Man Flies, Digs, and Dives in Conquest of Earth

(Continued from Page One) insect, he has gone deeper into the earth and higher

into the sky than any other living thing. Truly, man is a wonderful fellow. As yet he has not penetrated the ocean depths to a distance as great as have some forms of marine life. But—give him time. Without flying and without digging, man could,

were he physically capable, travel an up-and-down distance of more than 111/2 miles, from the bottom of the deepest ocean to the summit of the tallest

Everest, loftiest peak of the Himalayas, is the tallest mountain in the world, its highest tip 29,141 feet, or nearly six miles, above sea level. As this pits of their planes. In April, 1933, four flyers is written Everest remains a fatal jinx to mountain in two planes, led by the marquess of Clydesclimbers. Fourteen are known to have perished on dale, flew over the summit of this loftiest mounits frigid, wind-swept slopes, sacrifices of science to tain, after first climbing into the air to an altitude the heathen gods that, according to native legends, of more than 35,000 feet. guard the cloud-shrouded peak. Ten years ago Higher above its surrounding country than Ev-George Leigh Mallory and A. C. Irvine, two daring erest is above its adjacent territory, though only Britishers, were sighted just 400 feet below the sum- 20,300 feet above sea level, is Mount McKinley mit of Everest. They never returned to tell their in Alaska, the highest mountain in North Amerstory. It is not believed that they actually reached ica. Its summit first was reached on June 7, 1913, the peak of the mountain, and they have not been heroes of that bold exploit being Hudson Stuck, credited with that triumph. The only men who have H. P. Karstens, Robert Tatum, and Walter Harper. looked down upon the peak are aviators who have As to descending into the sea, the greatest viewed it from the comparative safety of the cock- known depth of which is that mysterious hole off



(A. P. photo.) Fedoseinko Vasenko

Piccard Donati

(A. P. photo.) (Acme photo.) (A. P. photo.) (Acme photo.) (Acme photo.) Fordney Settle

"In contrast to all records made in descending into the sea are the amazing records for altitude made by stratosphere balloonists and airplane pilots.



. set sail from Dayton, O., in the stratosphere balloon . (Settle and Fordney.)

Mindanao, of the Philippine group with its bottom lying 35,400 feet, or nearly seven miles, below the surface, there still are records to be broken. No one has gone to anywhere near the deepest bottoms of the deepest oceans, though Dr. William Beebe and Otis Barton on Aug. 15 of this year went down a distance of 3.028 feet, well over c half mile, in Beebe's strange submarine globe, the Bathysphere. The descent, for the purpose of observing marine life, was made in waters off Bermuda. A pressure was encountered of half a ton to each square inch of the Bathysphere's surface.

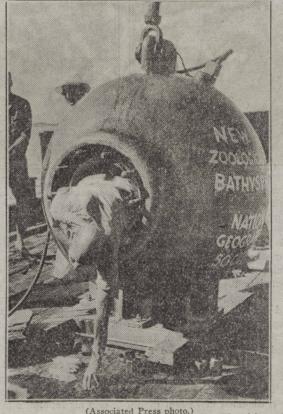
Deep Into the Sea

Submarines, since that queer hand-rowed craft of the Dutchman Cornelius Van Drebel submerged in the Thames in 1620 to a depth of twelve feet, have been diving deeper and deeper with each succeeding decade. First down fifty feet, then a hundred, then 200, and finally 300, modern submarines now are capable of submerging to that safety. A notable dive was that of the United States submarine V-5, which descended well as by night, or even into the upper reaches of

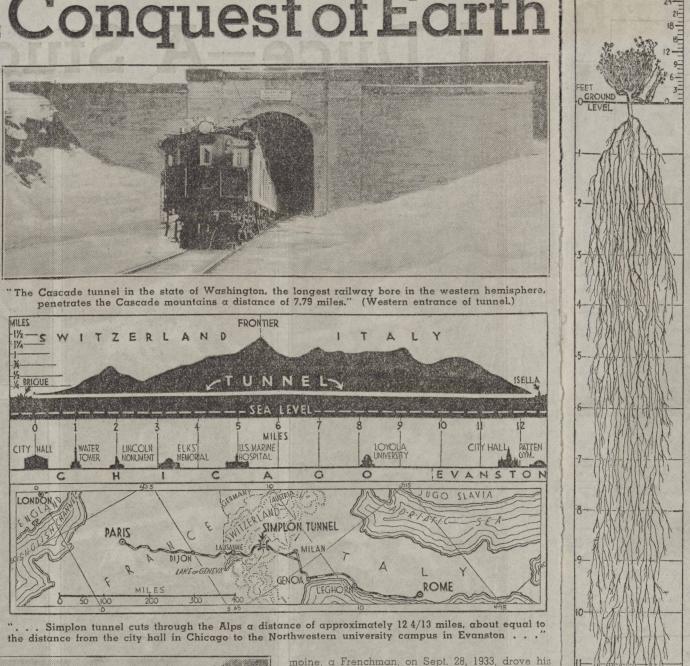
21, 1930. Then along came a sister ship, the V-6, from sea level to the bottom of the stratosphere. which submerged to a depth of 336 feet off the Isle roughly about eight or nine miles above the earth. of Shoals on April 8, 1931.

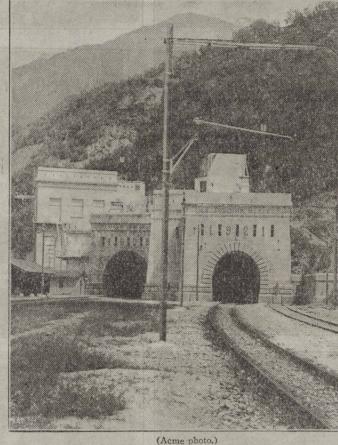
descended into the sea on numerous instances to At a certain point above the earth-a point that well over 200 feet. A record in that line is said to varies with conditions and locations-life is imposhave been established by a diver working on the sible without artificial means, such as tanks of wreck of the submarine F-4 off Honolulu in 1915 oxygen that can be liberated within the confines of when he was lowered to a depth of 288 feet. Mod- sealed globes containing balloonists or fed to adern divers in articulated metal suits are reported to venturous aviators through breathing tubes. have gone approximately 500 feet deep.

In contrast to all records made in descending into Fourteen Miles Above Earth the sea are the amazing records for altitude made In January of this year three Russian aeronauts by stratosphere balloonists and airplane pilots. perished after ascending to a height of 72,176 feet Whereas the diver or scientist exploring submarine almost 14 miles, in the balloon Osoaviakhim, that regions encounters tremendous pressures, the in- took off from the civil airport near Moscow. The trepid fellow who ventures into the purple regions men who were killed were Pavil Fedoseinko, Andrey



Beebe's strange submarine globe, the Bathysphere . . ." (Dr. Beebe entering it.)



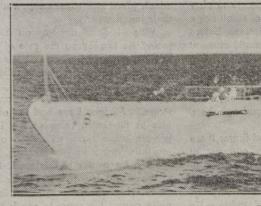


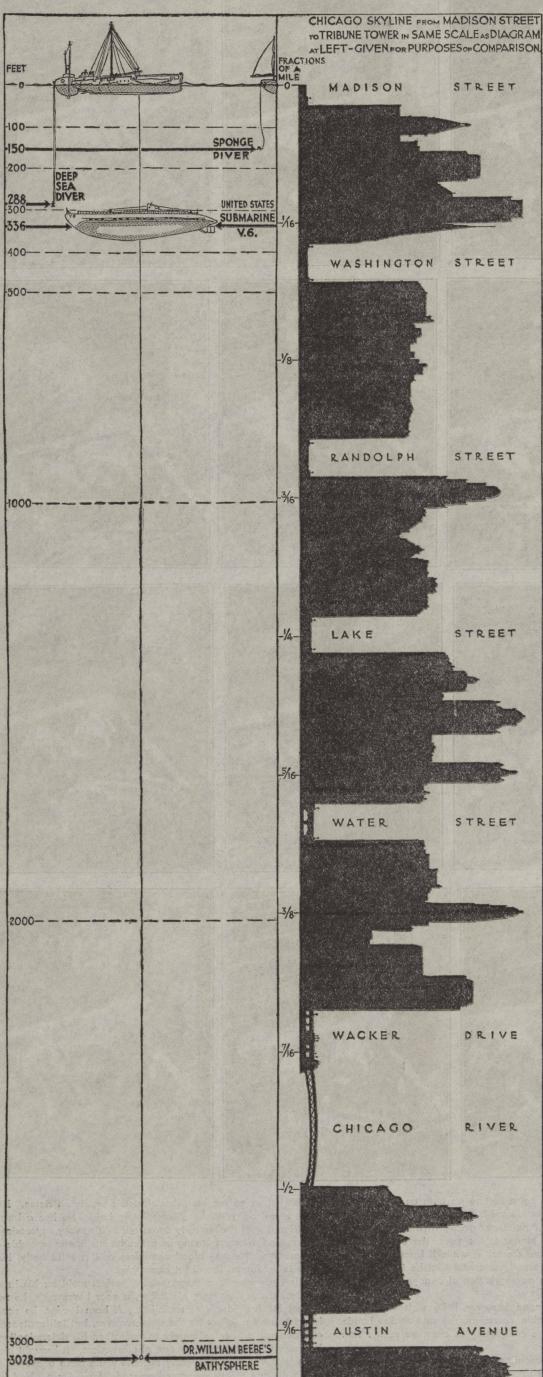
. . goes under a mountain to a depth of about a mile and a last-named depth with comparative quarter . . ." (Brigue, Switzerland, entrance to Simplon tunnel.)

off the Atlantic coast to a depth of 332 feet on Oct. the troposphere, that layer of space that reaches encounters directly the opposite of pressure, an in-Deep-sea divers in standard rubber suits have creasing rarity of the atmosphere, as he ascends.

of the stratosphere, where stars twinkle by day as Vasenko, and Ilya Usyskin. Records in their shattered gondola were mute evidence of their great Before the guns were ready Hindenburg retreated exploit. Almost as remarkable was the feat of to a new line. The guns had to be altered by Lieutenant Commander T. G. W. Settle of the adding muzzle tubes to lengthen their bores. As American navy and Maj. Chester L. Fordney of finally placed in operation some of these great the marines, who on Nov. 20, 1933, set sail from weapons, reconstructed from naval rifles, the cali-Dayton, O., in their stratosphere balloon A Cen- bers of which had been reduced considerably, tury of Progress. They reached an altitude of had a maximum range of 79.5 miles, approximate-61,237 feet, nearly 12 miles, and lived to tell about 1y the same distance as the air-line distance bet. Prof. Auguste Piccard, the Belgian scientist, tween Chicago and Milwaukee. reviously had made two notable ascents into the The "Big Berthas" were fired at an elevation stratosphere, the first to a height of 51,458 feet and of 50 degrees. As their shells reached the stratothe second to a height of 53,153 feet, or more than sphere they were traveling at approximately 45 ten miles.

> Crowding the balloonists for honors are the air- ic pressure, wind speeds in the lower atmosphere, plane pilots who have negotiated thin air eight the movement of the earth in rotating, rapid wear and nine miles above the earth. Gustave Le- on the rifling of the guns, propelling power of the





"Dr. William Beebe and Otis Barton went down a distance of 3,028 feet . . . the V-6 was submerged to a depth of 336 feet . . . a diver . . . was lowered to a depth of 288 feet . . ." (Depths of record descents into the sea as compared with relative distances in Michigan avenue, Chicago, from Madison street north to Austin avenue.)

plane to an altitude of 44,933 feet above the flying field at Villacoublay, France. Renato Donati, an Italian, on April 11 of this year forced his plane to an altitude of 47,560 feet in a flight above the Montecelio airdrome in Italy.

How man has eclipsed the birds in the busines of flying can be realized plainly if one considers for a moment that the great condor of the Andes. the bird which is said to fly higher than any other bird, never has been observed at an altitude o much more than 23,000 feet.

Shells Hurled Far in Sky

For the present, apparently, man's ceiling in the stratosphere is about 14 miles above sea level, the altitude attained by the Russian aeronauts, though frequently free balloons have been sent to heights of more than twenty miles. In projecting his creations into space, however, man never has devised any other objects to travel so far from earth as the shells of the German long-range guns that bombarded Paris during the World war. In the beginning the ordnance experts who designed the "Big Berthas" were counting on shelling Paris from a distance of between fifty and sixty miles.

AIR CONDITIONING EQUIPMENT

explosives used, which varied with almost every shot, and a number of other factors. hurling their murderous missils into the densely populated areas of the French capital. Various figures have been

DROVIDENCE

50 DEGREE ANGLE

mentioned from time to time as the maximum altitude of the shell of the long-range gun at the height of its arc. H. W. Miller, who wrote a book on the subject, has

. shell

perweapon

altitude :

its flight of

48 miles."

gram show

ing range of "Big Ber-

Milwaukee

been quoted as from the susaying that the shell from the of the World superweapon of war reached the World war an extreme reached an extreme altitude in its flight of (Right: Dia-48 miles. If the whole state of Rhode tha," the dis-Island could be tance from Chicago to set upright upon its south-



northern boundary would reach into the sky approximately as high as the shells of the "Big Berthas" traveled

PLANT

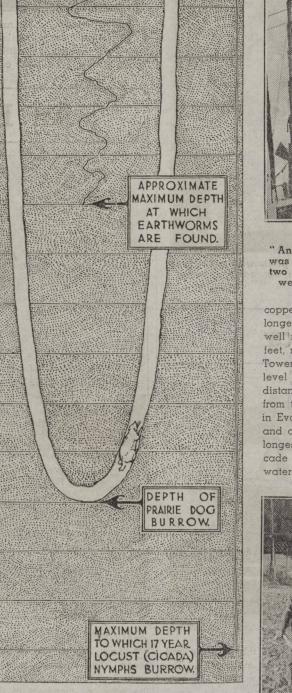
MAIN SHAFT

Exploits in the mysterious stratosphere and the equally mysterious depths of the sea seem more thrilling to the layman than the prosaic occupation of diaging, yet marvels have been performed in this last-named line. Man without machinery, of course, is a poor digger. Given a shovel and a pick, most primitive of implements, and assigned to dig a well ten feet in diameter, he can go

down into ordinary earth at the rate of about six feet a day. If he could have the earth he loosened removed as he dug deeper, and if he could continue to dig in ordinary earth at the rate of six feet a day, he could reach a depth of 2,190 feet in a year of 365 working days. In fifty years of effort-and that would be too much for almost any manhe could dig to a depth of slightly more than twenty miles, provided he could do his six feet a day.

Layers of Rock

But it would not be long after he began his job before he would encounter substances - m u c h harder



48MILES

TOP OF STRATOSPHERE

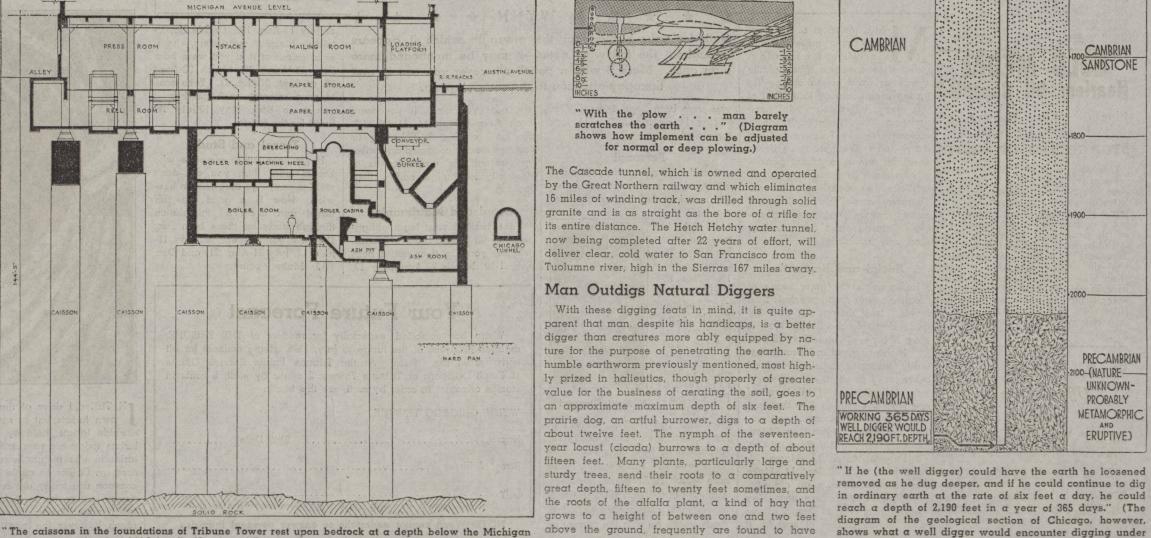
BOTTOM OF STRATOSPHERE

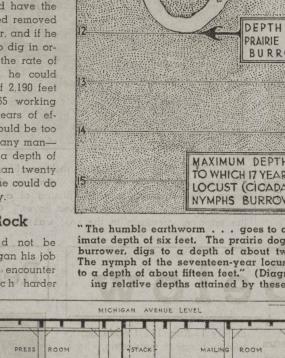
TOP OF TROPOSPHER

KENOSHA RACIN

WAUKEGAN

The humble earthworm . . . goes to an approx imate depth of six feet. The prairie dog, an artful burrower, digs to a depth of about twelve feet. The nymph of the seventeen-year locust burrows to a depth of about fifteen feet." (Diagram showing relative depths attained by these three.) MICHIGAN AVENUE







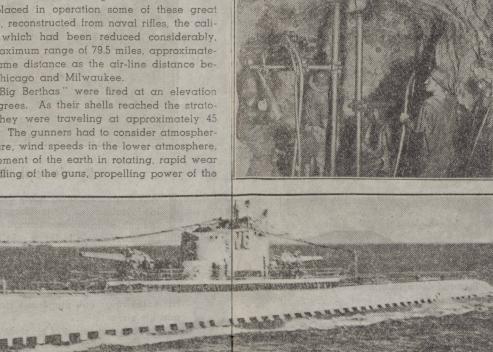
"Then along came a sister ship, the V-6 . . ." (This naval subsea craft submerged to a depth of 336 feet on April 8, 1931, off the Isle of Shoals. The vessel is 380 feet long and 33 feet in beam and has a displacement of 2,787 tons. Its maximum surface speed is 21 knots.) Sunday, October 14, 1934

". . . Robinson Deep, a gold mine in South Africa. is 8.380 feet deep . . ." (Above: Diagram of mine. Below: Miners working in the Robinson Deep.) degrees. The gunners had to consider atmospher-

WORK GALLERY

WORK GALLERY GREATEST DEPTH 8,380 FEET

4.000 FOOT LEVEL -----



. roots of the

TIPPLE

WORK GALLERY

alfalfa plant . . . fre-

quently are found

to have penetrated

the soil fifteen feet

or more.



MILWAUKE

longest shaft penetrates the earth to a distance of 9,009 feet. An oil well near Bakersfield, Cal., recently was drilled to a depth of 11,377 feet, more than two miles. The caissons in the foundation of Tribune Tower rest upon bedrock at a depth below the Michigan avenue street level of 144.5 feet. The great Simplon tunnel cuts through the Alps a distance of approximately 124/13 miles, about equal to the distance from the city hall in Chicago to the Northwestern university campus in Evanston, and goes under a mountain to a depth of about a mile and a quarter. The Cascade tunnel in the state of Washington, the longest railway bore in the western hemisphere, penetrates the Cascade mountains a distance of 7.79 miles. The new subterranean waterway of the Hetch Hetchy project in California is 25 miles long.



than ordinary earth. The diagram at the right side of this page shows just what he would find were he digging his well in Chicago. The drawing shows the geological section of Chicago as adapted from a sketch prepared by Henry W. Nichols, acting curaior of geology of the Field Museum of Nature History, with a picture of Tribune Tower, drawn to scale, superimposed to give a clear idea of the depths of the various earth strata. As can be seen, Chicago rests upon a layer of clay, sand, and gravel, which in turn rests upon rock. Below the upper rock stratum are layer after layer of other types of rock. The well digger, could he penetrate these layers of rock and continue on indefinitly into the earth, at some time in the far future certainly would encounter unbearable temperatures, for it is the accepted theory that the farther one penetrates into the earth the higher is the temperature he encounters-a theory based upon the belief that the center of the earth is a molten mass.

Merely Scratches the Earth

With the plow, an implement almost as common as the shovel and the pick, man barely scratches the earth to a depth of



"An oil well near Bakersfield, Cal., recently was drilled to a depth of 11,377 feet, more than

from four to five inches in so - called normal plowing and to a depth of six to eight inches in socalled deep plowing. He regulates the depth of his plowing by changing the point of coupling between plow beam and power, making the plowshare dig shallow or deep as he prefers. When modern

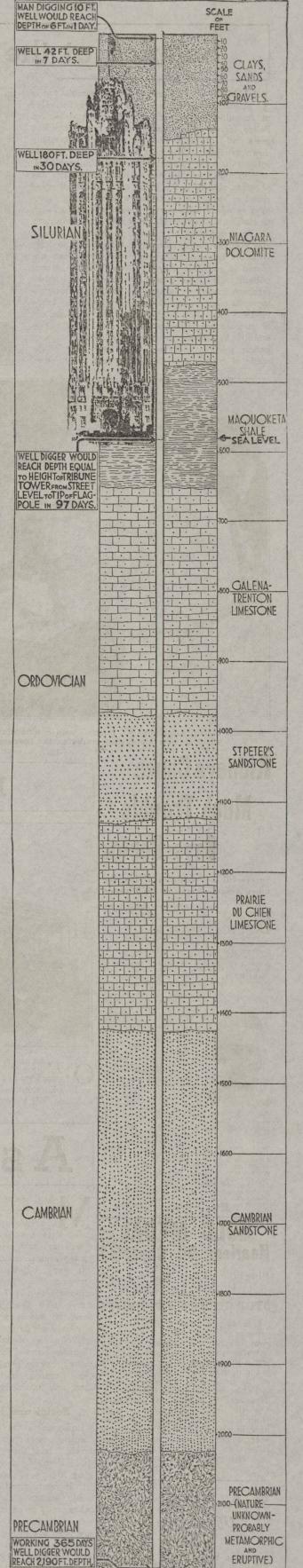
machinery is employed in penetrating the earth, as in mining, building tunnels, drilling oil or gas wells, or sinking caissons for he foundations o great buildings much greater depths an be attained. The Robinson Deep, a gold mine in South Africa, is 8,380 feet deep, nearly one and a half miles. The Quincy mine, a

shows how implement can be adjusted for normal or deep plowing.)

The Cascade tunnel, which is owned and operated by the Great Northern railway and which eliminates 16 miles of winding track, was drilled through solid granite and is as straight as the bore of a rifle for its entire distance. The Hetch Hetchy water tunnel, now being completed after 22 years of effort, will deliver clear, cold water to San Francisco from the Tuolumne river, high in the Sierras 167 miles away.

Man Outdigs Natural Diggers

With these digging feats in mind, it is quite apparent that man despite his handicaps, is a better digger than creatures more ably equipped by nature for the purpose of penetrating the earth. The humble earthworm previously mentioned, most highly prized in halieutics, though properly of greater value for the business of aerating the soil, goes to an approximate maximum depth of six feet. The prairie dog, an artful burrower, digs to a depth of about twelve feet. The nymph of the seventeenyear locust (cicada) burrows to a depth of about fifteen feet. Many plants, particularly large and sturdy trees, send their roots to a comparatively great depth, fifteen to twenty feet sometimes, and avenue street level of 144.5 feet." (Section of Tribune Tower foundation, showing various levels.) penetrated the soil fifteen feet or more.



"If he (the well digger) could have the earth he loosened removed as he dug deeper, and if he could continue to dig in ordinary earth at the rate of six feet a day, he could the roots of the alfalfa plant, a kind of hay that reach a depth of 2.190 feet in a year of 365 days." (The grows to a height of between one and two feet diagram of the geological section of Chicago, however, Chicago.)