MARTIANS BUILD TWO IMMENSE CANALS IN TWO YEARS

Vast Engineering Works Accomplished in an Incredibly Short Time by Our Planetary Neighbors--- Wonders of the September Sky.

By Mary Proctor.

According to a telegram dated Aug. 17, from Flagstaff Observatory, Arizona, Dr. Percival Lowell announces the rediscovery of two new canals of Mars, which were seen for the first time at the last opposition in 1909. The canals are now very conspicuous, and attracting world-wide attention because of their startling significance.

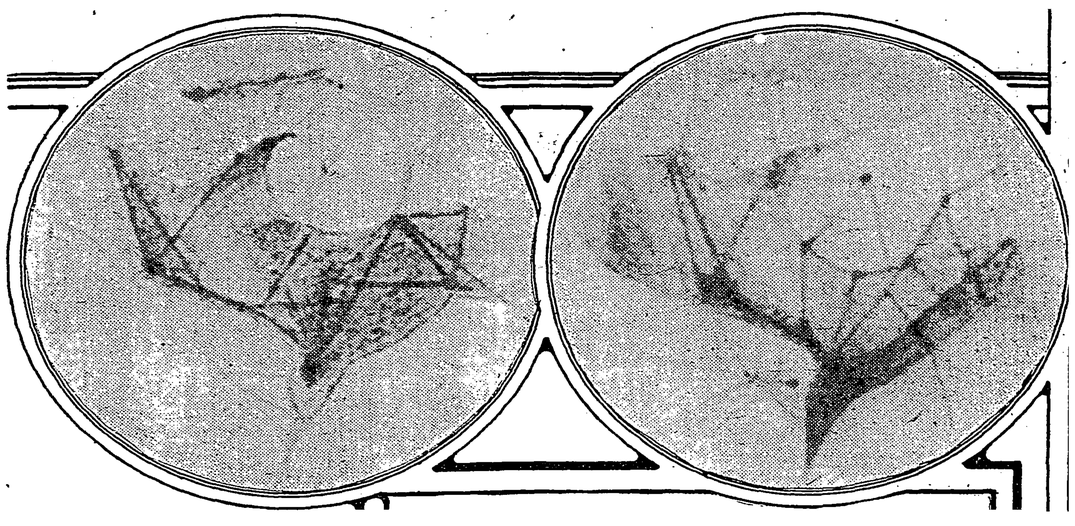
Measurement of their dimensions shows each of them to be a thousand miles long and some twenty miles wide. In comparison, the cañon of the Colorado River would be a secondary affair. What has been the cause of these vast chasms which have suddenly opened on Mars, where the internal forces are far less than could possibly be the case with our planet? Nothing like it has ever been seen or heard of before. To witness the coming into existence on another world of a surface feature in what we know to be no airy cloud-built fabric, but the solidest of ground, is in its character an event so far of unique occurrence.

That these vast chasms have been caused by some internal disturbance is out of the question, for shattering of the sort would certainly have left its mark in yawning, cavernous abysses—such as we see on our own planet in regions where volcanic disturbances have taken place. In the case of the new canals recently observed on Mars, such widespread, shattering effects are altogether absent, and as Dr. Lowell expresses it: "The outcome is purely local, and of most orderly self-restraint at that. An enormous change in the planet's features has taken place, with no concomitant disruption beyond the bounds it set. The whole thing is wonderfully clear-cut."

That the new canals were not a mere illusion or vagary of the imagination is proven by the fact that they are again visible, but they are as great a problem now as they were when first seen in 1909. Canals a thousand miles long and twenty miles wide are simply beyond our comprehension. Even though we are aware of the fact that, owing to the mass of the planet being a little less than one-ninth of the earth's mass, a rock which here weighs one hundred pounds would there only weigh thirty-eight pounds, engineering operations being in consequence less arduous than here, yet we can scarcely imagine the inhabitants of Mars capable of accomplishing this Herculean task within the short interval of two years.

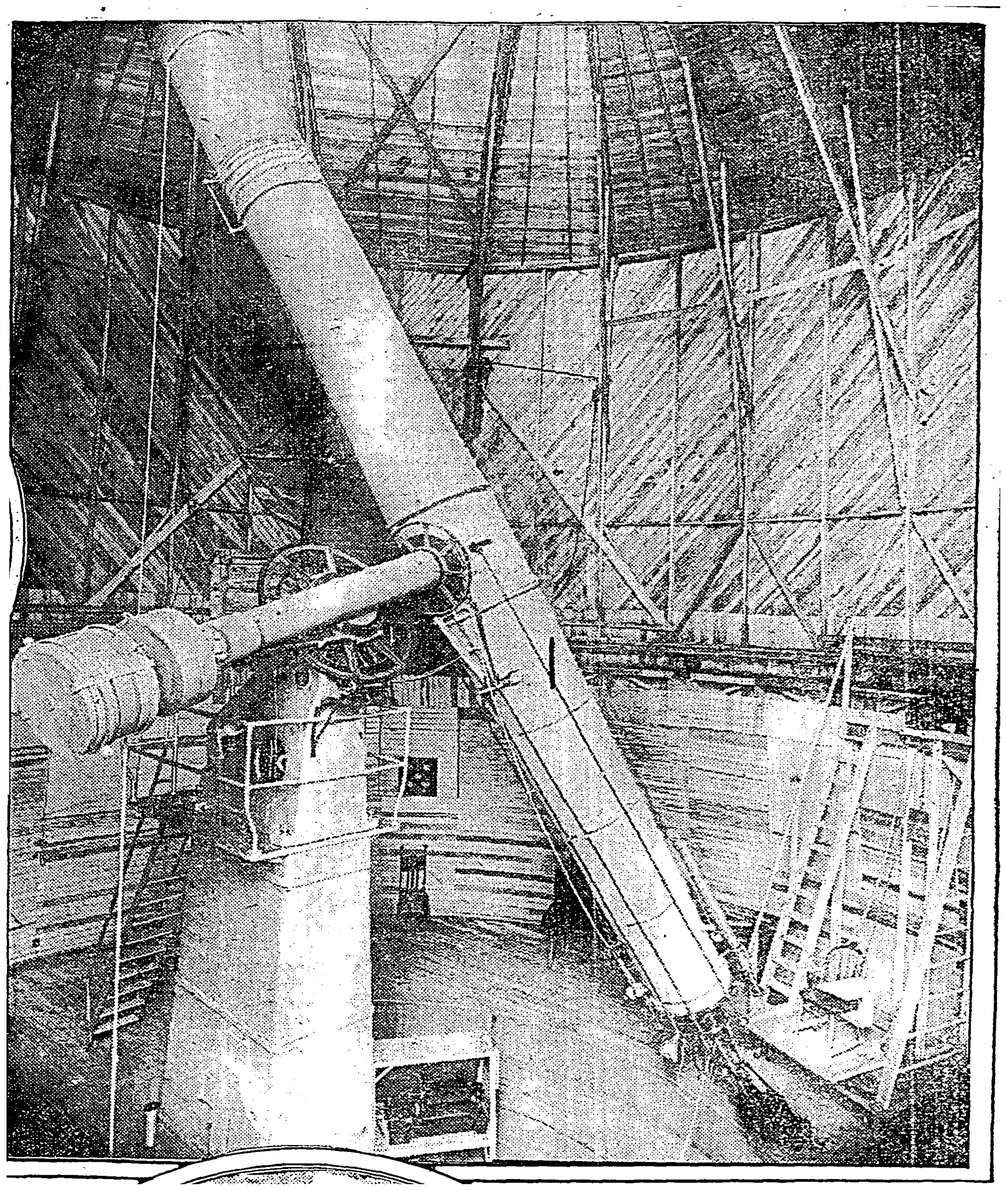
Examining the Flagstaff records for the past sixteen years, during which Mars has been kept under observation, no record has been found of these canals.

These Two Drawings by Prof. Lowell and Prof. E. C. Slipher Show the New Canals Just Observed.

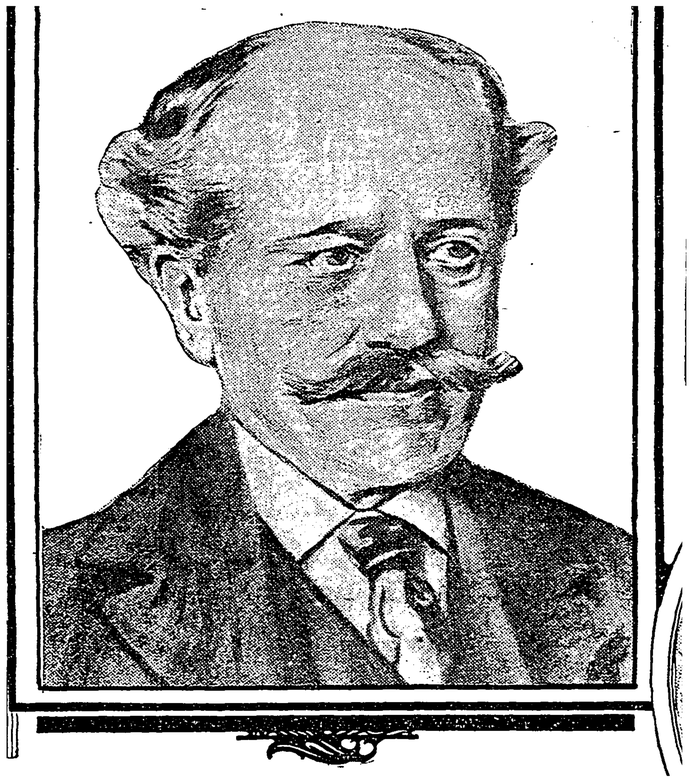


the planet. The record books were then examined, when it appeared that not a trace of them was to be found in the drawings of May, June, July, or August when this part of the planet was most carefully observed and drawn.. That they had not been observed in previous years was then conclusively ascertained by examination of the records of those years.

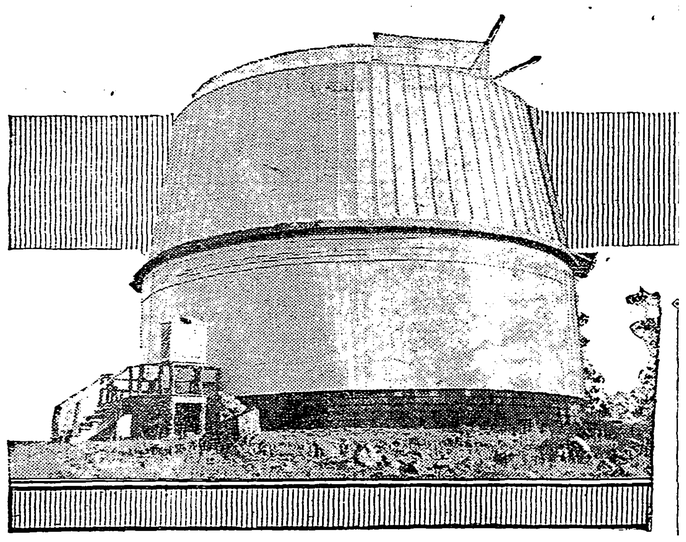
The record of canals seen at Flagstaff is registered at the Lowell Observatory after each opposition or near approach of the planet, when it is well placed for observation. From these records a fresh map, including all new details observed, is made of the planet's surface. These maps are, therefore, of the greatest value in enabling us to trace any peculiarities or changes on Mars, and they keep us in touch with any alterations which may be taking place on that planet. What new revelations are in store for us, at the present opposition, we know not, but of one fact we are certain, and that is the untiring energy and boundless enthusiasm of Dr. Lowell and his able assistants at the Lowell Observatory will make it simply impossible for any detail of the slightest significance on Mars to escape their vigilance.



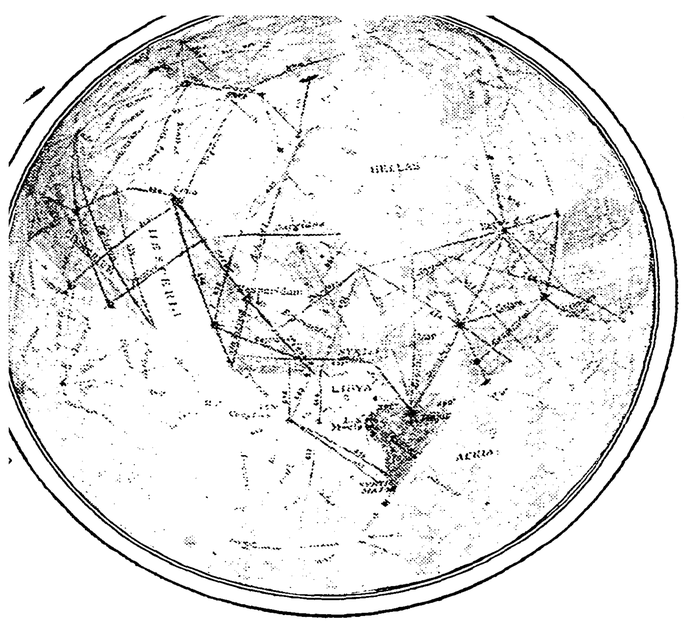
The Great Telescope at Lowell Observatory.



Prof. Percival Lowell, Discoverer of the Canals on Mars.



The Lowell Observatory at Flagstaff, Arizona.



The Canal Map of Mars Before the New Discoveries.

We are sure that seasonal changes cannot explain them, and that eleven years ago no such canals existed, nor before their discovery in 1909. In Martian chronology they not only did not exist in their present state during the previous Martian year, but also not four, five, and six Martian years before that. It is also certain that they were not in existence thirty and thirty-two years ago, inasmuch as Schiaparelli (the Milanese astronomer who first detected the canals of Mars) never saw them.

The observer can never be quite sure that his data are comparable until he has himself seen the Martian disk under like conditions, or nearly such, which recurrent presentations require a lapse of fifteen to seventeen years. Furthermore, to be conclusive, the observations must all have been made by the same observer working under like conditions, and grown, in consequence, familiar with every detail of the disk, since the personal equation, including by that term the site, instrumental methods and equipment, is always a factor.

A Martian cycle, that is a round of about sixteen years, must have been gone through by the same observer before definitive judgment can be pronounced. Such a cycle now stands complete at Flagstaff, and they prove conclusively by the records that although Mars has been observed four times previously at the same season of the Martian year at which these two new canals appeared, no such canals then existed.

They were first detected on Sept. 30, 1909, when the region known as the Syrtis Major came around again into view after its periodic hiding of six weeks, due to the unequal rotation periods of the earth and Mars. Two canals were at once evident to the east of the Syrtis in places where no canals had been previously seen.

Not only was their appearance unprecedented, but the canals themselves were the most conspicuous ones on that part of the disk. With the two main canals were associated several smaller ones, and at least two oases, all previously unseen, while from their interconnection they all clearly made part of one and the same addition to the general canal system.

Many independent drawings of the phenomena were made, both by the Director, Percival Lowell, and his assistant, Mr. E. C. Slipher, and in the course of the next few days the canals were photographed, appearing on the plates as the most marked features on that part of

A celestial drama of unusual interest is being enacted in the evening sky, the curtain rising shortly after the sun has disappeared low down in the West. Then—

"Silently, one by one, in the infinite meadows of Heaven,"

—the lovely stars blossom forth, led by ruddy Arcturus hovering over the sunset region; overhead are Vega and Altair on opposite sides of Cygnus, the Swan, which is represented in olden star maps, flying with outspread wings down the Milky Way. It is sometimes referred to as the Northern Cross, the upright piece extending from Alpha, or Deneb, to Beta, or Albireo, at the foot of the cross. The cross-piece consists of three stars, a central star and two on each side.

Take an opera glass and turn it in the direction of Alpha at the top of the cross. Slightly to the northwest can be seen Brooks's comet, so called because it was just discovered by Prof. Brooks of Geneva, N. Y. The comet has returned to our neighborhood for a brief visit, and, though insignificant compared with Halley's comet of recent fame, yet it is interesting because it can be seen with the unaided eye, and almost exactly overhead early in the evening.

About 10:30 the ring-girdled planet Saturn may be seen rising above the northeastern horizon, closely followed by ruddy Mars, which, however, it surpasses in brilliancy. Gradually Saturn rises higher and higher, till by midnight it has usurped the centre of the celestial stage, and the little comet is taking flight due west. The rings can be easily seen with a small three-inch telescope, and enthusiasts who bought telescopes at the time Halley's comet excited so much interest will do well to resurrect them, as Saturn is a beautiful object to observe at present, with its wide open rings and stately retinue of moons. To the fortunate owner of a small telescope Saturn is an endless source of delight, for it is unique among the heavenly bodies.

In my father's book entitled "Other Worlds Than Ours" he wrote: "I know nothing better calculated to lead men to choose astronomy as their favorite subject of study than the contemplation of the Saturnian system. I can well remember the sensation with which I saw the ringed planet for the first time. I look on that view as my introduction to the most fascinating of all the sciences." In his book, "Half Hours with the Telescope," he encourages the amateur to make a study of the planet, for even a good two-inch telescope will do much in showing the rings and belts of Saturn:

"Seen in a larger telescope Saturn is an object of surpassing loveliness. He must be an unimaginative man who can see Saturn for the first time in such a telescope without a feeling of awe and amazement. If there is any object in the heavens—I except not even the sun—calculated to impress one with a sense of the wisdom and omnipotence of the Creator it is this. 'His fashioning hand' is indeed visible throughout space, but in Saturn's system it is most impressively manifest."

Last September the writer had several opportunities for seeing the planet with the telescopes at the Yerkes Observatory. The first observations were made with the Brashear six-inch telescope, with which could be seen the outline of the planet and the ring system. It was also possible to obtain a glimpse of Titan, the largest moon, and one or two of the smaller moons.

Seen through the twelve-inch telescope, Saturn presented the appearance of a beautiful miniature of the planet, delicately tinted, and showing a sharp, clear outline against the dark blue sky. The rings were clearly defined, and four of the moons, including Titan, were visible. These glimpses through the six and twelve-inch telescopes were preparatory to a view of Saturn through the great 40-inch refractor.

It has been said that the great astronomer Tycho Brahe felt overwhelmed, as in the presence of princes, when he gazed upon the stars, for to him they were monarchs of the sky. In their honor he wore his velvet robes of state, befitting the presence of royalty. What would he have thought, however, could he have gazed upon Saturn through the giant forty-inch lens at the Yerkes Observatory.

The sight is a revelation no words can adequately describe. One is speechless while regarding the wonders of this superb planet, encircled by the golden-hued rings shaded with a mere suggestion of purple tint. The faint outline of the planet was visible through the transparent crape ring, and the shadow of the planet could be seen on the ring itself. Six of the attendant moons were in sight, faithful satellites hovering within the field of view adorned by their leader. Imperceptibly the moments flew by, while the writer enjoyed the wondrous scene. Then the clouds, baneful enemies of astronomers, drifted across the field of view, completely hiding Saturn from sight. Yet this was a memorable experience to be numbered among the red letter days of one's work at visual observations.

The climax, as far as seeing Saturn is concerned, is yet to be attained by enjoying a view of the planet through the great five-foot reflector at Mount Wilson, Cal. Last August forty of the world's most renowned astronomers climbed above the clouds hovering around Mount Wilson to visit the Solar Observatory, which is erected at an elevation of nearly 6,000 feet above sea level. Not only is the sun studied in all its phases at this observatory, but incidentally the stars and Saturn can be seen to the very greatest advantage with the five-foot reflector. Those who saw Saturn by its means returned with the most glowing accounts of their experience.

"It is hopeless to attempt a description of Saturn," writes one observer, in his account given for the Scientific American. "The rings are complex, while the dark or crape ring semed to be much wider and nearer the planet than when seen in small telescopes. A tinge of blue was observed on the Saturnian south pole, and yellow bands toward the Equator."

Prof. E. E. Barnard, who was among the visitors to Mount Wilson, was especially interested in the blue tint of the polar cap, which as a rule appears of a grayish hue. That the blue tint of the cap, however, is not altogether a novelty is shown by the observations of Mr. Browning, who was some forty years ago a maker of reflecting telescopes in London. He observed the planet Saturn with a small reflector in the year 1884. In "Old and New Astronomy" my father refers to Mr. Browning's description of the colors of Saturn's disk as follows:

"The rings are yellow ochre shaded with the same and sepia; the globe yellow ochre and brown madder, orange and purple shaded with sepia; the pole and narrow belts situated near it on the globe, pale cobalt blue. But there is a muddiness about all terrestrial colors when compared with the colors of objects seen in the skies. These colors could not be painted in all their brilliancy and purity, unless we could dip our pencils in the rainbow and transfer the prismatic hues to our paper."

If this description applies to a view of Saturn obtained with a small reflector, what visions it conjures up of the marvelous display which awaits the fortunate mortal who is enabled to gaze upon the planet through the great five-foot reflector at Mount Wilson.

Fine views of the planet can also be obtained through the great reflector at the Lowell Observatory at Flagstaff, Ariz., where the seeing is remarkably good. On September 19, 1909, while observing Saturn, Dr. Percival Lowell, Director of the Lowell Observatory noticed faint wisps traversing diagonally the planet's equatorial disk. They were also seen, and photographed by his assistant, Mr. E. C. Slipher.

In appearance Dr. Lowell describes the wisps as resembling faint shreds of some dark substance dropping from points on one edge of the bright belt over to the other. There is a curious resemblance between these markings and some of a like kind to be found on the planet Jupiter. Both planets have practically the same physical condition, their surface matter being rather gaseous than liquid, gases much condensed, in which float their clouds.

"Saturn is thus indicated to be a vast shell of gaseous matter surrounding a much smaller kernel of denser substance," Prof. Lowell remarks. "The existence, then, of lacings or regular persistent rents in these clouds so nearly resembling one another on the two planets, show that such features are the inevitable outcome of the forces at work under the physical conditions, and give us some clue to the meteorologic processes exemplified there."

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