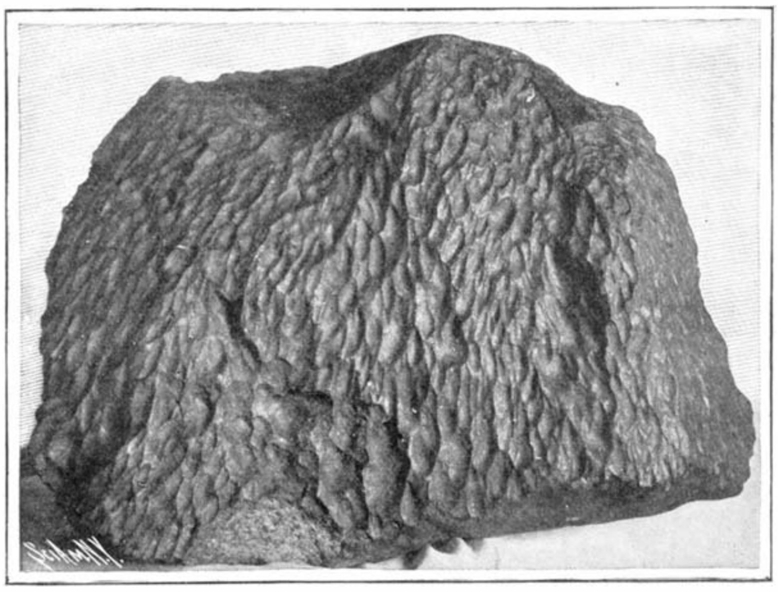
A NEW METEORITE RECENTLY PLACED IN THE AMERICAN MUSEUM OF NATURAL HISTORY.

On January 26 last there was placed on public exhibition at the Natural History Museum a new meteorite, one of the most remarkable of its class in the world. Prof. Henry A. Ward, of Chicago, read a paper before the regular meeting of the New York Mineralogical Club at the Natural History Museum, Wednesday evening, January 25, and gave a description of the meteorite. He stated that the Bath Furnace is an aerolite, or stony meteorite, which was seen to fall in the early evening of November 15, 1902, after a long luminous course through the heavens over Ohio and Kentucky, and its light was visible even to observers in Tennessee. Its course was N. 81 sec. E. until it reached the ground in Bath County, about fifty miles east of Lexington, Kentucky. The first description of the meteorite was published by Prof. Arthur M. Miller, of the State College of Kentucky. The few residents of the region where the pieces struck were much startled by the blinding light and the heavy detonations accompanying the fall. They spoke of the singing of the fragments as they flew through the air, and one eye-witness writes: "It sounded like a great buzz-saw ripping through a plank and coming at me through the air." Before striking the ground the mass broke into several fragments, three of which have been found.

The first-found piece fell at 6:45 P. M. in the road in front of the house of Buford Staten, near the old Bath Furnace, some five miles south of Salt Lake, and was picked up by him the following morning. It was about 8½ x 6 x 4 inches in extreme dimensions, and weighed 10 pounds 10½ ounces. It had cut a furrow about a foot long and three inches in greatest depth in the hard road where it first struck. A second piece, weighing half a pound, was found one hundred yards west of the first.

The third piece, the one which has now found a resting-place in the Ward-Coonley Collection at the Museum, was found by a squirrel hunter, Jack Pegrem by name, in May, 1903, about one and three-quarter miles south of the place where the other two pieces had been picked up. Mr. Pegrem's attention was attracted by a fresh scar on a white-oak tree some fifteen feet from the ground, and by the broken roots of a larger tree a few yards distant. Searching in the hole among the roots, he found a great stone buried less than two feet below the surface of the ground and crowded in among the roots, some of which had been severed by the collision.

This mass, as shown in the photograph, is one of the most completely furrowed and highly oriented aerolites known to science, and no other stone of American fall, at least, equals it in this respect. The mass is approximately a triangular prism in shape, and the furrowing of the bulging top and three sides is most complete. These furrows radiate from one point, or knob, in all directions, streaming back upon and over the sides. The regularity of the trend of the furrows is most interesting, as showing the steadiness of the mass in the air and the constancy of position of its axis, which doubtless was promptly taken after it entered our atmosphere and was retained throughout its whole flight. It owes this to the position of the center of gravity with reference to the shape of the mass.



BATH FURNACE NO. 3 METEORITE SHOWING A PECULIAR PITTED FORMATION.

In falling through space great heat occurs on the exterior of the mass, from which the melted particles are instantly brushed away as they form. It thus results that the brilliantly-glowing mass is in fact mainly cold. It brings with it the temperature of celestial space, which has been estimated at 504 deg. Fahrenheit below zero. This meteorite is thought to be the third aerolite in weight (184 pounds) ever found on our hemisphere. Iron meteorites run much larger.

The Bath Furnace aerolite, we find on examining its composition, is a base of fine, compact olivine and enstatite—both silicates of magnesia—with abundant sparkling points of nickel iron. It also has numerous white and gray spherical chondri of like material distributed through it, and breaking firmly with the mass. Its surface shows both primary and secondary crust.

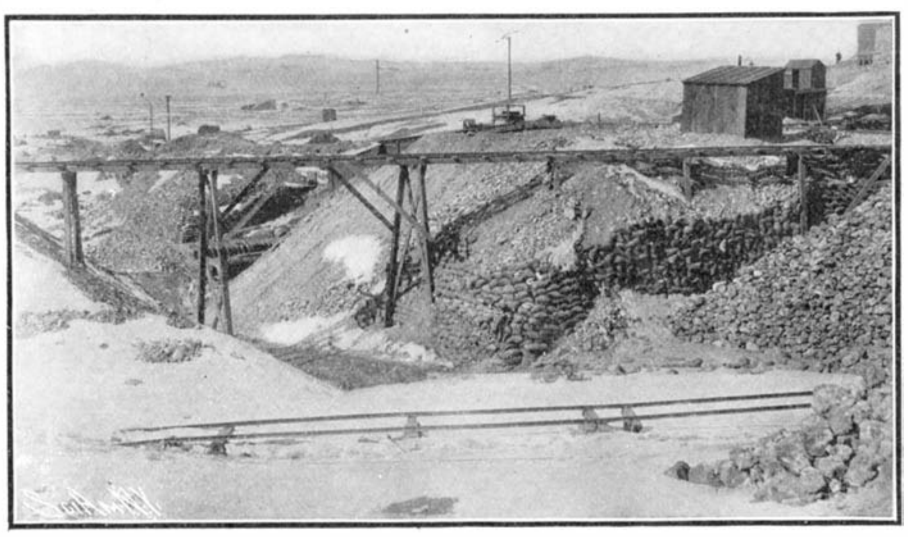
Its component minerals are allied to those of terrestrial volcanic rocks; but like other aerolites, it shows nothing of the melted slag structure of lavas. Stony meteorites apparently show us unchanged minerals from inner parts of the parent cosmic body. They bring us no new mineral elements, and a review of their chemistry shows that they yield only those elements which we know to exist on our globe. We may justly conclude that the most distant regions in stellar space contain only a repetition in varying proportions and combinations of the same elementary substances as obtain upon our earth.

Reichenbach has shown that a body like a meteorite, in falling through the atmosphere at the rate of forty miles per second, would have, by reason of air compression, a heat on its surface of over 7,200 deg. Fahrenheit, forming by melting and rubbing the peculiar glazing, pitting, and hollowing and channeling appearance which we find on the front and sides of meteorites.

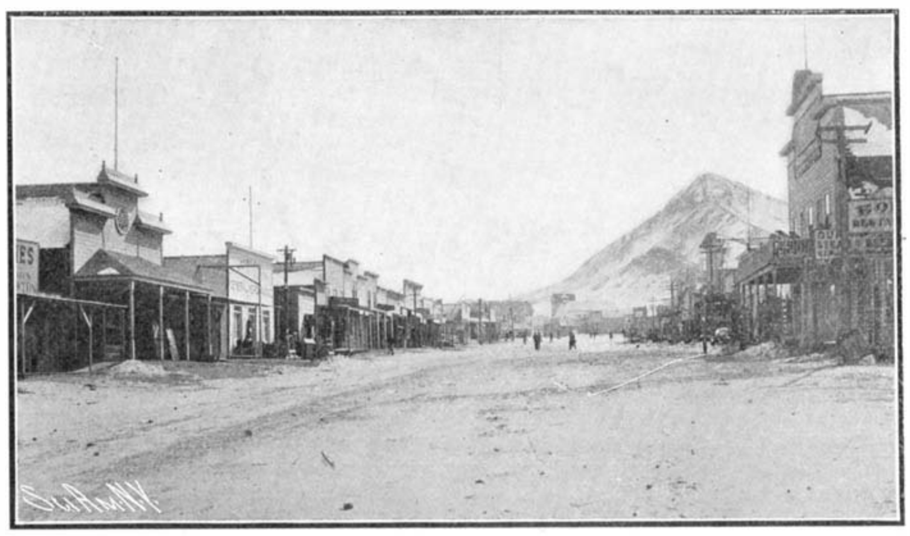
MODERN METHODS OF GOLD PROSPECTING AND MINING.

BY DAY ALLEN WILLEY.

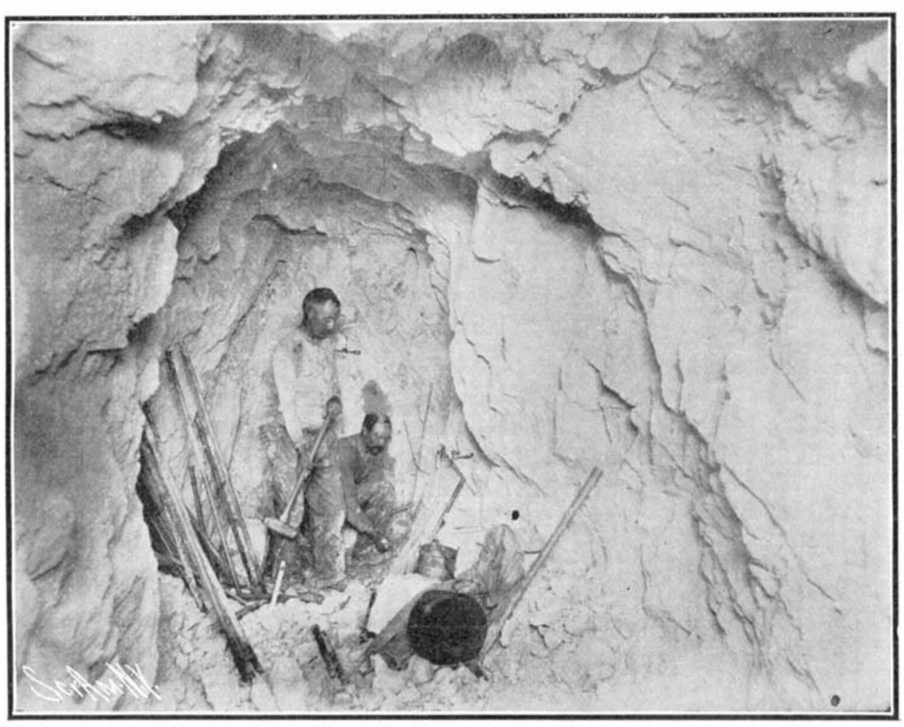
During the year 1903 the estimate of precious metal obtained from all of the districts controlled by the United States, outside of the Klondike, represented 25 per cent of the world's production of gold, and 33 per cent of the world's production of silver, being 3,600,000 ounces of gold and 56,500,000 ounces of silver. In 1895 the various States and Territories produced but 2,255,-



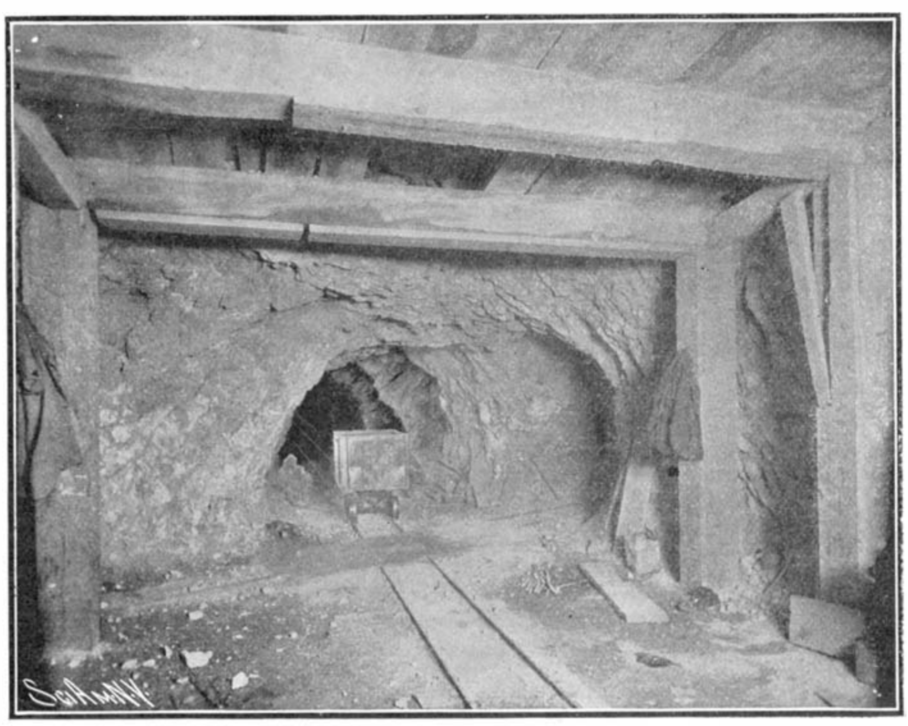
A Nevada Mine, Showing Piles of Ore Loose and Sacked for Shipment.



Street in Tonopah, One of the Mining Towns of Nevada.



Opening a Gallery From a Test Shaft to Secure Specimens of Ore for Analysis.



A Test Tunnel in the Rocky Mountains.

MODERN METHODS OF GOLD PROSPECTING.

000 ounces of gold. Consequently, the yield from the gold mines has increased 60 per cent in less than a decade.

In seeking the reasons for this truly remarkable development, one is especially prominent—the great advance which has been made in the methods followed by the modern gold seeker. The prospectors have taken advantage of progress in geology, chemistry, and other sciences, and have provided themselves with mechanical aids which are far superior to the crude implements employed by the metal hunters of the past. Their examination has not been confined to merely the bed of a creek or the side of a mountain, but often is so extensive that it embraces miles of area. Many a prospecting tour rises to the dignity of an expedition, and embraces a variety of apparatus, to say nothing of a staff of geologists and other experts.

In the old-fashioned system, as it might be termed, of seeking precious metal, the prospectors can be divided into two classes—those who are satisfied to obtain the metal in any form, and the "pocket hunters." The latter individual considers himself above the other type of prospector, terming his calling professional. Many a one has spent the better part of his life in exploring beds of streams and dry valleys in search of pockets. In southern Oregon the pocket hunters have been perhaps more numerous than elsewhere in the United States proper, as this section of the State has yielded a large amount of gold in this form. Pocket prospectors depend upon the pick, shovel, and pan as do their fellows, but they seldom dig further into the side of the bank or hill than their shovel will reach.

The ordinary prospector wades through the bed of the stream or tramps through its sand if it is "dry," here and there filling his pan with the material. Then immersing the pan in water, he thus separates the sand from the other matter, and gradually spilling out the sand, eagerly gazes at the bottom of the pan to note any glittering streak which may betoken the presence of gold. If he is working along the side of a hill where he believes the ledge of rock may contain a vein of gold-bearing ore, he breaks off likely portions with his pick, crushes them as best he can, and dumping the dust and fragments into his pan, repeats the separation process. In the examination of rock for metal-bearing ore the *arrastra* of the Mexicans and Spaniards has been used extensively, especially in California and Oregon. This contrivance consists of a vertical shaft or axis, which supports several wooden bars fastened at right angles to it. To the ends of the bars are attached heavy flat stones, which by the movement of the axis revolve in a circular pit. The specimens of ore are placed in the pit, a stream of water turned upon them, and the *arrastra* placed in motion by animal or water power. The ore is resolved into a slimy sediment by being ground in the water, and passes off through the sluiceway, which is provided with riffles for catching the gold.

The modern methods for searching for deposits of precious metal are so radically different from those described, that it may be said a revolution has taken place in prospecting in the United States. In the Rocky Mountain region the formation has been pierced as far as 2,000 feet in the effort to ascertain the existence of a vein, or the dimensions of one already discovered. Some of the projects which have been carried out preliminary to the opening of mines, represent an outlay of over a million dollars in the purchase of apparatus, the employment of noted experts, and in the general magnitude of the operations.

Among the mechanical appliances which have been of great assistance to the modern prospector is the drill. With it he can make borings in a week where if a shaft were sunk a year would be needed. If the formation is to be examined by a shaft, however, the cost of sinking it is reduced to a minimum by means of explosive cartridges, which are now manufactured especially for such service. They are ignited by means of the electric current, and it should be said that an essential part of the modern prospecting outfit is the chemical battery, which is not only of value for this purpose, but in the application of electrolytic methods to separating the precious metal from the dross.

Few expeditions of any size are sent out without an experienced geologist, who is usually provided with maps and other data giving the best information available regarding the region to be explored. Maps giving the extent of the claims, the direction of the veins, and the general topography of the region where the mine is to be opened are obviously of much value, and a draftsman is frequently included in the staff, with material for preparing the maps on the spot from the data obtained by the investigators.

Besides the geologist, the services of an expert chemist are also of great importance, and a laboratory in miniature is contained in the packs carried by the animals. So complete is this portion of the equipment, that a fairly correct field analysis can be made of the specimens secured by the use of the drill or by the other prospecting tools. If the outcropping of a quartz vein is discovered, enough is broken off to allow its character to be studied both from a geological and chemical standpoint. After examining it in connection with the formation in the vicinity, the geologist is often able to indicate where the surface can be bored with the possibility of reaching the ore-bearing strata at once. The value of the ore from the outcropping and that from the interior can be approximately determined by the chemist. To crush the ore is a slight undertaking, and with the lead which he has brought along, the material can be readily fused in a portable furnace. In fact, he has the essentials for making a "dry assay" on a limited scale, for cupels are now made of such light weight that they can readily be carried on muleback. Taking the ingot of lead and of precious metal, he can easily oxidize the lead by placing it in his cupel, and heating the latter to the required temperature in an oven constructed of material which he can obtain in the vicinity. With his nitric acid he separates the silver which may remain, leaving the gold only to be tested for its value. The proportion of the gold to a given quantity of ore can be determined by his scales, but by using his touchstone or black basalt, he can detect the quality of the gold by the color which this substance makes when drawn over the surface of the metal.

In the outfit of the modern prospector quicksilver has become practically indispensable. Its affinity for gold makes it a most valuable agent. Where the existence of placer gold is imagined, the introduction of mercury into the test washer soon solves the problem, and avoids the use of riffles and other crude appliances which were formerly depended upon almost entirely. After crushing the specimens of test ore, the quicksilver can also be used to ascertain the quantity of free gold among the particles. As the mercury can be eliminated by heating the composition to a sufficiently high temperature, it is now utilized in large quantities by the modern prospector.

THE CAPITAINE MARINE PRODUCER-GAS ENGINE.

(*Continued from page* 180.)

jected by means of an air blower driven by a gasoline motor. For some minutes the coal burns in precisely the same manner as it would in an ordinary furnace, and the combustion gases are allowed to escape through a chimney, though in their passage, by being directed through the center of the ring where the water is retained, they serve to gradually heat the water and prepare the steam ready for starting.

As the gas is produced and escapes from the fire of the generator at an excessively high temperature, it passes into the cooler. This part of the apparatus is shown at the left of the large generator, and consists of another drum of small diameter. The gas is first cooled at the top of the drum, by passing round a flat cooling coil through which a spray of water is passed, and it finally settles to the bottom of the scrubber, from which it is withdrawn by a pump. A fine spray of water is also forced upward from the bottom of this drum and strikes the wall about half way up. The result is that no gas can possibly emerge at the bottom without first having come into contact with the water jet, which arrests and carries off any impurities suspended in the gas. This process completed, the gas, comparatively cool and clean, is then deprived of the moisture with which it has become impregnated before it enters the engine. It escapes through a baffle at the bottom of the drum, and in so doing is partially dried, though to complete this operation it is conveyed to a centrifugal drier, consisting of a number of plates fixed on rings one behind the other in a small cylinder; this drier churns and agitates it until every trace of moisture has been completely removed. The gas is then ready for combustion in the engine.

In the gas produced by this process there is a larger percentage of carbon monoxide than carbon dioxide. The gas is consequently not very rich, but the resultant issue of this defect is that a larger cylinder capacity horse-power is required. The calorific value of the gas is 137 British thermal units per cubic foot. The formation of a larger percentage of carbon monoxide than carbon dioxide is preferable, inasmuch as less water is formed in the motor by the explosion of the gases than would otherwise be the case if there were a predominance of carbon dioxide. The formation of the greater quantity of carbon monoxide is attributable to the insufficiency of air, and consequently oxygen, injected into the generator during production.

The gas enters the engine through a double-seat valve, while an adjustable quantity of air can be admitted through the upper seating. In the arrangement of this motor, the cylinder valves are placed in the head of the cylinder, which can be removed by sliding forward after the release of the retaining nuts. The governing arrangement is ingenious. There is a quick-action governor, which when the maximum speed is exceeded grips a brass-ended fiber ring between two collars on the governor shaft. The governor also acts upon the low-tension magneto which is employed for ignition purposes. This magneto is driven off the governor shaft, and is completely under the control of the governor so far as the time of firing is concerned. In the hand control of the governor the time of ignition is also automatically controlled. This arrangement is exceedingly sensitive, an alteration of ⅜ inch of the collar varying the revolutions between 40 and 60 per minute.

The cylinders are water-cooled, the jacket for the same being shrunk on to the walls of the cylinder, and forced lubrication is employed. The exhaust is muffled in a water-jacket silencer, the water employed for this purpose being afterward used in the gas generator.

It is expected that some highly efficient results will be obtained by the application of this plant, particularly for certain types of commercial craft. It constitutes a cheap and efficient source of propelling power, and its development is being followed with great interest. Such a plant has extended possibilities upon tugboats and barges, where weight and space do not form such important considerations.

Engineering Notes.

Stone sawing by wire is done successfully in France, according to a paper by Mr. E. Bourdon in the Bulletin of the Society for the Encouragement of National Industry. A complete plant comprises an endless wire passing round a series of pulleys, one of which is a driving-pulley. The necessary tension is obtained by a straining trolley working on an inclined plane, and between the driving shaft and this trolley is situated the saw frame, which carries the guide-pulleys for the wire saw. This wire, which is driven at a given speed, is caused to press lightly on the stone, and the cutting is done by sand mixed with water, which is conveyed into the saw-cut as the work proceeds. Though the mode of operation appears simple, it entails various difficulties in practical application. Three twisted steel wires are used, each wire having a diameter of 0.098 inch. The strands must be twisted fairly tight and should make one turn in 1.18 inch. The wire may be driven in the workshop at a speed of 23 feet per second, but in quarries or adits the speed should not exceed 13 feet per second. The force exerted by the wire to produce the cut must be uniform and must be capable of being readily varied; moreover, it must be proportionate to the length of the cut.

In the notable passage of the turbine-propelled steamer "Loongana" from Glasgow to Australia, the marine steam turbine once again demonstrated its possibilities and suitability for the same class of work as that which has hitherto been fulfilled by the ordinary reciprocating engines. The journey was covered in 30½ days. The vessel experienced some of the roughest possible weather during the voyage, but even under these most adverse conditions it was found that with four boilers at work a speed of 18 knots per hour could be easily maintained. The average speed, however, throughout was 15 knots, and it was attained on a daily consumption of 63 tons of coal. Some interesting tests were carried out during the voyage to ascertain the relative economies of the turbine and the ordinary reciprocating engines, and conclusive data were obtained showing at what speeds the turbine is the less expensive. These experiments proved that for vessels where a speed of 16 knots is required the turbine is much more economical than the cylindrical engines, but it becomes more expensive if the speed is decreased below 15 knots. Special observations were made of the behavior of the turbines and vessel under fluctuating conditions. On no single occasion was there any sign of propeller racing and it was only when traveling at the highest possible speed that any vibration over the screws was experienced and then it was very slight. Far steadier running was obtained, and even in the roughest weather not a single sea was shipped by the steamer. Not the slightest trouble was experienced with the machinery, and the turbines did not have to be stopped for any purpose throughout the voyage except when coaling at ports. Nor did the necessity arise for repairing or renewing any part of the machinery. This is the longest journey that has ever been covered by a turbine-propelled steamer, and the steady running of the vessel under all conditions of weather constituted one of the most prominent features of the journey. Anticipations have been entertained that although this machinery has proved far more economical in regard to fuel consumption than reciprocating engines for vessels engaged in coast and short-distance traffic, it would prove more expensive for ordinary long-distance voyages. This trip, however, has proved the opposite to be the case and established the superiority of the turbine for long-distance traffic under all conditions.

Occasionally a mine-shaft is "sunk upward," to use a paradoxical expression, for some special reason. The shaft is divided temporarily by brattice-work, the space on one side being filled with excavated rock, and forming a platform for the men.—Engineering and Mining Journal.

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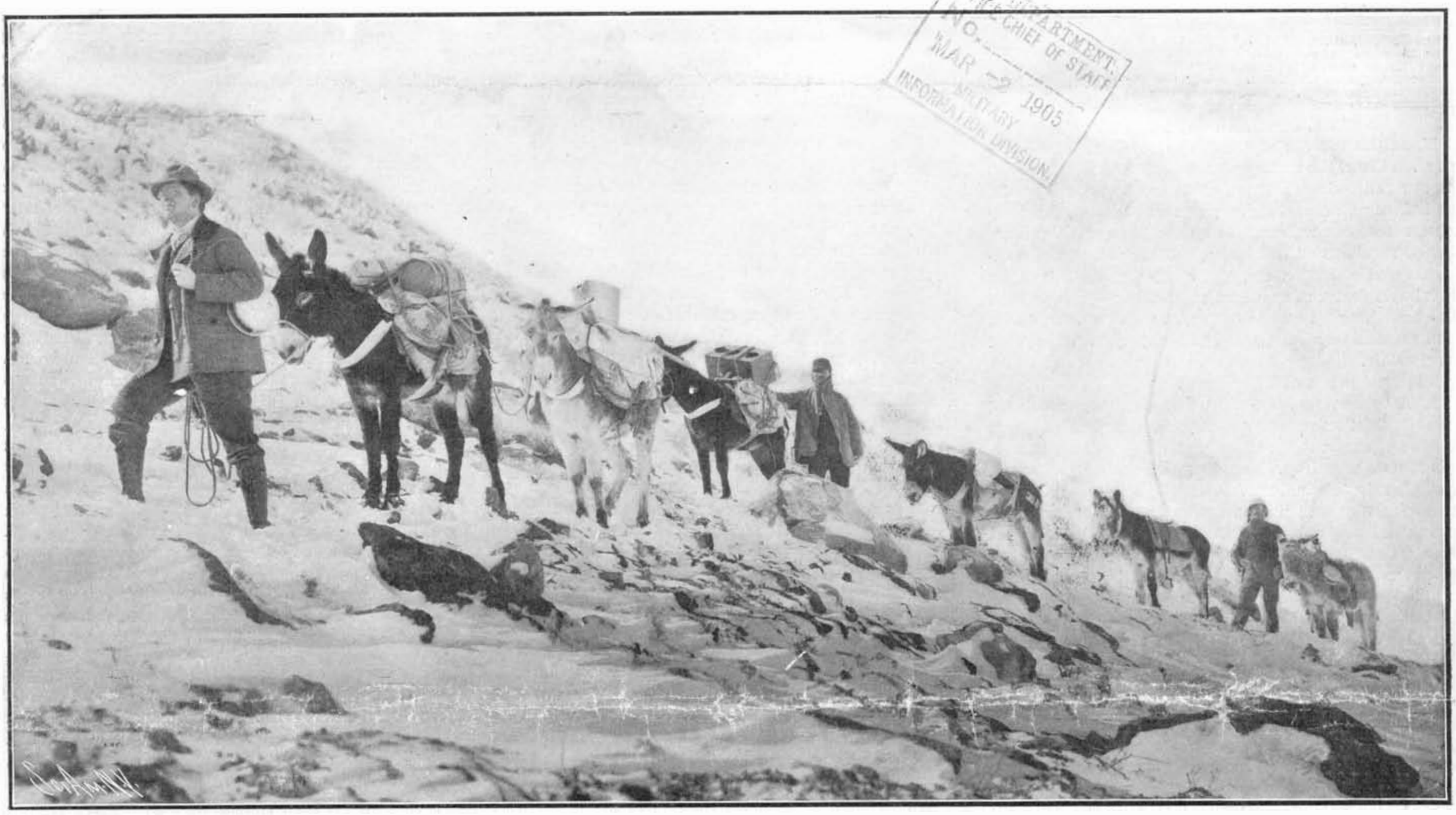

View of a Modern Prospecting Expedition in the Rocky Mountains, Showing the Method of Packing the Supplies and Other Equipment.

Loading Sacks of Gold and Silver Ore on Wagons for Shipment to the Smelters.

MODERN METHODS OF GOLD PROSPECTING.—[See page 181.]