Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors,
PUBLISHED WEEKLY AT
No. 361 BROADWAY, NEW YORK.

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The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

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NEW YORK, SATURDAY, OCTOBER 8, 1892.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT
No. 875.

For the Week Ending October 8, 1892.

Price 10 cents. For sale by all newsdealers.

SUGGESTIONS FOR INVENTORS.

There are at least two classes of inventors which are widely distinguished from each other in two important particulars. Inventors of one class are brimful of ideas, and are able to make choice of a large number of valuable subjects for invention, and seldom or never seek suggestions. Inventors of the other class are ingenious, able to invent when they see a necessity for it, but have not an exhaustless fountain of ideas, and are, therefore, dependent upon what they can obtain from others in the way of suggestions. For the latter class, who frequently inquire as to what inventions are needed, or how to go about it to get this valuable information, the following hints are given.

An inventor who has neither a large fortune nor exhaustless patience can make greater progress by working out small, simple inventions than by attempting great things. Here are a few subjects on which inventors of this class can work:

Bicycles, although brought to great perfection, seem to us to require something neater and better than the endless chain and sprocket wheel for connecting the crank shaft and drive wheel. Rowboats, especially such as are used by sea-going vessels, ought to be provided with better means of propulsion than the ancient oar. Such means should be something like the modern screw propeller, substituting man power for steam power. The important part of this invention would lie in the motor to be operated by the men. It should be very simple and so constructed that, although unused and exposed to the weather, it would still be ready for instant use at any time. The same device would apply to pleasure boats.

In these days apartment houses and flats are extensively used for dwelling places, and where room is economized to such an extent, furniture should be made to conform to the conditions: that is, to facilitate the delivery of furniture to such places and for convenience in moving, house cleaning, storage, etc., the furniture should all be made so as to knock down and fold up flat or nearly so. The parts of each piece of furniture should be connected so that they will not become separated and mismatched or lost, and when set up ready for use, the furniture should resemble that in common use to such an extent that the difference would not be readily noticeable.

Any good food product made in a new form and put up in an attractive shape takes well, and large fortunes are being made on this class of inventions. Articles of wearing apparel, especially those used by ladies, if novel and pleasing, go without much urging. Pocket conveniences for ladies or gentlemen are apt to prove profitable; toys are an unending source of profit to the inventor who strikes a vein of "taking" things, and so we might go on with an endless variety of subjects, great and small, which only await the wideawake inventor.

JUPITER'S NEW MOON.

The discovery of a new secondary planet is an event of no small importance in the world of astronomy. The fifth moon of Jupiter came into the ken of the great Lick telescope a few days ago quite as unexpectedly as the two satellites of Mars swam into the field of the Washington telescope in 1877. Neither E. E. Barnard nor Asaph Hall was looking for new or hitherto unseen worlds when they achieved immortality by a keenness of vision which enabled their practiced eyes and trained intellects to perceive what had escaped a host of other observers in the same field.

The discovery of the new Jovian satellite disturbs that nice geometrical progression which aided students to memorize the number of moons belonging to the solar system. Beginning with the earth and proceeding outwardly the account stood as follows: The earth one, Mars two, Jupiter four, Saturn eight, Uranus four, and Neptune one, total twenty. We might reasonably hope to find another satellite revolving around Neptune, thus perfecting the geometrical sequence, but the harmony of arrangement is utterly destroyed by the intrusion of Barnard's fifth satellite among Jupiter's moons.

Questions at once arise in the mind of the physicist, What is the meaning of this little lunar world? What relation does it sustain to the Jovian system? What light does it throw upon the process of world making? Are Jupiter and the other giant planets still engaged in throwing off new masses from their bulging equators?

The rapid diurnal rotation of both Jupiter and Saturn, giving objects on their surface an enormous centrifugal motion, lends color to the latter conjecture, and we notice that this theory has been broached by a writer in the Chicago *Post*. But is it tenable? Jupiter has long since cooled down from a gaseous to at least a semi-solid condition, and is about one-third heavier than water. It is true that the velocity of its diurnal motion has caused its equator to protrude so that the planet presents an oblate appearance in a telescope of moderate power, and measurements show that its equatorial diameter is 5,300 miles greater than its polar; but it is a simple problem to compute the centrifugal force of 26,000 miles per hour at the Jovian equator and compare it with the centripetal force of the planet's prodigious attracting mass. The latter greatly preponderates, and if calculations are not at fault, the giant planet has been holding itself firmly together for countless ages, and the active little world discovered by Barnard has been pursuing its rapid journey for a corresponding period of astronomical eons.

We can better appreciate the significance, or perhaps we should say the insignificance, of this little moon by comparing it with the other Jovian satellites and our own moon. With the exception of the minute orbs moving around Mars, it is he smallest known satellite of the solar system. But there are many asteroids which rival it in diminutiveness; these, however, are only half as far away as the Jovian system, and are not dimmed by proximity to his overpowering luster. Following is a table of Jupiter's moons—the outer four being copied from Young's "General Astronomy."

	Distance.	Diameter.	Period.
Barnard's.....	113,000	100	12h.
Io.....	261,000	2,500	1d. 18h.
Europa.....	415,000	2,100	3d. 13h.
Ganymede.....	664,000	3,550	7d. 4h.
Calypso.....	1,167,000	2,960	16d. 17h.

The second column gives the distance in miles from the center of the planet. As Jupiter has a diameter of 86,000 miles, Barnard's moon is only 70,000 miles from its surface, or less than one-third the distance of our moon from the earth. As our moon is 240,000 miles distant, has a diameter of 2,160 miles, and makes a siderial revolution in 27 days and 8 hours, it will be seen that it approximates the satellite Io in distance from its primary, and Europa in size. But note the great disparity in periods. While Io, a little further away than the moon, darts around Jupiter in 42 hours, our plodding satellite consumes 656 hours, or nearly sixteen times Io's period to accomplish a shorter journey.

This is striking evidence of the overwhelming mass of Jupiter as compared with its retinue of satellites. While it would require but 50 of our moons to equal the bulk of the earth, and 81 to equal its mass, it would require 316 earths to equal the mass and 1,300 to equal the bulk of Jupiter. These Jovian moons, then, are forced to move with high centrifugal velocity to overcome the attractive power of the mighty central mass.

Comparing these moons with some of the other planets, we find that Calypso has nearly the same diameter as Mercury, and Ganymede would equal the bulk of Mars if its diameter were 650 miles greater. Titan, the sixth moon of Saturn, is the only other satellite which equals Ganymede in size.

Are these Jovian and Saturnian worlds, with nearly half the earth's diameter, inhabited? Probably not. They may have low forms of animal and vegetable life, but the conditions do not seem favorable for the development of intelligent beings. If they have oceans and atmospheres, their vast primaries would produce such enormous tides that scarcely any portion of the habitable land would escape overflow. Of course we cannot even imagine the Barnard satellite to be the abode of life. A world only 100 miles or so in diameter parts with its heat very rapidly, and we may fairly assume that its surface is as cold as interstellar space.

But suppose a human being were permitted to step upon the surface of Io, what a magnificent celestial panorama would be unrolled to his gaze! Mighty Jupiter, with an apparent diameter 43 times that of our moon, would cover an area of the starry heavens 20 degrees in diameter. He would hide the entire constellation of Orion at one time. Unlike the unchanging face of our dead moon, which reflects only 17 per cent of the sun's rays, his surface is covered with great masses of brilliant vapor swirling and rolling and heaving in billows of tremendous agitation and reflecting 62 per cent of the sun's rays. And in addition, four balls, of lesser light, varying in size, and exhibiting all the phases from slender crescents to full-orbed globes, would be seen gliding across the heavens in a maze of intricate and rapid motions.

DREDGING THE HONOLULU HARBOR BAR.

A matter of interest to engineers and of great value to commerce is the accomplishment of the work of cutting a channel 200 feet wide and 30 feet deep through the bar at the entrance of the harbor of Honolulu, Hawaiian Islands.

The harbor is a deep, narrow channel, extending from the shore line out to the deep waters of the open sea—a distance of about 7,000 feet. It is flanked on both sides by extensive mud and sand flats, which are bounded on the seaward side by a line of coral reefs of irregular depth, upon which the surf is continually breaking. The width of the channel directly in front of the city is from 800 to 900 feet, gradually contracting to a width of about 450 feet at its mouth. The bar is situated near the outer end of the channel, is about 1,100 feet in length above the plane of 30 feet depth, and has on its apex a minimum depth of 21 feet at low tide. Inside of the bar, the depth of the harbor varies from 18 to 39 feet. The average rise of ordinary tides