Desert

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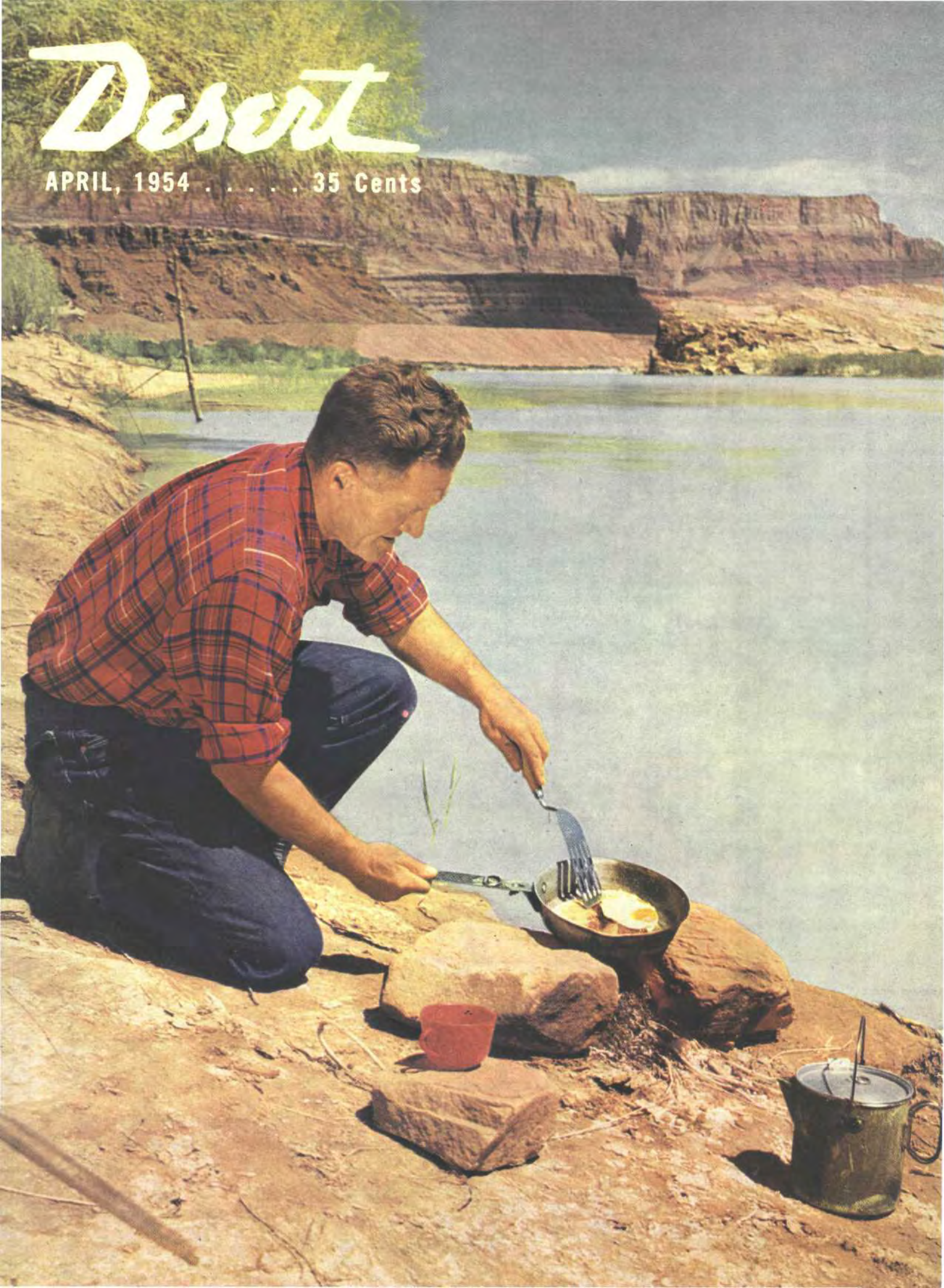


Primary water is most likely to be found in the mountains rather than on valley floors. At extreme right is the new 1500-gallon water well on Riess Ranch high above Simi Valley, Ventura County, California. Photo courtesy Primary Water Development Company, Beverly Hills, California.

New Source of Water for Desert Lands?

Most water is "secondhand." Over and over again it goes through the cycle of evaporation, condensation, precipitation, evaporation. Weather is the master. But Stephen Riess believes it is possible to tap primary sources of water at their original source. Not many geologists share his revolutionary theories as to the availability of primary or juvenile water—but here is his story.

By GASTON BURRIDGE

I AM FAIRLY certain most of the water any of us use today—no matter where we happen to be—is "secondhand" water, secondhand many times over, many years over. Stephen Riess, a German born and trained geochemist and geologist, is not interested in finding secondhand water. He is looking for firsthand water. It is called "primary," "juvenile" or "magmatic" water.

Perhaps "secondhand water" is not too apt a description for ordinary water—water of the hydraulic cycle.

The hydraulic cycle begins with evaporation—mostly from the oceans. From here, the sun's heat lifts water vapor. This water vapor rises until it contacts cooler air which condenses it into tiny drops of water. These droplets combine to make clouds. Clouds eventually become cooled sufficiently to allow their minute drops to combine into larger ones. These become so heavy that the force of gravity soon outweighs those factors holding them aloft, and they fall as rain, hail or snow. Probably most of this precipitation falls back into the sea, but some of it falls on land.

Of that portion falling on land about 50 percent runs off immediately in rills, creeks and rivers, and returns to the ocean relatively soon. Of the remaining 50 percent which sinks into the ground, 38 to 40 percent is returned, sooner or later, to the surface through capillary action and the transpiration of plant life. Eventually, 10 to 12 percent reaches the water table to feed our pumps. It too, joins the hydraulic cycle soon after use. This, then, is secondhand water—water used over and over again in the hydraulic cycle.

Primary water is water which has never seen the light of day before, never felt the throb and rhythm of ocean waves—water which has never known what has always seemed to me must be the most thrilling ride in all the world—the ride with the clouds. Neither has it ever been through the process of evaporation.

"Primary water is the child of darkness," says Riess. "It is conceived in convulsion and heat, in the interior depths of the earth where giant batholiths of fluid magmas continue to cool gradually and form first crystals of the more basic foundation stone. Primary water is, in my opinion, the

original source of all water on our globe."

One of the most exciting possibilities of juvenile water is that it can be found as easily in desert country as anywhere else. Perhaps easier. " Walk on granite," says Riess, "and you walk over primary water."

In the fissures and pipes of igneous and plutonic rock flows this new source of H2O. It can be found readily in the desert because there surface rock is more naked of top soil, thus revealing true faulting and contours.

Stephen Riess is not a seer. He is not a "water witch," a dowser or water diviner. He uses neither crystal ball nor gadgets. He uses his head. Riess is a trained geologist and geochemist who employs scientific methods. Much of the information he obtains, upon which his decisions are based, is produced in any one of several commercial laboratories, from their analyses of submitted samples. Riess studies the petrographic, the crystallographic as well as the chemical analysis of a site's rocks. How he uses this information is the important thing. That is his secret! A secret ferreted out the hard way—through long years of patient work, thinking, experimenting—being laughed at from many quarters.

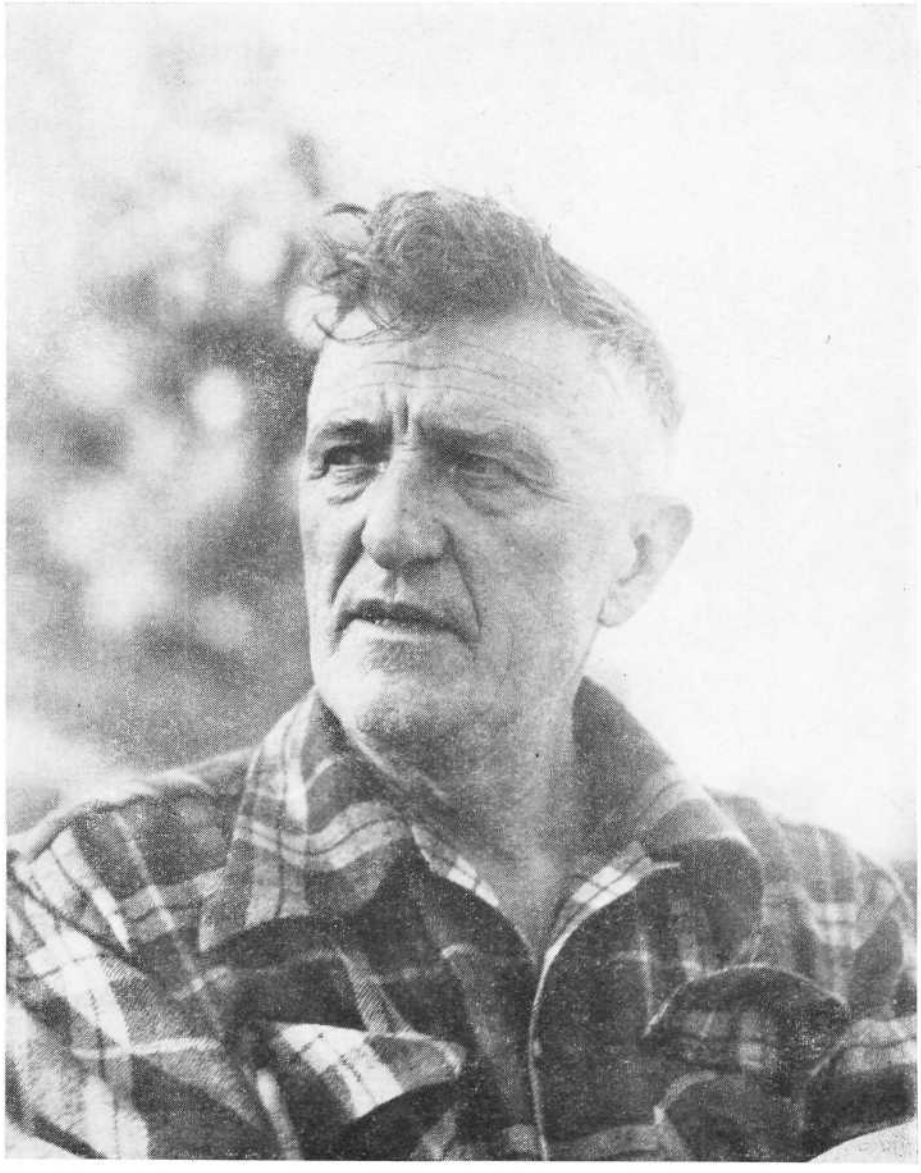
"I did not promulgate the primary water theory," says Riess. "Such geological bigwigs as Dr. Oscar Meinzer of the U. S. Geological Survey and Dr. Waldemar Lindgren of Massachusetts Institute of Technology have written on primary water, but you won't find out much about it in geological textbooks."

What Riess has done is to apply this theory, to learn how to use it in actually locating sources of this new kind of water.

Juvenile water is as wet as any other water. It tastes the same, boils the same, looks the same as that spilling from the spigot or dipped from an irrigation ditch. Ordinarily, primary water is softer than average well water found in the West.

To date, Riess has located 70 water wells—60 in the United States, six in Mexico, one in Canada, one in Brazil and one in Peru. The Brazil and Peru wells were found and drilled in 1922. They were the first and second wells. His third well was drilled on his own ranch 19 years ago. All save three are eminently successful and, he says, "I believe I now know why those three failed to meet my expectations. I learn something new with every well."

Such a record, built over so wide an area, either makes Stephen Riess one of the luckiest men in the world —who could far more profitably spend his time in Las Vegas, Reno or Monte Carlo—or it is evidence as to the validity of his thinking!



Stephen Riess, German-born geo-chemist, whose revolutionary theories on primary water have stirred a tempest among geologists. Photo by the author.

Riess lives high above Simi Valley in Ventura County between the Santa Susana Mountains and the Simi Hills about 35 miles east of Ventura, California. There, on his own land, he has three wells which he believes tap the source of juvenile water—the one drilled 19 years ago, one drilled two years ago and one just brought in. There is not one ordinary water well in Simi Valley which has not suffered greatly from a constantly sinking water table. Many wells have played out completely. Some can only be pumped a short time, then must be rested for days. Riess says his wells never change. The 19-year-old one delivers as much water today as it did when first brought in.

Primary water wells are not affected by surface climate. Drouth is as far from affecting them as the moon. If Simi Valley received no rain for a hundred years, Riess believes his wells would continue to deliver as much water. "Severe earthquakes may affect primary water wells temporarily, or permanently, by restricting or closing their orifice," explains Riess, "but climate—never!"

Riess does not go to the valleys looking for juvenile water, although, on occasions, it may be found there. No, he hikes to the mountains—and not the mountain valleys or canyon-bottoms, either. He seeks the high sides of mountains, sometimes even their higher tops. The wells which tap primary water are drilled through basic rock, into and through the very bones of the continent, because juvenile water is found flowing in fissures, cracks, flutes or pipes of these rocks. Primary water does not come from sedimentary collections of earth sur-

face materials caught in a basin and held for eons. The deepest well Riess has drilled for juvenile water is 1400 feet. His shallowest is 232 feet.

"All primary water may eventually find its way into the water table, or directly into water courses or into the sea," says Riess. "But I do not attempt to tap it there. I tap it long before it gets that far down!"

Juvenile water comes from deep, very deep within the heart of the rocks from which it issues. Its course is long and devious—probably as much as 40 miles! Naturally no one can be sure of just how the water comes into being. Riess says the trick isn't so much in finding primary water as it is finding cool, sweet primary water. Fully 75 percent of all juvenile water is so hot and so highly mineralized as to be unfit for human or agricultural use.

As crystallization takes place deep in the rock masses which lie beneath the surface, great quantities of the elemental gases are continually formed. These are generated under tremendous and constant pressure. This pressure forces these gases into multitudinous cracks which lace this forming rock. As the gases rise, they cool. As they cool, they contract. As they contract they leave space behind them for more gas to come along. As these gases continue to rise they come in contact with other elements and combinations of elements in different states of coolness and exposure. Here they combine with these other elements, or some of them do. New compounds are formed, perhaps leaving hydrogen and oxygen free to move on together.

Scientists now believe that water vapor—commonly called steam—does not exist as such at pressures above 560 pounds per square inch, but separates into its elemental gases, hydrogen and oxygen.

The cool, sweet juvenile water probably is born under conditions where these two gases travel together for a long enough period to cool below the 560-pound mark, then they are free to join and become water vapor, which is able to maintain its identity until cooled enough to condense and become water rather quickly in surroundings that preclude the absorption of solubles.

Nobody knows about these things. The deepest hole man has ever drilled in the earth is slightly over four miles. Ten times that is a long way, and we can have but theories for a while yet.

"It is my belief," says Riess, "that during a considerable portion of Earth's early history—even after its surface cooled sufficiently to hold water—there was little or none here; that all water now present on earth, was once juvenile water! I believe further that the total amount of water on the earth's surface is increasing, slowly, of course, and one day, some two or three billion years hence, water will cover most of that which is now land."

Riess is 53 years old. He was born in Bavaria. In Germany he attended a naval academy. His teacher of geology there was a rebel thinker, geologi-

Desert Quiz

There's a bit of geography, history, botany, mineralogy and general lore of the desert country in this Quiz—and you will find it an interesting and stimulating experience to test your own knowledge of this fascinating land of sun, sand and solitude. Twelve to 14 correct answers is fair, 15 to 17 good, 18 or more excellent. The answers are on page 26.

1—Bright Angel Trail leads to —The top of Mt. Whitney ____. The bottom of Grand Canyon ____. The shore of Great Salt Lake ____. The depths of Carlsbad Caverns ____.

2—Pat McCarran is—A U.S. senator from Nevada ____. The governor of Arizona ____. Director of the National Park Service ____. Secretary of the Interior ____.

3—The legendary Lost Dutchman mine was in the—Harqua Hala Mountains ____. Wasatch Mountains ____. Superstition Mountains ____. Chuckawalla Mountains ____.

4—El Morro National Monument is in—New Mexico ____. Utah ____. California ____. Arizona ____.

5—*Chinde* is a Navajo word meaning—Dwelling place ____. Spring ____. Scalp ____. Evil Spirit ____.

6—Before the Metropolitan Water district's dam was built in the Colorado River at Parker, the valley where the reservoir is now located was inhabited by—Apache Indians ____. Chemehuevi Indians ____. Mormon colonists ____. Yaqui Indians ____.

7—If you stood on the 12,000-foot peak of Mt. Timpanogos you would be looking down on the state of—Nevada ____. Arizona ____. New Mexico ____. Utah ____.

8—The color of the Evening Primrose which grows on the dunes after heavy winter rains is—Purple ____. White ____. Yellow ____. Orange ____.

9—The capital of New Mexico is—Santa Fe ____. Albuquerque ____. Gallup ____. Taos ____.

10—Kearny's Army of the West on its historic trek to win California for the Union crossed the Colorado River at—Yuma ____. Blythe ____. Parker ____. Needles ____.

11—Rock so light it will float on water is—Manganese ____. Talc ____. Pumice ____. Obsidian ____.

12—Until his death a few months ago Johnny Shoshone was a well known Indian in—Winnemucca ____. Peach Springs ____. Death Valley ____. Window Rock ____.

13—The author of *Death Valley in* '49 was—Kit Carson ____. William Lewis Manly ____. W. A. Chalfant ____. Will Caruthers ____.

14—Indian symbols incised in the rocks in many places in the Southwest properly are called — Petroglyphs ____. Pictographs ____. Hieroglyphics ____. Indian Sign language ____.

15—Fairy Duster is the common name given a desert—Hummingbird ____. Flower ____. Insect ____. Lizard ____.

16—Miners refer to a surface exposure of rock as an—Outcrop ____. Overburden ____. Vein ____. Ledge ____.

17—Stalactites found in caves generally are a form of—Limestone ____. Gypsum ____. Salt ____. Quartz ____.

18—The Museum of Northern Arizona is located at — Flagstaff ____. Prescott ____. Williams ____. Winslow ____.

19—Tombstone, during the height of its mining boom, produced mostly—Gold ____. Silver ____. Copper ____. Quicksilver ____.

20—The historic Oatman Massacre took place near—The present mining camp of Oatman ____. Along the Gila River ____. At Taos ____. In Death Valley ____.

cally. He instilled in Riess much independence of mind and dislike for what Riess calls, "a lot of deadwood of dogma" surrounding much of present day geological thinking.

Riess left Germany in 1932 after the Hitler *Putsch*. "I saw the handwriting on the wall for the Fatherland," he says. He traveled in nearly every country in the world, sailed nearly every sea, following the career of metallurgist and mining engineer. He and the late Louis Adamic, the writer, were friends. They learned English together on the deserts of California, reading a dictionary while they worked at the mining game.

How does Stephen Riess locate a juvenile water well? That, of course, is his secret. It is a complicated process having to do with the angles at which faults and strata lie in relation to one another and to the points of the compass, what the composition of each is in relation to its neighbor and to themselves in depth. In other words, what stratum lies on top of what stratum, for how far down, and at what angle, as well as in what relation to surrounding ridges, faults, strata and peaks. But let us assume a case.

Riess is called to make a survey for a primary water well. Once in the vicinity, he can tell by general lay of the land what the chances are of finding a source of juvenile water. If he thinks the situation favorable, he makes a careful, complicated check. This requires three to five days, depending on terrain, kind of rock encountered on the surface, position of faults to points of compass, to ridges, to peaks.

"If," says Riess, "after this survey is completed and the information obtained from it evaluated, I still feel there exists concrete possibilities for developing juvenile water, we must have core drillings made. Some of these drillings are sent to any one of several commercial laboratories for analyses. After the laboratory returns its findings I assemble the information for interpretation and combination with my own findings. From these, I determine how deep the pipe or flute carrying the water lies. Also, I can predict then what volume of water the well probably will produce."

After these conclusions are reached, there comes the problem of drilling the well itself. This is indeed no small part of the whole scheme. Well drillers generally have their own ideas, and are reluctant to take instruction. Riess says, "I know of only four rock drillers capable of drilling such holes as I must have." Why? Mostly because such a well driller must know what he is doing every minute of drilling time.

Stephen Riess beside one of the wells he has drilled in Ventura County, California. He says this well is unaffected by climate conditions. Photo by the author.

Such wells are no places for any guess work. One of the most important factors is, these bores must be straight! Not straight just one way, but both ways because targets are often small and if the hole is not plumb it can easily miss. A near miss is as tragic as a far one!

Naturally, there is immediate interest as to how much such wells cost. They are not cheap, but they are not prohibitive. "Because every juvenile well is an individual proposition as to depth, kind of rock to be penetrated, roads to bring in equipment and supplies, etc., no general figures can be set down. But the most may be from $10,000 to $20,000."

There is another important point. Unless one owns considerable land adjoining mountains and unless a well site can be located on land so owned, it is necessary for prospective juvenile well owners to proceed on the same basis to acquire the well site as he would if he were locating a mineral claim. This is done to be certain, after water is found, that the owner will be allowed to use that water for purposes intended.

How do we know it is primary water? Even a cursory review of volcano eruption information reveals such explosions carry immense quantities of water vapor under tremendous pressure. Where did this water vapor come from? Surely not from the surface of the earth! Such investigations as have been made there only point more in the direction Stephen Riess is going.

Primary water is new water, revolutionary water. It would appear to be a constant source of water. Whether one has a water problem or not, here is an interesting subject for future exploration.