

ZINC MINING IN KANSAS.

BY HARRY L. WOHLFORD.

From a small triangular area in southeastern Kansas—perhaps six miles wide at its base and ten miles high along its side—there have been mined, during a period of twenty-four years, lead and zinc ores to the value of more than thirty million dollars. The entire region presents a most curious aspect to the mining man from further west. On the surface may be seen the farmer busy with his grain or among his stock, while beneath him fifty, a hundred, and sometimes two hundred feet, the miners are toiling with pick and drill and blast. The discovery of mineral was made here in April, 1876, and since that date the productiveness of the mines and the working of them have continued unabated.

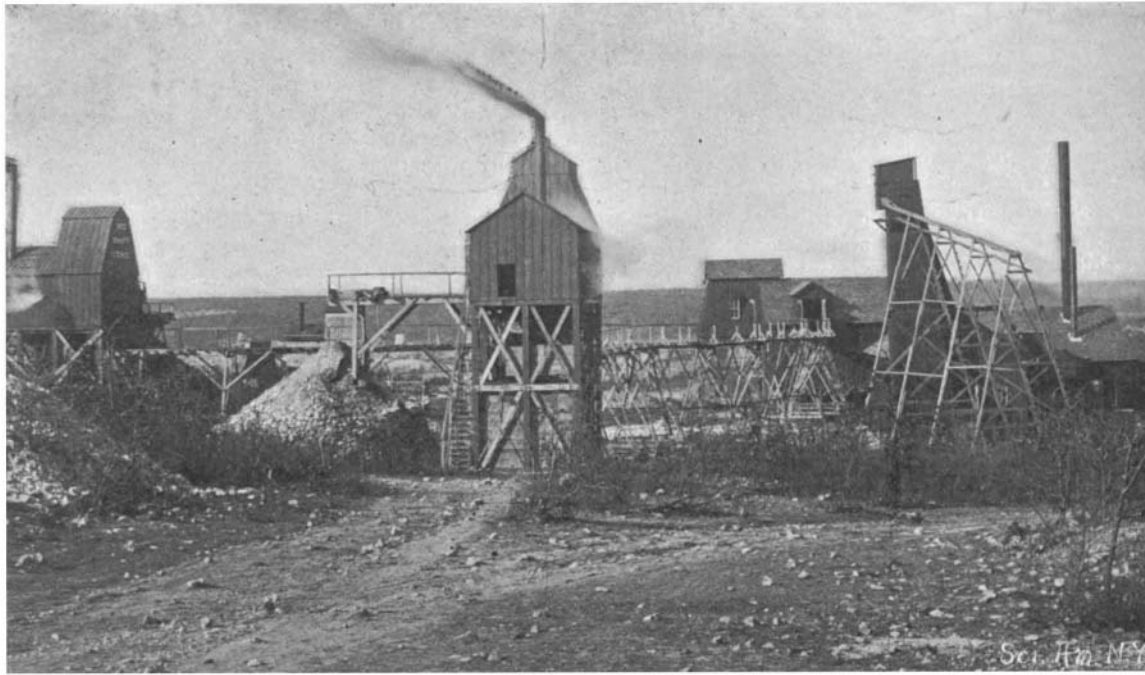
The galena, or lead ore, is the ordinary lead sulphide (PbS). It is a dark bluish black in color and is usually found in the form of cubes, varying in size from a pinhead to blocks six and eight inches across their face. There are also found here two, and in some localities three zinc ores, though the most important one is the common zinc sulphide (ZnS), containing about 67 per cent metallic zinc. When first brought to the surface its colors are widely diversified, many blocks forming the most beautiful specimens imaginable. Some retain their brilliancy indefinitely, others again lose their bright hues after a short exposure to the atmosphere. The miners have coined names for these multicolored ores, and they are known respectively as "rosin jack," "gray jack," "black jack," "peacock jack," etc., the last-named possessing colors with which the rainbow can scarcely vie.

Together with the lead and zinc ores are found a number of secondary ores and minerals. One of these is a double sulphide of iron, or "mundi," as the miners term it, having a specific gravity of 4.95. Its admixture with clean zinc is closely guarded against, as a small per cent of this impurity greatly affects the marketable value of the clean ore. Perhaps the most abundant of all the associate minerals is a calcium carbonate known locally as "tiff." It assumes various forms, though the most common one is crystalline. Some of the pieces taken from the ground are ravishingly beautiful, with their clustered crystals flashing in the sunlight and their translucent whiteness in sharp contrast against the somber colored blocks of lead. Aside from the ones mentioned there are yet other adulterants found in connection with the lead and zinc ores. One of these is a barium sulphate ($BaSO_4$), the other a calcium fluoride (CaF_2), though neither occurs throughout this district to any considerable extent.

The early history of the Short Creek district is one of crude methods, scanty results and illogical deductions. The mines were little else than surface prospecting, and the general opinion among the miners was that the ore deposits were of a superficial character and that no lower-lying bodies of ore existed. Since then strongly capitalized companies have taken in charge many tracts of land, deemed practically exhausted, and by means of huge centrifugal pumps have so thoroughly drained the ground that now deeper prospecting is found to be not only possible, but lucrative as well. Positive proof is shown by these deeper operations that greater bodies of ore lie below than above the hundred-foot level. The most rudimentary methods were employed by the early-day prospectors. A hoister-crane, dangerously weak-looking, with an ox or a slow-moving horse for motive power, a half barrel for a tub, and a sluice-box planted in the nearest stream, is a general description of the

average prospecting outfit. Now steam has taken the horse's place and the hoister sweeps and great iron tubs have forced the half barrels into the rubbish heap.

But of all the changes made, perhaps the most radical one was in the method of washing the ore-bearing earth. The sluice-box gave place to an affair known as a "jig tank," a large square box filled with water in which was suspended from uprights fastened at either



A TYPICAL KANSAS ZINC-ORE REDUCING MILL.

side an oblong trough, whose flat bottom was formed of iron bars. The interstices between the bars permitted the water in the larger box to pass upward through the wash-dirt in the trough, as it was raised and lowered by means of a long pole attached to a crosspiece above it. The wash of the water between the bars causes the ore, being the heaviest, to sink to the bottom of the trough, so that the flint and other waste might be shoveled from the top.

The crushers or mills throughout the district are capable of crushing and cleaning, during a shift of ten hours, from fifty to one hundred tons of ore-bearing rock at a cost ranging from ten to fourteen dollars per ton, much depending on the richness of the dirt and the facilities for rapid handling. The cost of one of these monsters is quite an item. Nothing worthy the name, even, can be erected for less than five thousand dollars, while many reach an approximate cost of from ten to twelve thousand.

There are now in the district more than a hundred mills, the greater part of them having been erected during the years 1899 and 1900.

Very little mining land is sold, the owner generally preferring to lease the ground on a royalty to some

and the waste during transit reduced to the minimum.

Antwerp in Belgium is progressing rapidly to the front as a consumer of American zinc. At present writing there has been pledged, by the producers in the Kansas zinc fields and the adjacent district in Missouri, more than a thousand tons weekly to the firm of J. Needham's Sons, of Antwerp. The through shipping rate will be less than six dollars per ton to land the ore in that city. It is fully believed by all the producers and operators in the two districts that this immense foreign market will very effectually regulate the price of zinc ore in the United States.

Mine ownership here is well distributed among the laboring class, and universal satisfaction and good will is always maintained. The fact that the mines have been operated since their discovery without a strike or labor trouble of any kind is ample proof of the feasibility of the system.

A CLEVER SALVAGE FEAT

We publish herewith a photograph relating to a unique salvage feat that has recently been accomplished in England. During the night of March 25 last, the steamship "Dinnington," while trying to make Portland Harbor during a heavy gale, was wrecked upon the outer arm of the new breakwater that is being constructed at Portland for the British Admiralty. The captain of the vessel missed the entrance and ran upon the rocks at full speed. It was high tide at the time, and a heavy southeasterly sea was running. The contractors for this breakwater have only just completed the submerged portion of the work, so that at high tide the structure is covered. A comprehensive idea of the speed at which the vessel was traveling at the time of the disaster may be gathered from the fact that she nearly jumped over the breakwater. There could not have been more than two feet of water covering the rocks at the time. The ship was caught by the rocks right amidships, and at low tide she was in the perilous position shown in our photograph. Four tugs were dispatched to her assistance, since it was thought that the damage to her hull was purely superficial, and that she could easily be hauled off. The combined power of these tugs, however, failed to move her, and closer examination proved that a sharp rock had penetrated her bottom amidships and she was jammed upon this as if fixed upon a pivot. The action of the waves severely bumped her upon the rocks, with

the result that several other holes were soon torn in her sides, and she rapidly filled with water. After several attempts to salvage her she was abandoned by the underwriters, and it was proposed to destroy her.

At this juncture, the West of England Salvage Company of Penzance offered to recover the wreck. The work was pursued under the superintendence of Capt. W. E. Anderson, the officer engaged by the American government to report upon the disaster to the battleship "Maine." The task was beset with innumerable difficulties. The wreck was fully exposed to the fury of the southeasterly gales, which at that time of the year were raging furiously. On two occasions he had completed his arrangements for towing her off the

rocks, but each time had to abandon the work on account of the gales springing up and destroying all his plans.

There was another danger. The constant bumping of the vessel by the motion of the waves was knocking her bottom all to pieces, and she threatened to slip off the rock that was holding her securely. There was a depth of 54 feet of water at the stern, but fortunately the weight of this was counterbalanced by a



S. S. "DINNINGTON" WRECKED ON PORTLAND BREAKWATER—AFTER END OF VESSEL LYING IN 54 FEET OF WATER.

person or company who in turn sublet it to the actual miner. The second lessee collects a royalty of 20 per cent from the miner, 10 per cent of which he in turn is assessed by the land owner.

All ore is weighed upon the company's scales, and it is to them and not to the actual owner of the ore that the buyer makes the check.

Ore intended for shipment to foreign markets is sacked, so that the handling of it is greatly facilitated,

heavy cargo which was stowed in her forward holds. By this means she was evenly balanced.

When the weather was once more propitious, Capt. Anderson hurried forward the arrangements for his next attempt to float her. He constructed a coffer dam six feet in diameter round the after end of the ship, and requisitioned the assistance of several powerful centrifugal pumps, the aggregate pumping capacity of which was 1,100 tons per hour. By this means the water in the after part of the wreck was soon removed, and with the aid of five powerful tugs he had the satisfaction of hauling her into deep water once more. The "Dennington" was towed into Portland Harbor, where she was temporarily patched up. She was then taken to Southampton by the salvage steamer "Greencastle."

A FEW REMARKABLE ARTESIAN WELLS AND THE USES TO WHICH THEY ARE PUT.

BY ERWIN HINCKLEY BARBOUR.

The traveler in eastern South Dakota and Nebraska is always duly impressed by the powerful flowing wells met with throughout this magnificent area. The conditions here seem to be favorable for artesian water, and wherever the general level is reduced by such rivers as the James and the Missouri, gushing wells seem a certainty, if drilled to a depth varying from 500 to 1,000 feet or more. The shales and limestones of the Carboniferous period form an underlying, impermeable stratum throughout this region. Upon these there rests a bed of 300 to 400 feet of very permeable sand of the Dakota Cretaceous. These are the finest water-bearing beds of the plains, and they are cased in above, even more effectually than below, by 1,000 to 2,000 feet of water-tight Cretaceous shale (chiefly Pierre) and bad-land clays (Oligocene). The beds are so tipped that there is a difference of several thousand feet between the eastern edge, where the great fountains occur, and the western edge, or the fountain head.

In the Rocky Mountain uplift, of which the Black Hills is but the most eastern spur, the western edge is thrust upward to an elevation of 5,000 to 6,000 feet higher than the eastern edge. The upturned edges of all of these beds are exposed along the eastern flank of the Rocky Mountains, ready to catch the falling rains, melting snows, and the mountain streams. On the lower levels, then, where this water-bearing Cretaceous is struck, flowing wells are so certain that to bore for water seems like tapping a water main.

When there is no friction or leakage the head would be equivalent to that of a column of water several thousand feet high. Hence, in spite of mechanical losses due to friction, etc., and to the natural escape of the water through leakage, a high pressure is to be expected, and is fully realized, in the great wells, which discharge large volumes of water, and even suffice to run mills and machinery. As an example of the

artesian well serving as an engine of some economic importance, a better instance could not be cited, perhaps, than that of the well at Niobrara, in Knox County, Nebraska, which, in addition to the work of pumping water and running the dynamos for the

Niobrara. From the stone-catcher the water is conducted to the mill, where it strikes the fans of a 4-foot Pelton wheel through a one and one-half inch nozzle.

It works perfectly, steadily, silently, and with no coal or ash to shovel, no engineer and stoker to pay. And, after first costs are met, it can be depended on for years of steady service without involving any additional outlay. In the event of fire, the full energy of the well is turned at the first alarm into the city mains, and the linemen, with hose have instant command of the situation.

Modern cities, boasting of the most approved systems, offer no better protection from fire.

than does this small Western town. At night the same water runs the dynamo and lights the place, besides filling the public reservoir—all of which seems like getting a great deal for nothing. After the energy of the water is expended on the Pelton wheel, it flows through a wasteway into a lakelet, and thence finds its way for three miles by a creditable little stream to the Niobrara River. A city might be founded on such a natural resource, for it seems assured that every wheel could be turned by this subterranean store of energy, which can be tapped indefinitely, and over many square miles of country.

Hundreds of these artesian wells are daily put to all sorts of commonplace uses, while here and there we find one engaged in work of a novel kind. One of these is the artesian irrigating plant on the Furgusson farm at Beaver Crossing, Seward County, Nebraska, where nine shallow artesian wells, none of them over 100 feet deep, make it possible to water 115 acres on short notice. The worse the drought, the better for the owner of such a farm.

The great Test Well at Lincoln, 2,463 feet deep, helps to supply water to Salt Lake, while the two wells at the Sulpho-Saline Baths of Lincoln supply water for the great natatorium of that institution. In Omaha a series of artesian wells add greatly to the beauty of various parks, by supplying fountains, streams, pools and lakes, the largest of which, seen on the Miller estate, covers some thirty acres. But of all the utilization of artesian water the most highly commendable and original seems to be that at Pierre, South Dakota, where three great wells perform the singular work of supplying water, natural gas, and electricity for the town. The discharge comes to the surface as

water, but, paradoxically enough, goes to the consumer as natural gas and electricity. Taking advantage of the discovery made shortly after the completion of the wells, that with the lowering of the pressure as the water escapes natural gas is liberated, the wells were piped into suitable retaining tanks and a sufficient quantity of natural gas was thus accumulated to supply the town and run the engines of the electric light plants as well as those of a 60 horse power pumping station.



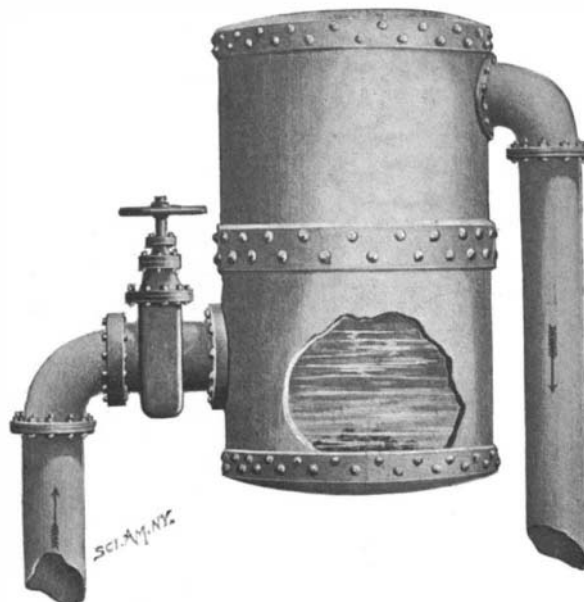
ARTESIAN WELL THAT DISCHARGES 11,158 GALLONS DAILY. DEPTH OF WELL, 1,303 FEET.



ARTESIAN WELL AT BEAVER CROSSING, NEB.—NINE SUCH WELLS MAKE IT POSSIBLE TO IRRIGATE 115 ACRES.

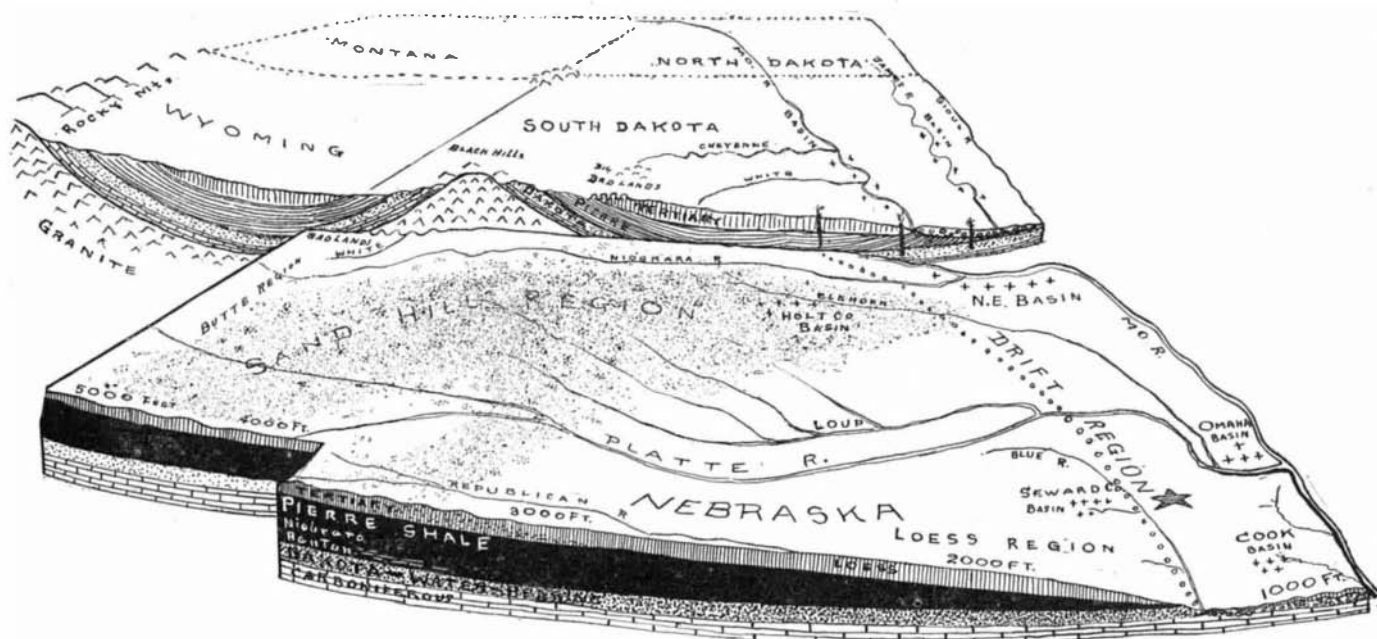
town, also drives the machinery of a 60-barrel flour mill.

The water flows through a 6-inch casing into a unique device called the "stone-catcher," the object



STEEL STONE-CATCHER AT THE HEAD OF ARTESIAN WELL.

of which is to arrest pebbles, small boulders, and stones, which are shot out with sufficient force to damage the steel casing and machinery. One such pebble, weighing 22½ pounds, is still preserved in



MAP DESIGNED TO SHOW THE RELATION OF THE BEDS TO THE ARTESIAN REGIONS IN NEBRASKA AND SOUTH DAKOTA.

The sandstone of the Dakota Cretaceous, some 300 feet in thickness, is encased below by Carboniferous limestones and shales, and above by shales chiefly of the Pierre. All beds dip downward from the mountains to the east, where the artesian regions occur.