The invention of the square set system of timbering was made by Philip Deidesheimer, while superintendent of the Ophir mine, on the Comstock Lode, in 1860.

In Monograph IV of the United States Geological Survey, "Comstock Mining and Miners," the following reference is made, which will be found interesting under this heading:

"At the 50-foot level (of the Ophir mine) the vein of black sulphurets was only 3 or 4 feet thick, and could readily be extracted through a drift along its line, propping up the walls and roof when necessary, by simple uprights and caps. As the ledge descended, the sulphuret vein grew broader, until at a depth of 175 feet it was 65 feet in width, and the miners were at a loss how to proceed, for the ore was so soft and crumbling that pillars could not be left to support the roof. They spliced timber together to hold up the caving ground, but these jointed props were too weak and illy supported to stand the pressure upon them, and were constantly broken and thrown out of place. The dilemma was a curious one. Surrounded by riches, they were unable to carry them off.

"The company was at a loss what to do, but finally secured the services of Philip Deidesheimer, of Georgetown, California, who visited and inspected the treasure-lined stopes of the Ophir."

During Mr. Deidesheimer's engagement at the Ophir, all the principles of square set timbering were evolved, under his immediate supervision, and the wide and rich ore bodies occurring in that mine were successfully extracted without the loss of ore or injury from caving by the use of this system. The system was then used in all the mines on the Comstock Lode, and subsequently, in all metalliferous mines elsewhere where the ore bodies exceed a width of 15 feet, the extreme width that is practical to timber by stulling.

The "square set" has undergone numerous modifications of detail in dimensions and the framing of its members in the various camps where it has been since used, owing mainly to local conditions, the dip of the vein and the character of the ore bodies and the enclosing rock.

Vein Characteristics at Rossland.—In the Rossland mines, the ore deposits have widths ranging up to 100 feet or more, and lengths of several hundred feet along the veins. The veins are sheer zone fissures, the vein filling consisting of country rock, which is now found replaced and cemented to various degrees of completeness by auriferous pyrrhotite and chalcopyrite.

The ore and the enclosing rock may be designated as extremely hard, and the veins dip at angles of about 70 degrees. These conditions facilitate and simplify timbering, without, however, doing away with its necessity.

Preliminary Work.—In stoping out these deposits the work is begun at the level drives or drifts run in the vein and continued upwards in steps or stopes.

The first work in opening up an ore chute or deposit preparatory to extraction consists of running drives or drifts through it from the level stations at the shaft, which are generally cut at distances of from 100 to 200 feet in depth below each other. Such drives may happen to be run along either wall of the vein, or through the vein at any point or distance (usually varying) from either wall.

These drives are considered as random bores, made longitudinally through the vein to determine, in a general way, its course or strike, and the behaviour and characteristics of the ore chute. They serve, besides, as preliminary thoroughfares for the traffic, drainage and ventilation necessary for the preparatory work of stoping, to be hereafter described.

As generally run, the drives have widths of about 6 feet, and heights of about 8 feet, and require no timbering, owing to their comparative small size and the hardness of the vein rock.

When it is decided to begin stoping on any new level, the first work done is to excavate the ore along the drives from wall to wall of the vein, making the excavation of sufficient height to receive the "sill floor" set of timbers, as the first series of square sets on the level is called, and to leave a space of 2 or 3 feet over the set. This space serves to provide room for blocking and wedging the timbers to place, and to receive a layer of old timbers, which act as a cushion in preventing the possible breaking of the timbers by the masses of rock that must be blasted down on them as the work of stoping out the ore above proceeds.

Sill Floor Construction.—The sill floor is a framework, made of 10x10-inch sawed timbers, laid down on the working level in the ore body; they serve as the sills or foundation timbers on which the square sets are to be erected. It is, therefore, the first, as well as the most important part of the square set system of timbering.

Figure 1,-plate 1, shows the sill floor as laid down and ready to receive the "sill floor set" of timbers. The members of the sill floor consist of three pieces the stringer or long sill, the spreader or short sill, and the butt spreader or brace. These members, when repeatedly laid in duplicate, will make up a sill floor to any extent required by the size of the deposit.

The dimensions and details of the framing of these members are shown on the plate.

The long sill measures 15 feet over all, and is framed from a 16-foot timber, which allows 6 inches to be cut from either end to square the piece and remove sun cracks.

The short sill, as framed, measures 5 feet 4 inches in length, over all, three of which may be cut from a 16-foot timber, if it overmeasured a few inches, as it generally does, and the ends are sound.

The butt sill or brace is framed of varying lengths, to suit the existing space, which generally varies owing to local bulgings or contractions of the vein. It is framed on one end exactly like the short sill, while the other is cut square or beveled to fit or butt against the wall rock, from which it is wedged tightly to place against the long sills.

A description of the method of framing the sill floor set of timbers is not needed, as it will be fully comprehended by a glance at the figures on the plate.

In laying the sill floor the long sills are set ends abutting flush against each other and as nearly as possible parallel with the general strike of the vein, ignoring any local bulging of the walls.

The first sill is laid close and approximately parallel to the foot wall, in which position it is levelled and