HENRY WARD BEECHER.

This great man—the most commanding genius of the present age—passed from the scene of human activities at Brooklyn, N. Y., on the 8th of March, 1887, in the 74th year of his life. He was born at Litchfield, Conn., in 1813. His talents were most versatile and extraordinary. What he was as a man, how his abilities were employed, and what he accomplished, is well condensed in the following resolutions of the Union League Club of New York:

"Inasmuch as it has pleased Almighty God to remove from the scenes of earth the Rev. Henry Ward Beecher, whose long, eventful, and distinguished life is known and recognized throughout the civilized world; be it, therefore,

"*Resolved*, That the Union League Club feels moved by the common sentiments of mourning which the occasion has universally called forth, and desires to add to the expression of other bodies its sense of appreciation of the great man who is now gone from us forever.

"*Resolved*, That in the person of Henry Ward Beecher we recognize, first of all, a great moral teacher, whose inspiration arose from an undying love of humanity and a belief in its worth and upward tendencies.

"*Resolved*, That his example as a liberal teacher, not only in secular and political affairs, but in religion also, has produced a marked effect upon the age, and has tended in the direction of leading men to a higher and better appreciation, not only of their earthly responsibilities and duties toward each other, but to a truer sense and knowledge of their relations to their Creator.

"*Resolved*, That the State and nation have, in the death of Mr. Beecher, lost a patriot whose love of country was always uppermost, and whose services in its behalf at a time and place of the most trying nature were equal to the great necessities at hand, and whose labors at that critical juncture were so peculiar, delicate, and effective that their value can never be overstated, as remembrance of them can never perish from the hearts of his grateful countrymen.

"*Resolved*, That we also recognize in Mr. Beecher a man of mighty intellect, lofty genius, marvelous fertility of thought, and unsurpassed in its expression, and that his contributions to the literature of the country will always retain the conspicuous place which his writings now occupy."

ASTRONOMICAL NOTES.

A Trio of Evening Stars.—The three planets Jupiter, Venus, and Saturn will be superb objects during the evenings of the latter part of March and the whole of April. We give Jupiter the first place, as his opposition with the sun occurs on April 21, this being his culminating point as seen from the earth. He then looms up in the east at sunset, looks down from the meridian at midnight, and sets at sunrise.

European astronomers have already seen this princely planet in full daylight with the naked eye. An observer at Argentan, France, followed the course of the planet from 7 o'clock till 10 o'clock on the morning of December 20, 1886, and on several succeeding mornings, and again on January 15 and 16, selecting the time when Jupiter was in or near conjunction with the moon, in order to know his exact position in the sky. The giant of the system in the full sunlight looked like a tiny shining point.

Observers with unusual visual power may now see the largest of the satellites with the unaided eye, and the whole four are visible in a marine glass.

Venus, in the western sky, worthily rivals her brother planet in the eastern sky. No planetary aspect is more charming than the one presented when the two most beautiful planets revealed to human view are found, the one rising with stately step in the east, while the other descends, serenely radiant, in the west. Venus is seen on the glowing twilight sky for more than two hours after sunset, and Jupiter, after opposition, will be her bright companion till she is lost to view, and then he reigns supreme among the starry throng till the morning dawns.

Saturn is the third member of the trio, but his brightness is on the wane, and before April closes he disappears from view before midnight. On April 1 he is on the meridian, about half-past 6 o'clock in the evening. He is still an interesting object as he descends in the west and approaches Venus, the two planets being near together on the evening of May 30. Saturn may be easily traced by his companions, Castor and Pollux on the north and Procyon on the south.

The Asteroids.—This unique planetary family is receiving constant accessions to its ranks. It now numbers 265 members. The latest comer was gathered in on February 25, by the indefatigable Palisa, and is of the twelfth magnitude. The later asteroids are not considered as very distinguished arrivals in the family. The older ones are more noteworthy in every respect. They are larger, they have the longest and the shortest periods, and their orbits are the most inclined or the most eccentric. One of them, Vesta, is now visible to the naked eye as a star of the sixth magnitude, about 10 degrees north of Jupiter. Those that are found now are of the twelfth and thirteenth magnitude. As telescopic power increases, an indefinite number of small asteroids may be discovered, but none of them will probably reach the tenth magnitude. The zone in which the asteroids travel is about as wide as three times the earth's distance from the sun. It is dangerously near to Jupiter, and absolutely encroaches upon the domain of Mars. It is said that Æthra, when in perihelion, gets inside of Mars in aphelion by as much as five million miles, though at so different a level in space that there is no close approach. The asteroids are troblesome members of the sun's family. They are hard to find, hard to keep when discovered. It is hard to trace their orbits and fix their places, and hardest of all to calculate their perturbations under the influence of Jupiter's mighty mass.

The Comets of 1887.—The present year rejoices in the discovery of four comets during the passage of the first two months.

Comet *a* was discovered on January 18, by Dr. Thorne, of the Cordoba Observatory. It promised to be a comet of renown, and closely resembled the great comet of 1880. Its tail was seen at Melbourne on January 21. As it passed perihelion on January 11, and its light is growing fainter, it will hardly merit a place among distinguished visitors.

Comet *b* was discovered on January 22, by Professor Brooks, of Phelps, N. Y. It was faint, moving slowly in a northwest direction, and was visible in a small telescope just below the North Star. Its ephemeris has been computed, and its elements show a singular resemblance to the comet of 1491, observed in China.

Comet *c* was discovered on January 23, by Prof. Barnard, of Nashville. It was faint, circular, with a nebulosity 1′ in diameter, had some central condensation, and was of the tenth magnitude.

Comet *d* was discovered by Prof. Barnard, on February 16. It was very faint, and moving rapidly in a northwesterly direction.

Eight comets passed perihelion during the year 1886. Prof. Brooks discovered three of them and Prof. Barnard two. Comets Fabry and Barnard were visible to the naked eye. One was Winnecke's comet on its periodic return, and two of the new ones, those of Finlay and the third one found by Brooks, were probably periodical.

Great numbers of telescopic comets, without doubt, are constantly flitting in our neighborhood, but they come and go without being perceived. Even those that are picked up by keen observers are, most of them, of little value, except as celestial curiosities, helping to swell the cometary records.

Weight of Dry and Moist Air.

N. S. C. writes: "In Cooley's New Natural Philosophy, page 54, I read: 'The atmospheric pressure will be greatest when there is the greatest amount of water vapor in the air; the barometer column will then rise.'

"In Kiddle's Physics, page 71, I am informed that: 'Watery vapor being lighter than air, the presence of large quantities of it reduces the pressure of the atmosphere.'

"When doctors disagree, who shall decide? Will the SCIENTIFIC AMERICAN please do it?"

A. Wet air is lighter than dry air. The general principles of the subject are enunciated in Dalton's laws, which may be thus expressed: 1. The tension (or pressure), and consequently the quantity of vapor (as of water vapor) that saturates a given space, is the same, whether that space was originally a vacuum or was filled with air or any other gas. 2. The tension (or pressure) of the mixture of a vapor and a gas is equal to the sum of the tensions (or pressures) which each would exert if filling that space alone. In studying these laws, it should be remembered that tension and pressure are synonymous for them, and that by Mariotte's and Boyle's law the volume of gases is inversely proportional to their tensions or pressures. Let us suppose now that we have two vessels filled, one with dry air and the other with air saturated with moisture. Assume the pressure or tension in each vessel to be 30 inches of mercury, and the temperature 60° Fah., and assume the volume of each vessel to be 600 cubic inches. The dry air will weigh $600 \times 0{\cdot}30935 = 185{\cdot}61$ grains. The tension of water vapor at the above temperature is about 0·5 inch. Therefore, by Dalton's second law, the 30 inches of tension or pressure in the vessel filled with wet air will be made up of that due to the water vapor, or 0·5 inch, and of that due to the air, or $30 - 0{\cdot}5 = 29{\cdot}5$ inches. Then by Mariotte's law the quantity of water vapor present in the vessel will be $\frac{600 \times 0{\cdot}5}{30}$ or 10 cubic inches, weighing about 5/8 as much as the same volume of air, or 1·93 grains. By Mariotte's law again, the volume of air alone present in the vessel will be $\frac{600 \times 29{\cdot}5}{30} = 590$ cubic inches, weighing 182·52. The contents of the second vessel, wet air, or air and water vapor, will weigh $1{\cdot}93 + 182{\cdot}52 = 184{\cdot}45$. The ratio of the weights of dry to wet air, therefore, at the above temperatures and pressures is 100 : 99·37.

Of course, even theoretically the above is not perfectly accurate, for Mariotte's and Boyle's law is only approximately true at ordinary temperatures. But if it is understood that moistening air merely means displacing a certain quantity of air and substituting therefor water vapor, and that such vapor is about 5/8 as heavy as a similar volume of air, there will be no difficulty in realizing that wet air is lighter than dry air.

Improved Gunpowder.

The charcoals hitherto used in the manufacture of gunpowder have been of comparatively low densities and inflammable natures, as well as highly hygroscopic. Mr. A. H. Durnford, of the Dartford Conservative Club, has, therefore, patented an invention, the object of which is to prepare a soft charcoal, which shall have an extremely light density, ignite at a low temperature, and exhibit very slight hygroscopic properties, and by its use in the manufacture of gunpowder to produce a gunpowder possessing the qualities of great energy and propelling power, combined with moderate pressures when fired in a gun. The invention consists chiefly in the production and use in gunpowder of a charcoal prepared from cork. The cork is put into cylinders and subjected to a destructive distillation by heating the cylinders to such temperatures as will produce the charcoal required. The improved gunpowder is made from mixtures consisting of, first, saltpeter and cork charcoal, in the proportions of about 80 and 20 per cent respectively; second, saltpeter, cork charcoal, and sulphur, the latter ingredient being in a proportion varying from about 1 to 10 per cent. It is claimed that the gunpowder produced by Mr. Durnford's process is comparatively smokeless and non-hygroscopic.

A Bomb Test.

A Washington dispatch says: "The inventor of a new kind of bomb, for which a patent is pending, came to see the Commissioner, who happened to be out. He brought with him a specimen bomb, which was inclosed in a pasteboard case, and he showed it to the Commissioner's private secretary, Mr. Will Montgomery. The inventor said that it would go off as soon as it touched water, and this specimen would make a noise when exploded like a fire cracker. The private secretary had some curiosity to see the bomb tested, and sent out and procured a pail of water. When the bomb was thrown into the water, the effect was startling. The water was forced up with violence to the ceiling, and fell in a shower pretty well all over the room, while the noise of the explosion was like the report of a cannon. As soon as the few spectators could wipe the water out of their eyes, they pronounced the test a great success."

A Great Balloon.

The captive balloon proposed by M. G. Yon for the French exhibition in 1889 will have the enormous volume of 60,000 cubic meters. The maximum altitude for the ascensions will be 1,000 meters, and it will be possible to take 100 passengers, a winding engine of 600 horse power being employed. In the construction of this balloon, the following point is of some interest: The surface of the balloon must always be tight, in order to prevent the damage which otherwise a strong wind might cause. To preserve tightness, notwithstanding variations in temperature, another small balloon is placed inside the large one, and the volume of this small balloon, which is filled with atmospheric air, can be increased or diminished by pumping in or exhausting air by means of an air pump, worked by an electric motor on the car, the current being supplied by a twin cable from a dynamo on the ground.

Death of A. J. Cambie.

Many readers of the SCIENTIFIC AMERICAN who have had business relations with the Canadian Patent Office will regret to hear of the death of its able chief clerk, Mr. A. J. Cambie, at Ottawa, on the 19th of February.

Mr. Cambie has acted as Deputy Commissioner of Patents for a number of years, and our extensive intercourse with the bureau over which he presided enables us to say that he was a most efficient and obliging officer. He proved himself to be a gentleman in all his dealings with those who had business to transact at the Patent Office.

GAS POWER.—The Gasmotoren Fabrik at Deutz have recently made a very successful trial of a double cylinder Otto engine, which gave a brake power of about 60 horse power when driven with Dowson's fuel gas. They are now making a four cylinder Otto engine which will not only develop over 100 horse power effective, but will have an impulse at every stroke. It will thus be seen that a considerable advance is being made in the sizes of gas engines now that Dowson's gas has been proved suitable for them, with a lower fuel consumption per horse power than is possible with steam engines of equal power.