pyroxene-andesite, and basalt associated with basic lava flows)*

EOCENE

- **Eab** — Early acid breccia *(fragments of hornblende-andesite and hornblende-mica-andesite, light-colored)*

UNCLASSIFIED CRYSTALLINE ROCKS

(Areas of metamorphic rocks of unknown origin are shown by patterns of short dashes)

ARCHEAN

- **Ærgn** — Granite and gneiss

⚒ *Silver and copper mines*