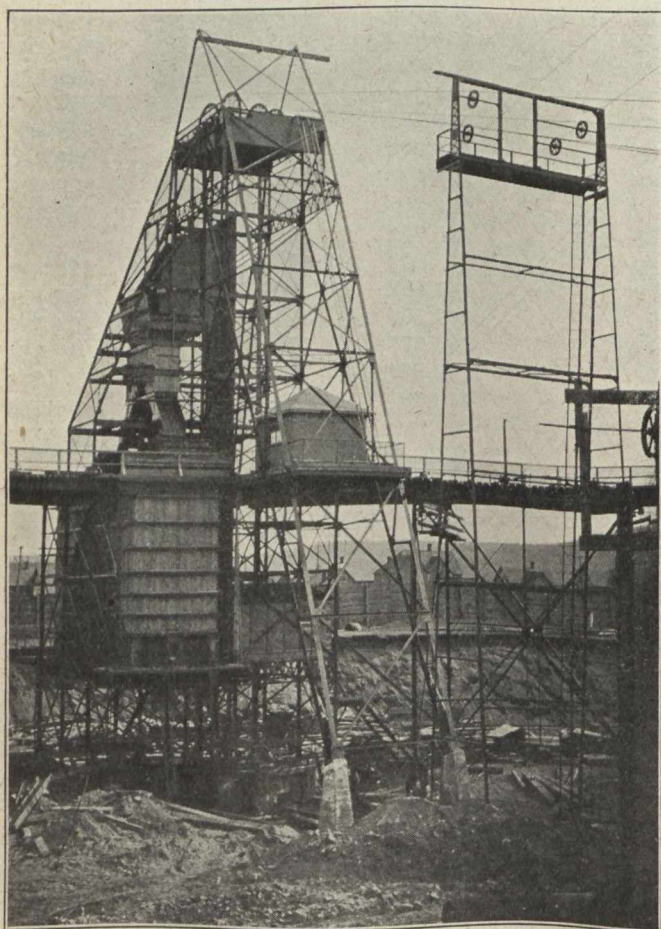


SINKING A SHAFT

By P. B. McDonald.

Of all the stubborn and ticklish jobs that confront a mine management, none is capable of more kinds of unexpectedness than shaft-sinking propositions. Mine superintendents recognize, as a rule, that sinking a shaft is no easy business, and consequently put on their best miners in three shifts to get the thing done. When it is done, they heave a great sigh.

Shaft-sinking can mean sinking from surface (with possibly sand and water problems), or deepening a shaft underground, or starting a winze in some new part of the mine, or raising a shaft from underground to meet another opening from above.



Head Frame at Maas Mine. Moved aside during concreting of shaft.

Shaft-sinking in nearly any form means look out for accidents, caves, water, getting-out-of-line, and general hell-to-pay. Somehow things happen fast at shaft-sinking.

A very great advance has been effected in shaft-sinking methods of late years. With the development of big, low grade ore deposits by "permanent" shafts and expensive equipment, the tendency has been toward fewer shafts and concentration of plant, both on surface and underground. The installation of electric haulage underground makes it possible to serve a considerable area with one main hoisting shaft.

The selection of the site for a main hoisting-shaft may well be the occasion for careful study, and sometimes develops into arguments among the mine officials. Beside the railroad spur or ore-loading considerations, there is the matter of whether it is better to

put the shaft down in the spot best adapted for serving tramming in the mine, or to pick the place where sinking is liable to be easiest. One iron mine at Iron River, Michigan, has its main hoisting shaft hundreds of feet back in the footwall, because to sink nearer the orebody would mean \$50,000 for a shaft through quicksand. Another company put its shaft down where it wanted it, and paid the \$50,000, figuring that years of tramming expense would be saved, and that, as the superintendent said, "the best way to do a thing is to do it."

The two most significant factors of late years in shaft-sinking at the 200 great mines of the Lake Superior iron and copper regions have been: concrete and the Jackhamer drill. To these might be appended the compressed air caisson for sandbags and drop-shaft work; but that is rather a special treatment not of interest except in quicksand.

The Jackhamer (a self-rotating, hammer-drill of the plugger or hold-in-your-hands type), has proved immensely popular at Lake Superior for shaft-sinking. It has four decisive advantages for this work over the customary, two-man reciprocating drill mounted on tripod or bar. They drill faster; twice the number can be used in a confined space; they can be hoisted out of the way expeditiously in a bucket when it is blasting time; they need no rigging up. Nearly all of the shaft-sinking on the Iron Ranges for the past two or three years—and there has been a good deal of it—has been accomplished by Jackhamers. In the Copper country, where vertical shafts (in which Jackhamers show up best), are as infrequent as inclined shafts at the iron mines, the Jackhamer does not excel so evidently, especially in shafts of low dip, as in the upper horizons of the Keweenaw series. (Incidentally, however, it may be remarked that Jackhamers in the copper mines have proven particularly efficacious for prospecting for copper on the sloping footwall in old or new stopes, as at Wolverine, Quincy, etc.)

Monthly records at sinking with Jackhamers on the Iron Ranges at shafts where system and celerity were unusually emphasized, have been the cause of considerable pride among the miners and bosses.

Concrete is not necessary for shaft-sinking in a hard, tough rock that is not very wet. In the broken up, sedimentary, more or less oxidized formations of the Iron Range, where water abounds in greater quantities than even the all-prevalent red stain of iron, concrete for a shaft-lining is at its best. It holds back whole lakes and swamps of water. The Maas mine of the Cleveland-Cliffs Iron Co. at Negaunee, Mich., replaced a few years ago at great expense its not-very-old timber shaft through sand of over a hundred feet by a solid monolithic tube of concrete, because Teal lake nearby was slowly draining into the Maas shaft with tendencies to twist and buckle the heavy timber structure that had taken nearly superhuman efforts to sink. For lining soft, wet rock shafts, concrete can be put on in slabs or squares made on surface. Some thousand foot shafts relined in this manner have given excellent satisfaction. Or it can be put in place directly. The use of steel alone for permanent shaft-timbering was considered by iron mining operators in Michigan, but concrete was preferred, since the formations are so wet.