cipally galena, anglesite, mimetite, and wulfenite, with very little quartz and calcite, the gangue being for the most part hydrated oxide of iron. It also carries gold and silver, and zinc is present probably as a silicate. Below the water-level it is composed chiefly of pyrite, arsenopyrite, galena, blende, and a few other sulphides, besides silver and gold.

The ore-deposits are confined to a mass of crushed limestone between the main fault and the quartzite. Those of any size are always capped by caves, or in some way connected with them and with fissures. The caves were probably formed subsequent to the deposition of the ore, being due, partly to the action of water carrying carbonic acid, and partly to shrinkage of the ore from decomposition. Since the latter occurred, the ore has in many instances been redistributed by the flow of underground waters, whose former presence is indicated by stratification of portions of the ore-bodies, and by traces of aqueous agencies in the surrounding limestone.

The constituents of the ore were probably derived by solution from some massive rock, not sedimentary, as assays of the country rock show that they could not have been so derived. The solutions were due to solfataric action, incident to the eruption of large masses of rhyolite. They entered the limestone from below, through fissures; and the greater part, at least, of the ore, was deposited by direct substitution for that rock. The limestone was fissured and crushed in many directions by the various faulting movements, and gave free ingress to the ore-bearing solutions, which naturally followed the channels of least resistance, and deposited the ore in masses of very irregular form. These are well shown in the model.

From the year 1869 up to the present time (1884) the Eureka district has produced about sixty million dollars of gold and silver, and about two hundred and twenty-five thousand tons of lead: and, as already stated, the largest portion of these metals was derived from the Ruby-hill mines.

TWO LARGE SUN-SPOTS.[1]

THE figures of sun-spots given with this article are from drawings made at the observatory at Palermo, and represent two of the largest spots observed during the last two years, so remarkable for the number of spots seen. Not only was their extent (which is readily appreciated by comparison with the figure of the earth given on each plate) immense, but the changes which were seen to take place were most rapid.

The first appeared on the eastern limb of the sun on June 25, 1883, about at latitude +7° 55′. After undergoing various transformations, it offered, on the 30th of June, the curious aspect shown in fig. 1. The spot was double; and its extreme length from east to west was not less than ten earth diameters, or about 3′. Considerable movements were agitating it. Two days afterward, on the 2d of July, the two parts had separated, and between them the photosphere shone with marked whiteness. From day to day this separation increased, until the 8th, when the spots disappeared on the western limb, after a deviation toward the north of 2° 30′. From the 28th of June to the 2d of July, long, brilliant tongues, ending in

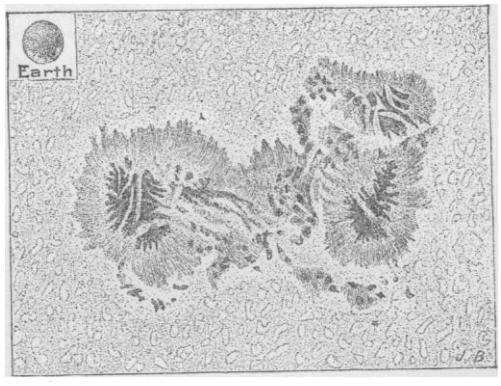

FIG. 1.

red hydrogen flames, were seen extending into the umbra; and a yellow coloring was observed on the penumbra and on some of the tongues, perhaps due to the presence of sodium (fig. 2).

This large spot was preceded and followed, on the limbs of the sun, by small but brilliant solar protuberances. It returned July 2, at latitude 8° 11′, much smaller and more regularly shaped, to make once more the tour across the disk of the sun, and disappeared at latitude +8° 23′, not to be seen again.

The second spot (figs. 3 and 4) was first seen on the

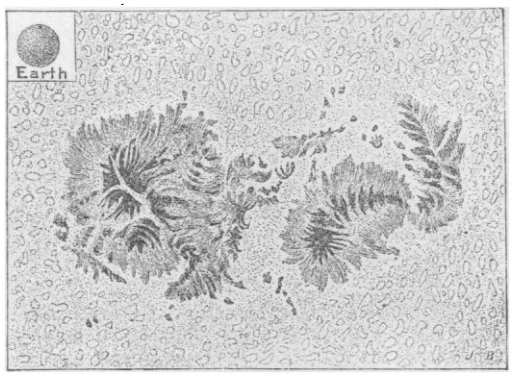

FIG. 2.

eastern limb, on the 10th of July, in latitude −7° 40′. It offered a strange appearance, and appeared to be the seat of much disturbance. On the 25th the centre was covered with luminous points which were in constant motion; and some strange lines of light seemed to be suspended over the umbra. The diam-

[1] Reproduced, with the cuts, from *L'Astronomie*.

eter of the spot itself was six times that of the earth, about 1′ 46″; but the portion of the sun's surface which was affected was much larger. By the 27th the secondary spots (fig. 4) which accompanied it had become much less conspicuous, while the spot itself was the more marked, and curved tongues above it indicated great activity. From that day the spot began to diminish, and become more regular. On the 1st of August it reached the west limb, in latitude −11° 13′, having consequently moved 3° 33′ toward the south. The appearance of this spot was heralded on the eastern limb by small, very brilliant chromospheric flames; and its disappearance was followed by small but brilliant protuberances, and by the reversal of the coronal ray 1474k. It returned on the east at latitude −10° 15′, but only as a couple of small dots, which vanished on the 21st.

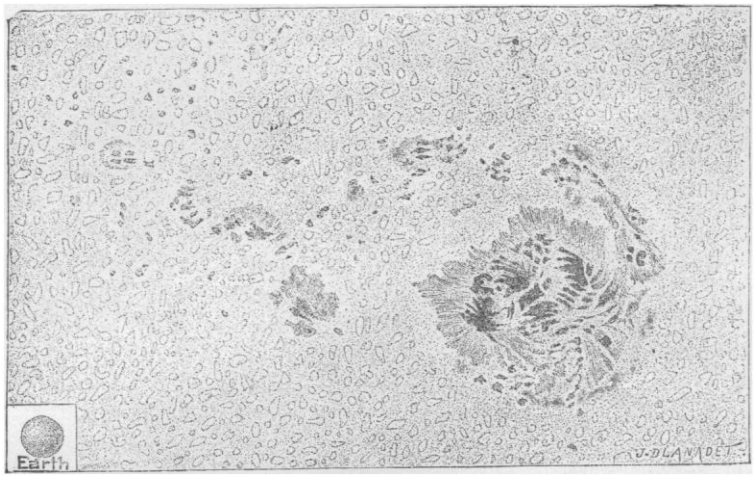

FIG. 3.

It is worthy of remark, that these two large spots were formed almost at the ends of the same solar diameter, and that each showed a motion towards the pole of its respective hemisphere.

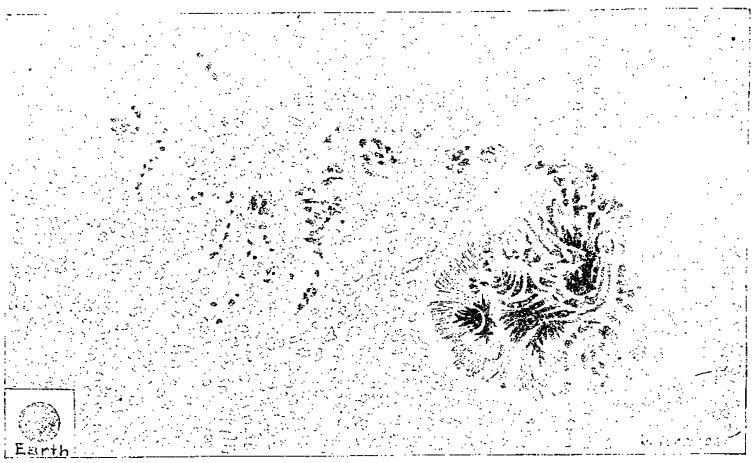

FIG. 4.

NEW VOLUME OF THE TENTH CENSUS.

THE eighth volume of the census of 1880, just issued from the government press, a bulky quarto of about twelve hundred pages and many plates and maps, is a curious medley, discussing as it does such diverse subjects as the newspaper and periodical press, the resources and sealeries of Alaska, and our ship-building industry. The appearance of these monographs under one cover is clearly a matter of convenience of distribution only.

The first portion, dealing as it does only with the political and literary press, hardly needs our special attention.

The report on the population, industries, and resources of Alaska, by Ivan Petroff, occupies a hundred and seventy-seven pages, while that on the seal-fisheries and collateral topics, by Henry W. Elliott, covers an equal number, not including indices.

As must always happen when reports of a frontier region remain unpublished for four or five years, the picture presented by them is chiefly useful for comparison with preceding or subsequent reports of the same kind. That there should, at the time of publication, be a considerable gap between the state of things as presented in the report, and their actual state, is inevitable; but perhaps in none of the census reports is