All Around The Moon

By

Jules Verne

PRELIMINARY CHAPTER,

RESUMING THE FIRST PART OF THE WORK AND SERVING AS AN INTRODUCTION TO THE SECOND.

A few years ago the world was suddenly astounded by hearing of an experiment of a most novel and daring nature, altogether unprecedented in the annals of science. The BALTIMORE GUN CLUB, a society of artillerymen started in America during the great Civil War, had conceived the idea of nothing less than establishing direct communication with the Moon by means of a projectile! President Barbican, the originator of the enterprise, was strongly encouraged in its feasibility by the astronomers of Cambridge Observatory, and took upon himself to provide all the means necessary to secure its success. Having realized by means of a public subscription the sum of nearly five and a half millions of dollars, he immediately set himself to work at the necessary gigantic labors.

In accordance with the Cambridge men's note, the cannon intended to discharge the projectile was to be planted in some country not further than 28° north or south from the equator, so that it might be aimed vertically at the Moon in the zenith. The bullet was to be animated with an initial velocity of 12,000 yards to the second. It was to be fired off on the night of December 1st, at thirteen minutes and twenty seconds before eleven o'clock, precisely. Four days afterwards it was to hit the Moon, at the very moment that she reached her perigee , that is to say, her nearest point to the Earth, about 228,000 miles distant.

The leading members of the Club, namely President Barbican, Secretary Marston, Major Elphinstone and General Morgan, forming the executive committee, held several meetings to discuss the shape and material of the bullet, the nature and position of the cannon, and the quantity and quality of the powder. The decision soon arrived at was as follows: 1st--The bullet was to be a hollow aluminium shell, its diameter nine feet, its walls a foot in thickness, and its weight 19,250 pounds; 2nd--The cannon was to be a columbiad 900 feet in length, a well of that depth forming the vertical mould in which it was to be cast, and 3rd--The powder was to be 400 thousand pounds of gun cotton, which, by developing more than 200 thousand millions of cubic feet of gas under the projectile, would easily send it as far as our satellite.

These questions settled, Barbican, aided by Murphy, the Chief Engineer of

In the meantime, J.T. Marston, the Secretary of the Gun Club, and a most devoted friend of Barbican's, had started for Long's Peak, Colorado, on the summit of which the immense telescope, already alluded to, had been erected; it was of the reflecting kind, and possessed power sufficient to bring the Moon within a distance of five miles. While Marston was prosecuting his long journey with all possible speed, Professor Belfast, who had charge of the telescope, was endeavoring to catch a glimpse of the Projectile, but for a long time with no success. The hazy, cloudy weather lasted for more than a week, to the great disgust of the public at large. People even began to fear that further observation would have to be deferred to the 3d of the following month, January, as during the latter half of December the waning Moon could not possibly give light enough to render the Projectile visible.

At last, however, to the unbounded satisfaction of all, a violent tempest suddenly cleared the sky, and on the 13th of December, shortly after midnight, the Moon, verging towards her last quarter, revealed herself sharp and bright on the dark background of the starry firmament.

That same morning, a few hours before Marston's arrival at the summit of Long's Peak, a very remarkable telegram had been dispatched by Professor Belfast to the Smithsonian Institute, Washington. It announced:

That on December 13th, at 2 o'clock in the morning, the Projectile shot from Stony Hill had been perceived by Professor Belfast and his assistants; that, deflected a little from its course by some unknown cause, it had not reached its mark, though it had approached near enough to be affected by the Lunar attraction; and that, its rectilineal motion having become circular, it should henceforth continue to describe a regular orbit around the Moon, of which in fact it had become the Satellite. The dispatch went on further to state:

That the elements of the new heavenly body had not yet been calculated, as at least three different observations, taken at different times, were necessary to determine them. The distance of the Projectile from the Lunar surface, however, might be set down roughly at roughly 2833 miles.

The dispatch concluded with the following hypotheses, positively pronounced to be the only two possible: Either, 1, The Lunar attraction would finally prevail, in which case the travellers would reach their destination; or 2, The Projectile, kept whirling forever in an immutable orbit, would go on revolving around the Moon till time should be no more.

In either alternative, what should be the lot of the daring adventurers? They had, it is true, abundant provisions to last them for some time, but even

resources, and Ardan's daring, eccentric, but brilliant and effective combinations.

Besides, it will show that J.T. Marston, their faithful friend and a man every way worthy of the friendship of such men, was only losing his time while mirroring the Moon in the speculum of the gigantic telescope on that lofty peak of the mountains.

always keep in the one spot. For my part, as long as I can have the privilege of looking out of the window, I am willing to lease it for a hundred years. Ah! Barbican, that brings out one of your stony smiles. You think our lease may last longer than that! Our tenement may become our coffin, eh? Be it so. I prefer it anyway to Mahomet's; it may indeed float in the air, but it won't be motionless as a milestone!"

Barbican, having made sure by personal inspection that everything was in perfect order, consulted his chronometer, which he had carefully set a short time before with Chief Engineer Murphy's, who had been charged to fire off the Projectile.

"Friends," he said, "it is now twenty minutes past ten. At 10 46' 40'', precisely, Murphy will send the electric current into the gun-cotton. We have, therefore, twenty-six minutes more to remain on earth."

"Twenty-six minutes and twenty seconds," observed Captain M'Nicholl, who always aimed at mathematical precision.

"Twenty-six minutes!" cried Ardan, gaily. "An age, a cycle, according to the use you make of them. In twenty-six minutes how much can be done! The weightiest questions of warfare, politics, morality, can be discussed, even decided, in twenty-six minutes. Twenty-six minutes well spent are infinitely more valuable than twenty-six lifetimes wasted! A few seconds even, employed by a Pascal, or a Newton, or a Barbican, or any other profoundly intellectual being

Whose thoughts wander through eternity--"

"As mad as Marston! Every bit!" muttered the Captain, half audibly.

"What do you conclude from this rigmarole of yours?" interrupted Barbican.

"I conclude that we have twenty-six good minutes still left--"

"Only twenty-four minutes, ten seconds," interrupted the Captain, watch in hand.

"Well, twenty-four minutes, Captain," Ardan went on; "now even in twenty-four minutes, I maintain--"

"Ardan," interrupted Barbican, "after a very little while we shall have plenty of time for philosophical disputations. Just now let us think of something

difference to us whether we are inside the bullet or in front of it. There is, no doubt, some difference," he added, seeing the great eyes made by his friends, "but it is exceedingly little."

"Thank heaven for the some !" interrupted Ardan, fervently.

"Don't you approve of my suggestion, Captain?" asked Barbican.

"Certainly," was the hasty reply. "That is to say, absolutely. Seventeen minutes twenty-seven seconds!"

"Mac isn't a human being at all!" cried Ardan, admiringly. "He is a repeating chronometer, horizontal escapement, London-made lever, capped, jewelled,--"

His companions let him run on while they busied themselves in making their last arrangements, with the greatest coolness and most systematic method. In fact, I don't think of anything just now to compare them to except a couple of old travellers who, having to pass the night in the train, are trying to make themselves as comfortable as possible for their long journey. In your profound astonishment, you may naturally ask me of what strange material can the hearts of these Americans be made, who can view without the slightest semblance of a flutter the approach of the most appalling dangers? In your curiosity I fully participate, but, I'm sorry to say, I can't gratify it. It is one of those things that I could never find out.

Three mattresses, thick and well wadded, spread on the disc forming the false bottom of the Projectile, were arranged in lines whose parallelism was simply perfect. But Ardan would never think of occupying his until the very last moment. Walking up and down, with the restless nervousness of a wild beast in a cage, he kept up a continuous fire of talk; at one moment with his friends, at another with the dogs, addressing the latter by the euphonious and suggestive names of Diana and Satellite.

"Ho, pets!" he would exclaim as he patted them gently, "you must not forget the noble part you are to play up there. You must be models of canine deportment. The eyes of the whole Selenitic world will be upon you. You are the standard bearers of your race. From you they will receive their first impression regarding its merits. Let it be a favorable one. Compel those Selenites to acknowledge, in spite of themselves, that the terrestrial race of canines is far superior to that of the very best Moon dog among them!"

"Dogs in the Moon!" sneered M'Nicholl, "I like that!"

"Four minutes and a half more," said Barbican.

"Oh! four and a half little minutes!" went on Ardan. "Only think of it! We are shut up in a bullet that lies in the chamber of a cannon nine hundred feet long. Underneath this bullet is piled a charge of 400 thousand pounds of gun-cotton, equivalent to 1600 thousand pounds of ordinary gunpowder! And at this very instant our friend Murphy, chronometer in hand, eye on dial, finger on discharger, is counting the last seconds and getting ready to launch us into the limitless regions of planetary--"

"Ardan, dear friend," interrupted Barbican, in a grave tone, "a serious moment is now at hand. Let us meet it with some interior recollection. Give me your hands, my dear friends."

"Certainly," said Ardan, with tears in his voice, and already at the other extreme of his apparent levity.

The three brave men united in one last, silent, but warm and impulsively affectionate pressure.

"And now, great God, our Creator, protect us! In Thee we trust!" prayed Barbican, the others joining him with folded hands and bowed heads.

"Ten, forty-six!" whispered the Captain, as he and Ardan quietly took their places on the mattresses.

Only forty seconds more!

Barbican rapidly extinguishes the gas and lies down beside his companions.

The deathlike silence now reigning in the Projectile is interrupted only by the sharp ticking of the chronometer as it beats the seconds.

Suddenly, a dreadful shock is felt, and the Projectile, shot up by the instantaneous development of 200,000 millions of cubic feet of gas, is flying into space with inconceivable rapidity!

In a very few minutes after the shock, one of the bodies stirred a little, the arms moved, the eyes opened, the head rose and tried to look around; finally, with some difficulty, the body managed to get on its knees. It was the Frenchman! He held his head tightly squeezed between his hands for some time as if to keep it from splitting. Then he felt himself rapidly all over, cleared his throat with a vigorous "hem!" listened to the sound critically for an instant, and then said to himself in a relieved tone, but in his native tongue:

"One man all right! Call the roll for the others!"

He tried to rise, but the effort was too great for his strength. He fell back again, his brain swimming, his eyes bursting, his head splitting. His state very much resembled that of a young man waking up in the morning after his first tremendous "spree."

"Br--rr!" he muttered to himself, still talking French; "this reminds me of one of my wild nights long ago in the Quartier Latin , only decidedly more so!"

Lying quietly on his back for a while, he could soon feel that the circulation of his blood, so suddenly and violently arrested by the terrific shock, was gradually recovering its regular flow; his heart grew more normal in its action; his head became clearer, and the pain less distracting.

"Time to call that roll," he at last exclaimed in a voice with some pretensions to firmness; "Barbican! MacNicholl!"

He listens anxiously for a reply. None comes. A snow-wrapt grave at midnight is not more silent. In vain does he try to catch even the faintest sound of breathing, though he listens intently enough to hear the beating of their hearts; but he hears only his own.

"Call that roll again!" he mutters in a voice far less assured than before; "Barbican! MacNicholl!"

The same fearful unearthly stillness.

"The thing is getting decidedly monotonous!" he exclaimed, still speaking French. Then rapidly recovering his consciousness as the full horror of the situation began to break on his mind, he went on muttering audibly: "Have they really hopped the twig? Bah! Fudge! what has not been able to knock the life out of one little Frenchman can't have killed two Americans! They're all right! But first and foremost, let us enlighten the situation!"

himself, but he even insisted on helping Ardan to lift Barbican, and deposit him gently on the sofa.

The poor President had evidently suffered more from the concussion than either of his companions. As they took off his coat they were at first terribly shocked at the sight of a great patch of blood staining his shirt bosom, but they were inexpressibly relieved at finding that it proceeded from a slight contusion of the shoulder, little more than skin deep.

Every approved operation that Ardan had performed for the Captain, both now repeated for Barbican, but for a long time with nothing like a favorable result.

Ardan at first tried to encourage the Captain by whispers of a lively and hopeful nature, but not yet understanding why M'Nicholl did not deign to make a single reply, he grew reserved by degrees and at last would not speak a single word. He worked at Barbican, however, just as before.

M'Nicholl interrupted himself every moment to lay his ear on the breast of the unconscious man. At first he had shaken his head quite despondingly, but by degrees he found himself more and more encouraged to persist.

"He breathes!" he whispered at last.

"Yes, he has been breathing for some time," replied Ardan, quietly, still unconsciously speaking French. "A little more rubbing and pulling and pounding will make him as spry as a young grasshopper."

They worked at him, in fact, so vigorously, intelligently and perseveringly, that, after what they considered a long hour's labor, they had the delight of seeing the pale face assume a healthy hue, the inert limbs give signs of returning animation, and the breathing become strong and regular.

At last, Barbican suddenly opened his eyes, started into an upright position on the sofa, took his friends by the hands, and, in a voice showing complete consciousness, demanded eagerly:

"Ardan, M'Nicholl, are we moving?"

His friends looked at each other, a little amused, but more perplexed. In their anxiety regarding their own and their friend's recovery, they had never thought of asking such a question. His words recalled them at once to a full sense of their situation.

M'Nicholl was still too much flustered to venture a word.

"If you want me to answer your question satisfactorily, my dear Ardan," replied Barbican, with a quiet smile, "you will have the kindness to put your questions in English."

"What do you mean, Barbican!" asked Ardan, hardly believing his ears.

"Hurrah!" cried M'Nicholl, in the tone of a man who has suddenly made a welcome but most unexpected discovery.

"I don't know exactly how it is with the Captain," continued Barbican, with the utmost tranquillity, "but for my part the study of the languages never was my strong point, and though I always admired the French, and even understood it pretty well, I never could converse in it without giving myself more trouble than I always find it convenient to assume."

"You don't mean to say that I have been talking French to you all this time!" cried Ardan, horror-stricken.

"The most elegant French I ever heard, backed by the purest Parisian accent," replied Barbican, highly amused; "Don't you think so, Captain?" he added, turning to M'Nicholl, whose countenance still showed the most comical traces of bewilderment.

"Well, I swan to man!" cried the Captain, who always swore a little when his feelings got beyond his control; "Ardan, the Boss has got the rig on both of us this time, but rough as it is on you it is a darned sight more so on me. Be hanged if I did not think you were talking English the whole time, and I put the whole blame for not understanding you on the disordered state of my brain!"

Ardan only stared, and scratched his head, but Barbican actually--no, not laughed , that serene nature could not laugh . His cast-iron features puckered into a smile of the richest drollery, and his eyes twinkled with the wickedest fun; but no undignified giggle escaped the portal of those majestic lips.

"It sounds like French, I'd say to myself," continued the Captain, "but I know it's English, and by and by, when this whirring goes out of my head, I shall easily understand it."

Ardan now looked as if he was beginning to see the joke.

Columbiad has not burst, four thousand dollars; the Projectile has risen at least six miles, five thousand dollars; come, Captain, bleed!"

"Let me first be sure we're right," said the Captain, quietly. "I don't deny, you see, that friend Barbican's arguments are quite right, and, therefore, that I have lost my nine thousand dollars. But there is another view of the case possible, which might annul the bet."

"What other view?" asked Barbican, quickly.

"Suppose," said the Captain, very drily, "that the powder had not caught, and that we were still lying quietly at the bottom of the Columbiad!"

"By Jove!" laughed Ardan, "there's an idea truly worthy of my own nondescript brain! We must surely have changed heads during that concussion! No matter, there is some sense left in us yet. Come now, Captain, consider a little, if you can. Weren't we both half-killed by the shock? Didn't I rescue you from certain death with these two hands? Don't you see Barbican's shoulder still bleeding by the violence of the shock?"

"Correct, friend Michael, correct in every particular," replied the Captain, "But one little question."

"Out with it!"

"Friend Michael, you say we're moving?"

"Yes."

"In consequence of the explosion?"

"Certainly!"

"Which must have been attended with a tremendous report?"

"Of course!"

"Did you hear that report, friend Michael?"

"N--o," replied Ardan, a little disconcerted at the question. "Well, no; I can't say that I did hear any report."

"Did you, friend Barbican?"

operating on the bottom light. But Barbican was the first to get through his work at one of the side lights, and M'Nicholl and Ardan soon heard him shouting:

"No, my friends!" he exclaimed, in tones of decided emotion; "we have not fallen back to Earth; nor are we lying in the bottom of the Gulf of Mexico. No! We are driving through space! Look at the stars glittering all around! Brighter, but smaller than we have ever seen them before! We have left the Earth and the Earth's atmosphere far behind us!"

"Hurrah! Hurrah!" cried M'Nicholl and Ardan, feeling as if electric shocks were coursing through them, though they could see nothing, looking down from the side light, but the blackest and profoundest obscurity.

Barbican soon convinced them that this pitchy blackness proved that they were not, and could not be, reposing on the surface of the Earth, where at that moment, everything was illuminated by the bright moonlight; also that they had passed the different layers of the atmosphere, where the diffused and refracted rays would be also sure to reveal themselves through the lights of the Projectile. They were, therefore, certainly moving. No doubt was longer possible.

"It's a fact!" observed the Captain, now quite convinced. "Then I've lost!"

"Let me congratulate you!" cried Ardan, shaking his hand.

"Here is your nine thousand dollars, friend Barbican," said the Captain, taking a roll of greenbacks of high denomination out of his porte-monnaie.

"You want a receipt, don't you, Captain?" asked Barbican, counting the money.

"Yes, I should prefer one, if it is not too much trouble," answered M'Nicholl; "it saves dispute."

Coolly and mechanically, as if seated at his desk, in his office, Barbican opened his memorandum book, wrote a receipt on a blank page, dated, signed and sealed it, and then handed it to the Captain, who put it away carefully among the other papers of his portfolio.

Ardan, taking off his hat, made a profound bow to both of his companions, without saying a word. Such formality, under such extraordinary circumstances, actually paralysed his tongue for the moment. No wonder

"Look! Look!" he exclaimed, in tones so perfectly expressive of his rapidly alternating feelings as to render the medium of words totally unnecessary. "How rapidly the cursed thing is nearing us! Plague take your ugly phiz, the more I know you, the less I like you! Every second she doubles in size! Come, Madame Projectile! Stir your stumps a little livelier, old lady! He's making for you as straight as an arrow! We're going right in his way, or he's coming in ours, I can't say which. It's taking a mean advantage of us either way. As for ourselves--what can we do! Before such a monster as that we are as helpless as three men in a little skiff shooting down the rapids to the brink of Niagara! Now for it!"

Nearer and nearer it came, but without noise, without sparks, without a trail, though its lower part was brighter than ever. Its path lying little above them, the nearer it came the more the collision seemed inevitable. Imagine yourself caught on a narrow railroad bridge at midnight with an express train approaching at full speed, its reflector already dazzling you with its light, the roar of the cars rattling in your ears, and you may conceive the feelings of the travellers. At last it was so near that the travellers started back in affright, with eyes shut, hair on end, and fully believing their last hour had come. Even then Ardan had his mot .

"We can neither switch off, down brakes, nor clap on more steam! Hard luck!"

In an instant all was over. The velocity of the Projectile was fortunately great enough to carry it barely above the dangerous point; and in a flash the terrible bolide disappeared rapidly several hundred yards beneath the affrighted travellers.

"Good bye! And may you never come back!" cried Ardan, hardly able to breathe. "It's perfectly outrageous! Not room enough in infinite space to let an unpretending bullet like ours move about a little without incurring the risk of being run over by such a monster as that! What is it anyhow? Do you know, Barbican?"

"I do," was the reply.

"Of course, you do! What is it that he don't know? Eh, Captain?"

"It is a simple bolide, but one of such enormous dimensions that the Earth's attraction has made it a satellite."

"What!" cried Ardan, "another satellite besides the Moon? I hope there are no

allowing for friction and gravity, we can hardly be more than 5,500 miles. Yes, friend Barbican, Petit does not seem to be very wrong in his calculations."

But Barbican hardly heard the observation. He had not yet answered the puzzling question that had already presented itself to them for solution; and until he had done so he could not attend to anything else.

"That's all very well and good, Captain," he replied in an absorbed manner, "but we have not yet been able to account for a very strange phenomenon. Why didn't we hear the report?"

No one replying, the conversation came to a stand-still, and Barbican, still absorbed in his reflections, began clearing the second light of its external shutter. In a few minutes the plate dropped, and the Moon beams, flowing in, filled the interior of the Projectile with her brilliant light. The Captain immediately put out the gas, from motives of economy as well as because its glare somewhat interfered with the observation of the interplanetary regions.

The Lunar disc struck the travellers as glittering with a splendor and purity of light that they had never witnessed before. The beams, no longer strained through the misty atmosphere of the Earth, streamed copiously in through the glass and coated the interior walls of the Projectile with a brilliant silvery plating. The intense blackness of the sky enhanced the dazzling radiance of the Moon. Even the stars blazed with a new and unequalled splendor, and, in the absence of a refracting atmosphere, they flamed as bright in the close proximity of the Moon as in any other part of the sky.

You can easily conceive the interest with which these bold travellers gazed on the Starry Queen, the final object of their daring journey. She was now insensibly approaching the zenith, the mathematical point which she was to reach four days later. They presented their telescopes, but her mountains, plains, craters and general characteristics hardly came out a particle more sharply than if they had been viewed from the Earth. Still, her light, unobstructed by air or vapor, shimmered with a lustre actually transplendent. Her disc shone like a mirror of polished platins. The travellers remained for some time absorbed in the silent contemplation of the glorious scene.

"How they're gazing at her this very moment from Stony Hill!" said the Captain at last to break the silence.

"By Jove!" cried Ardan; "It's true! Captain you're right. We were near

density of the atmospheric envelopes, was not quite as brilliant as the Moon's. But the Earth's crescent, compared to the Lunar, was of dimensions much greater, being fully 4 times larger. You would have called it a vast, beautiful, but very thin bow extending over the sky. A few points, brighter than the rest, particularly in its concave part, revealed the presence of lofty mountains, probably the Himalayahs. But they disappeared every now and then under thick vapory spots, which are never seen on the Lunar disc. They were the thin concentric cloud rings that surround the terrestrial sphere.

However, the travellers' eyes were soon able to trace the rest of the Earth's surface not only with facility, but even to follow its outline with absolute delight. This was in consequence of two different phenomena, one of which they could easily account for; but the other they could not explain without Barbican's assistance. No wonder. Never before had mortal eye beheld such a sight. Let us take each in its turn.

We all know that the ashy light by means of which we perceive what is called the Old Moon in the Young Moon's arms is due to the Earth-shine, or the reflection of the solar rays from the Earth to the Moon. By a phenomenon exactly identical, the travellers could now see that portion of the Earth's surface which was unillumined by the Sun; only, as, in consequence of the different areas of the respective surfaces, the Earthlight is thirteen times more intense than the Moonlight , the dark portion of the Earth's disc appeared considerably more adumbrated than the Old Moon .

But the other phenomenon had burst on them so suddenly that they uttered a cry loud enough to wake up Barbican from his problem. They had discovered a true starry ring! Around the Earth's outline, a ring, of internally well defined thickness, but somewhat hazy on the outside, could easily be traced by its surpassing brilliancy. Neither the Pleiades , the Northern Crown , the Magellanic Clouds nor the great nebulas of Orion , or of Argo , no sparkling cluster, no corona, no group of glittering star-dust that the travellers had ever gazed at, presented such attractions as the diamond ring they now saw encompassing the Earth, just as the brass meridian encompasses a terrestrial globe. The resplendency of its light enchanted them, its pure softness delighted them, its perfect regularity astonished them. What was it? they asked Barbican. In a few words he explained it. The beautiful luminous ring was simply an optical illusion, produced by the refraction of the terrestrial atmosphere. All the stars in the neighborhood of the Earth, and many actually behind it, had their rays refracted, diffused, radiated, and finally converged to a focus by the atmosphere, as if by a double convex lens of gigantic power.

puzzling over his problem. Dum vivimus vivamus ! As we are asleep let us be asleep!"

So saying he threw himself on the mattress, and his companions immediately followed the example.

They had been lying hardly a quarter of an hour, when Barbican started up with a cry so loud and sudden as instantly to awaken his companions.

The bright moonlight showed them the President sitting up in his bed, his eye blazing, his arms waving, as he shouted in a tone reminding them of the day they had found him in St. Helena wood.

" Eureka! I've got it! I know it!"

"What have you got?" cried Ardan, bouncing up and seizing him by the right hand.

"What do you know?" cried the Captain, stretching over and seizing him by the left.

"The reason why we did not hear the report!"

"Well, why did not we hear it!" asked both rapidly in the same breath.

"Because we were shot up 30 times faster than sound can travel!"

"Come out to your friends, charming Diana," he went on, "come out, my beauty, destined for a lofty niche in the temple of canine glory! Come out, worthy scion of a race deemed worthy by the Egyptians to be a companion of the great god, Anubis, by the Christians, to be a friend of the good Saint Roch! Come out and partake of a glory before which the stars of Montargis and of St. Bernard shall henceforward pale their ineffectual fire! Come out, my lady, and let me think o'er the countless multiplication of thy species, so that, while sailing through the interplanetary spaces, we may indulge in endless flights of fancy on the number and variety of thy descendants who will ere long render the Selenitic atmosphere vocal with canine ululation!"

Diana, whether flattered or not, allowed herself to be dragged out, still uttering short, plaintive whines. A hasty examination satisfying her friends that she was more frightened than hurt and more hungry than either, they continued their search for her companion.

"Satellite! Satellite! Step this way, sir!" cried Ardan. But no Satellite appeared and, what was worse, not the slightest sound indicated his presence. At last he was discovered on a ledge in the upper portion of the Projectile, whither he had been shot by the terrible concussion. Less fortunate than his female companion, the poor fellow had received a frightful shock and his life was evidently in great danger.

"The acclimatization project looks shaky!" cried Ardan, handing the animal very carefully and tenderly to the others. Poor Satellite's head had been crushed against the roof, but, though recovery seemed hopeless, they laid the body on a soft cushion, and soon had the satisfaction of hearing it give vent to a slight sigh.

"Good!" said Ardan, "while there's life there's hope. You must not die yet, old boy. We shall nurse you. We know our duty and shall not shirk the responsibility. I should rather lose the right arm off my body than be the cause of your death, poor Satellite! Try a little water?"

The suffering creature swallowed the cool draught with evident avidity, then sunk into a deep slumber.

The friends, sitting around and having nothing more to do, looked out of the window and began once more to watch the Earth and the Moon with great attention. The glittering crescent of the Earth was evidently narrower than it had been the preceding evening, but its volume was still enormous when compared to the Lunar crescent, which was now rapidly assuming the

lustily to fill the aching void. Ardan, as a Frenchman, claimed the post of chief cook, an important office, but his companions yielded it with alacrity. The gas furnished the requisite heat, and the provision chest supplied the materials for their first repast. They commenced with three plates of excellent soup, extracted from Liebig's precious tablets, prepared from the best beef that ever roamed over the Pampas.

To this succeeded several tenderloin beefsteaks, which, though reduced to a small bulk by the hydraulic engines of the American Dessicating Company , were pronounced to be fully as tender, juicy and savory as if they had just left the gridiron of a London Club House. Ardan even swore that they were "bleeding," and the others were too busy to contradict him.

Preserved vegetables of various kinds, "fresher than nature," according to Ardan, gave an agreeable variety to the entertainment, and these were followed by several cups of magnificent tea, unanimously allowed to be the best they had ever tasted. It was an odoriferous young hyson gathered that very year, and presented to the Emperor of Russia by the famous rebel chief Yakub Kushbegi, and of which Alexander had expressed himself as very happy in being able to send a few boxes to his friend, the distinguished President of the Baltimore Gun Club. To crown the meal, Ardan unearthed an exquisite bottle of Chambertin , and, in glasses sparkling with the richest juice of the Cote d'or, the travellers drank to the speedy union of the Earth and her satellite.

And, as if his work among the generous vineyards of Burgundy had not been enough to show his interest in the matter, even the Sun wished to join the party. Precisely at this moment, the Projectile beginning to leave the conical shadow cast by the Earth, the rays of the glorious King of Day struck its lower surface, not obliquely, but perpendicularly, on account of the slight obliquity of the Moon's orbit with that of the Earth.

"The Sun," cried Ardan.

"Of course," said Barbican, looking at his watch, "he's exactly up to time."

"How is it that we see him only through the bottom light of our Projectile?" asked Ardan.

"A moment's reflection must tell you," replied Barbican, "that when we started last night, the Sun was almost directly below us; therefore, as we continue to move in a straight line, he must still be in our rear."

"Don't be alarmed, dear friend," observed Barbican, quietly. "The Projectile has seen the worst as far as heat is concerned; when tearing through the atmosphere, she endured a temperature with which what she is liable to at present stands no comparison. In fact, I should not be astonished if, in the eyes of our friends at Stony Hill, it had resembled for a moment or two a red-hot meteor."

"Poor Marston must have looked on us as roasted alive!" observed Ardan.

"What could have saved us I'm sure I can't tell," replied Barbican. "I must acknowledge that against such a danger, I had made no provision whatever."

"I knew all about it," said the Captain, "and on the strength of it, I had laid my fifth wager."

"Probably," laughed Ardan, "there was not time enough to get grilled in: I have heard of men who dipped their fingers into molten iron with impunity."

Whilst Ardan and the Captain were arguing the point, Barbican began busying himself in making everything as comfortable as if, instead of a four days' journey, one of four years was contemplated. The reader, no doubt, remembers that the floor of the Projectile contained about 50 square feet; that the chamber was nine feet high; that space was economized as much as possible, nothing but the most absolute necessities being admitted, of which each was kept strictly in its own place; therefore, the travellers had room enough to move around in with a certain liberty. The thick glass window in the floor was quite as solid as any other part of it; but the Sun, streaming in from below, lit up the Projectile strangely, producing some very singular and startling effects of light appearing to come in by the wrong way.

The first thing now to be done was to see after the water cask and the provision chest. They were not injured in the slightest respect, thanks to the means taken to counteract the shock. The provisions were in good condition, and abundant enough to supply the travellers for a whole year--Barbican having taken care to be on the safe side, in case the Projectile might land in a deserted region of the Moon. As for the water and the other liquors, the travellers had enough only for two months. Relying on the latest observations of astronomers, they had convinced themselves that the Moon's atmosphere, being heavy, dense and thick in the deep valleys, springs and streams of water could hardly fail to show themselves there. During the journey, therefore, and for the first year of their installation on the Lunar continent, the daring travellers would be pretty safe from all danger of hunger or thirst.

interesting to verify if the Earth and her satellite were similarly affected by the magnetic forces.

A hypsometer, or instrument for ascertaining the heights of the Lunar mountains by the barometric pressure under which water boils, a sextant to measure the altitude of the Sun, a theodolite for taking horizontal or vertical angles, telescopes, of indispensable necessity when the travellers should approach the Moon,--all these instruments, carefully examined, were found to be still in perfect working order, notwithstanding the violence of the terrible shock at the start.

As to the picks, spades, and other tools that had been carefully selected by the Captain; also the bags of various kinds of grain and the bundles of various kinds of shrubs, which Ardan expected to transplant to the Lunar plains--they were all still safe in their places around the upper corners of the Projectile.

Some other articles were also up there which evidently possessed great interest for the Frenchman. What they were nobody else seemed to know, and he seemed to be in no hurry to tell. Every now and then, he would climb up, by means of iron pins fixed in the wall, to inspect his treasures; whatever they were, he arranged them and rearranged them with evident pleasure, and as he rapidly passed a careful hand through certain mysterious boxes, he joyfully sang in the falsest possible of false voices the lively piece from Nicolo :

Le temps est beau, la route est belle, La promenade est un plaisir .

{The day is bright, our hearts are light.} {How sweet to rove through wood and dell.}

or the well known air in Mignon :

Legères hirondelles, Oiseaux bénis de Dieu, Ouvrez-ouvrez vos ailes, Envolez-vous! adieu!

{Farewell, happy Swallows, farewell!} {With summer for ever to dwell} {Ye leave our northern strand} {For the genial southern land} {Balmy with breezes bland.} {Return? Ah, who can tell?} {Farewell, happy Swallows, farewell!}

Barbican was much gratified to find that his rockets and other fireworks had not received the least injury. He relied upon them for the performance of

tablets, he reviewed his calculations regarding the motion of projectiles, their velocities, ranges and paths, their retardations and their accelerations, jotting down the figures with a rapidity wonderful to behold. Ardan neither wrote nor calculated, but kept up an incessant fire of small talk, now with Barbican, who hardly ever answered him, now with M'Nicholl, who never heard him, occasionally with Diana, who never understood him, but oftenest with himself, because, as he said, he liked not only to talk to a sensible man but also to hear what a sensible man had to say. He never stood still for a moment, but kept "bobbing around" with the effervescent briskness of a bee, at one time roosting at the top of the ladder, at another peering through the floor light, now to the right, then to the left, always humming scraps from the Opera Bouffe , but never changing the air. In the small space which was then a whole world to the travellers, he represented to the life the animation and loquacity of the French, and I need hardly say he played his part to perfection.

The eventful day, or, to speak more correctly, the space of twelve hours which with us forms a day, ended for our travellers with an abundant supper, exquisitely cooked. It was highly enjoyed.

No incident had yet occurred of a nature calculated to shake their confidence. Apprehending none therefore, full of hope rather and already certain of success, they were soon lost in a peaceful slumber, whilst the Projectile, moving rapidly, though with a velocity uniformly retarding, still cleaved its way through the pathless regions of the empyrean.

"Stop this hullabaloo, won't you? Do you want me to fail in my great combination!"

"Hello?" cried Barbican and M'Nicholl, starting up and rubbing their eyes.

"What noise was that?" asked Barbican.

"Seems to me I heard the crowing of a cock," observed the Captain.

"I never thought your ears could be so easily deceived, Captain," cried Ardan, quickly, "Let us try it again," and, flapping his ribs with his arms, he gave vent to a crow so loud and natural that the lustiest chanticleer that ever saluted the orb of day might be proud of it.

The Captain roared right out, and even Barbican snickered, but as they saw that their companion evidently wanted to conceal something, they immediately assumed straight faces and pretended to think no more about the matter.

"Barbican," said Ardan, coming down the ladder and evidently anxious to change the conversation, "have you any idea of what I was thinking about all night?"

"Not the slightest."

"I was thinking of the promptness of the reply you received last year from the authorities of Cambridge University, when you asked them about the feasibility of sending a bullet to the Moon. You know very well by this time what a perfect ignoramus I am in Mathematics. I own I have been often puzzled when thinking on what grounds they could form such a positive opinion, in a case where I am certain that the calculation must be an exceedingly delicate matter."

"The feasibility, you mean to say," replied Barbican, "not exactly of sending a bullet to the Moon, but of sending it to the neutral point between the Earth and the Moon, which lies at about nine-tenths of the journey, where the two attractions counteract each other. Because that point once passed, the Projectile would reach the Moon's surface by virtue of its own weight."

"Well, reaching that neutral point be it;" replied Ardan, "but, once more, I should like to know how they have been able to come at the necessary initial velocity of 12,000 yards a second?"

"In one moment; only I can't give you the curve really described by the Projectile as it moves between the Earth and the Moon; this is to be obtained by allowing for their combined movement around the Sun. I will consider the Earth and the Sun to be motionless, that being sufficient for our present purpose."

"Why so?"

"Because to give you that exact curve would be to solve a point in the 'Problem of the Three Bodies,' which Integral Calculus has not yet reached."

"What!" cried Ardan, in a mocking tone, "is there really anything that Mathematics can't do?"

"Yes," said Barbican, "there is still a great deal that Mathematics can't even attempt."

"So far, so good;" resumed Ardan. "Now then what is this Integral Calculus of yours?"

"It is a branch of Mathematics that has for its object the summation of a certain infinite series of indefinitely small terms: but for the solution of which, we must generally know the function of which a given function is the differential coefficient. In other words," continued Barbican, "in it we return from the differential coefficient, to the function from which it was deduced."

"Clear as mud!" cried Ardan, with a hearty laugh.

"Now then, let me have a bit of paper and a pencil," added Barbican, "and in half an hour you shall have your formula; meantime you can easily find something interesting to do."

In a few seconds Barbican was profoundly absorbed in his problem, while M'Nicholl was watching out of the window, and Ardan was busily employed in preparing breakfast.

The morning meal was not quite ready, when Barbican, raising his head, showed Ardan a page covered with algebraic signs at the end of which stood the following formula:--

$$\frac{1}{2}\frac{2}{x}\left(v'^2 - v^2\right) = gr\left\{\frac{r}{m'} - 1 + \frac{r}{d-x}\left(\frac{r}{m'} - \frac{r}{d-r}\right)\right\}$$

even tell you the rate of our velocity at any particular point of our journey."

"You can?"

"I can."

"Then you're just as deep a one as our President."

"No, Ardan; not at all. The really difficult part of the question Barbican has done. That is, to make out such an equation as takes into account all the conditions of the problem. After that, it's a simple affair of Arithmetic, requiring only a knowledge of the four rules to work it out."

"Very simple," observed Ardan, who always got muddled at any kind of a difficult sum in addition.

"Captain," said Barbican, " you could have found the formulas too, if you tried."

"I don't know about that," was the Captain's reply, "but I do know that this formula is wonderfully come at."

"Now, Ardan, listen a moment," said Barbican, "and you will see what sense there is in all these letters."

"I listen," sighed Ardan with the resignation of a martyr.

" d is the distance from the centre of the Earth to the centre of the Moon, for it is from the centres that we must calculate the attractions."

"That I comprehend."

" r is the radius of the Earth."

"That I comprehend."

" m is the mass or volume of the Earth; m prime that of the Moon. We must take the mass of the two attracting bodies into consideration, since attraction is in direct proportion to their masses."

"That I comprehend."

" g is the gravity or the velocity acquired at the end of a second by a body

be...?"

"To be," cried M'Nicholl working rapidly with his pencil, "219,572 miles, the moment the Moon is in her perigee , or nearest point to the Earth."

"Very well," continued Barbican. "Now m prime over m , that is the ratio of the Moon's mass to that of the Earth is about the 1/81. g gravity being at Florida about 32-1/4 feet, of course g x r must be--how much, Captain?"

"38,465 miles," replied M'Nicholl.

"Now then?" asked Ardan.

"Now then," replied Barbican, "the expression having numerical values, I am trying to find v , that is to say, the initial velocity which the Projectile must possess in order to reach the point where the two attractions neutralize each other. Here the velocity being null, v prime becomes zero, and x the required distance of this neutral point must be represented by the nine-tenths of d , the distance between the two centres."

"I have a vague kind of idea that it must be so," said Ardan.

"I shall, therefore, have the following result;" continued Barbican, figuring up; " x being nine-tenths of d , and v prime being zero, my formula becomes:--

$$v^2 = gr\left\{1 - \frac{10r}{81d} - \frac{1}{d-r} + \frac{10r}{9d}\right\}$$

The Captain read it off rapidly.

"Right! that's correct!" he cried.

"You think so?" asked Barbican.

"As true as Euclid!" exclaimed M'Nicholl.

"Wonderful fellows," murmured the Frenchman, smiling with admiration.

"You understand now, Ardan, don't you?" asked Barbican.

"Don't I though?" exclaimed Ardan, "why my head is splitting with it!"

second were sufficient, our Projectile started with no greater velocity!"

"Well?" asked M'Nicholl.

"Well, such a velocity will never do!"

"How??" } "How!!" } cried the Captain and Ardan in one voice.

"We can never reach the neutral point!"

"Thunder and lightning"

"Fire and Fury!"

"We can't get even halfway!"

"Heaven and Earth!"

" Mille noms d'un boulet! " cried Ardan, wildly gesticulating.

"And we shall fall back to the Earth!"

"Oh!"

"Ah!"

They could say no more. This fearful revelation took them like a stroke of apoplexy.

piece of paper. The Captain looked on with keen interest; he knew very well that Barbican was calculating their distance from the Earth by the apparent measure of the terrestrial diameter, and he eyed him anxiously.

Pretty soon his friends saw a color stealing into Barbican's pale face, and a triumphant light glittering in his eye.

"No, my brave boys!" he exclaimed at last throwing down his pencil, "we're not falling! Far from it, we are at present more than 150 thousand miles from the Earth!"

"Hurrah!" } "Bravo!" } cried M'Nicholl and Ardan, in a breath.

"We have passed the point where we should have stopped if we had had no more initial velocity than the Cambridge men allowed us!"

"Hurrah! hurrah!"

"Bravo, Bravissimo!"

"And we're still going up!"

"Glory, glory, hallelujah!" sang M'Nicholl, in the highest excitement.

" Vive ce cher Barbican! " cried Ardan, bursting into French as usual whenever his feelings had the better of him.

"Of course we're marching on!" continued M'Nicholl, "and I know the reason why, too. Those 400,000 pounds of gun-cotton gave us greater initial velocity than we had expected!"

"You're right, Captain!" added Barbican; "besides, you must not forget that, by getting rid of the water, the Projectile was relieved of considerable weight!"

"Correct again!" cried the Captain. "I had not thought of that!"

"Therefore, my brave boys," continued Barbican, with some excitement; "away with melancholy! We're all right!"

"Yes; everything is lovely and the goose hangs high!" cried the Captain, who on grand occasions was not above a little slang.

"You may deny it, but I know better, and knowing better, I have laid in my stores accordingly. You have but to choose. I possess a varied assortment. Chess, draughts, cards, dominoes--everything in fact, but a billiard table?"

"What!" exclaimed Barbican; "cumbered yourself with such gimcracks?"

"Such gimcracks are not only good to amuse ourselves with, but are eminently calculated also to win us the friendship of the Selenites."

"Friend Michael," said Barbican, "if the Moon is inhabited at all, her inhabitants must have appeared several thousand years before the advent of Man on our Earth, for there seems to be very little doubt that Luna is considerably older than Terra in her present state. Therefore, Selenites, if their brain is organized like our own, must have by this time invented all that we are possessed of, and even much which we are still to invent in the course of ages. The probability is that, instead of their learning from us, we shall have much to learn from them."

"What!" asked Ardan, "you think they have artists like Phidias, Michael Angelo and Raphael?"

"Certainly."

"And poets like Homer, Virgil, Dante, Shakspeare, Göthe and Hugo?"

"Not a doubt of it."

"And philosophers like Plato, Aristotle, Descartes, Bacon, Kant?"

"Why not?"

"And scientists like Euclid, Archimedes, Copernicus, Newton, Pascal?"

"I should think so."

"And famous actors, and singers, and composers, and--and photographers?"

"I could almost swear to it."

"Then, dear boy, since they have gone ahead as far as we and even farther, why have not those great Selenites tried to start a communication with the Earth? Why have they not fired a projectile from the regions lunar to the regions terrestrial?"

with evident pleasure her very successful efforts towards its hasty and complete disappearance.

"Looking at Diana," he went on, "makes me almost wish we had made a Noah's Ark of our Projectile by introducing into it a pair of all the domestic animals!"

"Not room enough," observed Barbican.

"No doubt," remarked the Captain, "the ox, the cow, the horse, the goat, all the ruminating animals would be very useful in the Lunar continent. But we couldn't turn our Projectile into a stable, you know."

"Still, we might have made room for a pair of poor little donkeys!" observed Ardan; "how I love the poor beasts. Fellow feeling, you will say. No doubt, but there really is no animal I pity more. They are the most ill-treated brutes in all creation. They are not only banged during life; they are banged worse after death!"

"Hey! How do you make that out?" asked his companions, surprised.

"Because we make their skins into drum heads!" replied Ardan, with an air, as if answering a conundrum.

Barbican and M'Nicholl could hardly help laughing at the absurd reply of their lively companion, but their hilarity was soon stopped by the expression his face assumed as he bent over Satellite's body, where it lay stretched on the sofa.

"What's the matter now?" asked Barbican.

"Satellite's attack is over," replied Ardan.

"Good!" said M'Nicholl, misunderstanding him.

"Yes, I suppose it is good for the poor fellow," observed Ardan, in melancholy accents. "Life with one's skull broken is hardly an enviable possession. Our grand acclimatization project is knocked sky high, in more senses than one!"

There was no doubt of the poor dog's death. The expression of Ardan's countenance, as he looked at his friends, was of a very rueful order.

"Well," said the practical Barbican, "there's no help for that now; the next

say how low that is in the scale, or that it would be the temperature to which our Earth should fall, if the Sun were suddenly extinguished."

"Little fear of that for a few more million years," said M'Nicholl.

"Who can tell?" asked Ardan. "Besides, even admitting that the Sun will not soon be extinguished, what is to prevent the Earth from shooting away from him?"

"Let friend Michael speak," said Barbican, with a smile, to the Captain; "we may learn something."

"Certainly you may," continued the Frenchman, "if you have room for anything new. Were we not struck by a comet's tail in 1861?"

"So it was said, anyhow," observed the Captain. "I well remember what nonsense there was in the papers about the 'phosphorescent auroral glare.'"

"Well," continued the Frenchman, "suppose the comet of 1861 influenced the Earth by an attraction superior to the Sun's. What would be the consequence? Would not the Earth follow the attracting body, become its satellite, and thus at last be dragged off to such a distance that the Sun's rays could no longer excite heat on her surface?"

"Well, that might possibly occur," said Barbican slowly, "but even then I question if the consequences would be so terrible as you seem to apprehend."

"Why not?"

"Because the cold and the heat might still manage to be nearly equalized on our globe. It has been calculated that, had the Earth been carried off by the comet of '61, when arrived at her greatest distance, she would have experienced a temperature hardly sixteen times greater than the heat we receive from the Moon, which, as everybody knows, produces no appreciable effect, even when concentrated to a focus by the most powerful lenses."

"Well then," exclaimed Ardan, "at such a temperature--"

"Wait a moment," replied Barbican. "Have you never heard of the principle of compensation? Listen to another calculation. Had the Earth been dragged along with the comet, it has been calculated that at her perihelion, or nearest point to the Sun, she would have to endure a heat 28,000 times

"But is the air replaced by nothing?"

"Oh yes," replied Barbican. "By ether."

"Ah, ether! and what, pray, is ether?"

"Ether, friend Michael, is an elastic gas consisting of imponderable atoms, which, as we are told by works on molecular physics, are, in proportion to their size, as far apart as the celestial bodies are from each other in space. This distance is less than the 1/3000000 x 1/1000', or the one trillionth of a foot. The vibrations of the molecules of this ether produce the sensations of light and heat, by making 430 trillions of undulations per second, each undulation being hardly more than the one ten-millionth of an inch in width."

"Trillions per second! ten-millionths of an inch in width!" cried Ardan. "These oscillations have been very neatly counted and ticketed, and checked off! Ah, friend Barbican," continued the Frenchman, shaking his head, "these numbers are just tremendous guesses, frightening the ear but revealing nothing to the intelligence."

"To get ideas, however, we must calculate--"

"No, no!" interrupted Ardan: "not calculate, but compare. A trillion tells you nothing--Comparison, everything. For instance, you say, the volume of Uranus is 76 times greater than the Earth's; Saturn's 900 times greater; Jupiter's 1300 times greater; the Sun's 1300 thousand times greater--You may tell me all that till I'm tired hearing it, and I shall still be almost as ignorant as ever. For my part I prefer to be told one of those simple comparisons that I find in the old almanacs: The Sun is a globe two feet in diameter; Jupiter , a good sized orange; Saturn , a smaller orange; Neptune , a plum; Uranus , a good sized cherry; the Earth, a pea; Venus , also a pea but somewhat smaller; Mars , a large pin's head; Mercury , a mustard seed; Juno , Ceres , Vesta , Pallas , and the other asteroids so many grains of sand. Be told something like that, and you have got at least the tail of an idea!"

This learned burst of Ardan's had the natural effect of making his hearers forget what they had been arguing about, and they therefore proceeded at once to dispose of Satellite's body. It was a simple matter enough--no more than to fling it out of the Projectile into space, just as the sailors get rid of a dead body by throwing it into the sea. Only in this operation they had to act,

CHAPTER VI - INSTRUCTIVE CONVERSATION.

On the fourth of December, the Projectile chronometers marked five o'clock in the morning, just as the travellers woke up from a pleasant slumber. They had now been 54 hours on their journey. As to lapse of time , they had passed not much more than half of the number of hours during which their trip was to last; but, as to lapse of space , they had already accomplished very nearly the seven-tenths of their passage. This difference between time and distance was due to the regular retardation of their velocity.

They looked at the earth through the floor-light, but it was little more than visible--a black spot drowned in the solar rays. No longer any sign of a crescent, no longer any sign of ashy light. Next day, towards midnight, the Earth was to be new , at the precise moment when the Moon was to be full . Overhead, they could see the Queen of Night coming nearer and nearer to the line followed by the Projectile, and evidently approaching the point where both should meet at the appointed moment. All around, the black vault of heaven was dotted with luminous points which seemed to move somewhat, though, of course, in their extreme distance their relative size underwent no change. The Sun and the stars looked exactly as they had appeared when observed from the Earth. The Moon indeed had become considerably enlarged in size, but the travellers' telescopes were still too weak to enable them to make any important observation regarding the nature of her surface, or that might determine her topographical or geological features.

Naturally, therefore, the time slipped away in endless conversation. The Moon, of course, was the chief topic. Each one contributed his share of peculiar information, or peculiar ignorance, as the case might be. Barbican and M'Nicholl always treated the subject gravely, as became learned scientists, but Ardan preferred to look on things with the eye of fancy. The Projectile, its situation, its direction, the incidents possible to occur, the precautions necessary to take in order to break the fall on the Moon's surface--these and many other subjects furnished endless food for constant debate and inexhaustible conjectures.

For instance, at breakfast that morning, a question of Ardan's regarding the Projectile drew from Barbican an answer curious enough to be reported.

"Suppose, on the night that we were shot up from Stony Hill," said Ardan, "suppose the Projectile had encountered some obstacle powerful enough to

perspiring like a bull and hot as a furnace. Why am I then forced to stop? Simply because my motion has been transformed into heat! Of course, I understand all about it!"

Barbican smiled a moment at this comical illustration of his theory and then went on:

"Accordingly, in case of a collision it would have been all over instantly with our Projectile. You have seen what becomes of the bullet that strikes the iron target. It is flattened out of all shape; sometimes it is even melted into a thin film. Its motion has been turned into heat. Therefore, I maintain that if our Projectile had struck that bolide, its velocity, suddenly checked, would have given rise to a heat capable of completely volatilizing it in less than a second."

"Not a doubt of it!" said the Captain. "President," he added after a moment, "haven't they calculated what would be the result, if the Earth were suddenly brought to a stand-still in her journey, through her orbit?"

"It has been calculated," answered Barbican, "that in such a case so much heat would be developed as would instantly reduce her to vapor."

"Hm!" exclaimed Ardan; "a remarkably simple way for putting an end to the world!"

"And supposing the Earth to fall into the Sun?" asked the Captain.

"Such a fall," answered Barbican, "according to the calculations of Tyndall and Thomson, would develop an amount of heat equal to that produced by sixteen hundred globes of burning coal, each globe equal in size to the earth itself. Furthermore such a fall would supply the Sun with at least as much heat as he expends in a hundred years!"

"A hundred years! Good! Nothing like accuracy!" cried Ardan. "Such infallible calculators as Messrs. Tyndall and Thomson I can easily excuse for any airs they may give themselves. They must be of an order much higher than that of ordinary mortals like us!"

"I would not answer myself for the accuracy of such intricate problems," quietly observed Barbican; "but there is no doubt whatever regarding one fact: motion suddenly interrupted always develops heat. And this has given rise to another theory regarding the maintenance of the Sun's temperature at a constant point. An incessant rain of bolides falling on his surface

The Moon is either inhabited or she is not. If she is, the inhabitants must breathe. If she is not, there must be oxygen enough left for we, us and co., even if we should have to go after it to the bottom of the ravines, where, by its gravity, it must have accumulated! So much the better! we shall not have to climb those thundering mountains!"

So saying, he jumped up and began to gaze with considerable interest on the lunar disc, which just then was glittering with dazzling brightness.

"By Jove!" he exclaimed at length; "it must be pretty hot up there!"

"I should think so," observed the Captain; "especially when you remember that the day up there lasts 360 hours!"

"Yes," observed Barbican, "but remember on the other hand that the nights are just as long, and, as the heat escapes by radiation, the mean temperature cannot be much greater than that of interplanetary space."

"A high old place for living in!" cried Ardan. "No matter! I wish we were there now! Wouldn't it be jolly, dear boys, to have old Mother Earth for our Moon, to see her always on our sky, never rising, never setting, never undergoing any change except from New Earth to Last Quarter! Would not it be fun to trace the shape of our great Oceans and Continents, and to say: 'there is the Mediterranean! there is China! there is the gulf of Mexico! there is the white line of the Rocky Mountains where old Marston is watching for us with his big telescope!' Then we should see every line, and brightness, and shadow fade away by degrees, as she came nearer and nearer to the Sun, until at last she sat completely lost in his dazzling rays! But--by the way--Barbican, are there any eclipses in the Moon?"

"O yes; solar eclipses" replied Barbican, "must always occur whenever the centres of the three heavenly bodies are in the same line, the Earth occupying the middle place. However, such eclipses must always be annular, as the Earth, projected like a screen on the solar disc, allows more than half of the Sun to be still visible."

"How is that?" asked M'Nicholl, "no total eclipses in the Moon? Surely the cone of the Earth's shadow must extend far enough to envelop her surface?"

"It does reach her, in one sense," replied Barbican, "but it does not in another. Remember the great refraction of the solar rays that must be produced by the Earth's atmosphere. It is easy to show that this refraction prevents the Sun from ever being totally invisible. See here!" he continued,

"My ideas generally are of that category," observed Ardan with an affectation of dry pomposity.

"Not this time, however, friend Michael," observed M'Nicholl.

"Oh! I'm a plagiarist, am I?" asked the Frenchman, pretending to be irritated.

"Well, something very like it," observed M'Nicholl quietly. "Apollonius Rhodius, as I read one evening in the Philadelphia Library, speaks of the Arcadians of Greece having a tradition that their ancestors were so ancient that they inhabited the Earth long before the Moon had ever become our satellite. They therefore called them [Greek: Proselênoi] or Ante-lunarians . Now starting with some such wild notion as this, certain scientists have looked on the Moon as an ancient comet brought close enough to the Earth to be retained in its orbit by terrestrial attraction."

"Why may not there be something plausible in such a hypothesis?" asked Ardan with some curiosity.

"There is nothing whatever in it," replied Barbican decidedly: "a simple proof is the fact that the Moon does not retain the slightest trace of the vaporous envelope by which comets are always surrounded."

"Lost her tail you mean," said Ardan. "Pooh! Easy to account for that! It might have got cut off by coming too close to the Sun!"

"It might, friend Michael, but an amputation by such means is not very likely."

"No? Why not?"

"Because--because--By Jove, I can't say, because I don't know," cried Barbican with a quiet smile on his countenance.

"Oh what a lot of volumes," cried Ardan, "could be made out of what we don't know!"

"At present, for instance," observed M'Nicholl, "I don't know what o'clock it is."

"Three o'clock!" said Barbican, glancing at his chronometer.

the air alone that makes a difference of weight. Produce an artificial vacuum in a glass tube and you will see that all objects whatever falling through, whether bits of feather or grains of shot, move with precisely the same rapidity. Up here, in space, like cause and like effect."

"Correct," assented M'Nicholl. "Everything therefore that we shall throw out of the Projectile is bound to accompany us to the Moon."

"Well, we were smart!" cried Ardan suddenly.

"How so, friend Michael?" asked Barbican.

"Why not have packed the Projectile with ever so many useful objects, books, instruments, tools, et cetera, and fling them out into space once we were fairly started! They would have all followed us safely! Nothing would have been lost! And--now I think on it--why not fling ourselves out through the window? Shouldn't we be as safe out there as that bolide? What fun it would be to feel ourselves sustained and upborne in the ether, more highly favored even than the birds, who must keep on flapping their wings continually to prevent themselves from falling!"

"Very true, my dear boy," observed Barbican; "but how could we breathe?"

"It's a fact," exclaimed the Frenchman. "Hang the air for spoiling our fun! So we must remain shut up in our Projectile?"

"Not a doubt of it!"

--"Oh Thunder!" roared Ardan, suddenly striking his forehead.

"What ails you?" asked the Captain, somewhat surprised.

"Now I know what that bolide of ours is! Why didn't we think of it before? It is no asteroid! It is no particle of meteoric matter! Nor is it a piece of a shattered planet!"

"What is it then?" asked both of his companions in one voice.

"It is nothing more or less than the body of the dog that we threw out yesterday!"

So in fact it was. That shapeless, unrecognizable mass, melted, expunged, flat as a bladder under an unexhausted receiver, drained of its air, was poor

CHAPTER VII - A HIGH OLD TIME.

A new phenomenon, therefore, strange but logical, startling but admitting of easy explanation, was now presented to their view, affording a fresh subject for lively discussion. Not that they disputed much about it. They soon agreed on a principle from which they readily deducted the following general law: Every object thrown out of the Projectile should partake of the Projectile's motion: it should therefore follow the same path, and never cease to move until the Projectile itself came to a stand-still.

But, in sober truth, they were at anything but a loss of subjects of warm discussion. As the end of their journey began to approach, their senses became keener and their sensations vivider. Steeled against surprise, they looked for the unexpected, the strange, the startling; and the only thing at which they would have wondered would be to be five minutes without having something new to wonder at. Their excited imaginations flew far ahead of the Projectile, whose velocity, by the way, began to be retarded very decidedly by this time, though, of course, the travellers had as yet no means to become aware of it. The Moon's size on the sky was meantime getting larger and larger; her apparent distance was growing shorter and shorter, until at last they could almost imagine that by putting their hands out they could nearly touch her.

Next morning, December 5th, all were up and dressed at a very early hour. This was to be the last day of their journey, if all calculations were correct. That very night, at 12 o'clock, within nineteen hours at furthest, at the very moment of Full Moon, they were to reach her resplendent surface. At that hour was to be completed the most extraordinary journey ever undertaken by man in ancient or modern times. Naturally enough, therefore, they found themselves unable to sleep after four o'clock in the morning; peering upwards through the windows now visibly glittering under the rays of the Moon, they spent some very exciting hours in gazing at her slowly enlarging disc, and shouting at her with confident and joyful hurrahs.

The majestic Queen of the Stars had now risen so high in the spangled heavens that she could hardly rise higher. In a few degrees more she would reach the exact point of space where her junction with the Projectile was to be effected. According to his own observations, Barbican calculated that they should strike her in the northern hemisphere, where her plains, or seas as they are called, are immense, and her mountains are comparatively rare. This, of course, would be so much the more favorable, if, as was to be

deep in the yawning chasms of the craters, and easily follow the cracks, streaks, and ridges which stripe, flecker, and bar the immensity of her plains. But for the present all relief was lost in the dazzling glare. The Captain could hardly distinguish even those dark spots that impart to the full Moon some resemblance to the human face.

"Face!" cried Ardan: "well, a very fanciful eye may detect a face, though, for the sake of Apollo's beauteous sister, I regret to say, a terribly pockmarked one!"

The travellers, now evidently approaching the end of their journey, observed the rapidly increasing world above them with newer and greater curiosity every moment. Their fancies enkindled at the sight of the new and strange scenes dimly presented to their view. In imagination they climbed to the summit of this lofty peak. They let themselves down to the abyss of that yawning crater. Here they imagined they saw vast seas hardly kept in their basins by a rarefied atmosphere; there they thought they could trace mighty rivers bearing to vast oceans the tribute of the snowy mountains. In the first promptings of their eager curiosity, they peered greedily into her cavernous depths, and almost expected, amidst the deathlike hush of inaudible nature, to surprise some sound from the mystic orb floating up there in eternal silence through a boundless ocean of never ending vacuum.

This last day of their journey left their memories stored with thrilling recollections. They took careful note of the slightest details. As they neared their destination, they felt themselves invaded by a vague, undefined restlessness. But this restlessness would have given way to decided uneasiness, if they had known at what a slow rate they were travelling. They would have surely concluded that their present velocity would never be able to take them as far as the neutral point, not to talk of passing it. The reason of such considerable retardation was, that by this time the Projectile had reached such a great distance from the Earth that it had hardly any weight. But even this weight, such as it was, was to be diminished still further, and finally, to vanish altogether as soon as the bullet reached the neutral point, where the two attractions, terrestrial and lunar, should counteract each other with new and surprising effects.

Notwithstanding the absorbing nature of his observations, Ardan never forgot to prepare breakfast with his usual punctuality. It was eaten readily and relished heartily. Nothing could be more exquisite than his calf's foot jelly liquefied and prepared by gas heat, except perhaps his meat biscuits of preserved Texas beef and Southdown mutton. A bottle of Château Yquem and another of Clos de Vougeot, both of superlative excellence in quality and

get rid of his remains. With no earth to cover him up, no sea to plunge him into, his corpse would never disappear from view, but would pursue us day and night, grim and ghastly like an avenging ghost!"

"Ugh!" said the Captain, shuddering at the idea.

"But, by the bye, Barbican!" cried the Frenchman, dropping the subject with his usual abruptness; "you have forgotten something else! Why didn't you bring a scaphander and an air pump? I could then venture out of the Projectile as readily and as safely as the diver leaves his boat and walks about on the bottom of the river! What fun to float in the midst of that mysterious ether! to steep myself, aye, actually to revel in the pure rays of the glorious sun! I should have ventured out on the very point of the Projectile, and there I should have danced and postured and kicked and bobbed and capered in a style that Taglioni never dreamed of!"

"Shouldn't I like to see you!" cried the Captain grimly, smiling at the idea.

"You would not see him long!" observed Barbican quietly. "The air confined in his body, freed from external pressure, would burst him like a shell, or like a balloon that suddenly rises to too great a height in the air! A scaphander would have been a fatal gift. Don't regret its absence, friend Michael; never forget this axiom: As long as we are floating in empty space, the only spot where safety is possible is inside the Projectile! "

The words "possible" and "impossible" always grated on Ardan's ears. If he had been a lexicographer, he would have rigidly excluded them from his dictionary, both as meaningless and useless. He was preparing an answer for Barbican, when he was cut out by a sudden observation from M'Nicholl.

"See here, friends!" cried the Captain; "this going to the Moon is all very well, but how shall we get back?"

His listeners looked at each other with a surprised and perplexed air. The question, though a very natural one, now appeared to have presented itself to their consideration absolutely for the first time.

"What do you mean by such a question, Captain?" asked Barbican in a grave judicial tone.

"Mac, my boy," said Ardan seriously, "don't it strike you as a little out of order to ask how you are to return when you have not got there yet?"

vie in force with even the smallest volcano."

"Hurrah!" cried Ardan, delighted at his success; "just imagine the pleasure of sending our letters postage free! But--oh! what a splendid idea!--Dolts that we were for not thinking of it sooner!"

"Let us have the splendid idea!" cried the Captain, with some of his old acrimony.

"Why didn't we fasten a wire to the Projectile?" asked Ardan, triumphantly, "It would have enabled us to exchange telegrams with the Earth!"

"Ho! ho! ho!" roared the Captain, rapidly recovering his good humor; "decidedly the best joke of the season! Ha! ha! ha! Of course you have calculated the weight of a wire 240 thousand miles long?"

"No matter about its weight!" cried the Frenchman impetuously; "we should have laughed at its weight! We could have tripled the charge of the Columbiad; we could have quadrupled it!--aye, quintupled it, if necessary!" he added in tones evidently increasing in loudness and violence.

"Yes, friend Michael," observed Barbican; "but there is a slight and unfortunately a fatal defect in your project. The Earth, by its rotation, would have wrapped our wire around herself, like thread around a spool, and dragged us back almost with the speed of lightning!"

"By the Nine gods of Porsena!" cried Ardan, "something is wrong with my head to-day! My brain is out of joint, and I am making as nice a mess of things as my friend Marston was ever capable of! By the bye--talking of Marston--if we never return to the Earth, what is to prevent him from following us to the Moon?"

"Nothing!" replied Barbican; "he is a faithful friend and a reliable comrade. Besides, what is easier? Is not the Columbiad still at Stony Hill? Cannot gun-cotton be readily manufactured on any occasion? Will not the Moon again pass through the zenith of Florida? Eighteen years from now, will she not occupy exactly the same spot that she does to-day?"

"Certainly!" cried Ardan, with increasing enthusiasm, "Marston will come! and Elphinstone of the torpedo! and the gallant Bloomsbury, and Billsby the brave, and all our friends of the Baltimore Gun Club! And we shall receive them with all the honors! And then we shall establish projectile trains between the Earth and the Moon! Hurrah for J.T. Marston!"

"Hear! hear the Captain!" cried Barbican, stamping with his foot, like an excited fencing master. "There is one thing he must know!"

"I want to know what we're going to do when we get there!"

"He wants to know what we're going to do when we get there! A sensible question! Answer it, Ardan!"

"Answer it yourself, Barbican! You know more about the Moon than I do! You know more about it than all the Nasmyths that ever lived!"

"I'm blessed if I know anything at all about it!" cried Barbican, with a joyous laugh. "Ha, ha, ha! The first eastern shore Marylander or any other simpleton you meet in Baltimore, knows as much about the Moon as I do! Why we're going there, I can't tell! What we're going to do when we get there, can't tell either! Ardan knows all about it! He can tell! He's taking us there!"

"Certainly I can tell! should I have offered to take you there without a good object in view?" cried Ardan, husky with continual roaring. "Answer me that!"

"No conundrums!" cried the Captain, in a voice sourer and rougher than ever; "tell us if you can in plain English, what the demon we have come here for!"

"I'll tell you if I feel like it," cried Ardan, folding his arms with an aspect of great dignity; "and I'll not tell you if I don't feel like it!"

"What's that?" cried Barbican. "You'll not give us an answer when we ask you a reasonable question?"

"Never!" cried Ardan, with great determination. "I'll never answer a question reasonable or unreasonable, unless it is asked in a proper manner!"

"None of your French airs here!" exclaimed M'Nicholl, by this time almost completely out of himself between anger and excitement. "I don't know where I am; I don't know where I'm going; I don't know why I'm going; you know all about it, Ardan, or at least you think you do! Well then, give me a plain answer to a plain question, or by the Thirty-eight States of our glorious Union, I shall know what for!"

"Listen, Ardan!" cried Barbican, grappling with the Frenchman, and with some difficulty restraining him from flying at M'Nicholl's throat; "You ought

around with his vast strength until they stood back to back; "what are you going to fight about? Suppose there are Lunarians in the Moon! Is that a reason why there should be Lunatics in the Projectile! But, Ardan, why do you insist on Lunarians? Are we so shiftless that we can't do without them when we get to the Moon?"

"I don't insist on them!" cried Ardan, who submitted to Barbican like a child. "Hang the Lunarians! Certainly, we can do without them! What do I care for them? Down with them!"

"Yes, down with the Lunarians!" cried M'Nicholl as spitefully as if he had even the slightest belief in their existence.

"We shall take possession of the Moon ourselves!" cried Ardan. "Lunarians or no Lunarians!"

"We three shall constitute a Republic!" cried M'Nicholl.

"I shall be the House!" cried Ardan.

"And I the Senate!" answered the Captain.

"And Barbican our first President!" shrieked the Frenchman.

"Our first and last!" roared M'Nicholl.

"No objections to a third term!" yelled Ardan.

"He's welcome to any number of terms he pleases!" vociferated M'Nicholl.

"Hurrah for President Barbican of the Lunatic--I mean of the Lunar Republic!" screamed Ardan.

"Long may he wave, and may his shadow never grow less!" shouted Captain M'Nicholl, his eyes almost out of their sockets.

Then with voices reminding you of sand fiercely blown against the window panes, the President and the Senate chanted the immortal Yankee Doodle , whilst the House delivered itself of the Marseillaise , in a style which even the wildest Jacobins in Robespierre's day could hardly have surpassed.

But long before either song was ended, all three broke out into a dance,

CHAPTER VIII - THE NEUTRAL POINT.

What had taken place? Whence proceeded this strange intoxication whose consequences might have proved so disastrous? A little forgetfulness on Ardan's part had done the whole mischief, but fortunately M'Nicholl was able to remedy it in time.

After a regular fainting spell several minutes long, the Captain was the first man to return to consciousness and the full recovery of his intellectual faculties. His first feelings were far from pleasant. His stomach gnawed him as if he had not eaten for a week, though he had taken breakfast only a few hours before; his eyes were dim, his brain throbbing, and his limbs shaking. In short, he presented every symptom usually seen in a man dying of starvation. Picking himself up with much care and difficulty, he roared out to Ardan for something to eat. Seeing that the Frenchman was unable or unwilling to respond, he concluded to help himself, by beginning first of all to prepare a little tea. To do this, fire was necessary; so, to light his lamp, he struck a match.

But what was his surprise at seeing the sulphur tip of the match blazing with a light so bright and dazzling that his eyes could hardly bear it! Touching it to the gas burner, a stream of light flashed forth equal in its intensity to the flame of an electric lamp. Then he understood it all in an instant. The dazzling glare, his maddened brain, his gnawing stomach--all were now clear as the noon-day Sun.

"The oxygen!" he cried, and, suddenly stooping down and examining the tap of the air apparatus, he saw that it had been only half turned off. Consequently the air was gradually getting more and more impregnated with this powerful gas, colorless, odorless, tasteless, infinitely precious, but, unless when strongly diluted with nitrogen, capable of producing fatal disorders in the human system. Ardan, startled by M'Nicholl's question about the means of returning from the Moon, had turned the cock only half off.

The Captain instantly stopped the escape of the oxygen, but not one moment too soon. It had completely saturated the atmosphere. A few minutes more and it would have killed the travellers, not like carbonic acid, by smothering them, but by burning them up, as a strong draught burns up the coals in a stove.

Ardan threw a glance of comical bewilderment on half a dozen or so of splendid barn-yard fowls that were now beginning to recover from the effects of the oxygen. For an instant he could not utter a word; then, shrugging his shoulders, he muttered in a low voice:

"Catastrophe prematurely exploded!"

"What are you going to do with these chickens?" persisted Barbican.

"Acclimatize them in the Moon, by Jove! what else?" was the ready reply.

"Why conceal them then?"

"A hoax, a poor hoax, dear President, which proves a miserable failure! I intended to let them loose on the Lunar Continent at the first favorable opportunity. I often had a good laugh to myself, thinking of your astonishment and the Captain's at seeing a lot of American poultry scratching for worms on a Lunar dunghill!"

"Ah! wag, jester, incorrigible farceur !" cried Barbican with a smile; "you want no nitrous oxide to put a bee in your bonnet! He is always as bad as you and I were for a short time, M'Nicholl, under the laughing gas! He's never had a sensible moment in his life!"

"I can't say the same of you," replied Ardan; "you had at least one sensible moment in all your lives, and that was about an hour ago!"

Their incessant chattering did not prevent the friends from at once repairing the disorder of the interior of the Projectile. Cocks and hens were put back in their cages. But while doing so, the friends were astonished to find that the birds, though good sized creatures, and now pretty fat and plump, hardly felt heavier in their hands than if they had been so many sparrows. This drew their interested attention to a new phenomenon.

From the moment they had left the Earth, their own weight, and that of the Projectile and the objects therein contained, had been undergoing a progressive diminution. They might never be able to ascertain this fact with regard to the Projectile, but the moment was now rapidly approaching when the loss of weight would become perfectly sensible, both regarding themselves and the tools and instruments surrounding them. Of course, it is quite clear, that this decrease could not be indicated by an ordinary scales, as the weight to balance the object would have lost precisely as much as the object itself. But a spring balance, for instance, in which the

point. In such case, it would undoubtedly proceed onward to the Moon, being drawn thither by Lunar attraction.

2. Suppose it lacked the requisite velocity for reaching the neutral point. In such a case it would just as certainly fall back to the Earth, in obedience to the law of Terrestrial attraction.

3. Suppose it to be animated by just sufficient velocity to reach the neutral point, but not to pass it. In that case, the Projectile would remain forever in the same spot, perfectly motionless as far as regards the Earth and the Moon, though of course following them both in their annual orbits round the Sun.

Such was now the state of things, which Barbican tried to explain to his friends, who, it need hardly be said, listened to his remarks with the most intense interest. How were they to know, they asked him, the precise instant at which the Projectile would reach the neutral point? That would be an easy matter, he assured them. It would be at the very moment when both themselves and all the other objects contained in the Projectile would be completely free from every operation of the law of gravity; in other words, when everything would cease to have weight.

This gradual diminution of the action of gravity, the travellers had been for some time noticing, but they had not yet witnessed its total cessation. But that very morning, about an hour before noon, as the Captain was making some little experiment in Chemistry, he happened by accident to overturn a glass full of water. What was his surprise at seeing that neither the glass nor the water fell to the floor! Both remained suspended in the air almost completely motionless.

"The prettiest experiment I ever saw!" cried Ardan; "let us have more of it!"

And seizing the bottles, the arms, and the other objects in the Projectile, he arranged them around each other in the air with some regard to symmetry and proportion. The different articles, keeping strictly each in its own place, formed a very attractive group wonderful to behold. Diana, placed in the apex of the pyramid, would remind you of those marvellous suspensions in the air performed by Houdin, Herman, and a few other first class wizards. Only being kept in her place without being hampered by invisible strings, the animal rather seemed to enjoy the exhibition, though in all probability she was hardly conscious of any thing unusual in her appearance.

Our travellers had been fully prepared for such a phenomenon, yet it struck

"We shall have to crawl on the ceiling then like flies," said Ardan.

"Not at all," said the Captain; "the Projectile, having its centre of gravity very low, will turn upside down by degrees."

"Upside down!" cried Ardan. "That will be a nice mess! everything higgledy-piggledy!"

"No danger, friend Michael," said M'Nicholl; "there shall be no disorder whatever; nothing will quit its place; the movement of the Projectile will be effected by such slow degrees as to be imperceptible."

"Yes," added Barbican, "as soon as we shall have passed the neutral point, the base of the Projectile, its heaviest part, will swing around gradually until it faces the Moon. Before this phenomenon, however, can take place, we must of course cross the line."

"Cross the line!" cried the Frenchman; "then let us imitate the sailors when they do the same thing in the Atlantic Ocean! Splice the main brace!"

A slight effort carried him sailing over to the side of the Projectile. Opening a cupboard and taking out a bottle and a few glasses, he placed them on a tray. Then setting the tray itself in the air as on a table in front of his companions, he filled the glasses, passed them around, and, in a lively speech interrupted with many a joyous hurrah, congratulated his companions on their glorious achievement in being the first that ever crossed the lunar line.

This counteracting influence of the attractions lasted nearly an hour. By that time the travellers could keep themselves on the floor without much effort. Barbican also made his companions remark that the conical point of the Projectile diverged a little from the direct line to the Moon, while by an inverse movement, as they could notice through the window of the floor, the base was gradually turning away from the Earth. The Lunar attraction was evidently getting the better of the Terrestrial. The fall towards the Moon, though still almost insensible, was certainly beginning.

It could not be more than the eightieth part of an inch in the first second. But by degrees, as the attractive force would increase, the fall would be more decided, and the Projectile, overbalanced by its base, and presenting its cone to the Earth, would descend with accelerated velocity to the Lunar surface. The object of their daring attempt would then be successfully attained. No further obstacle, therefore, being likely to stand in the way of

"Don't feel so bad about it, Ardan;" observed M'Nicholl; "though there may be no orb from which gravity is excluded altogether, we shall soon land in one, where it is much less powerful than on the Earth."

"You mean the Moon!"

"Yes, the Moon. Her mass being 1/89 of the Earth's, her attractive power should be in the same proportion; that is, a boy 10 years old, whose weight on Earth is about 90 lbs., would weigh on the Moon only about 1 pound, if nothing else were to be taken into consideration. But when standing on the surface of the Moon, he is relatively 4 times nearer to the centre than when he is standing on the surface of the Earth. His weight, therefore, having to be increased by the square of the distance, must be sixteen times greater. Now 16 times 1/89 being less than 1/5, it is clear that my weight of 150 pounds will be cut down to nearly 30 as soon as we reach the Moon's surface."

"And mine?" asked Ardan.

"Yours will hardly reach 25 pounds, I should think," was the reply.

"Shall my muscular strength diminish in the same proportion?" was the next question.

"On the contrary, it will be relatively so much the more increased that you can take a stride 15 feet in width as easily as you can now take one of ordinary length."

"We shall be all Samsons, then, in the Moon!" cried Ardan.

"Especially," replied M'Nicholl, "if the stature of the Selenites is in proportion to the mass of their globe."

"If so, what should be their height?"

"A tall man would hardly be twelve inches in his boots!"

"They must be veritable Lilliputians then!" cried Ardan; "and we are all to be Gullivers! The old myth of the Giants realized! Perhaps the Titans that played such famous parts in the prehistoric period of our Earth, were adventurers like ourselves, casually arrived from some great planet!"

CHAPTER IX - A LITTLE OFF THE TRACK.

Barbican's mind was now completely at rest at least on one subject. The original force of the discharge had been great enough to send the Projectile beyond the neutral line. Therefore, there was no longer any danger of its falling back to the Earth. Therefore, there was no longer any danger of its resting eternally motionless on the point of the counteracting attractions. The next subject to engage his attention was the question: would the Projectile, under the influence of lunar attraction, succeed in reaching its destination?

The only way in which it could succeed was by falling through a space of nearly 24,000 miles and then striking the Moon's surface. A most terrific fall! Even taking the lunar attraction to be only the one-sixth of the Earth's, such a fall was simply bewildering to think of. The greatest height to which a balloon ever ascended was seven miles (Glaisher, 1862). Imagine a fall from even that distance! Then imagine a fall from a height of four thousand miles!

Yet it was for a fall of this appalling kind on the surface of the Moon that the travellers had now to prepare themselves. Instead of avoiding it, however, they eagerly desired it and would be very much disappointed if they missed it. They had taken the best precautions they could devise to guard against the terrific shock. These were mainly of two kinds: one was intended to counteract as much as possible the fearful results to be expected the instant the Projectile touched the lunar surface; the other, to retard the velocity of the fall itself, and thereby to render it less violent.

The best arrangement of the first kind was certainly Barbican's water-contrivance for counteracting the shock at starting, which has been so fully described in our former volume. (See Baltimore Gun Club , page 353.) But unfortunately it could be no longer employed. Even if the partitions were in working order, the water--two thousand pounds in weight had been required--was no longer to be had. The little still left in the tanks was of no account for such a purpose. Besides, they had not a single drop of the precious liquid to spare, for they were as yet anything but sanguine regarding the facility of finding water on the Moon's surface.

Fortunately, however, as the gentle reader may remember, Barbican, besides using water to break the concussion, had provided the movable disc with stout pillars containing a strong buffing apparatus, intended to protect it from striking the bottom too violently after the destruction of the different

"Your fall would be violent enough," the Captain had urged, "to splinter you like glass into a thousand fragments."

"And what shall prevent me," had been Ardan's ready reply, "from breaking my fall by means of counteracting rockets suitably disposed, and let off at the proper time?"

The practical utility of this idea had at once impressed Barbican. It could hardly be doubted that powerful rockets, fastened on the outside to the bottom of the Projectile, could, when discharged, considerably retard the velocity of the fall by their sturdy recoil. They could burn in a vacuum by means of oxygen furnished by themselves, as powder burns in the chamber of a gun, or as the volcanoes of the Moon continue their action regardless of the absence of a lunar atmosphere.

Barbican had therefore provided himself with rockets enclosed in strong steel gun barrels, grooved on the outside so that they could be screwed into corresponding holes already made with much care in the bottom of the Projectile. They were just long enough, when flush with the floor inside, to project outside by about six inches. They were twenty in number, and formed two concentric circles around the dead light. Small holes in the disc gave admission to the wires by which each of the rockets was to be discharged externally by electricity. The whole effect was therefore to be confined to the outside. The mixtures having been already carefully deposited in each barrel, nothing further need be done than to take away the metallic plugs which had been screwed into the bottom of the Projectile, and replace them by the rockets, every one of which was found to fit its grooved chamber with rigid exactness.

This evidently should have been all done before the disc had been finally laid on its springs. But as this had to be lifted up again in order to reach the bottom of the Projectile, more work was to be done than was strictly necessary. Though the labor was not very hard, considering that gravity had as yet scarcely made itself felt, M'Nicholl and Ardan were not sorry to have their little joke at Barbican's expense. The Frenchman began humming

" Aliquandoque bonus dormitat Homerus, "

to a tune from Orphée aux Enfers , and the Captain said something about the Philadelphia Highway Commissioners who pave a street one day, and tear it up the next to lay the gas pipes. But his friends' humor was all lost on Barbican, who was so wrapped up in his work that he probably never heard a word they said.

"What have you to say to that, Barbican?" asked Ardan.

"I don't think there was any error at the start," was the confident reply; "not even so much as a line! We took too many tests proving the absolute perpendicularity of the Columbiad, to entertain the slightest doubt on that subject. Its direction towards the zenith being incontestable, I don't see why we should not reach the Moon when she comes to the zenith."

"Perhaps we're behind time," suggested Ardan.

"What have you to say to that, Barbican?" asked the Captain. "You know the Cambridge men said the journey had to be done in 97 hours 13 minutes and 20 seconds. That's as much as to say that if we're not up to time we shall miss the Moon."

"Correct," said Barbican. "But we can't be behind time. We started, you know, on December 1st, at 13 minutes and 20 seconds before 11 o'clock, and we were to arrive four days later at midnight precisely. To-day is December 5th Gentlemen, please examine your watches. It is now half past three in the afternoon. Eight hours and a half are sufficient to take us to our journey's end. Why should we not arrive there?"

"How about being ahead of time?" asked the Captain.

"Just so!" said Ardan. "You know we have discovered the initial velocity to have been greater than was expected."

"Not at all! not at all!" cried Barbican "A slight excess of velocity would have done no harm whatever had the direction of the Projectile been perfectly true. No. There must have been a digression. We must have been switched off!"

"Switched off? By what?" asked both his listeners in one breath.

"I can't tell," said Barbican curtly.

"Well!" said Ardan; "if Barbican can't tell, there is an end to all further talk on the subject. We're switched off--that's enough for me. What has done it? I don't care. Where are we going to? I don't care. What is the use of pestering our brains about it? We shall soon find out. We are floating around in space, and we shall end by hauling up somewhere or other."

But in this indifference Barbican was far from participating. Not that he was

prevent him from endeavoring to solve his difficult problem. What had switched them off? The hours passed on, but brought no result. That the adventurers were approaching the Moon was evident, but it was just as evident that they should never reach her. The nearest point the Projectile could ever possibly attain would only be the result of two opposite forces, the attractive and the repulsive, which, as was now clear, influenced its motion. Therefore, to land in the Moon was an utter impossibility, and any such idea was to be given up at once and for ever.

" Quand même ! What of it!" cried Ardan; after some moments' silence. "We're not to land in the Moon! Well! let us do the next best thing--pass close enough to discover her secrets!"

But M'Nicholl could not accept the situation so coolly. On the contrary, he decidedly lost his temper, as is occasionally the case with even phlegmatic men. He muttered an oath or two, but in a voice hardly loud enough to reach Barbican's ear. At last, impatient of further restraint, he burst out:

"Who the deuce cares for her secrets? To the hangman with her secrets! We started to land in the Moon! That's what's got to be done! That I want or nothing! Confound the darned thing, I say, whatever it was, whether on the Earth or off it, that shoved us off the track!"

"On the Earth or off it!" cried Barbican, striking his head suddenly; "now I see it! You're right, Captain! Confound the bolide that we met the first night of our journey!"

"Hey?" cried Ardan.

"What do you mean?" asked M'Nicholl.

"I mean," replied Barbican, with a voice now perfectly calm, and in a tone of quiet conviction, "that our deviation is due altogether to that wandering meteor."

"Why, it did not even graze us!" cried Ardan.

"No matter for that," replied Barbican. "Its mass, compared to ours, was enormous, and its attraction was undoubtedly sufficiently great to influence our deviation."

"Hardly enough to be appreciable," urged M'Nicholl.

CHAPTER X - THE OBSERVERS OF THE MOON.

Barbican's happy conjecture had probably hit the nail on the head. The divergency even of a second may amount to millions of miles if you only have your lines long enough. The Projectile had certainly gone off its direct course; whatever the cause, the fact was undoubted. It was a great pity. The daring attempt must end in a failure due altogether to a fortuitous accident, against which no human foresight could have possibly taken precaution. Unless in case of the occurrence of some other most improbable accident, reaching the Moon was evidently now impossible. To failure, therefore, our travellers had to make up their minds.

But was nothing to be gained by the trip? Though missing actual contact with the Moon, might they not pass near enough to solve several problems in physics and geology over which scientists had been for a long time puzzling their brains in vain? Even this would be some compensation for all their trouble, courage, and intelligence. As to what was to be their own fate, to what doom were themselves to be reserved--they never appeared to think of such a thing. They knew very well that in the midst of those infinite solitudes they should soon find themselves without air. The slight supply that kept them from smothering could not possibly last more than five or six days longer. Five or six days! What of that? Quand même ! as Ardan often exclaimed. Five or six days were centuries to our bold adventurers! At present every second was a year in events, and infinitely too precious to be squandered away in mere preparations for possible contingencies. The Moon could never be reached, but was it not possible that her surface could be carefully observed? This they set themselves at once to find out.

The distance now separating them from our Satellite they estimated at about 400 miles. Therefore relatively to their power of discovering the details of her disc, they were still farther off from the Moon than some of our modern astronomers are to-day, when provided with their powerful telescopes.

We know, for example, that Lord Rosse's great telescope at Parsonstown, possessing a power of magnifying 6000 times, brings the Moon to within 40 miles of us; not to speak of Barbican's great telescope on the summit of Long's Peak, by which the Moon, magnified 48,000 times, was brought within 5 miles of the Earth, where it therefore could reveal with sufficient distinctness every object above 40 feet in diameter.

Therefore our adventurers, though at such a comparatively small distance,

The portion of the Moon they were now approaching was her northern hemisphere, found usually in the lower part of lunar maps. The lens of a telescope, as is well known, gives only the inverted image of the object; therefore, when an upright image is required, an additional glass must be used. But as every additional glass is an additional obstruction to the light, the object glass of a Lunar telescope is employed without a corrector; light is thereby saved, and in viewing the Moon, as in viewing a map, it evidently makes very little difference whether we see her inverted or not. Maps of the Moon therefore, being drawn from the image formed by the telescope, show the north in the lower part, and vice versa . Of this kind was the Mappa Selenographica , by Beer and Maedler, so often previously alluded to and now carefully consulted by Barbican. The northern hemisphere, towards which they were now rapidly approaching, presented a strong contrast with the southern, by its vast plains and great depressions, checkered here and there by very remarkable isolated mountains.[A]

At midnight the Moon was full. This was the precise moment at which the travellers would have landed had not that unlucky bolide drawn them off the track. The Moon was therefore strictly up to time, arriving at the instant rigidly determined by the Cambridge Observatory. She occupied the exact point, to a mathematical nicety, where our 28th parallel crossed the perigee. An observer posted in the bottom of the Columbiad at Stony Hill, would have found himself at this moment precisely under the Moon. The axis of the enormous gun, continued upwards vertically, would have struck the orb of night exactly in her centre.

It is hardly necessary to tell our readers that, during this memorable night of the 5th and 6th of December, the travellers had no desire to close their eyes. Could they do so, even if they had desired? No! All their faculties, thoughts, and desires, were concentrated in one single word: "Look!" Representatives of the Earth, and of all humanity past and present, they felt that it was with their eyes that the race of man contemplated the lunar regions and penetrated the secrets of our satellite! A certain indescribable emotion therefore, combined with an undefined sense of responsibility, held possession of their hearts, as they moved silently from window to window.

Their observations, recorded by Barbican, were vigorously remade, revised, and re-determined, by the others. To make them, they had telescopes which they now began to employ with great advantage. To regulate and investigate them, they had the best maps of the day.

Whilst occupied in this silent work, they could not help throwing a short

Cassini of Nice (1625-1712), the famous discoverer of Saturn's satellites. Though somewhat incorrect regarding measurements, it was superior to Riccioli's in execution, and for a long time it was considered a standard work. Copies of this map are still to be found, but Cassini's original copper-plate, preserved for a long time at the Imprimerie Royale in Paris, was at last sold to a brazier, by no less a personage than the Director of the establishment himself, who, according to Arago, wanted to get rid of what he considered useless lumber!

La Hire (1640-1718), professor of astronomy in the Collège de France , and an accomplished draughtsman, drew a map of the Moon which was thirteen feet in diameter. This map could be seen long afterwards in the library of St. Genevieve, Paris, but it was never engraved.

About 1760, Mayer, a famous German astronomer and the director of the observatory of Göttingen, began the publication of a magnificent map of the Moon, drawn after lunar measurements all rigorously verified by himself. Unfortunately his death in 1762 interrupted a work which would have surpassed in accuracy every previous effort of the kind.

Next appears Schroeter of Erfurt (1745-1816), a fine observer (he first discovered the Lunar Rills), but a poor draughtsman: his maps are therefore of little value. Lohrman of Dresden published in 1838 an excellent map of the Moon, 15 inches in diameter, accompanied by descriptive text and several charts of particular portions on a larger scale.

But this and all other maps were thrown completely into the shade by Beer and Maedler's famous Mappa Selenographica , so often alluded to in the course of this work. This map, projected orthographically--that is, one in which all the rays proceeding from the surface to the eye are supposed to be parallel to each other--gives a reproduction of the lunar disc exactly as it appears. The representation of the mountains and plains is therefore correct only in the central portion; elsewhere, north, south, east, or west, the features, being foreshortened, are crowded together, and cannot be compared in measurement with those in the centre. It is more than three feet square; for convenient reference it is divided into four parts, each having a very full index; in short, this map is in all respects a master piece of lunar cartography.[B]

After Beer and Maedler, we should allude to Julius Schmitt's (of Athens) excellent selenographic reliefs: to Doctor Draper's, and to Father Secchi's successful application of photography to lunar representation; to De La Rue's (of London) magnificent stereographs of the Moon, to be had at every

CHAPTER XI - FACT AND FANCY.

"Have you ever seen the Moon?" said a teacher ironically one day in class to one of his pupils.

"No, sir;" was the pert reply; "but I think I can safely say I've heard it spoken about."

Though saying what he considered a smart thing, the pupil was probably perfectly right. Like the immense majority of his fellow beings, he had looked at the Moon, heard her talked of, written poetry about her, but, in the strict sense of the term, he had probably never seen her--that is--scanned her, examined her, surveyed her, inspected her, reconnoitred her--even with an opera glass! Not one in a thousand, not one in ten thousand, has ever examined even the map of our only Satellite. To guard our beloved and intelligent reader against this reproach, we have prepared an excellent reduction of Beer and Maedler's Mappa , on which, for the better understanding of what is to follow, we hope he will occasionally cast a gracious eye.

When you look at any map of the Moon, you are struck first of all with one peculiarity. Contrary to the arrangement prevailing in Mars and on our Earth, the continents occupy principally the southern hemisphere of the lunar orb. Then these continents are far from presenting such sharp and regular outlines as distinguish the Indian Peninsula, Africa, and South America. On the contrary, their coasts, angular, jagged, and deeply indented, abound in bays and peninsulas. They remind you of the coast of Norway, or of the islands in the Sound, where the land seems to be cut up into endless divisions. If navigation ever existed on the Moon's surface, it must have been of a singularly difficult and dangerous nature, and we can scarcely say which of the two should be more pitied--the sailors who had to steer through these dangerous and complicated passes, or the map-makers who had to designate them on their charts.

You will also remark that the southern pole of the Moon is much more continental than the northern. Around the latter, there exists only a slight fringe of lands separated from the other continents by vast "seas." This word "seas"--a term employed by the first lunar map constructors--is still retained to designate those vast depressions on the Moon's surface, once perhaps covered with water, though they are now only enormous plains. In the south, the continents cover nearly the whole hemisphere. It is therefore

long before the tides of the ocean and the winds of the atmosphere had begun to strew her rough surface with sand and clay, rock and coal, forest and meadow, gradually preparing it, according to the laws of our beneficent Creator, to be at last the pleasant though the temporary abode of Man!

Having wandered over vast continents, your eye is attracted by the "seas" of dimensions still vaster. Not only their shape, situation, and look, remind us of our own oceans, but, again like them, they occupy the greater part of the Moon's surface. The "seas," or, more correctly, plains, excited our travellers' curiosity to a very high degree, and they set themselves at once to examine their nature.

The astronomer who first gave names to those "seas" in all probability was a Frenchman. Hevelius, however, respected them, even Riccioli did not disturb them, and so they have come down to us. Ardan laughed heartily at the fancies which they called up, and said the whole thing reminded him of one of those "maps of matrimony" that he had once seen or read of in the works of Scudéry or Cyrano de Bergerac.

"However," he added, "I must say that this map has much more reality in it than could be found in the sentimental maps of the 17th century. In fact, I have no difficulty whatever in calling it the Map of Life! very neatly divided into two parts, the east and the west, the masculine and the feminine. The women on the right, and the men on the left!"

At such observations, Ardan's companions only shrugged their shoulders. A map of the Moon in their eyes was a map of the Moon, no more, no less; their romantic friend might view it as he pleased. Nevertheless, their romantic friend was not altogether wrong. Judge a little for yourselves.

What is the first "sea" you find in the hemisphere on the left? The Mare Imbrium or the Rainy Sea, a fit emblem of our human life, beaten by many a pitiless storm. In a corresponding part of the southern hemisphere you see Mare Nubium , the Cloudy Sea, in which our poor human reason so often gets befogged. Close to this lies Mare Humorum , the Sea of Humors, where we sail about, the sport of each fitful breeze, "everything by starts and nothing long." Around all, embracing all, lies Oceanus Procellarum , the Ocean of Tempests, where, engaged in one continuous struggle with the gusty whirlwinds, excited by our own passions or those of others, so few of us escape shipwreck. And, when disgusted by the difficulties of life, its deceptions, its treacheries and all the other miseries "that flesh is heir to," where do we too often fly to avoid them? To the Sinus Iridium or the Sinus Roris , that is Rainbow Gulf and Dewy Gulf whose glittering lights, alas! give

eyes. They studied this new world and tried to get it by heart, working at it like a school boy at his lessons. They began by measuring its angles and diameters.

To their practical, common sense vision Mare Nubium , the Cloudy Sea, was an immense depression of the surface, sprinkled here and there with a few circular mountains. Covering a great portion of that part of the southern hemisphere which lies east of the centre, it occupied a space of about 270 thousand square miles, its central point lying in 15° south latitude and 20° east longitude. Northeast from this lay Oceanus Procellarum , the Ocean of Tempests, the most extensive of all the plains on the lunar disc, embracing a surface of about half a million of square miles, its centre being in 10° north and 45° east. From its bosom those wonderful mountains Kepler and Aristarchus lifted their vast ramparts glittering with innumerable streaks radiating in all directions.

To the north, in the direction of Mare Frigoris , extends Mare Imbrium , the Sea of Rains, its central point in 35° north and 20° east. It is somewhat circular in shape, and it covers a space of about 300 thousand square miles. South of Oceanus Procellarum and separated from Mare Nubium by a goodly number of ring mountains, lies the little basin of Mare Humorum , the Sea of Humors, containing only about 66 thousand square miles, its central point having a latitude of 25° south and a longitude of 40° east.

On the shores of these great seas three "Gulfs" are easily found: Sinus Aestuum , the Gulf of the Tides, northeast of the centre; Sinus Iridium , the Gulf of the Rainbows, northeast of the Mare Imbrium ; and Sinus Roris , the Dewy Gulf, a little further northeast. All seem to be small plains enclosed between chains of lofty mountains.

The western hemisphere, dedicated to the ladies, according to Ardan, and therefore naturally more capricious, was remarkable for "seas" of smaller dimensions, but much more numerous. These were principally: Mare Serenitatis , the Sea of Serenity, 25° north and 20° west, comprising a surface of about 130 thousand square miles; Mare Crisium , the Sea of Crises, a round, well defined, dark depression towards the northwestern edge, 17° north 55° west, embracing a surface of 60 thousand square miles, a regular Caspian Sea in fact, only that the plateau in which it lies buried is surrounded by a girdle of much higher mountains. Then towards the equator, with a latitude of 5° north and a longitude of 25° west, appears Mare Tranquillitatis , the Sea of Tranquillity, occupying about 180 thousand square miles. This communicates on the south with Mare Nectaris , the Sea of Nectar, embracing an extent of about 42 thousand square miles, with a

--"A skimming dish, a buckwheat cake, a lump of green cheese--" went on Barbican--.

--In fact, there is no knowing how far they would have proceeded with their designations, comparisons, and scientific expressions, had not Ardan, driven to extremities by Barbican's last profanity, suddenly jumped up, broken away from his companions, and clapped a forcible extinguisher on their eloquence by putting his hands on their lips and keeping them there awhile. Then striking a grand attitude, he looked towards the Moon and burst out in accents of thrilling indignation:

"Pardon, O beautiful Diana of the Ephesians! Pardon, O Phoebe, thou pearl-faced goddess of night beloved of Greece! O Isis, thou sympathetic queen of Nile-washed cities! O Astarte, thou favorite deity of the Syrian hills! O Artemis, thou symbolical daughter of Jupiter and Latona, that is of light and darkness! O brilliant sister of the radiant Apollo! enshrined in the enchanting strains of Virgil and Homer, which I only half learned at college, and therefore unfortunately forget just now! Otherwise what pleasure I should have had in hurling them at the heads of Barbican, M'Nicholl, and every other barbarous iconoclast of the nineteenth century!--"

Here he stopped short, for two reasons: first he was out of breath; secondly, he saw that the irrepressible scientists had been too busy making observations of their own to hear a single word of what he had uttered, and were probably totally unconscious that he had spoken at all. In a few seconds his breath came back in full blast, but the idea of talking when only deaf men were listening was so disconcerting as to leave him actually unable to get off another syllable.

us keep our souls free from every distraction. We are now astronomers. We see now what no mortal eye has ever gazed on before. This Projectile is simply a work room of the great Cambridge Observatory lifted into space. Let us take observations!"

With these words, he set to work with a renewed ardor, in which his companions fully participated. The consequence was that they soon had several of the outline maps covered with the best sketches they could make of the Moon's various aspects thus presented under such favorable circumstances. They could now remark not only that they were passing the tenth degree of north latitude, but that the Projectile followed almost directly the twentieth degree of east longitude.

"One thing always puzzled me when examining maps of the Moon," observed Ardan, "and I can't say that I see it yet as clearly as if I had thought over the matter. It is this. I could understand, when looking through a lens at an object, why we get only its reversed image--a simple law of optics explains that . Therefore, in a map of the Moon, as the bottom means the north and the top the south, why does not the right mean the west and the left the east? I suppose I could have made this out by a little thought, but thinking, that is reflection, not being my forte, it is the last thing I ever care to do. Barbican, throw me a word or two on the subject."

"I can see what troubles you," answered Barbican, "but I can also see that one moment's reflection would have put an end to your perplexity. On ordinary maps of the Earth's surface when the north is the top, the right hand must be the east, the left hand the west, and so on. That is simply because we look down from above . And such a map seen through a lens will appear reversed in all respects. But in looking at the Moon, that is up from down , we change our position so far that our right hand points west and our left east. Consequently, in our reversed map, though the north becomes south, the right remains east, and--"

"Enough said! I see it at a glance! Thank you, Barbican. Why did not they make you a professor of astronomy? Your hint will save me a world of trouble."[C]

Aided by the Mappa Selenographica , the travellers could easily recognize the different portions of the Moon over which they were now moving. An occasional glance at our reduction of this map, given as a frontispiece, will enable the gentle reader to follow the travellers on the line in which they moved and to understand the remarks and observations in which they occasionally indulged.

"Seas" at a time. The wonderful complexity of its bright streaks diverging on all sides from its centre presented a scene alike splendid and unique. These streaks, the travellers thought, could be traced further north than in any other direction: they fancied they could detect them even in the Mare Imbrium , but this of course might be owing to the point from which they made their observations. At one o'clock in the morning, the Projectile, flying through space, was exactly over this magnificent mountain.

In spite of the brilliant sunlight that was blazing around them, the travellers could easily recognize the peculiar features of Copernicus . It belongs to those ring mountains of the first class called Circuses. Like Kepler and Aristarchus , who rule over Oceanus Procellarum , Copernicus , when viewed through our telescopes, sometimes glistens so brightly through the ashy light of the Moon that it has been frequently taken for a volcano in full activity. Whatever it may have been once, however, it is certainly nothing more now than, like all the other mountains on the visible side of the Moon, an extinct volcano, only with a crater of such exceeding grandeur and sublimity as to throw utterly into the shade everything like it on our Earth. The crater of Etna is at most little more than a mile across. The crater of Copernicus has a diameter of at least 50 miles. Within it, the travellers could easily discover by their glasses an immense number of terraced ridges, probably landslips, alternating with stratifications resulting from successive eruptions. Here and there, but particularly in the southern side, they caught glimpses of shadows of such intense blackness, projected across the plateau and lying there like pitch spots, that they could not tell them from yawning chasms of incalculable depth. Outside the crater the shadows were almost as deep, whilst on the plains all around, particularly in the west, so many small craters could be detected that the eye in vain attempted to count them.

"Many circular mountains of this kind," observed Barbican, "can be seen on the lunar surface, but Copernicus , though not one of the greatest, is one of the most remarkable on account of those diverging streaks of bright light that you see radiating from its summit. By looking steadily into its crater, you can see more cones than mortal eye ever lit on before. They are so numerous as to render the interior plateau quite rugged, and were formerly so many openings giving vent to fire and volcanic matter. A curious and very common arrangement of this internal plateau of lunar craters is its lying at a lower level than the external plains, quite the contrary to a terrestrial crater, which generally has its bottom much higher than the level of the surrounding country. It follows therefore that the deep lying curve of the bottom of these ring mountains would give a sphere with a diameter somewhat smaller than the Moon's."

were at their wildest, suddenly frozen into solidity. Over this rugged, rumpled, wrinkled surface and in all directions, ran the wonderful streaks whose radiating point appeared to be the summit of Copernicus . Many of them appeared to be ten miles wide and hundreds of miles in length.

The travellers disputed for some time on the origin of these strange radii, but could hardly be said to have arrived at any conclusion more satisfactory than that already reached by some terrestrial observers.

To M'Nicholl's question:

"Why can't these streaks be simply prolonged mountain crests reflecting the sun's rays more vividly by their superior altitude and comparative smoothness?"

Barbican readily replied:

"These streaks can't be mountain crests, because, if they were, under certain conditions of solar illumination they should project shadows --a thing which they have never been known to do under any circumstances whatever. In fact, it is only during the period of the full Moon that these streaks are seen at all; as soon as the sun's rays become oblique, they disappear altogether--a proof that their appearance is due altogether to peculiar advantages in their surface for the reflection of light."

"Dear boys, will you allow me to give my little guess on the subject?" asked Ardan.

His companions were profuse in expressing their desire to hear it.

"Well then," he resumed, "seeing that these bright streaks invariably start from a certain point to radiate in all directions, why not suppose them to be streams of lava issuing from the crater and flowing down the mountain side until they cooled?"

"Such a supposition or something like it has been put forth by Herschel," replied Barbican; "but your own sense will convince you that it is quite untenable when you consider that lava, however hot and liquid it may be at the commencement of its journey, cannot flow on for hundreds of miles, up hills, across ravines, and over plains, all the time in streams of almost exactly equal width."

"That theory of yours holds no more water than mine, Ardan," observed

Does not this plain look like an immense battle field piled with the bleaching bones of myriads who had slaughtered each other to a man at the bidding of some mighty Caesar? What do you think of that lofty comparison, hey?"

"It is quite on a par with the other," muttered Barbican.

"He's hard to please, Captain," continued Ardan, "but let us try him again! Does not this plain look like--?"

"My worthy friend," interrupted Barbican, quietly, but in a tone to discourage further discussion, "what you think the plain looks like is of very slight import, as long as you know no more than a child what it really is !"

"Bravo, Barbican! well put!" cried the irrepressible Frenchman. "Shall I ever realize the absurdity of my entering into an argument with a scientist!"

But this time the Projectile, though advancing northward with a pretty uniform velocity, had neither gained nor lost in its nearness to the lunar disc. Each moment altering the character of the fleeting landscape beneath them, the travellers, as may well be imagined, never thought of taking an instant's repose. At about half past one, looking to their right on the west, they saw the summits of another mountain; Barbican, consulting his map, recognized Eratosthenes .

This was a ring mountain, about 33 miles in diameter, having, like Copernicus , a crater of immense profundity containing central cones. Whilst they were directing their glasses towards its gloomy depths, Barbican mentioned to his friends Kepler's strange idea regarding the formation of these ring mountains. "They must have been constructed," he said, "by mortal hands."

"With what object?" asked the Captain.

"A very natural one," answered Barbican. "The Selenites must have undertaken the immense labor of digging these enormous pits at places of refuge in which they could protect themselves against the fierce solar rays that beat against them for 15 days in succession!"

"Not a bad idea, that of the Selenites!" exclaimed Ardan.

"An absurd idea!" cried M'Nicholl. "But probably Kepler never knew the real dimensions of these craters. Barbican knows the trouble and time required

Cordilleras 10 to 20 12,000 Hemisphere. { Pyrenees 8 to 18 12,000 { Riphean 5 to 10 2,600

{ Haemus 10 to 20 6,300 { Carpathian 15 to 19 6,000 { Apennines 14 to 27 18,000 Northern { Taurus 25 to 34 8,500 Hemisphere. { Hercynian 17 to 29 3,400 { Caucasus 33 to 40 17,000 { Alps 42 to 30 10,000

Of these different chains, the most important is that of the Apennines , about 450 miles long, a length, however, far inferior to that of many of the great mountain ranges of our globe. They skirt the western shores of the Mare Imbrium , over which they rise in immense cliffs, 18 or 20 thousand feet in height, steep as a wall and casting over the plain intensely black shadows at least 90 miles long. Of Mt. Huyghens , the highest in the group, the travellers were just barely able to distinguish the sharp angular summit in the far west. To the east, however, the Carpathians , extending from the 18th to 30th degrees of east longitude, lay directly under their eyes and could be examined in all the peculiarities of their distribution.

Barbican proposed a hypothesis regarding the formation of those mountains, which his companions thought at least as good as any other. Looking carefully over the Carpathians and catching occasional glimpses of semi-circular formations and half domes, he concluded that the chain must have formerly been a succession of vast craters. Then had come some mighty internal discharge, or rather the subsidence to which Mare Imbrium is due, for it immediately broke off or swallowed up one half of those mountains, leaving the other half steep as a wall on one side and sloping gently on the other to the level of the surrounding plains. The Carpathians were therefore pretty nearly in the same condition as the crater mountains Ptolemy , Alpetragius and Arzachel would find themselves in, if some terrible cataclysm, by tearing away their eastern ramparts, had turned them into a chain of mountains whose towering cliffs would nod threateningly over the western shores of Mare Nubium . The mean height of the Carpathians is about 6,000 feet, the altitude of certain points in the Pyrenees such as the Port of Pineda , or Roland's Breach , in the shadow of Mont Perdu . The northern slopes of the Carpathians sink rapidly towards the shores of the vast Mare Imbrium .

Towards two o'clock in the morning, Barbican calculated the Projectile to be on the 20th northern parallel, and therefore almost immediately over the little ring mountain called Pytheas , about 4600 feet in height. The distance of the travellers from the Moon at this point could not be more than about

CHAPTER XIII - LUNAR LANDSCAPES

At half past two in the morning of December 6th, the travellers crossed the 30th northern parallel, at a distance from the lunar surface of 625 miles, reduced to about 6 by their spy-glasses. Barbican could not yet see the least probability of their landing at any point of the disc. The velocity of the Projectile was decidedly slow, but for that reason extremely puzzling. Barbican could not account for it. At such a proximity to the Moon, the velocity, one would think, should be very great indeed to be able to counteract the lunar attraction. Why did it not fall? Barbican could not tell; his companions were equally in the dark. Ardan said he gave it up. Besides they had no time to spend in investigating it. The lunar panorama was unrolling all its splendors beneath them, and they could not bear to lose one of its slightest details.

The lunar disc being brought within a distance of about six miles by the spy-glasses, it is a fair question to ask, what could an aeronaut at such an elevation from our Earth discover on its surface? At present that question can hardly be answered, the most remarkable balloon ascensions never having passed an altitude of five miles under circumstances favorable for observers. Here, however, is an account, carefully transcribed from notes taken on the spot, of what Barbican and his companions did see from their peculiar post of observation.

Varieties of color, in the first place, appeared here and there upon the disc. Selenographers are not quite agreed as to the nature of these colors. Not that such colors are without variety or too faint to be easily distinguished. Schmidt of Athens even says that if our oceans on earth were all evaporated, an observer in the Moon would hardly find the seas and continents of our globe even so well outlined as those of the Moon are to the eye of a terrestrial observer. According to him, the shade of color distinguishing those vast plains known as "seas" is a dark gray dashed with green and brown,--a color presented also by a few of the great craters.

This opinion of Schmidt's, shared by Beer and Maedler, Barbican's observations now convinced him to be far better founded than that of certain astronomers who admit of no color at all being visible on the Moon's surface but gray. In certain spots the greenish tint was quite decided, particularly in Mare Serenitatis and Mare Humorum, the very localities where Schmidt had most noticed it. Barbican also remarked that several large craters, of the class that had no interior cones, reflected a kind of

"You can see them in all directions," answered Ardan; "but two are particularly visible: one running north from Archimedes , the other south towards the Apennines ."

M'Nicholl's face, as he gazed, gradually assumed a grin which soon developed into a snicker, if not a positive laugh, as he observed to Ardan:

"Your Selenites must be Brobdignagians, their oxen Leviathans, and their ploughs bigger than Marston's famous cannon, if these are furrows!"

"How's that, Barbican?" asked Ardan doubtfully, but unwilling to submit to M'Nicholl.

"They're not furrows, dear friend," said Barbican, "and can't be, either, simply on account of their immense size. They are what the German astronomers called Rillen ; the French, rainures , and the English, grooves , canals , clefts , cracks , chasms , or fissures ."

"You have a good stock of names for them anyhow," observed Ardan, "if that does any good."

"The number of names given them," answered Barbican, "shows how little is really known about them. They have been observed in all the level portion of the Moon's surface. Small as they appear to us, a little calculation must convince you that they are in some places hundreds of miles in length, a mile in width and probably in many points several miles in depth. Their width and depth, however, vary, though their sides, so far as observed, are always rigorously parallel. Let us take a good look at them."

Putting the glass to his eye, Barbican examined the clefts for some time with close attention. He saw that their banks were sharp edged and extremely steep. In many places they were of such geometrical regularity that he readily excused Gruithuysen's idea of deeming them to be gigantic earthworks thrown up by the Selenite engineers. Some of them were as straight as if laid out with a line, others were curved a little here and there, though still maintaining the strict parallelism of their sides. These crossed each other; those entered craters and came out at the other side. Here, they furrowed annular plateaus, such as Posidonius or Petavius . There, they wrinkled whole seas, for instance, Mare Serenitatis .

These curious peculiarities of the lunar surface had interested the astronomic mind to a very high degree at their first discovery, and have proved to be very perplexing problems ever since. The first observers do not

"In the question under consideration, however," continued the Frenchman, "my conjecture has this advantage over some others: it explains why these rills appear and seem to disappear at regular intervals."

"Let us hear the explanation," said the Captain.

"They become invisible when the trees lose their leaves, and they reappear when they resume them."

"His explanation is not without ingenuity," observed Barbican to M'Nicholl, "but, my dear friend," turning to Ardan, "it is hardly admissible."

"Probably not," said Ardan, "but why not?"

"Because as the Sun is nearly always vertical to the lunar equator, the Moon can have no change of seasons worth mentioning; therefore her vegetation can present none of the phenomena that you speak of."

This was perfectly true. The slight obliquity of the Moon's axis, only 1-1/2°, keeps the Sun in the same altitude the whole year around. In the equatorial regions he is always vertical, and in the polar he is never higher than the horizon. Therefore, there can be no change of seasons; according to the latitude, it is a perpetual winter, spring, summer, or autumn the whole year round. This state of things is almost precisely similar to that which prevails in Jupiter, who also stands nearly upright in his orbit, the inclination of his axis being only about 3°.

But how to account for the grooves ? A very hard nut to crack. They must certainly be a later formation than the craters and the rings, for they are often found breaking right through the circular ramparts. Probably the latest of all lunar features, the results of the last geological epochs, they are due altogether to expansion or shrinkage acting on a large scale and brought about by the great forces of nature, operating after a manner altogether unknown on our earth. Such at least was Barbican's idea.

"My friends," he quietly observed, "without meaning to put forward any pretentious claims to originality, but by simply turning to account some advantages that have never before befallen contemplative mortal eye, why not construct a little hypothesis of our own regarding the nature of these grooves and the causes that gave them birth? Look at that great chasm just below us, somewhat to the right. It is at least fifty or sixty miles long and runs along the base of the Apennines in a line almost perfectly straight. Does not its parallelism with the mountain chain suggest a causative

and towards the north, beneath him, bare mountains of the aridest character.

Not the slightest vestige of man's work could be detected over the vast expanse. Not the slightest sign of a ruin spoke of his ever having been there. Nothing betrayed the slightest trace of the development of animal life, even in an inferior degree. No movement. Not the least glimpse of vegetation. Of the three great kingdoms that hold dominion on the surface of the globe, the mineral, the vegetable and the animal, one alone was represented on the lunar sphere: the mineral, the whole mineral, and nothing but the mineral.

"Why!" exclaimed Ardan, with a disconcerted look, after a long and searching examination, "I can't find anybody. Everything is as motionless as a street in Pompeii at 4 o'clock in the morning!"

"Good comparison, friend Ardan;" observed M'Nicholl. "Lava, slag, volcanic eminences, vitreous matter glistening like ice, piles of scoria, pitch black shadows, dazzling streaks, like rivers of light breaking over jagged rocks--these are now beneath my eye--these alone I can detect--not a man--not an animal--not a tree. The great American Desert is a land of milk and honey in comparison with the joyless orb over which we are now moving. However, even yet we can predicate nothing positive. The atmosphere may have taken refuge in the depths of the chasms, in the interior of the craters, or even on the opposite side of the Moon, for all we know!"

"Still we must remember," observed Barbican, "that even the sharpest eye cannot detect a man at a distance greater than four miles and a-half, and our glasses have not yet brought us nearer than five."

"Which means to say," observed Ardan, "that though we can't see the Selenites, they can see our Projectile!"

But matters had not improved much when, towards four o'clock in the morning, the travellers found themselves on the 50th parallel, and at a distance of only about 375 miles from the lunar surface. Still no trace of the least movement, or even of the lowest form of life.

"What peaked mountain is that which we have just passed on our right?" asked Ardan. "It is quite remarkable, standing as it does in almost solitary grandeur in the barren plain."

"That is Pico ," answered Barbican. "It is at least 8000 feet high and is well known to terrestrial astronomers as well by its peculiar shadow as on

a faint echo of the chorus you could chant, if a wild storm roared over your beetling summits! The pine forests of Norwegian mountains howling in midwinter would not be an accordeon in comparison!"

"Wonderful instance of subsidence on a grand scale!" exclaimed the Captain, hastily relapsing into science.

"Not at all!" cried the Frenchman, still true to his colors; "no subsidence there! A comet simply came too close and left its mark as it flew past."

"Fanciful exclamations, dear friends," observed Barbican; "but I'm not surprised at your excitement. Yonder is the famous Valley of the Alps , a standing enigma to all selenographers. How it could have been formed, no one can tell. Even wilder guesses than yours, Ardan, have been hazarded on the subject. All we can state positively at present regarding this wonderful formation, is what I have just recorded in my note-book: the Valley of the Alps is about 5 mile wide and 70 or 80 long: it is remarkably flat and free from debris , though the mountains on each side rise like walls to the height of at least 10,000 feet.--Over the whole surface of our Earth I know of no natural phenomenon that can be at all compared with it."

"Another wonder almost in front of us!" cried Ardan. "I see a vast lake black as pitch and round as a crater; it is surrounded by such lofty mountains that their shadows reach clear across, rendering the interior quite invisible!"

"That's Plato ;" said M'Nicholl; "I know it well; it's the darkest spot on the Moon: many a night I gazed at it from my little observatory in Broad Street, Philadelphia."

"Right, Captain," said Barbican; "the crater Plato , is, indeed, generally considered the blackest spot on the Moon, but I am inclined to consider the spots Grimaldi and Riccioli on the extreme eastern edge to be somewhat darker. If you take my glass, Ardan, which is of somewhat greater power than yours, you will distinctly see the bottom of the crater. The reflective power of its plateau probably proceeds from the exceedingly great number of small craters that you can detect there."

"I think I see something like them now," said Ardan. "But I am sorry the Projectile's course will not give us a vertical view."

"Can't be helped!" said Barbican; "we must go where it takes us. The day may come when man can steer the projectile or the balloon in which he is shut up, in any way he pleases, but that day has not come yet!"

magical effects of chiaro-oscuro --this diffused light has absolutely no existence on the surface of the Moon. Nothing is there to break the inexorable contrast between intense white and intense black. At mid-day, let a Selenite shade his eyes and look at the sky: it will appear to him as black as pitch, while the stars still sparkle before him as vividly as they do to us on the coldest and darkest night in winter.

From this you can judge of the impression made on our travellers by those strange lunar landscapes. Even their decided novelty and very strange character produced any thing but a pleasing effect on the organs of sight. With all their enthusiasm, the travellers felt their eyes "get out of gear," as Ardan said, like those of a man blind from his birth and suddenly restored to sight. They could not adjust them so as to be able to realize the different plains of vision. All things seemed in a heap. Foreground and background were indistinguishably commingled. No painter could ever transfer a lunar landscape to his canvas.

"Landscape," Ardan said; "what do you mean by a landscape? Can you call a bottle of ink intensely black, spilled over a sheet of paper intensely white, a landscape?"

At the eightieth degree, when the Projectile was hardly 100 miles distant from the Moon, the aspect of things underwent no improvement. On the contrary, the nearer the travellers approached the lunar surface, the drearier, the more inhospitable, and the more unearthly , everything seem to look. Still when five o'clock in the morning brought our travellers to within 50 miles of Mount Gioja --which their spy-glasses rendered as visible as if it was only about half a mile off, Ardan could not control himself.

"Why, we're there" he exclaimed; "we can touch her with our hands! Open the windows and let me out! Don't mind letting me go by myself. It is not very inviting quarters I admit. But as we are come to the jumping off place, I want to see the whole thing through. Open the lower window and let me out. I can take care of myself!"

"That's what's more than any other man can do," said M'Nicholl drily, "who wants to take a jump of 50 miles!"

"Better not try it, friend Ardan," said Barbican grimly: "think of Satellite! The Moon is no more attainable by your body than by our Projectile. You are far more comfortable in here than when floating about in empty space like a bolide."

CHAPTER XIV - A NIGHT OF FIFTEEN DAYS.

The Projectile being not quite 30 miles from the Moon's north pole when the startling phenomenon, recorded in our last chapter, took place, a few seconds were quite sufficient to launch it at once from the brightest day into the unknown realms of night. The transition was so abrupt, so unexpected, without the slightest shading off, from dazzling effulgence to Cimmerian gloom, that the Moon seemed to have been suddenly extinguished like a lamp when the gas is turned off.

"Where's the Moon?" cried Ardan in amazement.

"It appears as if she had been wiped out of creation!" cried M'Nicholl.

Barbican said nothing, but observed carefully. Not a particle, however, could he see of the disc that had glittered so resplendently before his eyes a few moments ago. Not a shadow, not a gleam, not the slightest vestige could he trace of its existence. The darkness being profound, the dazzling splendor of the stars only gave a deeper blackness to the pitchy sky. No wonder. The travellers found themselves now in a night that had plenty of time not only to become black itself, but to steep everything connected with it in palpable blackness. This was the night 354-1/4 hours long, during which the invisible face of the Moon is turned away from the Sun. In this black darkness the Projectile now fully participated. Having plunged into the Moon's shadow, it was as effectually cut off from the action of the solar rays as was every point on the invisible lunar surface itself.

The travellers being no longer able to see each other, it was proposed to light the gas, though such an unexpected demand on a commodity at once so scarce and so valuable was certainly disquieting. The gas, it will be remembered, had been intended for heating alone, not illumination, of which both Sun and Moon had promised a never ending supply. But here both Sun and Moon, in a single instant vanished from before their eyes and left them in Stygian darkness.

"It's all the Sun's fault!" cried Ardan, angrily trying to throw the blame on something, and, like every angry man in such circumstances, bound to be rather nonsensical.

"Put the saddle on the right horse, Ardan," said M'Nicholl patronizingly, always delighted at an opportunity of counting a point off the Frenchman.

natural subject of conversation was this terrible night 354 hours long, which the laws of nature have imposed on the Lunar inhabitants. Barbican undertook to give his friends some explanation regarding the cause of the startling phenomenon, and the consequences resulting from it.

"Yes, startling is the word for it," observed Barbican, replying to a remark of Ardan's; "and still more so when we reflect that not only are both lunar hemispheres deprived, by turns, of sun light for nearly 15 days, but that also the particular hemisphere over which we are at this moment floating is all that long night completely deprived of earth-light. In other words, it is only one side of the Moon's disc that ever receives any light from the Earth. From nearly every portion of one side of the Moon, the Earth is always as completely absent as the Sun is from us at midnight. Suppose an analogous case existed on the Earth; suppose, for instance, that neither in Europe, Asia or North America was the Moon ever visible--that, in fact, it was to be seen only at our antipodes. With what astonishment should we contemplate her for the first time on our arrival in Australia or New Zealand!"

"Every man of us would pack off to Australia to see her!" cried Ardan.

"Yes," said M'Nicholl sententiously; "for a visit to the South Sea a Turk would willingly forego Mecca; and a Bostonian would prefer Sidney even to Paris."

"Well," resumed Barbican, "this interesting marvel is reserved for the Selenite that inhabits the side of the Moon which is always turned away from our globe."

"And which," added the Captain, "we should have had the unspeakable satisfaction of contemplating if we had only arrived at the period when the Sun and the Earth are not at the same side of the Moon--that is, 15 days sooner or later than now."

"For my part, however," continued Barbican, not heeding these interruptions, "I must confess that, notwithstanding the magnificent splendor of the spectacle when viewed for the first time by the Selenite who inhabits the dark side of the Moon, I should prefer to be a resident on the illuminated side. The former, when his long, blazing, roasting, dazzling day is over, has a night 354 hours long, whose darkness, like that, just now surrounding us, is ever unrelieved save by the cold cheerless rays of the stars. But the latter has hardly seen his fiery sun sinking on one horizon when he beholds rising on the opposite one an orb, milder, paler, and colder indeed than the Sun, but fully as large as thirteen of our full Moons, and

--"In the Moon is hardly possible!" cried both in one voice.

"Besides?" asked Barbican: "even if there is any life--?"

--"That to live on the dark side would be much more inconvenient than on the light side!" cried M'Nicholl promptly.

--"That there is no choice between them!" cried Ardan just as ready. "For my part, I should think a residence on Mt. Erebus or in Grinnell Land a terrestrial paradise in comparison to either. The Earth shine might illuminate the light side of the Moon a little during the long night, but for any practical advantage towards heat or life, it would be perfectly useless!"

"But there is another serious difference between the two sides," said Barbican, "in addition to those enumerated. The dark side is actually more troubled with excessive variations of temperature than the light one."

"That assertion of our worthy President," interrupted Ardan, "with all possible respect for his superior knowledge, I am disposed to question."

"It's as clear as day!" said Barbican.

"As clear as mud, you mean, Mr. President;" interrupted Ardan, "the temperature of the light side is excited by two objects at the same time, the Earth and the Sun, whereas--"

--"I beg your pardon, Ardan--" said Barbican.

--"Granted, dear boy--granted with the utmost pleasure!" interrupted the Frenchman.

"I shall probably have to direct my observations altogether to you, Captain," continued Barbican; "friend Michael interrupts me so often that I'm afraid he can hardly understand my remarks."

"I always admired your candor, Barbican," said Ardan; "it's a noble quality, a grand quality!"

"Don't mention it," replied Barbican, turning towards M'Nicholl, still in the dark, and addressing him exclusively; "You see, my dear Captain, the period at which the Moon's invisible side receives at once its light and heat is exactly the period of her conjunction , that is to say, when she is lying

"Well done, friend Ardan!" cried Barbican, clapping his hands with pleasure. "Yes, Captain, he understood it as well as either of us the whole time. Intelligence, not indifference, caused him to interrupt. Wonderful fellow!"

"That's the kind of a man I am!" replied Ardan, not without some degree of complacency. Then he added simply: "Barbican, my friend, if I understand your explanations so readily, attribute it all to their astonishing lucidity. If I have any faculity, it is that of being able to scent common sense at the first glimmer. Your sentences are so steeped in it that I catch their full meaning long before you end them--hence my apparent inattention. But we're not yet done with the visible face of the Moon: it seems to me you have not yet enumerated all the advantages in which it surpasses the other side."

"Another of these advantages," continued Barbican, "is that it is from the visible side alone that eclipses of the Sun can be seen. This is self-evident, the interposition of the Earth being possible only between this visible face and the Sun. Furthermore, such eclipses of the Sun would be of a far more imposing character than anything of the kind to be witnessed from our Earth. This is chiefly for two reasons: first, when we, terrestrians, see the Sun eclipsed, we notice that, the discs of the two orbs being of about the same apparent size, one cannot hide the other except for a short time; second, as the two bodies are moving in opposite directions, the total duration of the eclipse, even under the most favorable circumstances, can't last longer than 7 minutes. Whereas to a Selenite who sees the Earth eclipse the Sun, not only does the Earth's disc appear four times larger than the Sun's, but also, as his day is 14 times longer than ours, the two heavenly bodies must remain several hours in contact. Besides, notwithstanding the apparent superiority of the Earth's disc, the refracting power of the atmosphere will never allow the Sun to be eclipsed altogether. Even when completely screened by the Earth, he would form a beautiful circle around her of yellow, red, and crimson light, in which she would appear to float like a vast sphere of jet in a glowing sea of gold, rubies, sparkling carbuncles and garnets."

"It seems to me," said M'Nicholl, "that, taking everything into consideration, the invisible side has been rather shabbily treated."

"I know I should not stay there very long," said Ardan; "the desire of seeing such a splendid sight as that eclipse would be enough to bring me to the visible side as soon as possible."

"Yes, I have no doubt of that, friend Michael," pursued Barbican; "but to see

The two friends kept up a desultory conversation, but Barbican did not hear them. One fact, in particular, troubled him, and he sought in vain to account for it. Having come so near the Moon--about 30 miles--why had not the Projectile gone all the way? Had its velocity been very great, the tendency to fall could certainly be counteracted. But the velocity being undeniably very moderate, how explain such a decided resistance to Lunar attraction? Had the Projectile come within the sphere of some strange unknown influence? Did the neighborhood of some mysterious body retain it firmly imbedded in ether? That it would never reach the Moon, was now beyond all doubt; but where was it going? Nearer to her or further off? Or was it rushing resistlessly into infinity on the wings of that pitchy night? Who could tell, know, calculate--who could even guess, amid the horror of this gloomy blackness? Questions, like these, left Barbican no rest; in vain he tried to grapple with them; he felt like a child before them, baffled and almost despairing.

In fact, what could be more tantalizing? Just outside their windows, only a few leagues off, perhaps only a few miles, lay the radiant planet of the night, but in every respect as far off from the eyes of himself and his companions as if she was hiding at the other side of Jupiter! And to their ears she was no nearer. Earthquakes of the old Titanic type might at that very moment be upheaving her surface with resistless force, crashing mountain against mountain as fiercely as wave meets wave around the storm-lashed cliffs of Cape Horn. But not the faintest far off murmur even of such a mighty tumult could break the dead brooding silence that surrounded the travellers. Nay, the Moon, realizing the weird fancy of the Arabian poet, who calls her a "giant stiffening into granite, but struggling madly against his doom," might shriek, in a spasm of agony, loudly enough to be heard in Sirius. But our travellers could not hear it. Their ears no sound could now reach. They could no more detect the rending of a continent than the falling of a feather. Air, the propagator and transmitter of sound, was absent from her surface. Her cries, her struggles, her groans, were all smothered beneath the impenetrable tomb of eternal silence!

These were some of the fanciful ideas by which Ardan tried to amuse his companions in the present unsatisfactory state of affairs. His efforts, however well meant, were not successful. M'Nicholl's growls were more savage than usual, and even Barbican's patience was decidedly giving way. The loss of the other face they could have easily borne--with most of its details they had been already familiar. But, no, it must be the dark face that now escaped their observation! The very one that for numberless reasons they were actually dying to see! They looked out of the windows once more at the black Moon beneath them.

For, candidly and truly speaking, never before had mortal eye revelled on such a scene of starry splendor. The black sky sparkled with lustrous fires, like the ceiling of a vast hall of ebony encrusted with flashing diamonds. Ardan's eye could take in the whole extent in an easy sweep from the Southern Cross to the Little Bear , thus embracing within one glance not only the two polar stars of the present day, but also Campus and Vega , which, by reason of the precession of the Equinoxes , are to be our polar stars 12,000 years hence. His imagination, as if intoxicated, reeled wildly through these sublime infinitudes and got lost in them. He forgot all about himself and all about his companions. He forgot even the strangeness of the fate that had sent them wandering through these forbidden regions, like a bewildered comet that had lost its way. With what a soft sweet light every star glowed! No matter what its magnitude, the stream that flowed from it looked calm and holy. No twinkling, no scintillation, no nictitation, disturbed their pure and lambent gleam. No atmosphere here interposed its layers of humidity or of unequal density to interrupt the stately majesty of their effulgence. The longer he gazed upon them, the more absorbing became their attraction. He felt that they were great kindly eyes looking down even yet with benevolence and protection on himself and his companions now driving wildly through space, and lost in the pathless depths of the black ocean of infinity!

He soon became aware that his friends, following his example, had interested themselves in gazing at the stars, and were now just as absorbed as himself in the contemplation of the transcendent spectacle. For a long time all three continued to feast their eyes on all the glories of the starry firmament; but, strange to say, the part that seemed to possess the strangest and weirdest fascination for their wandering glances was the spot where the vast disc of the Moon showed like an enormous round hole, black and soundless, and apparently deep enough to permit a glance into the darkest mysteries of the infinite.

A disagreeable sensation, however, against which they had been for some time struggling, at last put an end to their contemplations, and compelled them to think of themselves. This was nothing less than a pretty sharp cold, at first somewhat endurable, but which soon covered the inside surface of the window panes with a thick coating of ice. The fact was that, the Sun's direct rays having no longer an opportunity of warming up the Projectile, the latter began to lose rapidly by radiation whatever heat it had stored away within its walls. The consequence was a very decided falling of the thermometer, and so thick a condensation of the internal moisture on the window glasses as to soon render all external observations extremely

Physics at the Sorbonne, where he died, last year, I think."

"Thank you, Captain," said Ardan; "the cold does not injure your memory, though it is decidedly on the advance. See how thick the ice is already on the window panes! Let it only keep on and we shall soon have our breaths falling around us in flakes of snow."

"Let us prepare a thermometer," said Barbican, who had already set himself to work in a business-like manner.

A thermometer of the usual kind, as may be readily supposed, would be of no use whatever in the experiment that was now about to be made. In an ordinary thermometer Mercury freezes hard when exposed to a temperature of 40° below zero. But Barbican had provided himself with a Minimum , self-recording thermometer, of a peculiar nature, invented by Wolferdin, a friend of Arago's, which could correctly register exceedingly low degrees of temperature. Before beginning the experiment, this instrument was tested by comparison with one of the usual kind, and then Barbican hesitated a few moments regarding the best means of employing it.

"How shall we start this experiment?" asked the Captain.

"Nothing simpler," answered Ardan, always ready to reply; "you just open your windows, and fling out your thermometer. It follows your Projectile, as a calf follows her mother. In a quarter of an hour you put out your hand--"

"Put out your hand!" interrupted Barbican.

"Put out your hand--" continued Ardan, quietly.

"You do nothing of the kind," again interrupted Barbican; "that is, unless you prefer, instead of a hand, to pull back a frozen stump, shapeless, colorless and lifeless!"

"I prefer a hand," said Ardan, surprised and interested.

"Yes," continued Barbican, "the instant your hand left the Projectile, it would experience the same terrible sensations as is produced by cauterizing it with an iron bar white hot. For heat, whether rushing rapidly out of our bodies or rapidly entering them, is identically the same force and does the same amount of damage. Besides I am by no means certain that we are still followed by the objects that we flung out of the Projectile."

CHAPTER XV - GLIMPSES AT THE INVISIBLE.

In spite of the dreadful condition in which the three friends now found themselves, and the still more dreadful future that awaited them, it must be acknowledged that Ardan bravely kept up his spirits. And his companions were just as cheerful. Their philosophy was quite simple and perfectly intelligible. What they could bear, they bore without murmuring. When it became unbearable, they only complained, if complaining would do any good. Imprisoned in an iron shroud, flying through profound darkness into the infinite abysses of space, nearly a quarter million of miles distant from all human aid, freezing with the icy cold, their little stock not only of gas but of air rapidly running lower and lower, a near future of the most impenetrable obscurity looming up before them, they never once thought of wasting time in asking such useless questions as where they were going, or what fate was about to befall them. Knowing that no good could possibly result from inaction or despair, they carefully kept their wits about them, making their experiments and recording their observations as calmly and as deliberately as if they were working at home in the quiet retirement of their own cabinets.

Any other course of action, however, would have been perfectly absurd on their part, and this no one knew better than themselves. Even if desirous to act otherwise, what could they have done? As powerless over the Projectile as a baby over a locomotive, they could neither clap brakes to its movement nor switch off its direction. A sailor can turn his ship's head at pleasure; an aeronaut has little trouble, by means of his ballast and his throttle-valve, in giving a vertical movement to his balloon. But nothing of this kind could our travellers attempt. No helm, or ballast, or throttle-valve could avail them now. Nothing in the world could be done to prevent things from following their own course to the bitter end.

If these three men would permit themselves to hazard an expression at all on the subject, which they didn't, each could have done it by his own favorite motto, so admirably expressive of his individual nature. " Donnez tête baissée! " (Go it baldheaded!) showed Ardan's uncalculating impetuosity and his Celtic blood. " Fata quocunque vocant! " (To its logical consequence!) revealed Barbican's imperturbable stoicism, culture hardening rather than loosening the original British phlegm. Whilst M'Nicholl's "Screw down the valve and let her rip!" betrayed at once his unconquerable Yankee coolness and his old experiences as a Western steamboat captain.

particles of matter, shine only from being inflamed by the friction of the atmosphere. Therefore they can never be at a greater distance from the Earth than 30 or 40 miles at furthest, and yet they seldom fall on it. So with our Projectile. It may go very close to the Moon without falling into it."

"But our roving Projectile must pull up somewhere in the long run," replied Ardan, "and I should like to know where that somewhere can be, if not in the Moon."

"Softly again, dear boy," said Barbican; "how do you know that our Projectile must pull up somewhere?"

"It's self-evident," replied Ardan; "it can't keep moving for ever."

"Whether it can or it can't depends altogether on which one of two mathematical curves it has followed in describing its course. According to the velocity with which it was endowed at a certain moment, it must follow either the one or the other; but this velocity I do not consider myself just now able to calculate."

"Exactly so," chimed in M'Nicholl; "it must describe and keep on describing either a parabola or a hyperbola."

"Precisely," said Barbican; "at a certain velocity it would take a parabolic curve; with a velocity considerably greater it should describe a hyperbolic curve."

"I always did like nice corpulent words," said Ardan, trying to laugh; "bloated and unwieldy, they express in a neat handy way exactly what you mean. Of course, I know all about the high--high--those high curves, and those low curves. No matter. Explain them to me all the same. Consider me most deplorably ignorant on the nature of these curves."

"Well," said the Captain, a little bumptiously, "a parabola is a curve of the second order, formed by the intersection of a cone by a plane parallel to one of its sides."

"You don't say so!" cried Ardan, with mouth agape. "Do tell!"

"It is pretty nearly the path taken by a shell shot from a mortar."

"Well now!" observed Ardan, apparently much surprised; "who'd have thought it? Now for the high--high--bully old curve!"

"Any one not convinced at a glance that this eccentricity is equal to unity , must be blind as a bat!" exclaimed Barbican, fast losing his ordinary urbanity.

" Less than unity , you mean! If you want spectacles, here are mine!" shouted the Captain, angrily tearing them off and offering them to his adversary.

"Dear boys!" interposed Ardan--

--"The eccentricity is equal to unity !" cried Barbican.

--"The eccentricity is less than unity !" screamed M'Nicholl.

"Talking of eccentricity--" put in Ardan.

--"Therefore it's a parabola , and must be!" cried Barbican, triumphantly.

--"Therefore it's hyperbola and nothing shorter!" was the Captain's quite as confident reply.

"For gracious sake!--" resumed Ardan.

"Then produce your asymptote !" exclaimed Barbican, with an angry sneer.

"Let us see the symmetrical point !" roared the Captain, quite savagely.

"Dear boys! old fellows!--" cried Ardan, as loud as his lungs would let him.

"It's useless to argue with a Mississippi steamboat Captain," ejaculated Barbican; "he never gives in till he blows up!"

"Never try to convince a Yankee schoolmaster," replied M'Nicholl; "he has one book by heart and don't believe in any other!"

"Here, friend Michael, get me a cord, won't you? It's the only way to convince him!" cried Barbican, hastily turning to the Frenchman.

"Hand me over that ruler, Ardan!" yelled the Captain. "The heavy one! It's the only way now left to bring him to reason!"

"Look here, Barbican and M'Nicholl!" cried Ardan, at last making himself

"Because they are both open curves, and therefore can never end!"

"Is it of the slightest possible importance which of the two curves controls the Projectile?"

"Not the slightest--except in the Eye of Science!"

"Then let the Eye of Science and her parabolas and hyperbolas, and conjugates, and asymptotes, and the rest of the confounded nonsensical farrago, all go to pot! What's the use of bothering your heads about them here! Have you not enough to trouble you otherwise? A nice pair of scientists you are? 'Stanislow' scientists, probably. Do real scientists lose their tempers for a trifle? Am I ever to see my ideal of a true scientific man in the flesh? Barbican came very near realizing my idea perfectly; but I see that Science just has as little effect as Culture in driving the Old Adam out of us! The idea of the only simpleton in the lot having to lecture the others on propriety of deportment! I thought they were going to tear each other's eyes out! Ha! Ha! Ha! It's impayable ! Give me that cord, Michael! Hand me the heavy ruler, Ardan! It's the only way to bring him to reason! Ho! Ho! Ho! It's too good! I shall never get over it!" and he laughed till his sides ached and his cheeks streamed.

His laughter was so contagious, and his merriment so genuine, that there was really no resisting it, and the next few minutes witnessed nothing but laughing, and handshaking and rib-punching in the Projectile--though Heaven knows there was very little for the poor fellows to be merry about. As they could neither reach the Moon nor return to the Earth, what was to befall them? The immediate outlook was the very reverse of exhilarating. If they did not die of hunger, if they did not die of thirst, the reason would simply be that, in a few days, as soon as their gas was exhausted, they would die for want of air, unless indeed the icy cold had killed them beforehand!

By this time, in fact, the temperature had become so exceedingly cold that a further encroachment on their little stock of gas could be put off no longer. The light, of course, they could manage to do without; but a little heat was absolutely necessary to prevent them from freezing to death. Fortunately, however, the caloric developed by the Reiset and Regnault process for purifying the air, raised the internal temperature of the Projectile a little, so that, with an expenditure of gas much less than they had expected, our travellers were able to maintain it at a degree capable of sustaining human life.

Moon. Now suppose we had really landed there, as we expected to do yesterday, would it not have been much more agreeable to behold the lunar continents enjoying the full light of day than to find them plunged in the dismal obscurity of night? Would not our first installation of discovery have been under circumstances decidedly extremely favorable? Your silence shows that you agree with me. As to the invisible side, once landed, we should have the power to visit it when we pleased, and therefore we could always choose whatever time would best suit our purpose. Therefore, if we wanted to land in the Moon, the period of the Full Moon was the best period to select. The period was well chosen, the time was well calculated, the force was well applied, the Projectile was well aimed, but missing our way spoiled everything."

"That's sound logic, no doubt," said Ardan; "still I can't help thinking that all for want of a little light we are losing, probably forever, a splendid opportunity of seeing the Moon's invisible side. How about the other planets, Barbican? Do you think that their inhabitants are as ignorant regarding their satellites as we are regarding ours?"

"On that subject," observed M'Nicholl, "I could venture an answer myself, though, of course, without pretending to speak dogmatically on any such open question. The satellites of the other planets, by their comparative proximity, must be much easier to study than our Moon. The Saturnians, the Uranians, the Jovians, cannot have had very serious difficulty in effecting some communication with their satellites. Jupiter's four moons, for instance, though on an average actually 2-1/2 times farther from their planet's centre than the Moon is from us, are comparatively four times nearer to him on account of his radius being eleven times greater than the Earth's. With Saturn's eight moons, the case is almost precisely similar. Their average distance is nearly three times greater than that of our Moon; but as Saturn's diameter is about 9 times greater than the Earth's, his bodyguards are really between 3 and 4 times nearer to their principal than ours is to us. As to Uranus, his first satellite, Ariel , half as far from him as our Moon is from the Earth, is comparatively, though not actually, eight times nearer."

"Therefore," said Barbican, now taking up the subject, "an experiment analogous to ours, starting from either of these three planets, would have encountered fewer difficulties. But the whole question resolves itself into this. If the Jovians and the rest have been able to quit their planets, they have probably succeeded in discovering the invisible sides of their satellites. But if they have not been able to do so, why, they're not a bit wiser than ourselves--But what's the matter with the Projectile? It's certainly shifting!"

conclusion of the existence of a lunar atmosphere."

This fire mountain was situated, according to the most plausible conjecture, somewhere in the neighborhood of the 45th degree, south latitude, of the Moon's invisible side. For a little while the travellers indulged the fond hope that they were directly approaching it, but, to their great disappointment, the path described by the Projectile lay in a different direction. Its nature therefore they had no opportunity of ascertaining. It began to disappear behind the dark horizon within less than half an hour after the time that M'Nicholl had signalled it. Still, the fact of the uncontested existence of such a phenomenon was a grand one, and of considerable importance in selenographic investigations. It proved that heat had not altogether disappeared from the lunar world; and the existence of heat once settled, who can say positively that the vegetable kingdom and even the animal kingdom have not likewise resisted so far every influence tending to destroy them? If terrestrial astronomers could only be convinced, by undoubted evidence, of the existence of this active volcano on the Moon's surface, they would certainly admit of very considerable modifications in the present doubts regarding her inhabitability.

Thoughts of this kind continued to occupy the minds of our travellers even for some time after the little spark of light had been extinguished in the black gloom. But they said very little; even Ardan was silent, and continued to look out of the window. Barbican surrendered himself up to a reverie regarding the mysterious destinies of the lunar world. Was its present condition a foreshadowing of what our Earth is to become? M'Nicholl, too, was lost in speculation. Was the Moon older or younger than the Earth in the order of Creation? Had she ever been a beautiful world of life, and color, and magnificent variety? If so, had her inhabitants--

Great Mercy, what a cry from Ardan! It sounded human, so seldom do we hear a shriek so expressive at once of surprise and horror and even terror! It brought back his startled companions to their senses in a second. Nor did they ask him for the cause of his alarm. It was only too clear. Right in their very path, a blazing ball of fire had suddenly risen up before their eyes, the pitchy darkness all round it rendering its glare still more blinding. Its phosphoric coruscation filled the Projectile with white streams of lurid light, tinging the contents with a pallor indescribably ghastly. The travellers' faces in particular, gleamed with that peculiar livid and cadaverous tinge, blue and yellow, which magicians so readily produce by burning table salt in alcohol.

" Sacré! " cried Ardan who always spoke his own language when much

faces were petrified with horror. No wonder. Their Projectile, whose course they were powerless as children to guide, was making straight for this fiery mass, whose glare in a few seconds had become more blinding than the open vent of a reverberating furnace. Their own Projectile was carrying them headlong into a bottomless abyss of fire!

Still, even in this moment of horror, their presence of mind, or at least their consciousness, never abandoned them. Barbican had grasped each of his friends by the hand, and all three tried as well as they could to watch through half-closed eyelids the white-hot asteroid's rapid approach. They could utter no word, they could breathe no prayer. They gave themselves up for lost--in the agony of terror that partially interrupted the ordinary functions of their brains, this was absolutely all they could do! Hardly three minutes had elapsed since Ardan had caught the first glimpse of it--three ages of agony! Now it was on them! In a second--in less than a second, the terrible fireball had burst like a shell! Thousands of glittering fragments were flying around them in all directions--but with no more noise than is made by so many light flakes of thistle-down floating about some warm afternoon in summer. The blinding, blasting steely white glare of the explosion almost bereft the travellers of the use of their eyesight forever, but no more report reached their ears than if it had taken place at the bottom of the Gulf of Mexico. In an atmosphere like ours, such a crash would have burst the ear-membranes of ten thousand elephants!

In the middle of the commotion another loud cry was suddenly heard. It was the Captain who called this time. His companions rushed to his window and all looked out together in the same direction.

What a sight met their eyes! What pen can describe it? What pencil can reproduce the magnificence of its coloring? It was a Vesuvius at his best and wildest, at the moment just after the old cone has fallen in. Millions of luminous fragments streaked the sky with their blazing fires. All sizes and shapes of light, all colors and shades of colors, were inextricably mingled together. Irradiations in gold, scintillations in crimson, splendors in emerald, lucidities in ultramarine--a dazzling girandola of every tint and of every hue. Of the enormous fireball, an instant ago such an object of dread, nothing now remained but these glittering pieces, shooting about in all directions, each one an asteroid in its turn. Some flew out straight and gleaming like a steel sword; others rushed here and there irregularly like chips struck off a red-hot rock; and others left long trails of glittering cosmical dust behind them like the nebulous tail of Donati's comet.

These incandescent blocks crossed each other, struck each other, crushed

Nothing more! In less than a second the illumination had come to an end, involving everything in the Moon's direction once more in pitchy darkness.

But had the impression made on the travellers' eyes been a mere vision or the result of a reality? an optical delusion or the shadow of a solid fact? Could an observation so rapid, so fleeting, so superficial, be really regarded as a genuine scientific affirmation? Could such a feeble glimmer of the invisible disc justify them in pronouncing a decided opinion on the inhabitability of the Moon? To such questions as these, rising spontaneously and simultaneously in the minds of our travellers, they could not reply at the moment; they could not reply to them long afterwards; even to this day they can give them no satisfactory answer. All they could do at the moment, they did. To every sight and sound they kept their eyes and ears open, and, by observing the most perfect silence, they sought to render their impressions too vivid to admit of deception.

There was now, however, nothing to be heard, and very little more to be seen. The few coruscations that flashed over the sky, gradually became fewer and dimmer; the asteroids sought paths further and further apart, and finally disappeared altogether. The ether resumed its original blackness. The stars, eclipsed for a moment, blazed out again on the firmament, and the invisible disc, that had flashed into view for an instant, once more relapsed forever into the impenetrable depths of night.

Projectile was bound to quit pretty soon the cone of the shadow, at a point directly opposite to where it had entered it. This cone could not possibly be of very great extent, considering the very slight ratio borne by the Moon's diameter when compared with the Sun's. Still, to all appearances, the Projectile seemed to be quite as deeply immersed in the shadow as ever, and there was apparently not the slightest sign of such a state of things coming soon to an end. At what rate was the Projectile now moving? Hard to say, but certainly not slowly, certainly rapidly enough to be out of the shadow by this time, if describing a curve rigidly parabolic. Was the curve therefore not parabolic? Another puzzling problem and sadly bewildering to poor Barbican, who had now almost lost his reason by attempting to clear up questions that were proving altogether too profound for his overworked brains.

Not that he ever thought of taking rest. Not that his companions thought of taking rest. Far from it. With senses as high-strung as ever, they still watched carefully for every new fact, every unexpected incident that might throw some light on the sidereal investigations. Even their dinner, or what was called so, consisted of only a few bits of bread and meat, distributed by Ardan at five o'clock, and swallowed mechanically. They did not even turn on the gas full head to see what they were eating; each man stood solidly at his window, the glass of which they had enough to do in keeping free from the rapidly condensing moisture.

At about half-past five, however, M'Nicholl, who had been gazing for some time with his telescope in a particular direction, called the attention of his companions to some bright specks of light barely discernible in that part of the horizon towards which the Projectile was evidently moving. His words were hardly uttered when his companions announced the same discovery. They could soon all see the glittering specks not only becoming more and more numerous, but also gradually assuming the shape of an extremely slender, but extremely brilliant crescent. Rapidly more brilliant and more decided in shape the profile gradually grew, till it soon resembled the first faint sketch of the New Moon that we catch of evenings in the western sky, or rather the first glimpse we get of her limb as it slowly moves out of eclipse. But it was inconceivably brighter than either, and was furthermore strangely relieved by the pitchy blackness both of sky and Moon. In fact, it soon became so brilliant as to dispel in a moment all doubt as to its particular nature. No meteor could present such a perfect shape; no volcano, such dazzling splendor.

"The Sun!" cried Barbican.

to perish pretty soon for want of air. Our travellers, therefore, had no particular reason for rejoicing over the new destiny reserved for the Projectile in obedience to the inexorable laws of the centripetal and centrifugal forces. They were soon, it is true, to have the opportunity of beholding once more the illuminated face of the Moon. They might even live long enough to catch a last glimpse of the distant Earth bathed in the glory of the solar rays. They might even have strength enough left to be able to chant one solemn final eternal adieu to their dear old Mother World, upon whose features their mortal eyes should never again rest in love and longing! Then, what was their Projectile to become? An inert, lifeless, extinct mass, not a particle better than the most defunct asteroid that wanders blindly through the fields of ether. A gloomy fate to look forward to. Yet, instead of grieving over the inevitable, our bold travellers actually felt thrilled with delight at the prospect of even a momentary deliverance from those gloomy depths of darkness and of once more finding themselves, even if only for a few hours, in the cheerful precincts illuminated by the genial light of the blessed Sun!

The ring of light, in the meantime, becoming brighter and brighter, Barbican was not long in discovering and pointing out to his companions the different mountains that lay around the Moon's south pole.

"There is Leibnitz on your right," said he, "and on your left you can easily see the peaks of Doerfel . Belonging rather to the Moon's dark side than to her Earth side, they are visible to terrestrial astronomers only when she is in her highest northern latitudes. Those faint peaks beyond them that you can catch with such difficulty must be those of Newton and Curtius ."

"How in the world can you tell?" asked Ardan.

"They are the highest mountains in the circumpolar regions," replied Barbican. "They have been measured with the greatest care; Newton is 23,000 feet high."

"More or less!" laughed Ardan. "What Delphic oracle says so?"

"Dear friend," replied Barbican quietly, "the visible mountains of the Moon have been measured so carefully and so accurately that I should hardly hesitate in affirming their altitude to be as well known as that of Mont Blanc, or, at least, as those of the chief peaks in the Himalayahs or the Rocky Mountain Range."

"I should like to know how people set about it," observed Ardan

other parts of the triangle. Very ingenious--but now, that I think of it--is not this method absolutely impracticable for every mountain except those in the immediate neighborhood of the light and shadow line?"

"That's a defect easily remedied by patience," explained Barbican--the Captain, who did not like being interrupted, having withdrawn to his telescope--"As this line is continually changing, in course of time all the mountains must come near it. A third method--to measure the mountain profile directly by means of the micrometer--is evidently applicable only to altitudes lying exactly on the lunar rim."

"That is clear enough," said Ardan, "and another point is also very clear. In Full Moon no measurement is possible. When no shadows are made, none can be measured. Measurements, right or wrong, are possible only when the solar rays strike the Moon's surface obliquely with regard to the observer. Am I right, Signor Barbicani, maestro illustrissimo?"

"Perfectly right," replied Barbican. "You are an apt pupil."

"Say that again," said Ardan. "I want Mac to hear it."

Barbican humored him by repeating the observation, but M'Nicholl would only notice it by a grunt of doubtful meaning.

"Was Galileo tolerably successful in his calculations?" asked Ardan, resuming the conversation.

Before answering this question, Barbican unrolled the map of the Moon, which a faint light like that of day-break now enabled him to examine. He then went on: "Galileo was wonderfully successful--considering that the telescope which he employed was a poor instrument of his own construction, magnifying only thirty times. He gave the lunar mountains a height of about 26,000 feet--an altitude cut down by Hevelius, but almost doubled by Riccioli. Herschel was the first to come pretty close to the truth, but Beer and Maedler, whose *Mappa Selenographica* now lies before us, have left really nothing more to be done for lunar astronomy--except, of course, to pay a personal visit to the Moon--which we have tried to do, but I fear with a very poor prospect of success."

"Cheer up! cheer up!" cried Ardan. "It's not all over yet by long odds. Who can say what is still in store for us? Another bolide may shunt us off our ellipse and even send us to the Moon's surface."

Huyghens , Biancanus , Tycho , Kircher , Clavius , Endymion , and Catharina ."

"Now those not quite up to Mont Blanc?" asked Ardan, hardly knowing what to say.

"Here they are, about half a dozen of them: Moretus , Theophilus , Harpalus , Eratosthenes , Werner , and Piccolomini ," answered Barbican as ready as a schoolboy reciting his lesson, and pointing them out on the map as quickly as a compositor distributing his type.

"The next in rank?" asked Ardan, astounded at his friend's wonderful memory.

"The next in rank," replied Barbican promptly, "are those about the size of the Matterhorn, that is to say about 2-3/4 miles in height. They are Macrobius , Delambre , and Conon . Come," he added, seeing Ardan hesitating and at a loss what other question to ask, "don't you want to know what lunar mountains are about the same height as the Peak of Teneriffe? or as Ætna? or as Mount Washington? You need not be afraid of puzzling me. I studied up the subject thoroughly, and therefore know all about it."

"Oh! I could listen to you with delight all day long!" cried Ardan, enthusiastically, though with some embarrassment, for he felt a twinge of conscience in acting so falsely towards his beloved friend. "The fact is," he went on, "such a rational conversation as the present, on such an absorbing subject, with such a perfect master--"

"The Sun!" cried M'Nicholl starting up and cheering. "He's cleared the disc completely, and he's now himself again! Long life to him! Hurrah!"

"Hurrah!" cried the others quite as enthusiastically (Ardan did not seem a bit desirous to finish his sentence).

They tossed their maps aside and hastened to the window.

their desolation, and all hearts Were chilled into a selfish prayer for light !"

As he pronounced these words in accents at once monotonous and melancholy, Ardan, fully appreciative, quietly gesticulated in perfect cadence with the rhythm. Then the three men remained completely silent for several minutes. Buried in recollection, or lost in thought, or magnetized by the bright Sun, they seemed to be half asleep while steeping their limbs in his vitalizing beams.

Barbican was the first to dissolve the reverie by jumping up. His sharp eye had noticed that the base of the Projectile, instead of keeping rigidly perpendicular to the lunar surface, turned away a little, so as to render the elliptical orbit somewhat elongated. This he made his companions immediately observe, and also called their attention to the fact that from this point they could easily have seen the Earth had it been Full, but that now, drowned in the Sun's beams, it was quite invisible. A more attractive spectacle, however, soon engaged their undivided attention--that of the Moon's southern regions, now brought within about the third of a mile by their telescopes. Immediately resuming their posts by the windows, they carefully noted every feature presented by the fantastic panorama that stretched itself out in endless lengths beneath their wondering eyes.

Mount Leibnitz and Mount Doerfel form two separate groups developed in the regions of the extreme south. The first extends westwardly from the pole to the 84th parallel; the second, on the southeastern border, starting from the pole, reaches the neighborhood of the 65th. In the entangled valleys of their clustered peaks, appeared the dazzling sheets of white, noted by Father Secchi, but their peculiar nature Barbican could now examine with a greater prospect of certainty than the illustrious Roman astronomer had ever enjoyed.

"They're beds of snow," he said at last in a decided tone.

"Snow!" exclaimed M'Nicholl.

"Yes, snow, or rather glaciers heavily coated with glittering ice. See how vividly they reflect the Sun's rays. Consolidated beds of lava could never shine with such dazzling uniformity. Therefore there must be both water and air on the Moon's surface. Not much--perhaps very little if you insist on it--but the fact that there is some can now no longer be questioned."

This assertion of Barbican's, made so positively by a man who never decided

grain of impalpable dust.

Careful observations, taken by Barbican and repeated by his companions, soon satisfied them that the ridgy outline of the mountains on the Moon's border, though perhaps due to different forces from those acting in the centre, still presented a character generally uniform. The same bulwark-surrounded hollows, the same abrupt projections of surface. Yet a different arrangement, as Barbican pointed out to his companions, might be naturally expected. In the central portion of the disc, the Moon's crust, before solidification, must have been subjected to two attractions--that of the Moon herself and that of the Earth--acting, however, in contrary directions and therefore, in a certain sense, serving to neutralize each other. Towards the border of her disc, on the contrary, the terrestrial attraction, having acted in a direction perpendicular to that of the lunar, should have exerted greater power, and therefore given a different shape to the general contour. But no remarkable difference had so far been perceived by terrestrial observers; and none could now be detected by our travellers. Therefore the Moon must have found in herself alone the principle of her shape and of her superficial development--that is, she owed nothing to external influences. "Arago was perfectly right, therefore," concluded Barbican, "in the remarkable opinion to which he gave expression thirty years ago:

'No external action whatever has contributed to the formation of the Moon's diversified surface.'"

"But don't you think, Barbican," asked the Captain, "that every force, internal or external, that might modify the Moon's shape, has ceased long ago?"

"I am rather inclined to that opinion," said Barbican; "it is not, however, a new one. Descartes maintained that as the Earth is an extinct Sun, so is the Moon an extinct Earth. My own opinion at present is that the Moon is now the image of death, but I can't say if she has ever been the abode of life."

"The abode of life!" cried Ardan, who had great repugnance in accepting the idea that the Moon was no better than a heap of cinders and ashes; "why, look there! If those are not as neat a set of the ruins of an abandoned city as ever I saw, I should like to know what they are!"

He pointed to some very remarkable rocky formations in the neighborhood of Short , a ring mountain rising to an altitude considerably higher than that of Mont Blanc. Even Barbican and M'Nicholl could detect some regularity

says, reigns eternal darkness, so absolute that Earth-shine or even Sunlight is never able to dispel it. Had Michael's friends the old mythologists ever known anything about it, they would doubtless have made it the entrance to the infernal regions. On the whole surface of our Earth, there is no mountain even remotely resembling it. It is a perfect type of the lunar crater. Like most of them, it shows that the peculiar formation of the Moon's surface is due, first, to the cooling of the lunar crust; secondly, to the cracking from internal pressure; and, thirdly, to the violent volcanic action in consequence. This must have been of a far fiercer nature than it has ever been with us. The matter was ejected to a vast height till great mountains were formed; and still the action went on, until at last the floor of the crater sank to a depth far lower than the level of the external plain."

"You may be right," said Ardan by way of reply; "as for me, I'm looking out for another city. But I'm sorry to say that our Projectile is increasing its distance so fast that, even if one lay at my feet at this moment, I doubt very much if I could see it a bit better than either you or the Captain."

Newton was soon passed, and the Projectile followed a course that took it directly over the ring mountain Moretus . A little to the west the travellers could easily distinguish the summits of Blancanus , 7,000 feet high, and, towards seven o'clock in the evening, they were approaching the neighborhood of Clavius .

This walled-plain, one of the most remarkable on the Moon, lies 55° S. by 15° E. Its height is estimated at 16,000 feet, but it is considered to be about a hundred and fifty miles in diameter. Of this vast crater, the travellers now at a distance of 250 miles, reduced to 2-1/2 by their telescopes, had a magnificent bird's-eye view.

"Our terrestrial volcanoes," said Barbican, "as you can now readily judge for yourselves, are no more than molehills when compared with those of the Moon. Measure the old craters formed by the early eruptions of Vesuvius and Ætna, and you will find them little more than three miles in diameter. The crater of Cantal in central France is only about six miles in width; the famous valley in Ceylon, called the Crater , though not at all due to volcanic action, is 44 miles across and is considered to be the greatest in the world. But even this is very little in comparison to the diameter of Clavius lying beneath us at the present moment."

"How much is its diameter?" asked the Captain.

"At least one hundred and forty-two miles," replied Barbican; "it is probably

The Projectile advanced, but the scene of desolation seemed to remain unchanged. Craters, ring mountains, pitted plateaus dotted with shapeless wrecks, succeeded each other without interruption. For level plain, for dark "sea," for smooth plateau, the eye here sought in vain. It was a Swiss Greenland, an Icelandic Norway, a Sahara of shattered crust studded with countless hills of glassy lava.

At last, in the very centre of this blistered region, right too at its very culmination, the travellers came on the brightest and most remarkable mountain of the Moon. In the dazzling Tycho they found it an easy matter to recognize the famous lunar point, which the world will for ever designate by the name of the distinguished astronomer of Denmark.

This brilliant luminosity of the southern hemisphere, no one that ever gazes at the Full Moon in a cloudless sky, can help noticing. Ardan, who had always particularly admired it, now hailed it as an old friend, and almost exhausted breath, imagination and vocabulary in the epithets with which he greeted this cynosure of the lunar mountains.

"Hail!" he cried, "thou blazing focus of glittering streaks, thou coruscating nucleus of irradiation, thou starting point of rays divergent, thou egress of meteoric flashes! Hub of the silver wheel that ever rolls in silent majesty over the starry plains of Night! Paragon of jewels enchased in a carcanet of dazzling brilliants! Eye of the universe, beaming with heavenly resplendescence!

"Who shall say what thou art? Diana's nimbus? The golden clasp of her floating robes? The blazing head of the great bolt that rivets the lunar hemispheres in union inseverable? Or cans't thou have been some errant bolide, which missing its way, butted blindly against the lunar face, and there stuck fast, like a Minie ball mashed against a cast-iron target? Alas! nobody knows. Not even Barbican is able to penetrate thy mystery. But one thing I know. Thy dazzling glare so sore my eyes hath made that longer on thy light to gaze I do not dare. Captain, have you any smoked glass?"

In spite of this anti-climax, Ardan's companions could hardly consider his utterings either as ridiculous or over enthusiastic. They could easily excuse his excitement on the subject. And so could we, if we only remember that Tycho , though nearly a quarter of a million miles distant, is such a luminous point on the lunar disc, that almost any moonlit night it can be easily perceived by the unaided terrestrial eye. What then must have been its splendor in the eyes of our travellers whose telescopes brought it actually

They could easily distinguish the annular ramparts of the external circumvallation, the mountains buttressing the gigantic walls internally as well as externally, the vast esplanades descending irregularly and abruptly to the sunken plains all around. They could even detect a difference of a few hundred feet in altitude in favor of the western or right hand side over the eastern. They could also see that these dividing ridges were actually inaccessible and completely unsurmountable, at least by ordinary terrestrian efforts. No system of castrametation ever devised by Polybius or Vauban could bear the slightest comparison with such vast fortifications, A city built on the floor of the circular cavity could be no more reached by the outside Lunarians than if it had been built in the planet Mars.

This idea set Ardan off again. "Yes," said he, "such a city would be at once completely inaccessible, and still not inconveniently situated in a plateau full of aspects decidedly picturesque. Even in the depths of this immense crater, Nature, as you can see, has left no flat and empty void. You can easily trace its special oreography, its various mountain systems which turn it into a regular world on a small scale. Notice its cones, its central hills, its valleys, its substructures already cut and dry and therefore quietly prepared to receive the masterpieces of Selenite architecture. Down there to the left is a lovely spot for a Saint Peter's; to the right, a magnificent site for a Forum; here a Louvre could be built capable of entrancing Michael Angelo himself; there a citadel could be raised to which even Gibraltar would be a molehill! In the middle rises a sharp peak which can hardly be less than a mile in height--a grand pedestal for the statue of some Selenite Vincent de Paul or George Washington. And around them all is a mighty mountain-ring at least 3 miles high, but which, to an eye looking from the centre of our vast city, could not appear to be more than five or six hundred feet. Enormous circus, where mighty Rome herself in her palmiest days, though increased tenfold, would have no reason to complain for want of room!"

He stopped for a few seconds, perhaps to take breath, and then resumed:

"Oh what an abode of serene happiness could be constructed within this shadow-fringed ring of the mighty mountains! O blessed refuge, unassailable by aught of human ills! What a calm unruffled life could be enjoyed within thy hallowed precincts, even by those cynics, those haters of humanity, those disgusted reconstructors of society, those misanthropes and misogynists old and young, who are continually writing whining verses in odd corners of the newspapers!"

"Right at last, Ardan, my boy!" cried M'Nicholl, quietly rubbing the glass of his spectacles; "I should like to see the whole lot of them carted in there

CHAPTER XVIII - PUZZLING QUESTIONS.

It was not until the Projectile had passed a little beyond Tycho's immense concavity that Barbican and his friends had a good opportunity for observing the brilliant streaks sent so wonderfully flying in all directions from this celebrated mountain as a common centre. They examined them for some time with the closest attention.

What could be the nature of this radiating aureola? By what geological phenomena could this blazing coma have been possibly produced? Such questions were the most natural things in the world for Barbican and his companions to propound to themselves, as indeed they have been to every astronomer from the beginning of time, and probably will be to the end.

What did they see? What you can see, what anybody can see on a clear night when the Moon is full--only our friends had all the advantages of a closer view. From Tycho , as a focus, radiated in all directions, as from the head of a peeled orange, more than a hundred luminous streaks or channels, edges raised, middle depressed--or perhaps vice versa , owing to an optical illusion--some at least twelve miles wide, some fully thirty. In certain directions they ran for a distance of at least six hundred miles, and seemed--especially towards the west, northwest, and north--to cover half the southern hemisphere. One of these flashes extended as far as Neander on the 40th meridian; another, curving around so as to furrow the Mare Nectaris , came to an end on the chain of the Pyrenees , after a course of perhaps a little more than seven hundred miles. On the east, some of them barred with luminous network the Mare Nubium and even the Mare Humorum .

The most puzzling feature of these glittering streaks was that they ran their course directly onward, apparently neither obstructed by valley, crater, or mountain ridge however high. They all started, as said before, from one common focus, Tycho's crater. From this they certainly all seemed to emanate. Could they be rivers of lava once vomited from that centre by resistless volcanic agency and afterwards crystallized into glassy rock? This idea of Herschel's, Barbican had no hesitation in qualifying as exceedingly absurd. Rivers running in perfectly straight lines, across plains, and up as well as down mountains!

"Other astronomers," he continued, "have looked on these streaks as a peculiar kind of moraines , that is, long lines of erratic blocks belched forth

"An English scientist," continued Barbican, "Nasmyth by name, is decidedly of your opinion, especially ever since a little experiment of his own has confirmed him in it. He filled a glass globe with water, hermetically sealed it, and then plunged it into a hot bath. The enclosed water, expanding at a greater rate than the glass, burst the latter, but, in doing so, it made a vast number of cracks all diverging in every direction from the focus of disruption. Something like this he conceives to have taken place around Tycho . As the crust cooled, it cracked. The lava from the interior, oozing out, spread itself on both sides of the cracks. This certainly explains pretty satisfactorily why those flat glistening streaks are of much greater width than the fissures through which the lava had at first made its way to the surface."

"Well done for an Englishman!" cried Ardan in great spirits.

"He's no Englishman," said M'Nicholl, glad to have an opportunity of coming off with some credit. "He is the famous Scotch engineer who invented the steam hammer, the steam ram, and discovered the 'willow leaves' in the Sun's disc."

"Better and better," said Ardan--"but, powers of Vulcan! What makes it so hot? I'm actually roasting!"

This observation was hardly necessary to make his companions conscious that by this time they felt extremely uncomfortable. The heat had become quite oppressive. Between the natural caloric of the Sun and the reflected caloric of the Moon, the Projectile was fast turning into a regular bake oven. This transition from intense cold to intense heat was already about quite as much as they could bear.

"What shall we do, Barbican?" asked Ardan, seeing that for some time no one else appeared inclined to say a word.

"Nothing, at least yet awhile, friend Ardan," replied Barbican, "I have been watching the thermometer carefully for the last few minutes, and, though we are at present at 38° centigrade, or 100° Fahrenheit, I have noticed that the mercury is slowly falling. You can also easily remark for yourself that the floor of the Projectile is turning away more and more from the lunar surface. From this I conclude quite confidently, and I see that the Captain agrees with me, that all danger of death from intense heat, though decidedly alarming ten minutes ago, is over for the present and, for some time at least, it may be dismissed from further consideration."

"That's the way to go about it," said the Captain. "Now then, Ardan, what do you say to the first question? Yes, or no?"

"I really can't say anything," replied Ardan. "In the presence of such distinguished scientists, I'm only a listener, a 'mere looker on in Vienna' as the Divine Williams has it. However, for the sake of argument, suppose I reply in the affirmative, and say that the Moon is inhabitable ."

"If you do, I shall most unhesitatingly contradict you," said Barbican, feeling just then in splendid humor for carrying on an argument, not, of course, for the sake of contradicting or conquering or crushing or showing off or for any other vulgar weakness of lower minds, but for the noble and indeed the only motive that should impel a philosopher--that of enlightening and convincing , "In taking the negative side, however, or saying that the Moon is not inhabitable, I shall not be satisfied with merely negative arguments. Many words, however, are not required. Look at her present condition: her atmosphere dwindled away to the lowest ebb; her 'seas' dried up or very nearly so; her waters reduced to next to nothing; her vegetation, if existing at all, existing only on the scantiest scale; her transitions from intense heat to intense cold, as we ourselves can testify, sudden in the extreme; her nights and her days each nearly 360 hours long. With all this positively against her and nothing at all that we know of positively for her, I have very little hesitation in saying that the Moon appears to me to be absolutely uninhabitable. She seems to me not only unpropitious to the development of the animal kingdom but actually incapable of sustaining life at all--that is, in the sense that we usually attach to such a term."

"That saving clause is well introduced, friend Barbican," said M'Nicholl, who, seeing no chance of demolishing Ardan, had not yet made up his mind as to having another little bout with the President. "For surely you would not venture to assert that the Moon is uninhabitable by a race of beings having an organization different from ours?"

"That question too, Captain," replied Barbican, "though a much more difficult one, I shall try to answer. First, however, let us see, Captain, if we agree on some fundamental points. How do we detect the existence of life? Is it not by movement ? Is not motion its result, no matter what may be its organization?"

"Well," said the Captain in a drawling way, "I guess we may grant that."

"Then, dear friends," resumed Barbican, "I must remind you that, though we

Barbican, opening his note-book, made the proper entry among the minutes of the meeting of December 6th.

"Now then, gentlemen," continued Ardan, "if you are ready for the second question, the necessary complement of the first, we may as well approach it at once. I propound it for discussion in the following form: Has the Moon ever been inhabited? Captain, the Committee would be delighted to hear your remarks on the subject."

"Gentlemen," began the Captain in reply, "I had formed my opinion regarding the ancient inhabitability of our Satellite long before I ever dreamed of testing my theory by anything like our present journey. I will now add that all our observations, so far made, have only served to confirm me in my opinion. I now venture to assert, not only with every kind of probability in my favor but also on what I consider most excellent arguments, that the Moon was once inhabited by a race of beings possessing an organization similar to our own, that she once produced animals anatomically resembling our terrestrial animals, and that all these living organizations, human and animal, have had their day, that that day vanished ages and ages ago, and that, consequently, Life , extinguished forever, can never again reveal its existence there under any form."

"Is the Chair," asked Ardan, "to infer from the honorable gentleman's observations that he considers the Moon to be a world much older than the Earth?"

"Not exactly that," replied the Captain without hesitation; "I rather mean to say that the Moon is a world that grew old more rapidly than the Earth; that it came to maturity earlier; that it ripened quicker, and was stricken with old age sooner. Owing to the difference of the volumes of the two worlds, the organizing forces of matter must have been comparatively much more violent in the interior of the Moon than in the interior of the Earth. The present condition of its surface, as we see it lying there beneath us at this moment, places this assertion beyond all possibility of doubt. Wrinkled, pitted, knotted, furrowed, scarred, nothing that we can show on Earth resembles it. Moon and Earth were called into existence by the Creator probably at the same period of time. In the first stages of their existence, they do not seem to have been anything better than masses of gas. Acted upon by various forces and various influences, all of course directed by an omnipotent intelligence, these gases by degrees became liquid, and the liquids grew condensed into solids until solidity could retain its shape. But the two heavenly bodies, though starting at the same time, developed at a very different ratio. Most undoubtedly, our globe was still gaseous or at most

creatures, her days and nights were by no means 354 hours long."

"Well! if anything could surprise me," said Ardan quickly, "such an assertion as that most certainly would. On what does the honorable gentleman base his most firm conviction ?"

"We know," replied the Captain, "that the reason of the Moon's present long day and night is the exact equality of the periods of her rotation on her axis and of her revolution around the Earth. When she has turned once around the Earth, she has turned once around herself. Consequently, her back is turned to the Sun during one-half of the month; and her face during the other half. Now, I don't believe that this state of things existed at the period referred to."

"The gentleman does not believe!" exclaimed Ardan. "The Chair must be excused for reminding the honorable gentleman that it can not accept his incredulity as a sound and valid argument. These two movements have certainly equal periods now; why not always?"

"For the simple reason that this equality of periods is due altogether to the influence of terrestrial attraction," replied the ready Captain. "This attraction at present, I grant, is so great that it actually disables the Moon from revolving on herself; consequently she must always keep the same face turned towards the Earth. But who can assert that this attraction was powerful enough to exert the same influence at the epoch when the Earth herself was only a fluid substance? In fact, who can even assert that the Moon has always been the Earth's satellite?"

"Ah, who indeed?" exclaimed Ardan. "And who can assert that the Moon did not exist long before the Earth was called into being at all? In fact, who can assert that the Earth itself is not a great piece broken off the Moon? Nothing like asking absurd questions! I've often found them passing for the best kind of arguments!"

"Friend Ardan," interposed Barbican, who noticed that the Captain was a little too disconcerted to give a ready reply; "Friend Ardan, I must say you are not quite wrong in showing how certain methods of reasoning, legitimate enough in themselves, may be easily abused by being carried too far. I think, however, that the Captain might maintain his position without having recourse to speculations altogether too gigantic for ordinary intellect. By simply admitting the insufficiency of the primordeal attraction to preserve a perfect balance between the movements of the lunar rotation and revolution, we can easily see how the nights and days could once succeed each other on

"Perhaps your philosophership has taken the trouble to calculate how many years it will take our unfortunate Terra Mater to cool off?"

"Well; I have."

"And you can rely on your figures?"

"Implicitly."

"Why not tell it at once then to a fellow that's dying of impatience to know all about it? Captain, the Chair considers you one of the most tantalizing creatures in existence!"

"If you only listen, you will hear," replied M'Nicholl quietly. "By careful observations, extended through a series of many years, men have been able to discover the average loss of temperature endured by the Earth in a century. Taking this as the ground work of their calculations, they have ascertained that our Earth shall become an uninhabitable planet in about--"

"Don't cut her life too short! Be merciful!" cried Ardan in a pleading tone half in earnest. "Come, a good long day, your Honor! A good long day!"

"The planet that we call the Earth," continued the Captain, as grave as a judge, "will become uninhabitable to human beings, after a lapse of 400 thousand years from the present time."

"Hurrah!" cried Ardan, much relieved. " Vive la Science! Henceforward, what miscreant will persist in saying that the Savants are good for nothing? Proudly pointing to this calculation, can't they exclaim to all defamers: 'Silence, croakers! Our services are invaluable! Haven't we insured the Earth for 400 thousand years?' Again I say vive la Science! "

"Ardan," began the Captain with some asperity, "the foundations on which Science has raised--"

"I'm half converted already," interrupted Ardan in a cheery tone; "I do really believe that Science is not altogether unmitigated homebogue! Vive --"

--"But what has all this to do with the question under discussion?" interrupted Barbican, desirous to keep his friends from losing their tempers in idle disputation.

Proven! "

"And with this conclusion," said Barbican, hastily rising, "of a subject on which, to tell the truth, we are unable as yet to throw any light worth speaking of, let us be satisfied for the present. Another question of greater moment to us just now is: where are we? It seems to me that we are increasing our distance from the Moon very decidedly and very rapidly."

It was easy to see that he was quite right in this observation. The Projectile, still following a northerly course and therefore approaching the lunar equator, was certainly getting farther and farther from the Moon. Even at 30° S., only ten degrees farther north than the latitude of Tycho , the travellers had considerable difficulty, comparatively, in observing the details of Pitatus , a walled mountain on the south shores of the Mare Nubium . In the "sea" itself, over which they now floated, they could see very little, but far to the left, on the 20th parallel, they could discern the vast crater of Bullialdus , 9,000 feet deep. On the right, they had just caught a glimpse of Purbach , a depressed valley almost square in shape with a round crater in the centre, when Ardan suddenly cried out:

"A Railroad!"

And, sure enough, right under them, a little northeast of Purbach , the travellers easily distinguished a long line straight and black, really not unlike a railroad cutting through a low hilly country.

This, Barbican explained, was of course no railway, but a steep cliff, at least 1,000 feet high, casting a very deep shadow, and probably the result of the caving in of the surface on the eastern edge.

Then they saw the immense crater of Arzachel and in its midst a cone mountain shining with dazzling splendor. A little north of this, they could detect the outlines of another crater, Alphonse , at least 70 miles in diameter. Close to it they could easily distinguish the immense crater or, as some observers call it, Ramparted Plain, Ptolemy , so well known to lunar astronomers, occupying, as it does, such a favorable position near the centre of the Moon, and having a diameter fully, in one direction at least, 120 miles long.

The travellers were now in about the same latitude as that at which they had at first approached the Moon, and it was here that they began most unquestionably to leave her. They looked and looked, readjusting their glasses, but the details were becoming more and more difficult to catch. The

CHAPTER XIX - IN EVERY FIGHT, THE IMPOSSIBLE WINS.

No matter what we have been accustomed to, it is sad to bid it farewell forever. The glimpse of the Moon's wondrous world imparted to Barbican and his companions had been, like that of the Promised Land to Moses on Mount Pisgah, only a distant and a dark one, yet it was with inexpressibly mournful eyes that, silent and thoughtful, they now watched her fading away slowly from their view, the conviction impressing itself deeper and deeper in their souls that, slight as their acquaintance had been, it was never to be renewed again. All doubt on the subject was removed by the position gradually, but decidedly, assumed by the Projectile. Its base was turning away slowly and steadily from the Moon, and pointing surely and unmistakably towards the Earth.

Barbican had been long carefully noticing this modification, but without being able to explain it. That the Projectile should withdraw a long distance from the Moon and still be her satellite, he could understand; but, being her satellite, why not present towards her its heaviest segment, as the Moon does towards the Earth? That was the point which he could not readily clear up.

By carefully noting its path, he thought he could see that the Projectile, though now decidedly leaving the Moon, still followed a curve exactly analogous to that by which it had approached her. It must therefore be describing a very elongated ellipse, which might possibly extend even to the neutral point where the lunar and terrestrial attractions were mutually overcome.

With this surmise of Barbican's, his companions appeared rather disposed to agree, though, of course, it gave rise to new questions.

"Suppose we reach this dead point," asked Ardan; "what then is to become of us?"

"Can't tell!" was Barbican's unsatisfactory reply.

"But you can form a few hypotheses?"

"Yes, two!"

"Let us have them."

"Correct the movement that's now running away with us!"

"Correct it?"

"Certainly, correct it! or modify it! or clap brakes on it! or take some advantage of it that will be in our favor! What matters the exact term so you comprehend me?"

"Easy talking!"

"As easy doing!"

"Doing what? Doing how?"

"The what, and the how, is your business, not mine! What kind of an artillery man is he who can't master his bullets? The gunner who cannot command his own gun should be rammed into it head foremost himself and blown from its mouth! A nice pair of savants you are! There you sit as helpless as a couple of babies, after having inveigled me--"

"Inveigled!!" cried Barbican and M'Nicholl starting to their feet in an instant; "WHAT!!!"

"Come, come!" went on Ardan, not giving his indignant friends time to utter a syllable; "I don't want any recrimination! I'm not the one to complain! I'll even let up a little if you consider the expression too strong! I'll even withdraw it altogether, and assert that the trip delights me! that the Projectile is a thing after my own heart! that I was never in better spirits than at the present moment! I don't complain, I only appeal to your own good sense, and call upon you with all my voice to do everything possible, so that we may go somewhere , since it appears we can't get to the Moon!"

"But that's exactly what we want to do ourselves, friend Ardan," said Barbican, endeavoring to give an example of calmness to the impatient M'Nicholl; "the only trouble is that we have not the means to do it."

"Can't we modify the Projectile's movement?"

"No."

"Nor diminish its velocity?"

It was near four o'clock in the morning when our travellers, now well fortified physically and morally, once more resumed their observations with renewed courage and determination, and with a system of recording really perfect in its arrangements.

Around the Projectile, they could still see floating most of the objects that had been dropped out of the window. This convinced them that, during their revolution around the Moon, they had not passed through any atmosphere; had anything of the kind been encountered, it would have revealed its presence by its retarding effect on the different objects that now followed close in the wake of the Projectile. One or two that were missing had been probably struck and carried off by a fragment of the exploded bolide.

Of the Earth nothing as yet could be seen. She was only one day Old, having been New the previous evening, and two days were still to elapse before her crescent would be sufficiently cleared of the solar rays to be capable of performing her ordinary duty of serving as a time-piece for the Selenites. For, as the reflecting reader need hardly be reminded, since she rotates with perfect regularity on her axis, she can make such rotations visible to the Selenites by bringing some particular point on her surface once every twenty-four hours directly over the same lunar meridian.

Towards the Moon, the view though far less distinct, was still almost as dazzling as ever. The radiant Queen of Night still glittered in all her splendor in the midst of the starry host, whose pure white light seemed to borrow only additional purity and silvery whiteness from the gorgeous contrast. On her disc, the "seas" were already beginning to assume the ashy tint so well known to us on Earth, but the rest of her surface sparkled with all its former radiation, Tycho glowing like a sun in the midst of the general resplendescence.

Barbican attempted in vain to obtain even a tolerable approximation of the velocity at which the Projectile was now moving. He had to content himself with the knowledge that it was diminishing at a uniform rate--of which indeed a little reflection on a well known law of Dynamics readily convinced him. He had not much difficulty even in explaining the matter to his friends.

"Once admitting," said he, "the Projectile to describe an orbit round the Moon, that orbit must of necessity be an ellipse. Every moving body circulating regularly around another, describes an ellipse. Science has proved this incontestably. The satellites describe ellipses around the planets, the planets around the Sun, the Sun himself describes an ellipse

"I'm sure I can't tell," answered Barbican, "unless, perhaps, because we had too many other things to think about. Your thought, my dear friend, is a most happy one, and, of course, we shall utilize it."

"When? How soon?"

"At the first favorable opportunity, not sooner. For you can see for yourselves, dear friends," he went on explaining, "that with the present obliquity of the Projectile with regard to the lunar disc, a discharge of our rockets would be more likely to send us away from the Moon than towards her. Of course, you are both still desirous of reaching the Moon?"

"Most emphatically so!"

"Then by reserving our rockets for the last chance, we may possibly get there after all. In consequence of some force, to me utterly inexplicable, the Projectile still seems disposed to turn its base towards the Earth. In fact, it is likely enough that at the neutral point its cone will point vertically to the Moon. That being the moment when its velocity will most probably be nil , it will also be the moment for us to discharge our rockets, and the possibility is that we may force a direct fall on the lunar disc."

"Good!" cried Ardan, clapping hands.

"Why didn't we execute this grand manoeuvre the first time we reached the neutral point?" asked M'Nicholl a little crustily.

"It would be useless," answered Barbican; "the Projectile's velocity at that time, as you no doubt remember, not only did not need rockets, but was actually too great to be affected by them."

"True!" chimed in Ardan; "a wind of four miles an hour is very little use to a steamer going ten."

"That assertion," cried M'Nicholl, "I am rather dis--"

--"Dear friends," interposed Barbican, his pale face beaming and his clear voice ringing with the new excitement; "let us just now waste no time in mere words. We have one more chance, perhaps a great one. Let us not throw it away! We have been on the brink of despair--"

--"Beyond it!" cried Ardan.

"Now then, friends," said M'Nicholl, rubbing his eyes but hardly able to keep them open, "I'm not over fond of talking, but this time I think I may offer a slight proposition."

"We shall be most happy to entertain it, my dear Captain," said Barbican.

"I propose we lie down and take a good nap."

"Good gracious!" protested Ardan; "What next?"

"We have not had a blessed wink for forty hours," continued the Captain; "a little sleep would recuperate us wonderfully."

"No sleep now!" exclaimed Ardan.

"Every man to his taste!" said M'Nicholl; "mine at present is certainly to turn in!" and suiting the action to the word, he coiled himself on the sofa, and in a few minutes his deep regular breathing showed his slumber to be as tranquil as an infant's.

Barbican looked at him in a kindly way, but only for a very short time; his eyes grew so filmy that he could not keep them open any longer. "The Captain," he said, "may not be without his little faults, but for good practical sense he is worth a ship-load like you and me, Ardan. By Jove, I'm going to imitate him, and, friend Michael, you might do worse!"

In a short time he was as unconscious as the Captain.

Ardan gazed on the pair for a few minutes, and then began to feel quite lonely. Even his animals were fast asleep. He tried to look out, but observing without having anybody to listen to your observations, is dull work. He looked again at the sleeping pair, and then he gave in.

"It can't be denied," he muttered, slowly nodding his head, "that even your practical men sometimes stumble on a good idea."

Then curling up his long legs, and folding his arms under his head, his restless brain was soon forming fantastic shapes for itself in the mysterious land of dreams.

But his slumbers were too much disturbed to last long. After an uneasy, restless, unrefreshing attempt at repose, he sat up at about half-past seven o'clock, and began stretching himself, when he found his companions

Another phenomenon, in any case, was to mark the arrival of the exact moment. At the dead point, the two attractions, terrestrial and lunar, would again exactly counterbalance each other. For a few seconds, objects would no longer possess the slightest weight. This curious circumstance, which had so much surprised and amused the travellers at its first occurrence, was now to appear again as soon as the conditions should become identical. During these few seconds then would come the moment for striking the decisive blow.

They could soon notice the gradual approach of this important instant. Objects began to weigh sensibly lighter. The conical point of the Projectile had become almost directly under the centre of the lunar surface. This gladdened the hearts of the bold adventurers. The recoil of the rockets losing none of its power by oblique action, the chances pronounced decidedly in their favor. Now, only supposing the Projectile's velocity to be absolutely annihilated at the dead point, the slightest force directing it towards the Moon would be certain to cause it finally to fall on her surface.

Supposing!--but supposing the contrary!

--Even these brave adventurers had not the courage to suppose the contrary!

"Five minutes to one o'clock," said M'Nicholl, his eyes never quitting his watch.

"Ready?" asked Barbican of Ardan.

"Ay, ay, sir!" was Ardan's reply, as he made sure that the electric apparatus to discharge the rockets was in perfect working order.

"Wait till I give the word," said Barbican, pulling out his chronometer.

The moment was now evidently close at hand. The objects lying around had no weight. The travellers felt their bodies to be as buoyant as a hydrogen balloon. Barbican let go his chronometer, but it kept its place as firmly in empty space before his eyes as if it had been nailed to the wall!

"One o'clock!" cried Barbican in a solemn tone.

Ardan instantly touched the discharging key of the little electric battery. A dull, dead, distant report was immediately heard, communicated probably

feeble resistance offered by the rockets. It was all clear now. The same velocity that had carried the Projectile beyond the neutral point on its way to the Moon, was still swaying it on its return to the Earth. A well known law of motion required that, in the path which it was now about to describe, it should repass, on its return through all the points through which it had already passed during its departure .

No wonder that our friends were struck almost senseless when the fearful fall they were now about to encounter, flashed upon them in all its horror. They were to fall a clear distance of nearly 200 thousand miles! To lighten or counteract such a descent, the most powerful springs, checks, rockets, screens, deadeners, even if the whole Earth were engaged in their construction--would produce no more effect than so many spiderwebs. According to a simple law in Ballistics, the Projectile was to strike the Earth with a velocity equal to that by which it had been animated when issuing from the mouth of the Columbiad --a velocity of at least seven miles a second!

To have even a faint idea of this enormous velocity, let us make a little comparison. A body falling from the summit of a steeple a hundred and fifty feet high, dashes against the pavement with a velocity of fifty five miles an hour. Falling from the summit of St. Peter's, it strikes the earth at the rate of 300 miles an hour, or five times quicker than the rapidest express train. Falling from the neutral point, the Projectile should strike the Earth with a velocity of more than 25,000 miles an hour!

"We are lost!" said M'Nicholl gloomily, his philosophy yielding to despair.

"One consolation, boys!" cried Ardan, genial to the last. "We shall die together!"

"If we die," said Barbican calmly, but with a kind of suppressed enthusiasm, "it will be only to remove to a more extended sphere of our investigations. In the other world, we can pursue our inquiries under far more favorable auspices. There the wonders of our great Creator, clothed in brighter light, shall be brought within a shorter range. We shall require no machine, nor projectile, nor material contrivance of any kind to be enabled to contemplate them in all their grandeur and to appreciate them fully and intelligently. Our souls, enlightened by the emanations of the Eternal Wisdom, shall revel forever in the blessed rays of Eternal Knowledge!"

"A grand view to take of it, dear friend Barbican;" replied Ardan, "and a consoling one too. The privilege of roaming at will through God's great

CHAPTER XX - OFF THE PACIFIC COAST.

"Well, Lieutenant, how goes the sounding?"

"Pretty lively, Captain; we're nearly through;" replied the Lieutenant. "But it's a tremendous depth so near land. We can't be more than 250 miles from the California coast."

"The depression certainly is far deeper than I had expected," observed Captain Bloomsbury. "We have probably lit on a submarine valley channelled out by the Japanese Current."

"The Japanese Current, Captain?"

"Certainly; that branch of it which breaks on the western shores of North America and then flows southeast towards the Isthmus of Panama."

"That may account for it, Captain," replied young Brownson; "at least, I hope it does, for then we may expect the valley to get shallower as we leave the land. So far, there's no sign of a Telegraphic Plateau in this quarter of the globe."

"Probably not, Brownson. How is the line now?"

"We have paid out 3500 fathoms already, Captain, but, judging from the rate the reel goes at, we are still some distance from bottom."

As he spoke, he pointed to a tall derrick temporarily rigged up at the stern of the vessel for the purpose of working the sounding apparatus, and surrounded by a group of busy men. Through a block pulley strongly lashed to the derrick, a stout cord of the best Italian hemp, wound off a large reel placed amidships, was now running rapidly and with a slight whirring noise.

"I hope it's not the 'cup-lead' you are using, Brownson?" said the Captain, after a few minutes observation.

"Oh no, Captain, certainly not," replied the Lieutenant. "It's only Brooke's apparatus that is of any use in such depths."

"Clever fellow that Brooke," observed the Captain; "served with him under Maury. His detachment of the weight is really the starting point for every

movement towards laying down an Ocean Cable, which the Pacific Cable Company contemplated finally extending to China. She lay just now a few hundred miles directly south of San Diego, an old Spanish town in southwestern California, and the point which is expected to be the terminus of the great Texas and Pacific Railroad .

The Captain, John Bloomsbury by name, but better known as 'High-Low Jack' from his great love of that game--the only one he was ever known to play--was a near relation of our old friend Colonel Bloomsbury of the Baltimore Gun Club. Of a good Kentucky family, and educated at Annapolis, he had passed his meridian without ever being heard of, when suddenly the news that he had run the gauntlet in a little gunboat past the terrible batteries of Island Number Ten, amidst a perfect storm of shell, grape and canister discharged at less than a hundred yards distance, burst on the American nation on the sixth of April, 1862, and inscribed his name at once in deep characters on the list of the giants of the Great War. But war had never been his vocation. With the return of peace, he had sought and obtained employment on the Western Coast Survey, where every thing he did he looked on as a labor of love. The Sounding Expedition he had particularly coveted, and, once entered upon it, he discharged his duties with characteristic energy.

He could not have had more favorable weather than the present for a successful performance of the nice and delicate investigations of sounding. His vessel had even been fortunate enough to have lain altogether out of the track of the terrible wind storm already alluded to, which, starting from somewhere southwest of the Sierra Madre, had swept away every vestige of mist from the summits of the Rocky Mountains and, by revealing the Moon in all her splendor, had enabled Belfast to send the famous despatch announcing that he had seen the Projectile. Every feature of the expedition was, in fact, advancing so favorably that the Captain expected to be able, in a month or two, to submit to the P.C. Company a most satisfactory report of his labors.

Cyrus W. Field, the life and soul of the whole enterprise, flushed with honors still in full bloom (the Atlantic Telegraph Cable having been just laid), could congratulate himself with good reason on having found a treasure in the Captain. High-Low Jack was the congenial spirit by whose active and intelligent aid he promised himself the pleasure of seeing before long the whole Pacific Ocean covered with a vast reticulation of electric cables. The practical part, therefore, being in such safe hands, Mr. Field could remain with a quiet conscience in Washington, New York or London, seeing after the financial part of the grand undertaking, worthy of the

volcanic scoriae , but apparently not much the worse for the wear; ring mountains, craters, sharp peaks, etc. all around; old MAC discovered taking observations with his levelling staff; BARBICAN perched on the summit of a sharp pointed rock, writing up his note-book; ARDAN, eye-glass on nose, hat under arm, legs apart, puffing at his Imperador , like a--"

--"A locomotive!" interrupted the young Midshipman, his excitable imagination so far getting the better of him as to make him forget his manners. He had just finished Locke's famous MOON HOAX, and his brain was still full of its pictures. "In the background," he went on, "can be seen thousands of Vespertiliones-Homines or Man-Bats , in all the various attitudes of curiosity, alarm, or consternation; some of them peeping around the rocks, some fluttering from peak to peak, all gibbering a language more or less resembling the notes of birds. Enter LUNATICO, King of the Selenites--"

"Excuse us, Mr. Midshipman," interrupted Brownson with an easy smile, "Locke's authority may have great weight among the young Middies at Annapolis, but it does not rank very high at present in the estimation of practical scientists." This rebuff administered to the conceited little Midshipman, a rebuff which the Doctor particularly relished, Brownson continued: "Gentlemen, we certainly know nothing whatever regarding our friends' fate; guessing gives no information. How we ever are to hear from the Moon until we are connected with it by a lunar cable, I can't even imagine. The probability is that we shall never--"

"Excuse me, Lieutenant," interrupted the unrebuffed little Midshipman; "Can't Barbican write?"

A shout of derisive comments greeted this question.

"Certainly he can write, and send his letter by the Pony Express!" cried one.

"A Postal Card would be cheaper!" cried another.

"The New York Herald will send a reporter after it!" was the exclamation of a third.

"Keep cool, just keep cool, gentlemen," persisted the little Midshipman, not in the least abashed by the uproarious hilarity excited by his remarks. "I asked if Barbican couldn't write. In that question I see nothing whatever to laugh at. Can't a man write without being obliged to send his letters?"

"Marston would be one of the first of them," observed Brownson, lighting his cigar.

"Oh, he would have plenty of company!" cried the Midshipman. "I should be delighted to go if he'd only take me."

"No doubt you would, Mr. Midshipman," said Brownson, "the wise men, you know, are not all dead yet."

"Nor the fools either, Lieutenant," growled old Frisby, the fourth officer, getting tired of the conversation.

"There is no question at all about it," observed another; "every time a Projectile started, it would take off as many as it could carry."

"I wish it would only start often enough to improve the breed!" growled old Frisby.

"I have no doubt whatever," added the Chief Engineer, "that the thing would get so fashionable at last that half the inhabitants of the Earth would take a trip to the Moon."

"I should limit that privilege strictly to some of our friends in Washington," said old Frisby, whose temper had been soured probably by a neglect to recognize his long services; "and most of them I should by all means insist on sending to the Moon. Every month I would ram a whole raft of them into the Columbiad, with a charge under them strong enough to blow them all to the--But--Hey!--what in creation's that?"

Whilst the officer was speaking, his companions had suddenly caught a sound in the air which reminded them immediately of the whistling scream of a Lancaster shell. At first they thought the steam was escaping somewhere, but, looking upwards, they saw that the strange noise proceeded from a ball of dazzling brightness, directly over their heads, and evidently falling towards them with tremendous velocity. Too frightened to say a word, they could only see that in its light the whole ship blazed like fireworks, and the whole sea glittered like a silver lake. Quicker than tongue can utter, or mind can conceive, it flashed before their eyes for a second, an enormous bolide set on fire by friction with the atmosphere, and gleaming in its white heat like a stream of molten iron gushing straight from the furnace. For a second only did they catch its flash before their eyes; then striking the bowsprit of the vessel, which it shivered into a thousand pieces, it vanished in the sea in an instant with a hiss, a scream, and a roar, all equally

CHAPTER XXI - NEWS FOR MARSTON!

In a few minutes, consciousness had restored order on board the Susquehanna , but the excitement was as great as ever. They had escaped by a hairsbreadth the terrible fate of being both burned and drowned without a moment's warning, without a single soul being left alive to tell the fatal tale; but on this neither officer nor man appeared to bestow the slightest thought. They were wholly engrossed with the terrible catastrophe that had befallen the famous adventurers. What was the loss of the Susquehanna and all it contained, in comparison to the loss experienced by the world at large in the terrible tragic dénouement just witnessed? The worst had now come to the worst. At last the long agony was over forever. Those three gallant men, who had not only conceived but had actually executed the grandest and most daring enterprise of ancient or modern times, had paid by the most fearful of deaths, for their sublime devotion to science and their unselfish desire to extend the bounds of human knowledge! Before such a reflection as this, all other considerations were at once reduced to proportions of the most absolute insignificance.

But was the death of the adventurers so very certain after all? Hope is hard to kill. Consciousness had brought reflection, reflection doubt, and doubt had resuscitated hope.

"It's they!" had exclaimed the little Midshipman, and the cry had thrilled every heart on board as with an electric shock. Everybody had instantly understood it. Everybody had felt it to be true. Nothing could be more certain than that the meteor which had just flashed before their eyes was the famous projectile of the Baltimore Gun Club. Nothing could be truer than that it contained the three world renowned men and that it now lay in the black depths of the Pacific Ocean.

But here opinions began to diverge. Some courageous breasts soon refused to accept the prevalent idea.

"They're killed by the shock!" cried the crowd.

"Killed?" exclaimed the hopeful ones; "Not a bit of it! The water here is deep enough to break a fall twice as great."

"They're smothered for want of air!" exclaimed the crowd.

Evidently, therefore, the most advisable plan was to sail directly for the bay of San Francisco, the Golden Gate, the finest harbor on the Pacific Coast and one of the safest in the world. Here telegraphic communication with all parts of the Union was assured beyond a doubt. San Francisco, about 750 miles distant, the Susquehanna could probably make in three days; with a little increased pressure, possibly in two days and a-half. The sooner then she started, the better.

The fires were soon in full blast. The vessel could get under weigh at once. In fact, nothing delayed immediate departure but the consideration that two miles of sounding line were still to be hauled up from the ocean depths. Rut the Captain, after a moment's thought, unwilling that any more time should be lost, determined to cut it. Then marking its position by fastening its end to a buoy, he could haul it up at his leisure on his return.

"Besides," said he, "the buoy will show us the precise spot where the Projectile fell."

"As for that, Captain," observed Brownson, "the exact spot has been carefully recorded already: 27° 7' north latitude by 41° 37' west longitude, reckoning from the meridian of Washington."

"All right, Lieutenant," said the Captain curtly. "Cut the line!"

A large cone-shaped metal buoy, strengthened still further by a couple of stout spars to which it was securely lashed, was soon rigged up on deck, whence, being hoisted overboard, the whole apparatus was carefully lowered to the surface of the sea. By means of a ring in the small end of the buoy, the latter was then solidly attached to the part of the sounding line that still remained in the water, and all possible precautions were taken to diminish the danger of friction, caused by the contrary currents, tidal waves, and the ordinary heaving swells of ocean.

It was now a little after three o'clock in the morning. The Chief Engineer announced everything to be in perfect readiness for starting. The Captain gave the signal, directing the pilot to steer straight for San Francisco, north-north by west. The waters under the stern began to boil and foam; the ship very soon felt and yielded to the power that animated her; and in a few minutes she was making at least twelve knots an hour. Her sailing powers were somewhat higher than this, but it was necessary to be careful in the neighborhood of such a dangerous coast as that of California.

from limb.

"To the telegraph office! Like lightning!" were his stifled mutterings, as he struggled in the arms of the Irish giant who had at last succeeded in securing him.

"To the telegraph office!" cried most of the crowd, running after him like fox hounds, but the more knowing ones immediately began questioning the boatmen in the Captain's gig. These honest fellows, nothing loth to tell all that they knew and more that they invented, soon had the satisfaction of finding themselves the centrepoint of a wonder stricken audience, greedily swallowing up every item of the extraordinary news and still hungrily gaping for more.

By this time, however, an important dispatch was flying east, bearing four different addresses: To the Secretary of the U.S. Navy, Washington; To Colonel Joseph Wilcox, Vice-President pro tem. , Baltimore Gun Club, Md; To J.T. Marston, Esq. Long's Peak, Grand County, Colorado; and To Professor Wenlock, Sub-Director of the Cambridge Observatory, Mass.

This dispatch read as follows:

"In latitude twenty-seven degrees seven minutes north and longitude forty-one degrees thirty-seven minutes west shortly after one o'clock on the morning of twelfth instant Columbiad Projectile fell in Pacific--send instructions--

BLOOMSBURY,

Captain , SUSQUEHANNA."

In five minutes more all San Francisco had the news. An hour later, the newspaper boys were shrieking it through the great cities of the States. Before bed-time every man, woman, and child in the country had heard it and gone into ecstasies over it. Owing to the difference in longitude, the people of Europe could not hear it till after midnight. But next morning the astounding issue of the great American enterprise fell on them like a thunder clap.

We must, of course, decline all attempts at describing the effects of this most unexpected intelligence on the world at large.

The Secretary of the Navy immediately telegraphed directions to the

whistlings, barkings, mewings, cock crowings, all of the most fearful and demoniacal character, turned the immense hall into a regular pandemonium. In vain did President Wilcox fire off his detonating bell, with a report on ordinary occasions as loud as the roar of a small piece of ordnance. In the dreadful noise then prevailing it was no more heard than the fizz of a lucifer match.

Some cries, however, made themselves occasionally heard in the pauses of the din. "Read! Read!" "Dry up!" "Sit down!" "Give him an egg!" "Fair play!" "Hurrah for Barbican!" "Down with his enemies!" "Free Speech!" "Belfast won't bite you!" "He'd like to bite Barbican, but his teeth aren't sharp enough!" "Barbican's a martyr to science, let's hear his fate!" "Martyr be hanged; the Old Man is to the good yet!" "Belfast is the grandest name in Science!" "Groans for the grandest name!" (Awful groans.) "Three cheers for Old Man Barbican!" (The exceptional strength alone of the walls saved the building, from being blown out by an explosion in which at least 5,000 pairs of lungs participated.)

"Three cheers for M'Nicholl and the Frenchman!" This was followed by another burst of cheering so hearty, vigorous and long continued that the scientific party, or Belfasters as they were now called, seeing that further prolongation of the meet was perfectly useless, moved to adjourn. It was carried unanimously. President Wilcox left the chair, the meeting broke up in the wildest disorder--the scientists rather crest fallen, but the Barbican men quite jubilant for having been so successful in preventing the reading of that detested dispatch.

Little sleeping was done that night in Baltimore, and less business next day. Even in the public schools so little work was done by the children that S.T. Wallace, Esq., President of the Education Board, advised an anticipation of the usual Christmas recess by a week. Every one talked of the Projectile; nothing was heard at the corners but discussions regarding its probable fate. All Baltimore was immediately rent into two parties, the Belfasters and the Barbicanites . The latter was the most enthusiastic and noisy, the former decidedly the most numerous and influential.

Science, or rather pseudo-science, always exerts a mysterious attraction of an exceedingly powerful nature over the generality--that is, the more ignorant portion of the human race. Assert the most absurd nonsense, call it a scientific truth, and back it up with strange words which, like potentiality , etc., sound as if they had a meaning but in reality have none, and nine out of every ten men who read your book will believe you. Acquire a remarkable name in one branch of human knowledge, and presto! you are

The Barbicanites were very doleful, but they never though of giving in. They would die sooner. When pressed for a scientific reply to a scientific argument, they denied that there was any argument to reply to. What! Had not Belfast seen the Projectile? No! Was not the Great Telescope then good for anything? Yes, but not for everything! Did not Belfast know his business? No! Did they mean to say that he had seen nothing at all? Well, not exactly that, but those scientific gentlemen can seldom be trusted; in their rage for discovery, they make a mountain out of a molehill, or, what is worse, they start a theory and then distort facts to support it. Answers of this kind either led directly to a fight, or the Belfasters moved away thoroughly disgusted with the ignorance of their opponents, who could not see a chain of reasoning as bright as the noonday sun.

Things were in this feverish state on the evening of the 14th, when, all at once, Bloomsbury's dispatch arrived in Baltimore. I need not say that it dropped like a spark in a keg of gun powder. The first question all asked was: Is it genuine or bogus? real or got up by the stockbrokers? But a few flashes backwards and forwards over the wires soon settled that point. The stunning effects of the new blow were hardly over when the Barbicanites began to perceive that the wonderful intelligence was decidedly in their favor. Was it not a distinct contradiction of the whole story told by their opponents? If Barbican and his friends were lying at the bottom of the Pacific, they were certainly not circumgyrating around the Moon. If it was the Projectile that had broken off the bowsprit of the Susquehanna , it could not certainly be the Projectile that Belfast had seen only the day previous doing the duty of a satellite. Did not the truth of one incident render the other an absolute impossibility? If Bloomsbury was right, was not Belfast an ass? Hurrah!

The new revelation did not improve poor Barbican's fate a bit--no matter for that! Did not the party gain by it? What would the Belfasters say now? Would not they hold down their heads in confusion and disgrace?

The Belfasters , with a versatility highly creditable to human nature, did nothing of the kind. Rapidly adopting the very line of tactics they had just been so severely censuring, they simply denied the whole thing. What! the truth of the Bloomsbury dispatch? Yes, every word of it! Had not Bloomsbury seen the Projectile? No! Were not his eyes good for anything? Yes, but not for everything! Did not the Captain know his business? No! Did they mean to say that the bowsprit of the Susquehanna had not been broken off? Well, not exactly that, but those naval gentlemen are not always to be trusted; after a pleasant little supper, they often see the wrong light-house, or, what is worse, in their desire to shield their negligence from

A decided resolution was therefore immediately taken. Everything that man could do was to be done at once, in order to fish up their brave associates from the depths of the Pacific. That very night, in fact, whilst the streets of Baltimore were still resounding with the yells of contending Belfasters and Barbicanites , a committee of four, Morgan, Hunter, Murphy, and Elphinstone, were speeding over the Alleghanies in a special train, placed at their disposal by the Baltimore and Ohio Railroad Company , and fast enough to land them in Chicago pretty early on the following evening.

Here a fresh locomotive and a Pullman car taking charge of them, they were whirled off to Omaha, reaching that busy locality at about supper time on the evening of December 16th. The Pacific Train, as it was called though at that time running no further west than Julesburg, instead of waiting for the regular hour of starting, fired up that very night, and was soon pulling the famous Baltimore Club men up the slopes of the Nebraska at the rate of forty miles an hour. They were awakened before light next morning by the guard, who told them that Julesburg, which they were just entering, was the last point so far reached by the rails. But their regret at this circumstance was most unexpectedly and joyfully interrupted by finding their hands warmly clasped and their names cheerily cried out by their old and beloved friend, J.T. Marston, the illustrious Secretary of the Baltimore Gun Club.

At the close of the first volume of our entertaining and veracious history, we left this most devoted friend and admirer of Barbican established firmly at his post on the summit of Long's Peak, beside the Great Telescope, watching the skies, night and day, for some traces of his departed friends. There, as the gracious Reader will also remember, he had come a little too late to catch that sight of the Projectile which Belfast had at first reported so confidently, but of which the Professor by degrees had begun to entertain the most serious doubts.

In these doubts, however, Marston, strange to say, would not permit himself for one moment to share. Belfast might shake his head as much as he pleased; he, Marston, was no fickle reed to be shaken by every wind; he firmly believed the Projectile to be there before him, actually in sight, if he could only see it. All the long night of the 13th, and even for several hours of the 14th, he never quitted the telescope for a single instant. The midnight sky was in magnificent order; not a speck dimmed its azure of an intensely dark tint. The stars blazed out like fires; the Moon refused none of her secrets to the scientists who were gazing at her so intently that night from the platform on the summit of Long's Peak. But no black spot crawling over her resplendent surface rewarded their eager gaze. Marston indeed would occasionally utter a joyful cry announcing some discovery, but in a moment

The learned Professor was quite right, but in a way which he did not exactly expect. That very evening, after a weary day, apparently a month long, during which Marston sought in vain for a few hours' repose, just as all hands, well wrapped up in warm furs, were getting ready to assume their posts once more near the mouth of the gigantic Telescope, Mr. M'Connell hastily presented himself with a dispatch for Belfast.

The Professor was listlessly breaking the envelope, when he uttered a sharp cry of surprise.

"Hey!" cried Marston quickly. "What's up now?"

"Oh!! The Pro--pro--projectile!!"

"What of it? What? Oh what?? Speak!!"

"IT'S BACK!!"

Marston uttered a wild yell of mingled horror, surprise, and joy, jumped a little into the air, and then fell flat and motionless on the platform. Had Belfast shot him with a ten pound weight, right between the two eyes, he could not have knocked him flatter or stiffer. Having neither slept all night, nor eaten all day, the poor fellow's system had become so weak that such unexpected news was really more than he could bear. Besides, as one of the Cambridge men of the party, a young medical student, remarked: the thin, cold air of these high mountains was extremely enervating.

The astronomers, all exceedingly alarmed, did what they could to recover their friend from his fit, but it was nearly ten minutes before they had the satisfaction of seeing his limbs moving with a slight quiver and his breast beginning to heave. At last the color came back to his face and his eyes opened. He stared around for a few seconds at his friends, evidently unconscious, but his senses were not long in returning.

"Say!" he uttered at last in a faint voice.

"Well!" replied Belfast.

"Where is that infernal Pro--pro--jectile?"

"In the Pacific Ocean."

"What??"

CHAPTER XXII - ON THE WINGS OF THE WIND.

Leaving M'Connell and a few other Cambridge men to take charge of the Great Telescope, Marston and Belfast in little more than an hour after the receipt of the exciting dispatch, were scudding down the slopes of Long's Peak by the only possible route--the inclined railroad. This mode of travelling, however, highly satisfactory as far as it went, ceased altogether at the mountain foot, at the point where the Dale River formed a junction with Cache la Poudre Creek. But Marston, having already mapped out the whole journey with some care and forethought, was ready for almost every emergency. Instinctively feeling that the first act of the Baltimore Gun Club would be to send a Committee to San Francisco to investigate matters, he had determined to meet this deputation on the route, and his only trouble now was to determine at what point he would be most likely to catch them. His great start, he knew perfectly well, could not put him more than a day in advance of them: they having the advantage of a railroad nearly all the way, whilst himself and Belfast could not help losing much time in struggling through ravines, canyons, mountain precipices, and densely tangled forests, not to mention the possibility of a brush or two with prowling Indians, before they could strike the line of the Pacific Railroad, along which he knew the Club men to be approaching. After a few hours rest at La Porte, a little settlement lately started in the valley, early in the morning they took the stage that passed through from Denver to Cheyenne, a town at that time hardly a year old but already flourishing, with a busy population of several thousand inhabitants.

Losing not a moment at Cheyenne, where they arrived much sooner than they had anticipated, they took places in Wells, Fargo and Co.'s Overland Stage Mail bound east, and were soon flying towards Julesburg at the rate of twelve miles an hour. Here Marston was anxious to meet the Club men, as at this point the Pacific Railroad divided into two branches--one bearing north, the other south of the Great Salt Lake --and he feared they might take the wrong one.

But he arrived in Julesburg fully 10 hours before the Committee, so that himself and Belfast had not only ample time to rest a little after their rapid flight from Long's Peak, but also to make every possible preparation for the terrible journey of more than fifteen hundred miles that still lay before them.

This journey, undertaken at a most unseasonable period of the year, and over one of the most terrible deserts in the world, would require a volume for

Occasionally, however, this savage scenery decidedly changed its character. Now, a lovely glen would smile before our travellers, traversed by tinkling streams, waving with sweet grasses, dotted with little groves, alive with hares, antelopes, and even elks, but apparently never yet trodden by the foot of man. Now, our Club men felt like travelling on clouds, as they careered along the great plateau west of the Black Hills, fully 8,000 feet above the level of the sea, though even there the grass was as green and fresh as if it grew in some sequestered valley of Pennsylvania. Again,

"In this untravelled world whose margin fades For ever and for ever as they moved,"

they would find themselves in an immense, tawny, treeless plain, outlined by mountains so distant as to resemble fantastic cloud piles. Here for days they would have to skirt the coasts of a Lake, vast, unruffled, unrippled, apparently of metallic consistency, from whose sapphire depths rose pyramidal islands to a height of fully three thousand feet above the surface.

In a few days all would change. No more sand wastes, salt water flats, or clouds of blinding alkali dust. The travellers' road, at the foot of black precipitous cliffs, would wind along the brink of a roaring torrent, whose devious course would lead them into the heart of the Sierras, where misty peaks solemnly sentinelled the nestling vales still smiling in genial summer verdure. Across these they were often whirled through immense forests of varied character, here dense enough to obscure the track, there swaying in the sweet sunlight and vocal with joyous birds of bright and gorgeous plumage. Then tropical vegetation would completely hide the trail, crystal lakes would obstruct it, cascades shooting down from perpendicular rocks would obliterate it, mountain passes barricaded by basaltic columns would render it uncertain, and on one occasion it was completely covered up by a fall of snow to a depth of more than twenty feet.

But nothing could oppose serious delay to our travellers. Their motto was ever "onward!" and what they lost in one hour by some mishap they endeavored to recover on the next by redoubled speed. They felt that they would be no friends of Barbican's if they were discouraged by impossibilities. Besides, what would have been real impossibilities at another time, several concurrent circumstances now rendered comparatively easy.

The surveys, the gradings, the cuttings, and the other preliminary labors in the great Pacific Railroad, gave them incalculable aid. Horses, help,

was blinding, the alkali dust choking, the ride for five or six hours was up considerable grade; still they had accomplished their 150 miles before resting for the night at Elko, even at this period a flourishing little village on the banks of the Humboldt. After another smothering ride on the 23d, they rested, at Winnemucca, another flourishing village, situated at the precise point in the desert where the Little Humboldt joins Humboldt River, without, however, making the channel fuller or wider. The 24th was decidedly the hardest day, their course lying through the worst part of the terrible Nevada desert. But a glimpse of the Sierras looming in the western horizon gave them courage and strength enough to reach Wadsworth, at their foot, a little before midnight. Our travellers had now but one day's journey more to make before reaching the railroad at Cisco, but, this being a very steep ascent nearly all the way up, each mile cost almost twice as much time and exertion.

At last, late in the evening of Christmas Day, amidst the most enthusiastic cheers of all the inhabitants of Cisco, who welcomed them with a splendid pine brand procession, Marston and his friends, thoroughly used up, feet swelled, limbs bruised, bones aching, stomachs seasick, eyes bleared, ears ringing, and brains on fire for want of rest, took their places in the State Car waiting for them, and started without a moment's delay for Sacramento, about a hundred miles distant. How delicious was the change to our poor travellers! Washed, refreshed, and lying at full length on luxurious sofas, their sensations, as the locomotive spun them down the ringing grooves of the steep Sierras, can be more easily imagined than described. They were all fast asleep when the train entered Sacramento, but the Mayor and the other city authorities who had waited up to receive them, had them carried carefully, so as not to disturb their slumbers, on board the Yo Semite , a fine steamer belonging to the California Navigation Company, which landed them safely at San Francisco about noon on the 26th, after accomplishing the extraordinary winter journey of 1500 miles over land in little more than nine days, only about 200 miles being done by steam.

Half-past two P.M. found our travellers bathed, dressed, shaved, dined, and ready to receive company in the grand parlor of the Occidental Hotel . Captain Bloomsbury was the first to call.

Marston hobbled eagerly towards him and asked:

"What have you done towards fishing them up, Captain?"

"A good deal, Mr. Marston; indeed almost everything is ready."

CHAPTER XXIII - THE CLUB MEN GO A FISHING.

Captain Bloomsbury was perfectly right when he said that almost everything was ready for the commencement of the great work which the Club men had to accomplish. Considering how much was required, this was certainly saying a great deal; but here also, as on many other occasions, fortune had singularly favored the Club men.

San Francisco Bay, as everybody knows, though one of the finest and safest harbors in the world, is not without some danger from hidden rocks. One of these in particular, the Anita Rock as it was called, lying right in mid channel, had become so notorious for the wrecks of which it was the cause, that, after much time spent in the consideration of the subject, the authorities had at last determined to blow it up. This undertaking having been very satisfactorily accomplished by means of dynamite or giant powder, another improvement in the harbor had been also undertaken with great success. The wrecks of many vessels lay scattered here and there pretty numerously, some, like that of the Flying Dragon , in spots so shallow that they could be easily seen at low water, but others sunk at least twenty fathoms deep, like that of the Caroline , which had gone down in 1851, not far from Blossom Rock, with a treasure on board of 20,000 ounces of gold. The attempt to clear away these wrecks had also turned out very well; even sufficient treasure had been recovered to repay all the expense, though the preparations for the purpose by the contractors, M'Gowan and Co. had been made on the most extensive scale, and in accordance with the latest improvements in the apparatus for submarine operations.

Buoys, made of huge canvas sacks, coated with India rubber, and guarded by a net work of strong cordage, had been manufactured and provided by the New York Submarine Company . These buoys, when inflated and working in pairs, had a lifting capacity of 30 tons a pair. Reservoirs of air, provided with powerful compression pumps, always accompanied the buoys. To attach the latter, in a collapsed condition, with strong chains to the sides of the vessels which were to be lifted, a diving apparatus was necessary. This also the New York Company had provided, and it was so perfect in its way that, by means of peculiar appliances of easy management, the diver could walk about on the bottom, take his own bearings, ascend to the surface at pleasure, and open his helmet without assistance. A few sets likewise of Rouquayrol and Denayrouze's famous submarine armor had been provided. These would prove of invaluable advantage in all operations

"Can the divers readily reach such depths?"

"That remains to be seen Mr. Marston."

"Captain," said Morgan, now joining the party, "you are a worthy member of our Gun Club. You have done wonders. Heaven grant it may not be all in vain! Who knows if our poor friends are still alive?"

"Hush!" cried Marston quickly. "Have more sense than to ask such questions. Is Barbican alive! Am I alive? They're all alive, I tell you, only we must be quick about reaching them before the air gives out. That's what's the matter! Air! Provisions, water--abundance! But air--oh! that's their weak point! Quick, Captain, quick--They're throwing the reel--I must see her rate!" So saying, he hurried off to the stern, followed by General Morgan. Chief Engineer Murphy and the Captain of the Susquehanna were thus left for awhile together.

These two men had a long talk on the object of their journey and the likelihood of anything satisfactory being accomplished. The man of the sea candidly acknowledged his apprehensions. He had done everything in his power towards collecting suitable machinery for fishing up the Projectile, but he had done it all, he said, more as a matter of duty than because he believed that any good could result from it; in fact, he never expected to see the bold adventurers again either living or dead. Murphy, who well understood not only what machinery was capable of effecting, but also what it would surely fail in, at first expressed the greatest confidence in the prosperous issue of the undertaking. But when he learned, as he now did for the first time, that the ocean bed on which the Projectile was lying could be hardly less than 20,000 feet below the surface, he assumed a countenance as grave as the Captain's, and at once confessed that, unless their usual luck stood by them, his poor friends had not the slightest possible chance of ever being fished up from the depths of the Pacific.

The conversation maintained among the officers and the others on board the Susquehanna , was pretty much of the same nature. It is almost needless to say that all heads--except Belfast's, whose scientific mind rejected the Projectile theory with the most serene contempt--were filled with the same idea, all hearts throbbed with the same emotion. Wouldn't it be glorious to fish them up alive and well? What were they doing just now? Doing? Doing! Their bodies most probably were lying in a shapeless pile on the floor of the Projectile, like a heap of clothes, the uppermost man being the last smothered; or perhaps floating about in the water inside the Projectile, like

Midshipman, who was standing nearest:

"Coleridge realized, with variations:

The breeze drops down, the sail drops down, All's still as still can be; If we speak, it is only to break The silence of the sea. Still are the clouds, still are the shrouds, No life, no breath, no motion; Idle are all as a painted ship Upon a painted ocean!"

Chief Engineer Murphy now took command. Before letting down the buoys, the first thing evidently to be done was to find out, if possible, the precise point where the Projectile lay. For this purpose, the Nautilus was clearly the only part of the machinery that could be employed with advantage. Its chambers were accordingly soon filled with water, its air reservoirs were also soon completely charged, and the Nautilus itself, suspended by chains from the end of a yard, lay quietly on the ocean surface, its manhole on the top remaining open for the reception of those who were willing to encounter the dangers that awaited it in the fearful depths of the Pacific. Every one looking on was well aware that, after a few hundred feet below the surface, the pressure would grow more and more enormous, until at last it became quite doubtful if any line could bear the tremendous strain. It was even possible that at a certain depth the walls of the Nautilus might be crushed in like an eggshell, and the whole machine made as flat as two leaves of paper pasted together.

Perfectly conscious of the nature of the tremendous risk they were about to run, Marston, Morgan, and Murphy quietly bade their friends a short farewell and were lowered into the manhole. The Nautilus having room enough for four, Belfast had been expected to be of the party but, feeling a little sea sick, the Professor backed out at the last moment, to the great joy of Mr. Watkins, the famous reporter of the N.Y. Herald , who was immediately allowed to take his place.

Every provision against immediate danger had been made. By means of preconcerted signals, the inmates could have themselves drawn up, let down, or carried laterally in whatever direction they pleased. By barometers and other instruments they could readily ascertain the pressure of the air and water, also how far they had descended and at what rate they were moving. The Captain, from his bridge, carefully superintended every detail of the operation. All signals he insisted on attending to himself personally, transmitting them instantly by his bell to the engineer below. The whole power of the steam engine had been brought to bear on the windlass; the chains could withstand an enormous strain. The wheels had been carefully

further descent.

The Clubmen's distress was very great; Marston's, in particular, was indescribable. In vain, catching at straws, he signalled "eastwards!" "westwards!" "northwards!" or "southwards!" the Nautilus moved readily every way but downwards.

"Oh! what shall we do?" he cried in despair; "Barbican, must we really give you up though separated from us by the short distance of only a few miles?"

At last, nothing better being to be done, the unwilling signal "heave upwards!" was given, and the hauling up commenced. It was done very slowly, and with the greatest care. A sudden jerk might snap the chains; an incautious twist might put a kink on the air tube; besides, it was well known that the sudden removal of heavy pressure resulting from rapid ascent, is attended by very disagreeable sensations, which have sometimes even proved fatal.

It was near midnight when the Clubmen were lifted out of the manhole. Their faces were pale, their eyes bloodshot, their figures stooped. Even the Herald Reporter seemed to have got enough of exploring. But Marston was as confident as ever, and tried to be as brisk.

He had hardly swallowed the refreshment so positively enjoined in the circumstances, when he abruptly addressed the Captain:

"What's the weight of your heaviest cannon balls?"

"Thirty pounds, Mr. Marston."

"Can't you attach thirty of them to the Nautilus and sink us again?"

"Certainly, Mr. Marston, if you wish it. It shall be the first thing done to-morrow."

"To-night, Captain! At once! Barbican has not an instant to lose."

"At once then be it, Mr. Marston. Just as you say."

The new sinkers were soon attached to the Nautilus, which disappeared once more with all its former occupants inside, except the Herald Reporter, who had fallen asleep over his notes, or at least seemed to be. He had probably made up his mind as to the likelihood of the Nautilus ever getting

"further prolongation of vital energy would be simply impossible. Want of air, want of food, want of courage--"

"No, sir!" interrupted Marston quite savagely. "Want of air, of meat, of drink, as much as you like! But when you speak of Barbican's want of courage, you don't know what you are talking about! No holy martyr ever died at the stake with a loftier courage than my noble friend Barbican!"

That night he asked the Captain if he would not sail down as far as Cape San Lucas. Bloomsbury saw that further search was all labor lost, but he respected such heroic grief too highly to give a positive refusal. He consented to devote the following day, New Year's, to an exploring expedition as far as Magdalena Bay, making the most diligent inquiries in all directions.

But New Year's was just as barren of results as any of its predecessors, and, a little before sunset, Captain Bloomsbury, regardless of further entreaties and unwilling to risk further delay, gave orders to 'bout ship and return to San Francisco.

The Susquehanna was slowly turning around in obedience to her wheel, as if reluctant to abandon forever a search in which humanity at large was interested, when the look-out man, stationed in the forecastle, suddenly sang out:

"A buoy to the nor'east, not far from shore!"

All telescopes were instantly turned in the direction indicated. The buoy, or whatever object it was, could be readily distinguished. It certainly did look like one of those buoys used to mark out the channel that ships follow when entering a harbor. But as the vessel slowly approached it, a small flag, flapping in the dying wind--a strange feature in a buoy--was seen to surmount its cone, which a nearer approach showed to be emerging four or five feet from the water. And for a buoy too it was exceedingly bright and shiny, reflecting the red rays of the setting sun as strongly as if its surface was crystal or polished metal!

"Call Mr. Marston on deck at once!" cried the Captain, his voice betraying unwonted excitement as he put the glass again to his eye.

Marston, thoroughly worn out by his incessant anxiety during the day, had been just carried below by his friends, and they were now trying to make him take a little refreshment and repose. But the Captain's order brought them all on deck like a flash.

"I mean," roared the terrible Secretary, "that we are no better than a lot of cabbage heads, dead beats, and frauds, calling ourselves scientists! O Barbican, how you must blush for us! If we were schoolboys, we should all be skinned alive for our ignorance! Do you forget, you herd of ignoramuses, that the Projectile weighs only ten tons?"

"We don't forget it! We know it well! What of it?"

"This of it: it can't sink in water without displacing its own volume in water; its own volume in water weighs thirty tons! Consequently, it can't sink; more consequently, it hasn't sunk; and, most consequently, there it is before us, bobbing up and down all the time under our very noses! O Barbican, how can we ever venture to look at you straight in the face again!"

Marston's extravagant manner of showing it did not prevent him from being perfectly right. With all their knowledge of physics, not a single one of those scientific gentlemen had remembered the great fundamental law that governs sinking or floating bodies. Thanks to its slight specific gravity, the Projectile, after reaching unknown depths of ocean through the terrific momentum of its fall, had been at last arrested in its course and even obliged to return to the surface.

By this time, all the passengers of the Susquehanna could easily recognize the object of such weary longings and desperate searches, floating quietly a short distance before them in the last rays of the declining day!

The boats were out in an instant. Marston and his friends took the Captain's gig. The rowers pulled with a will towards the rapidly nearing Projectile. What did it contain? The living or the dead? The living certainly! as Marston whispered to those around him; otherwise how could they have ever run up that flag?

The boats approached in perfect silence, all hearts throbbing with the intensity of newly awakened hope, all eyes eagerly watching for some sign to confirm it. No part of the windows appeared over the water, but the trap hole had been thrown open, and through it came the pole that bore the American flag. Marston made for the trap hole and, as it was only a few feet above the surface, he had no difficulty in looking in.

At that moment, a joyful shout of triumph rose from the interior, and the whole boat's crew heard a dry drawling voice with a nasal twang exclaiming:

CHAPTER XXIV - FAREWELL TO THE BALTIMORE GUN CLUB.

The intense interest of our extraordinary but most veracious history having reached its culmination at the end of the last chapter, our absorbing chronicle might with every propriety have been then and there concluded; but we can't part from our gracious and most indulgent reader before giving him a few more details which may be instructive perhaps, if not amusing.

No doubt he kindly remembers the world-wide sympathy with which our three famous travellers had started on their memorable trip to the Moon. If so, he may be able to form some idea of the enthusiasm universally excited by the news of their safe return. Would not the millions of spectators that had thronged Florida to witness their departure, now rush to the other extremity of the Union to welcome them back? Could those innumerable Europeans, Africans and Asiatics, who had visited the United States simply to have a look at M'Nicholl, Ardan and Barbican, ever think of quitting the country without having seen those wonderful men again? Certainly not! Nay, more--the reception and the welcome that those heroes would everywhere be greeted with, should be on a scale fully commensurate with the grandeur of their own gigantic enterprise. The Sons of Earth who had fearlessly quitted this terrestrial globe and who had succeeded in returning after accomplishing a journey inconceivably wonderful, well deserved to be received with every extremity of pride, pomp and glorious circumstance that the world is capable of displaying.

To catch a glimpse of these demi-gods, to hear the sound of their voices, perhaps even to touch their hands--these were the only emotions with which the great heart of the country at large was now throbbing.

To gratify this natural yearning of humanity, to afford not only to every foreigner but to every native in the land an opportunity of beholding the three heroes who had reflected such indelible glory on the American name, and to do it all in a manner eminently worthy of the great American Nation, instantly became the desire of the American People.

To desire a thing, and to have it, are synonymous terms with the great people of the American Republic.

A little thinking simplified the matter considerably: as all the people could not go to the heroes, the heroes should go to all the people.

of a conscientious man who has passed within a few hundred miles of Tycho , the culminating point in the strangest of all the strange systems of lunar oreography? What reply can you make to a man who has sounded the dark abysses of the Plato crater? How can you dare to contradict those men whom the vicissitudes of their daring journey had swept over the dark, Invisible Face of the Moon, never before revealed to human eye? It was now confessedly the privilege and the right of these men to set limits to that selenographic science which had till now been making itself so very busy in reconstructing the lunar world. They could now say, authoritatively, like Cuvier lecturing over a fossil skeleton: "Once the Moon was this, a habitable world, and inhabitable long before our Earth! And now the Moon is that, an uninhabitable world, and uninhabitable ages and ages ago!"

We must not even dream of undertaking a description of the grand fête by which the return of the illustrious members of the Gun Club was to be adequately celebrated, and the natural curiosity of their countrymen to see them was to be reasonably gratified. It was one worthy in every way of its recipients, worthy of the Gun Club, worthy of the Great Republic, and, best of all, every man, woman, and child in the United States could take part in it. It required at least three months to prepare it: but this was not to be regretted as its leading idea could not be properly carried out during the severe colds of winter.

All the great railroads of the Union had been closely united by temporary rails, a uniform gauge had been everywhere adopted, and every other necessary arrangement had been made to enable a splendid palace car, expressly manufactured for the occasion by Pullman himself, to visit every chief point in the United States without ever breaking connection. Through the principal street in each city, or streets if one was not large enough, rails had been laid so as to admit the passage of the triumphal car. In many cities, as a precaution against unfavorable weather, these streets had been arched over with glass, thus becoming grand arcades, many of which have been allowed to remain so to the present day. The houses lining these streets, hung with tapestry, decorated with flowers, waving with banners, were all to be illuminated at night time in a style at once both the most brilliant and the most tasteful. On the sidewalks, tables had been laid, often miles and miles long, at the public expense; these were to be covered with every kind of eatables, exquisitely cooked, in the greatest profusion, and free to everyone for twelve hours before the arrival of the illustrious guests and also for twelve hours after their departure. The idea mainly aimed at was that, at the grand national banquet about to take place, every inhabitant of the United States, without exception, could consider Barbican and his companions as his own particular guests for the time being, thus giving

lasted twenty-four hours. The Gun Club insisted on paying all the expenses of the day, and the city compromised by being allowed to celebrate in whatever way it pleased the reception of the Club men on their return.

They started on their trip that same day in the midst of one of the grandest ovations possible to conceive. They stopped for a little while at Wilmington, but they took dinner in Philadelphia, where the splendor of Broad Street (at present the finest boulevard in the world, being 113 feet wide and five miles long) can be more easily alluded to than even partially described.

The house fronts glittered with flowers, flags, pictures, tapestries, and other decorations; the chimneys and roofs swarmed with men and boys cheerfully risking their necks every moment to get one glance at the "Moon men"; every window was a brilliant bouquet of beautiful ladies waving their scented handkerchiefs and showering their sweetest smiles; the elevated tables on the sidewalks, groaning with an abundance of excellent and varied food, were lined with men, women, and children, who, however occupied in eating and drinking, never forgot to salute the heroes, cheering them lustily as they slowly moved along; the spacious street itself, just paved from end to end with smooth Belgian blocks, was a living moving panorama of soldiers, temperance men, free masons, and other societies, radiant in gorgeous uniforms, brilliant in flashing banners, and simply perfect in the rhythmic cadence of their tread, wings of delicious music seeming to bear them onward in their proud and stately march.

A vast awning, spanning the street from ridge to ridge, had been so prepared and arranged that, in case of rain or too strong a glare from the summer sun, it could be opened out wholly or partially in the space of a very few minutes. There was not, however, the slightest occasion for using it, the weather being exceedingly fine, almost paradisiacal, as Marston loved to phrase it.

[Illustration: THEIR ARRIVAL WAS WELCOMED WITH EQUAL FURORE .]

The "Moon men" supped and spent the night in New York, where they were received with even greater enthusiasm than at Philadelphia. But no detailed description can be given of their majestic progress from city to city through all portions of the mighty Republic. It is enough to say that they visited every important town from Portland to San Francisco, from Salt Lake City to New Orleans, from Mobile to Charleston, and from Saint Louis to Baltimore; that, in every section of the great country, preparations for their reception were equally as enthusiastic, their arrival was welcomed with equal furore , and their departure accompanied with an equal amount of affectionate and

In fact, within a very few months after the return of the Club men from the Continental Banquet, as it was called in the papers, the country was flooded by a number of little books, like Insurance pamphlets, thrust into every letter box and pushed under every door, announcing the formation of a new company called The Grand Interstellar Communication Society . The Capital was to be 100 million dollars, at a thousand dollars a share: J.P. BARBICAN, ESQ., P.G.C. was to be President; Colonel JOSHUA D. M'NICHOLL, Vice-President; Hon. J.T. MARSTON, Secretary; Chevalier MICHAEL ARDAN, General Manager; JOHN MURPHY, ESQ., Chief Engineer; H. PHILLIPS COLEMAN, ESQ. (Philadelphia lawyer), Legal Adviser; and the Astrological Adviser was to be Professor HENRY of Washington. (Belfast's blunder had injured him so much in public estimation, his former partisans having become his most merciless revilers, that it was considered advisable to omit his name altogether even in the list of the Directors.)

From the very beginning, the moneyed public looked on the G.I.C.S, with decided favor, and its shares were bought up pretty freely. Conducted on strictly honorable principles, keeping carefully aloof from all such damaging connection as the Credit Mobilier , and having its books always thrown open for public inspection, its reputation even to-day is excellent and continually improving in the popular estimation. Holding out no utopian inducements to catch the unwary, and making no wheedling promises to blind the guileless, it states its great objects with all their great advantages, without at the same time suppressing its enormous and perhaps insuperable difficulties. People know exactly what to think of it, and, whether it ever meets with perfect success or proves a complete failure, no one in the country will ever think of casting a slur on the bright name of its peerless President, J.P. Barbican.

For a few years this great man devoted every faculty of his mind to the furthering of the Company's objects. But in the midst of his labors, the rapid approach of the CENTENNIAL surprised him. After a long and careful consultation on the subject, the Directors and Stockholders of the G.I.C.S. advised him to suspend all further labors in their behalf for a few years, in order that he might be freer to devote the full energies of his giant intellect towards celebrating the first hundredth anniversary of his country's Independence--as all true Americans would wish to see it celebrated--in a manner every way worthy of the GREAT REPUBLIC OF THE WEST!

Obeying orders instantly and with the single-idea'd, unselfish enthusiasm of his nature, he threw himself at once heart and soul into the great enterprise. Though possessing no official prominence--this he absolutely insists upon--he is well known to be the great fountain head whence