THE HEAVENS FOR OCTOBER.

BY WILLIAM R. BROOKS, M.A., F.R.A.S.

MERCURY.

Mercury is evening star at the opening of the month, but too near the sun for observation. It comes into inferior conjunction on October eighth at four o'clock, when it will be between the earth and sun. It then changes to morning star, and, pursuing its fleet onward course, it reaches its greatest western elongation 18° 26' on the twenty-fourth of the month, at 7 o'clock in the morning. This will be the best time to observe Mercury as morning star, say for about a week before and after the 24th inst. Mercury will be in conjunction with the moon on the night of October sixth, when Mercury will be 2° north of the moon, which became new only seven hours before.

VENUS.

Venus is also evening star, and will begin to shine resplendently in the western gloaming during October. It is moving rapidly out from the sun's rays, and will be a conspicuous object for the rest of the year. By the middle of October it will set an hour and a half after the sun. Venus will be in conjunction with the beautiful two-days old moon on the eighth at 4 o'clock in the afternoon, Venus being 5° 18' north of the moon. It will be in conjunction with Uranus on the early morning of the nineteenth, Venus being south of Uranus less than three-quarters of a degree.

MARS.

This exceedingly interesting planet, which comes into opposition on the tenth of December next, and will then be at its nearest approach to the earth at their opposition, may now be well observed by midnight. On the first of the month it will be at a good elevation at that hour, and by the last of October will be in excellent position for telescopic scrutiny. Its high northern declination is very favorable for good definition.

Already the great telescopes are turned toward this planet, and many of its markings have been seen to wonderful advantage. Not only have the so-called canals been seen, but their duplication, a feature so long maintained by the able Italian astronomer Schiaparelli alone, has been proved beyond a doubt. As opposition approaches, and the planet comes nearer to us, small telescopes of four to six inches aperture will reveal much to the persevering observer.

About the 1st of October Mars is fifteen degrees east by north of Aldebaran, which star it now greatly surpasses in brilliancy. Its rapid movement from night to night among the stars affords a splendid illustration of a planet's orbital motion. Mars will be in conjunction with the moon on the 26th of the month, when the planet will be three and one-half degrees south of the moon.

JUPITER.

Jupiter is in the morning sky, but, rising only about two hours before the sun, it is not well placed for telescopic observation. It is in conjunction with the moon on the 3d of the month, when it is one degree and forty minutes north of the moon, and again on the 31st, when it is two degrees and twenty-five minutes north of the moon.

SATURN, URANUS AND NEPTUNE.

Both Saturn and Uranus are low down in the western evening sky, and so near the sun as to be hidden from our view by his overpowering rays. Neptune is in the morning sky between the horns of Taurus, about two degrees west of the famous Crab nebula.

COMETS.

Three telescopic comets are now visible. Sperra's comet, discovered on August 31, and verified by the writer on September 4, is in Ursa Major, my latest observation being on September 9, when it was in right ascension 14h. 11m. 20s.; declination north 55° 6'. It is moving easterly.

Giacobini's comet was discovered at Nice, September 4. It is in Serpentarius, and its position at this writing is right ascension 17h. 40m.; declination south 9° 55'; moving southeast.

Brooks' periodic comet, discovered by the writer in 1889 and now returned to visibility after its seven years' journey around the sun, is apparently almost stationary in Aquarius, on the left thigh of that figure. The position of the comet on October 1 is right ascension 22h. 8m.; declination south 17° 29'. An illustrated article describing this comet was published in the SCIENTIFIC AMERICAN of August 22 of the present year.

Smith Observatory, Geneva, N. Y., September 18, 1896.

The Northland Under Water.

The cabin decks of the steamship Northland, of the Great Northern line, lie under water in the slip where she was laid up for the winter at Duluth, Minn. It is suspected that the seacocks were opened the night of September 21, by some one, probably discharged employes. The steamer cost $700,000, and is the finest on the lakes. The ruin of the interior decorations will make the loss considerable. She completed her season's trips between Duluth and Buffalo less than a fortnight ago.

Two Remarkable Guns for Coast Defense.

The United States Ordnance Board is about to construct two guns of 16 inch and 12 inch caliber, both of them experimental, and both possessing features of great interest and novelty. The 16 inch gun will be remarkable for its weight and power, which will give it an undisputed claim to the title of the biggest gun in the world; the 12 inch weapon, which is to be a Brown segmental wire-wound gun, is being built to ascertain whether the good results which were obtained with the 5 inch Brown gun, two years ago, can be repeated in a weapon of large caliber.

The 16 inch gun will be 50 feet in length, will weigh 125 tons, and will be capable of throwing a 2,370 pound projectile, with an initial velocity of 2,000 feet a second, to an extreme range of 16 miles. The charge of brown powder will weigh over half a ton. The outside diameter of the breech of the gun will be 5 feet 2 inches and the diameter of the breech opening 20 inches. The shell will be capable of penetrating 27½ inches of steel at a distance of two miles.

It will be noticed that while this is the most powerful gun in the world, its caliber is not so great as that of some existing guns. There is no necessary connection between the weight and power of a gun and its caliber.

There are a couple of old smooth bores in the vicinity of New York which already confer the distinction upon the United States government of possessing the largest calibered guns in existence, the diameter of the bore being 20 inches. Then, again, the English navy mounts some 16¼ inch rifled guns and the Italian navy some 17 inch guns, of modern construction, which are of considerably less power than the 16 inch gun now under construction at the Watervliet Arsenal.

There is only one big gun which will compare with the new weapon in power, and this is the 16½ inch Krupp breech loader exhibited at Chicago in 1893, which weighs 120 tons and fires a 2,204 pound shell with an initial velocity of 1,981 feet a second. Its muzzle energy is 60,002 foot tons, or 4,000 foot tons less than that of the Watervliet gun.

The comparative dimensions and performance of the great guns of the world are shown in the accompanying table:

Builders.	Caliber. Inch.	Length. Feet.	Weight of gun. Tons.	Weight of shell. Lb.	Muzzle velocity. Ft. sec.	Muzzle Energy. Ft. tons.	Penetration at muzzle.
Watervliet Arsenal	16	50	125	2,370	2,000	64,000	*33 in. steel
Krupp............	16½	46	120	2,204	1,981	60,000	42 in. iron
Armstrong.... ...	16¼	43½	110½	1,800	2,087	54,390	37½ "
Armstrong..	17	40	104	2,000	1,992	55,030	33½ "

* The equivalent penetration through iron would be about 4 feet.

At first thought it might seem that our government was taking a step backward in commencing the construction of these large guns at a time when foreign nations have abandoned them in favor of lighter weapons of 12 inch and 13 inch caliber; but, as a matter of fact, the conditions which put a stop to their construction have changed, and new conditions have arisen which call for these monster weapons to meet them. The 16¼ inch guns failed, not in their destructive effects, which were enormous, but because of certain structural defects, which caused them to sag at the muzzle after firing a limited number of rounds. The system of building up adopted in the manufacture of large guns in the United States will entirely prevent this weakness. Moreover, at the time when the large guns fell into disfavor it was found that guns of 12 inch and 13 inch caliber could be built which would effect an equal penetration through the best armor of that date.

To-day, however, the introduction of the Harvey system of manufacture has raised the resisting power of armor plate so greatly that it bids fair to become more than a match for the 13 inch gun. Even at the testing grounds, where the shell has everything in its favor, it can scarcely get through a reforged Harvey plate; and when it is delivered at a passing ship, where the range is less certain, the blow less direct, and the exact location of the armor not known, the chances of penetration are very slim. Now it is well understood that one successful penetration into the vitals of a ship is worth a dozen blows, however destructive, that fail to get through. It is here that the value of the 125 ton gun comes in. Its penetration is about 35 per cent greater than that of the 13 inch gun, and its energy, or the crushing in effect which it exerts upon the side of the ship, is nearly double; the energy of the 13 inch gun being 33,627 foot tons and that of the 16 inch gun 64,000 foot tons. The gun now under construction is strictly experimental, and some idea of the costliness of these huge weapons is gained from the fact that it will take three years to complete it.

The Ordnance and Fortification Board has recently made an allotment for a 12 inch Brown segmental wire-wound gun. This decision has been prompted by the successful tests of the 5 inch Brown gun two years ago, when 200 rounds were fired with very high pressures before any defect developed in the gun. Moreover, the British government has achieved such excellent results with their wire-wound guns, built on the Longridge system, that they have adopted a 12 inch gun of this type as the main armament of the fleet. In the wire-wound gun the metal of the inner tube or liner is thrown into a state of initial compression by the enormous tension at which the wire wrapping is wound upon it. By this means it is able to withstand much greater powder pressures than a gun of the built up, hooped construction. As a consequence, a wire-wound gun may be built of the same weight as a hooped gun which will have far greater energy and penetration. What the system has done in the English navy is shown in the following comparison of its 12 inch hooped and 12 inch wire guns.

Nature of Gun.	Weight.	Weight of Shell.	Muzzle Velocity.	Energy Developed. At Muzzle.	Energy Developed. Per Ton of Gun.	Energy Developed. Per Pound of Powder.
	Tons.	Lb.	F. S.	F. T.	F. T.	F. T.
12 in. hooped gun................	45	714	1,892	18,060	420	61
12 in. wire gun	46	850	2,323	31,800	691	212

From this comparison it is seen that for the same total weight of weapon the energy is nearly double in the wire-wound gun.

The peculiar feature of the Brown gun is that between the inner tube and the wire coil is a set of steel staves, or longitudinal segments, which are bound together by the steel wire "under a tension that will produce such a compression between the segments at their inner surface that they will not begin to open under ordinary powder pressures." The advantage of making the tube in segments is that a much higher quality of metal can be obtained than is possible in a solid tube. It will have the maximum longitudinal strength and a higher elastic limit for compression. Moreover, every segment may be carefully tested before it is put into the gun.

We hope to give a more detailed description of the Brown segmental gun in a later issue.

Phosphorescence in Development.

A. Helheim draws attention to this subject in the Photographisches Archiv. After reciting the experiments of Dr. Neuhauss in 1892, Dr. Precht in 1895, and those of Lenard and Wolff in 1888, he writes that he has had similar experience in studying the action of formaldehyde as a constituent of the developer. He made up a developer of—

Water......	30 grammes.
Pyrogallic acid.......................................;	1 gramme.
Carbonate of soda...................................	1½ grammes.
Formaldehyde (40 per cent)...........	2 grammes.

The negative was over-exposed and fogged. After laying aside a few minutes, the plate was seen to glimmer, first at the edges and then toward the center. The light was bluish-white, and observable even in presence of the dark room lamp. The phosphorescence appeared as soon as all moisture was absorbed from the surface, and lasted several minutes. Thinking the absorption an important factor, as the phosphorescence was imperceptible while the plate was in the dish, the writer tried the effect of another absorber of water, and added 30 c. c. of alcohol to the developer. A very intense phosphorescence was at once visible. As it passed away, it could be revived by shaking the bottle. The addition of alcohol, of course, precipitated the carbonate of soda, and produced similar conditions to those in the experiments of Lenard and Wolff, who poured pyrogallic acid developer into an equal quantity of saturated solution of alum.—British Journal of Photography.

The Load of a Dust Storm.

Blown dust is a general and familiar nuisance to housekeepers over the entire West. A minimum estimate, verified by direct observation, for the quantity of dust settling on floors during such storms is about a fourteenth of an ounce of dust on a surface of a square yard in half a day. A maximum estimate made on the basis of the above newspaper accounts would be at least five pounds to a square yard of surface for a storm lasting twenty-four hours. If we then suppose that a house that is twenty-four feet wide and thirty-two feet long has open crevices, which average a sixteenth of an inch in width and have a running length in windows and doors of one hundred and fifty feet, the wind may be supposed to enter half of these crevices with a velocity of five miles per hour for the time the storm lasts, or for twenty-four hours. The dust may be supposed to settle on not less than eighty-five square yards of surface, including floor space and horizontal surfaces of furniture. The minimum estimate, based on these figures, gives us two hundred and twenty-five tons of dust to the cubic mile of air. The maximum estimate would be one hundred and twenty-six thousand tons.—From Dust and Sand Storms in the West, by Prof. J. A. Udden, in Appletons' Popular Science Monthly.