Yellowstone Has Great New Geyser

Geophysics

By Frank Thone

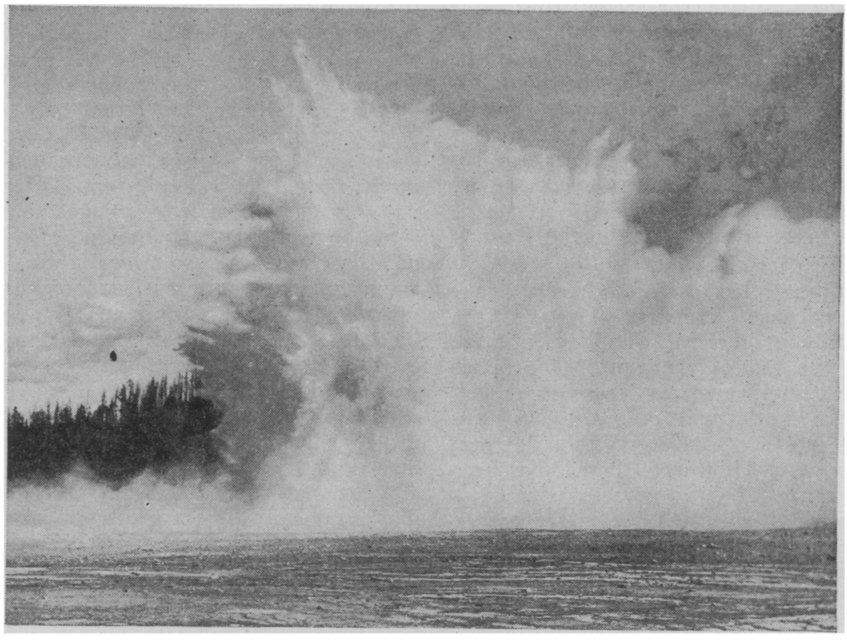
A tremendous new geyser, the hugest wonder of its kind in the world, has burst forth in Yellowstone National Park. Twice a day, with explosions like gunfire, it hurls into the air masses of hot water greater than are erupted by any other geyser now active. There has been nothing with which to compare it since the days of the old Excelsior Geyser, which blew itself to pieces in 1888 and has since lain as a simmering hot lake in the ragged chasm of its old crater. The new Titan, as yet unnamed, already bids fair to attract more attention from tourists than the Park's chief standby, Old Faithful, and it has made pygmies of the Giant and the Giantess, until now the biggest active geysers.

The new geyser has a crater of roughly circular form; about eight feet deep; its longest diameter is about 120 feet and its shortest 100 feet. It erupts twice in 24 hours, and each eruption lasts three hours or longer. Like most geysers, it does not play steadily like a firehose or a park fountain, but hurls its burden of hot water skyward in a series of spurts or jets. It throws these jets, frequently in all directions, at intervals of 15 to 20 seconds during its period of eruption, bursting forth from a quiet surface with a loud explosion and throwing a column of water to an average height of 60 to 75 feet, with occasional spurts of 100 feet.

The outlet through which the erupted water runs off is a gap four feet wide. Through this, during the entire period of each eruption, the hot water rushes in a stream eight inches deep at a speed of 120 feet per minute. Flowing at that rate through a three-hour period, this would represent, roughly, 450,000 gallons of water thrown out during each eruption. Assuming an initial temperature of 60 degrees Fahrenheit and an eruption temperature of 180 degrees (most of the geyser and hot spring waters are hotter than that), this mass of heated liquid would represent 432,000,000 British Thermal Units.

Assuming again a boiler efficiency of 25 per cent. (which is pretty high), it would require 67 tons of anthracite coal to heat that much water to such a temperature. And this geyser does that twice a day.

All this great volume of hot water that pours through the basin outlet comes from the geyser. There is no-



OLD EXCELSIOR GEYSER, extinct since 1888, was the only peer that Yellowstone National Park's new phenomenon has ever known. (Photos by J. E. Haynes, St. Paul.)

where else for it to come from. And the geyser does a thorough job; when it is through, it is through. It ceases its eruption suddenly, with an explosion as loud as the one it started with, and leaves the basin empty, except for a ten-foot fissure and a few bubbling mud springs on its north side.

The power of the geyser may be guessed at from a look at what it broke through to reach daylight. The outer edge of the crater shows a top layer of the hard, siliceous sinter which constitutes the surface rock throughout most of the geyser basins. Sinter is a stone like flint. It is, indeed, chemically very similar to flint, but differs in the mode of its formation. Sinter is deposited out of solution in geyser waters, usually very slowly. It is quite dense, and in a layer as thick as the one which surrounds the new crater it is exceedingly strong. Beneath the two-foot sinter layer is a stratum of black sand and hardened clay. The main orifice or fissure through wich the principal action of the eruption takes place is lined with sinter.

Scientists anxious to investigate the new geyser for once got their turn first, instead of having to wait until the news was broadcast and finding crowds of curious people ahead of them. This was due to a fortunate combination of circumstances. The department of geophysics of the Carnegie Institution of Washington, under the leadership of Dr. A. L. Day, has for several years been carrying on field investigations on the steam and hot-water phenomena of the Park in general. Dr. E. T. Allen has been in immediate charge of this work. Thus when the new geyser "broke," the best-informed minds on this continent were within a few miles of the spot, with equipment for immediate research.

A further fortunate circumstance was what might be called the "isolated accessibility" of the new geyser. It is near enough to the highway so that the exploring party could drive to within a couple of miles of it in automobiles, but still far enough away so that it could roar away day and night without attracting the attention of the casual traveler. It lies two miles due west of Excelsior geyser, and eight miles southwest of the Fountain ranger station, in the Fairy Creek region.

When Superintendent H. M. Albright was informed of the new outburst he wisely refrained from telling the world about it for a few days, until the scientific party could go in and complete their preliminary studies. Then, with infor- (*Turn to next page*)

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mation in hand as to the real nature of the new monster, and with an estimate of how intimate an approach might be safe for large crowds, he visited the place himself and laid plans for a new road which will make the place easily accessible to the thousands of tourists who annually pass through the geyser basins. The great size of the new geyser, its regularity of action, and the explosive violence of its eruptions, promise to make it one of the greatest attractions in the Park.

Although this new geyser is almost unprecedented in size and power, it is by no means the first addition to the family of thermal wonders up there on the top of the world. Surprises are commonplace in Yellowstone National Park, and only the big ones get into the papers. Within the past few years, however, there have been a couple of new geysers which, although they turned out in the end to be but temporary ones, were nevertheless big enough to make page one in their time. Both of them most accommodatingly put in their appearance near the main highway—one of them, as a matter of fact, considerably too near it for comfort.

Early on an August morning in 1922, a solitary driver of a road sprinkler, performing his beneficial office on the highway near Roaring Mountain, received the scare of his life. What had always been a quiet, muddy, hot pool so obscure that it could hardly claim a name suddenly lifted itself a hundred feet or more into the air and came down upon the road with a thundering shower of water and mud and stones and waterlogged wood. For a part of the day traffic had to be held up on the road while a detour was laid down around the puddle that had suddenly become a geyser. The new spring erupted several times more during the next few days, killing trees for many yards and plastering everything thickly with mud. Then it became quiet again and has not erupted since.

The following year, during the visit of the late President Harding, another new geyser broke out in the Norris geyser basin. It also was a muddy spring of irregular eruptive period, and after the first few weeks its activity diminished to the point where it is now listed as "infrequent," and may really be extinct, except as a quietly running hot spring.

Geysers not only get born; they also die. The greatest geyser that has ever been seen by man, the old Excelsior geyser, nearest notable neighbor of Yellowstone's new giant, met such a fate. This monster among hot-water springs, which had a crater even huger than the new geyser's, was picturesquely known to earlier travelers in the Park as "Hell's Half-Acre." Its eruptions were not so frequent as those of the new geyser, and lasted only a half-hour instead of three hours; but they were even more violent, and threw masses of water from 100 to 200 feet into the air. It is stated that after an eruption the Firehole river, on whose left bank the crater yawned, would have its water level temporarily raised as much as four feet. But in the late 1880's Excelsior began to excel even itself. Its eruptions became so explosive that they tore off great chunks of the flinty sinter that crusted it over, hurling the masses of rock high into the air. The geyser literally erupted itself to death, and today is no more than a great hot lake, seething at the bottom of its precipitous-sided pit.

There is, of course, no way of telling when a supposedly extinct geyser may burst forth into renewed activity. Beehive geyser, noted for its symmetrical dome-shaped little cone and the height to which it throws its slender column of water, was rated as extinct a few years ago, but to everybody's surprise and delight resumed activity. Economic geyser, so called because it caught every drop it erupted in its wide basin and used it over again, has not played for years, but the rangers still watch it hopefully for possible signs of life. Mud Volcano, which is really a great boiling mud spring, has had a couple of violent eruptive periods, during which it blocked the Hayden valley road. The last of these was nearly thirty years ago; but that this awesomely ugly natural howitzer will never let loose another blast is too much to prophesy.

Every once in a while a chunk of the soft chalky travertine terraces at Mammoth Hot Springs gets too heavy for its perch on the steep hillside, and slumps off. An especially large slide of this kind occurred about five years ago, spilling the road to overflowing with what looked like extra soft white finishing plaster. The report got out that the terraces had exploded and were setting up in business as geysers. As a matter of fact, Mammoth Hot Springs is the one place in Yellowstone Park where there can not be a geyser. The mineral deposited out of the hot waters at this place is not silica but calcium carbonate, chemically identical with limestone but here forming a much softer rock, not strong enough to stand up under the explosive steam action required for a real geyser eruption.

For true geyser action, such as is found in the geyser basins of Yellowstone National Park, three things are necessary. First, a supply of heat. This comes from steam released by deeply buried masses of lava. Nobody knows how far down the lava masses that are Yellowstone's furnaces may lie; perhaps a mile, perhaps less. At any rate, they are so thickly blanketed under layers of earth and rock that they have never cooled, though ages have elapsed since they were first forced into their present position.

The second thing a geyser needs is a tube or vent through which the eruptions can take place. This may be simply a crack in the rock or it may be a tube that the geyser has formed for itself out of sinter. The tube may be either crooked or straight; it may be either simple or branched or equipped with outpocketings on its sides. No two geysers are quite alike in these respects, hence no two of them erupt in quite the same manner or at quite the same time-intervals.

The third requisite for a geyser is a supply of water. This does not come, as was once widely believed, from deep subterranean sources, but is surface water, from rain or melted snow. It is because of this fact that geysers are almost without exception located in valleys, not far from streams or lakes. The water finds its way into the tube, either through the top, or more frequently through underground opening into the sides. The tube becomes filled, and the steam, rising from the lavas far beneath, heats the water up. The lower part of the water column is finally hotter than boiling point, but because of the pressure of the water above, it can not evaporate into steam. At last, however, a little of it spills over, or a bubble of steam lifts a few gallons over the rim. That takes off some of the pressure at the bottom of the tube, and part of the overheated water flashes at once into steam. The steam lifts out a still greater mass of water, the pressure is still further reduced, a huge volume of steam leaps into being and with an irresistible upward surge the newly released power of a thousand giants hurls the water out of the tube in a roaring eruption.

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The Chinese use the color red to symbolize happiness or good luck.