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the Cold Spring Iron Works, selected a spot in Florida, near the 27th degree north latitude, called Stony Hill, where after the performance of many wonderful feats in mining engineering, the Columbiad was successfully cast.

Things had reached this state when an incident occurred which excited the general interest a hundred fold.

A Frenchman from Paris, Michel Ardan by name, eccentric, but keen and shrewd as well as daring, demanded, by the Atlantic telegraph, permission to be enclosed in the bullet so that he might be carried to the Moon, where he was curious to make certain investigations. Received in America with great enthusiasm, Ardan held a great meeting, triumphantly carried his point, reconciled Barbican to his mortal foe, a certain Captain M'Nicholl, and even, by way of clinching the reconciliation, induced both the newly made friends to join him in his contemplated trip to the Moon.

The bullet, so modified as to become a hollow conical cylinder with plenty of room inside, was further provided with powerful water-springs and readily-ruptured partitions below the floor, intended to deaden the dreadful concussion sure to accompany the start. It was supplied with provisions for a year, water for a few months, and gas for nearly two weeks. A self-acting apparatus, of ingenious construction, kept the confined atmosphere sweet and healthy by manufacturing pure oxygen and absorbing carbonic acid. Finally, the Gun Club had constructed, at enormous expense, a gigantic telescope, which, from the summit of Long's Peak, could pursue the Projectile as it winged its way through the regions of space. Everything at last was ready.

On December 1st, at the appointed moment, in the midst of an immense concourse of spectators, the departure took place, and, for the first time in the world's history, three human beings quitted our terrestrial globe with some possibility in their favor of finally reaching a point of destination in the inter-planetary spaces. They expected to accomplish their journey in 97 hours, 13 minutes and 20 seconds, consequently reaching the Lunar surface precisely at midnight on December 5-6, the exact moment when the Moon would be full.

Unfortunately, the instantaneous explosion of such a vast quantity of gun-cotton, by giving rise to a violent commotion in the atmosphere, generated so much vapor and mist as to render the Moon invisible for several nights to the innumerable watchers in the Western Hemisphere, who vainly tried to catch sight of her.

supposing that they did reach the Moon and thereby completely establish the practicability of their daring enterprise, how were they ever to get back? Could they ever get back? or ever even be heard from? Questions of this nature, freely discussed by the ablest pens of the day, kept the public mind in a very restless and excited condition.

We must be pardoned here for making a little remark which, however, astronomers and other scientific men of sanguine temperament would do well to ponder over. An observer cannot be too cautious in announcing to the public his discovery when it is of a nature purely speculative. Nobody is obliged to discover a planet, or a comet, or even a satellite, but, before announcing to the world that you have made such a discovery, first make sure that such is really the fact. Because, you know, should it afterwards come out that you have done nothing of the kind, you make yourself a butt for the stupid jokes of the lowest newspaper scribblers. Belfast had never thought of this. Impelled by his irrepressible rage for discovery--the furor inveniendi ascribed to all astronomers by Aurelius Priscus--he had therefore been guilty of an indiscretion highly un-scientific when his famous telegram, launched to the world at large from the summit of the Rocky Mountains, pronounced so dogmatically on the only possible issues of the great enterprise.

The truth was that his telegram contained two very important errors: 1. Error of observation, as facts afterwards proved; the Projectile was not seen on the 13th and could not have been on that day, so that the little black spot which Belfast professed to have seen was most certainly not the Projectile; 2. Error of theory regarding the final fate of the Projectile, since to make it become the Moon's satellite was flying in the face of one of the great fundamental laws of Theoretical Mechanics.

Only one, therefore, the first, of the hypotheses so positively announced, was capable of realization. The travellers--that is to say if they still lived--might so combine and unite their own efforts with those of the Lunar attraction as actually to succeed at last in reaching the Moon's surface.

Now the travellers, those daring but cool-headed men who knew very well what they were about, did still live, they had survived the frightful concussion of the start, and it is to the faithful record of their wonderful trip in the bullet-car, with all its singular and dramatic details, that the present volume is devoted. The story may destroy many illusions, prejudices and conjectures; but it will at least give correct ideas of the strange incidents to which such an enterprise is exposed, and it will certainly bring out in strong colors the effects of Barbican's scientific conceptions, M'Nicholl's mechanical

CHAPTER I - FROM 10 P.M. TO 10 46' 40".

The moment that the great clock belonging to the works at Stony Hill had struck ten, Barbican, Ardan and M'Nicholl began to take their last farewells of the numerous friends surrounding them. The two dogs intended to accompany them had been already deposited in the Projectile. The three travellers approached the mouth of the enormous cannon, seated themselves in the flying car, and once more took leave for the last time of the vast throng standing in silence around them. The windlass creaked, the car started, and the three daring men disappeared in the yawning gulf.

The trap-hole giving them ready access to the interior of the Projectile, the car soon came back empty; the great windlass was presently rolled away; the tackle and scaffolding were removed, and in a short space of time the great mouth of the Columbiad was completely rid of all obstructions.

M'Nicholl took upon himself to fasten the door of the trap on the inside by means of a powerful combination of screws and bolts of his own invention. He also covered up very carefully the glass lights with strong iron plates of extreme solidity and tightly fitting joints.

Ardan's first care was to turn on the gas, which he found burning rather low; but he lit no more than one burner, being desirous to economize as much as possible their store of light and heat, which, as he well knew, could not at the very utmost last them longer than a few weeks.

Under the cheerful blaze, the interior of the Projectile looked like a comfortable little chamber, with its circular sofa, nicely padded walls, and dome shaped ceiling.

All the articles that it contained, arms, instruments, utensils, etc., were solidly fastened to the projections of the wadding, so as to sustain the least injury possible from the first terrible shock. In fact, all precautions possible, humanly speaking, had been taken to counteract this, the first, and possibly one of the very greatest dangers to which the courageous adventurers would be exposed.

Ardan expressed himself to be quite pleased with the appearance of things in general.

"It's a prison, to be sure," said he "but not one of your ordinary prisons that

far more pressing."

"More pressing! what do you mean? are we not fully prepared?"

"Yes, fully prepared, as far at least as we have been able to foresee. But we may still, I think, possibly increase the number of precautions to be taken against the terrible shock that we are so soon to experience."

"What? Have you any doubts whatever of the effectiveness of your brilliant and extremely original idea? Don't you think that the layers of water, regularly disposed in easily-ruptured partitions beneath this floor, will afford us sufficient protection by their elasticity?"

"I hope so, indeed, my dear friend, but I am by no means confident."

"He hopes! He is by no means confident! Listen to that, Mac! Pretty time to tell us so! Let me out of here!"

"Too late!" observed the Captain quietly. "The trap-hole alone would take ten or fifteen minutes to open."

"Oh then I suppose I must make the best of it," said Ardan, laughing. "All aboard, gentlemen! The train starts in twenty minutes!"

"In nineteen minutes and eighteen seconds," said the Captain, who never took his eye off the chronometer.

The three travellers looked at each other for a little while, during which even Ardan appeared to become serious. After another careful glance at the several objects lying around them, Barbican said, quietly:

"Everything is in its place, except ourselves. What we have now to do is to decide on the position we must take in order to neutralize the shock as much as possible. We must be particularly careful to guard against a rush of blood to the head."

"Correct!" said the Captain.

"Suppose we stood on our heads, like the circus tumblers!" cried Ardan, ready to suit the action to the word.

"Better than that," said Barbican; "we can lie on our side. Keep clearly in mind, dear friends, that at the instant of departure it makes very little

"Plenty of dogs!" cried Ardan, "and horses too, and cows, and sheep, and no end of chickens!"

"A hundred dollars to one there isn't a single chicken within the whole Lunar realm, not excluding even the invisible side!" cried the Captain, in an authoritative tone, but never taking his eye off the chronometer.

"I take that bet, my son," coolly replied Ardan, shaking the Captain's hand by way of ratifying the wager; "and this reminds me, by the way, Mac, that you have lost three bets already, to the pretty little tune of six thousand dollars."

"And paid them, too!" cried the captain, monotonously; "ten, thirty-six, six!"

"Yes, and in a quarter of an hour you will have to pay nine thousand dollars more; four thousand because the Columbiad will not burst, and five thousand because the Projectile will rise more than six miles from the Earth."

"I have the money ready," answered the Captain, touching his breeches pocket. "When I lose I pay. Not sooner. Ten, thirty-eight, ten!"

"Captain, you're a man of method, if there ever was one. I think, however, that you made a mistake in your wagers."

"How so?" asked the Captain listlessly, his eye still on the dial.

"Because, by Jove, if you win there will be no more of you left to take the money than there will be of Barbican to pay it!"

"Friend Ardan," quietly observed Barbican, "my stakes are deposited in the Wall Street Bank, of New York, with orders to pay them over to the Captain's heirs, in case the Captain himself should fail to put in an appearance at the proper time."

"Oh! you rhinoceroses, you pachyderms, you granite men!" cried Ardan, gasping with surprise; "you machines with iron heads, and iron hearts! I may admire you, but I'm blessed if I understand you!"

"Ten, forty-two, ten!" repeated M'Nicholl, as mechanically as if it was the chronometer itself that spoke.

CHAPTER II - THE FIRST HALF HOUR.

What had taken place within the Projectile? What effect had been produced by the frightful concussion? Had Barbican's ingenuity been attended with a fortunate result? Had the shock been sufficiently deadened by the springs, the buffers, the water layers, and the partitions so readily ruptured? Had their combined effect succeeded in counteracting the tremendous violence of a velocity of 12,000 yards a second, actually sufficient to carry them from London to New York in six minutes? These, and a hundred other questions of a similar nature were asked that night by the millions who had been watching the explosion from the base of Stony Hill. Themselves they forgot altogether for the moment; they forgot everything in their absorbing anxiety regarding the fate of the daring travellers. Had one among them, our friend Marston, for instance, been favored with a glimpse at the interior of the projectile, what would he have seen?

Nothing at all at first, on account of the darkness; except that the walls had solidly resisted the frightful shock. Not a crack, nor a bend, nor a dent could be perceived; not even the slightest injury had the admirably constructed piece of mechanical workmanship endured. It had not yielded an inch to the enormous pressure, and, far from melting and falling back to earth, as had been so seriously apprehended, in showers of blazing aluminium, it was still as strong in every respect as it had been on the very day that it left the Cold Spring Iron Works, glittering like a silver dollar.

Of real damage there was actually none, and even the disorder into which things had been thrown in the interior by the violent shock was comparatively slight. A few small objects lying around loose had been furiously hurled against the ceiling, but the others appeared not to have suffered the slightest injury. The straps that fastened them up were unfrayed, and the fixtures that held them down were uncracked.

The partitions beneath the disc having been ruptured, and the water having escaped, the false floor had been dashed with tremendous violence against the bottom of the Projectile, and on this disc at this moment three human bodies could be seen lying perfectly still and motionless.

Were they three corpses? Had the Projectile suddenly become a great metallic coffin bearing its ghastly contents through the air with the rapidity of a lightning flash?

So saying, he contrived without much difficulty to get on his feet. Balancing himself then for a moment, he began groping about for the gas. But he stopped suddenly.

"Hold on a minute!" he cried; "before lighting this match, let us see if the gas has been escaping. Setting fire to a mixture of air and hydrogen would make a pretty how-do-you-do! Such an explosion would infallibly burst the Projectile, which so far seems all right, though I'm blest if I can tell whether we're moving or not."

He began sniffing and smelling to discover if possible the odor of escaped gas. He could not detect the slightest sign of anything of the kind. This gave him great courage. He knew of course that his senses were not yet in good order, still he thought he might trust them so far as to be certain that the gas had not escaped and that consequently all the other receptacles were uninjured.

At the touch of the match, the gas burst into light and burned with a steady flame. Ardan immediately bent anxiously over the prostrate bodies of his friends. They lay on each other like inert masses, M'Nicholl stretched across Barbican.

Ardan first lifted up the Captain, laid him on the sofa, opened his clenched hands, rubbed them, and slapped the palms vigorously. Then he went all over the body carefully, kneading it, rubbing it, and gently patting it. In such intelligent efforts to restore suspended circulation, he seemed perfectly at home, and after a few minutes his patience was rewarded by seeing the Captain's pallid face gradually recover its natural color, and by feeling his heart gradually beat with a firm pulsation.

At last M'Nicholl opened his eyes, stared at Ardan for an instant, pressed his hand, looked around searchingly and anxiously, and at last whispered in a faint voice:

"How's Barbican?"

"Barbican is all right, Captain," answered Ardan quietly, but still speaking French. "I'll attend to him in a jiffy. He had to wait for his turn. I began with you because you were the top man. We'll see in a minute what we can do for dear old Barby (ce cher Barbican)!"

In less than thirty seconds more, the Captain not only was able to sit up

"Moving? Blessed if I can tell!" said Ardan, still speaking French.

"We may be lying fifty feet deep in a Florida marsh, for all I know," observed M'Nicholl.

"Or, likely as not, in the bottom of the Gulf of Mexico," suggested Ardan, still in French.

"Suppose we find out," observed Barbican, jumping up to try, his voice as clear and his step as firm as ever.

But trying is one thing, and finding out another. Having no means of comparing themselves with external objects, they could not possibly tell whether they were moving, or at an absolute stand-still. Though our Earth is whirling us continually around the Sun at the tremendous speed of 500 miles a minute, its inhabitants are totally unconscious of the slightest motion. It was the same with our travellers. Through their own personal consciousness they could tell absolutely nothing. Were they shooting through space like a meteor? They could not tell. Had they fallen back and buried themselves deep in the sandy soil of Florida, or, still more likely, hundreds of fathoms deep beneath the waters of the Gulf of Mexico? They could not form the slightest idea.

Listening evidently could do no good. The profound silence proved nothing. The padded walls of the Projectile were too thick to admit any sound whether of wind, water, or human beings. Barbican, however, was soon struck forcibly by one circumstance. He felt himself to be very uncomfortably warm, and his friend's faces looked very hot and flushed. Hastily removing the cover that protected the thermometer, he closely inspected it, and in an instant uttered a joyous exclamation.

"Hurrah!" he cried. "We're moving! There's no mistake about it. The thermometer marks 113 degrees Fahrenheit. Such a stifling heat could not come from the gas. It comes from the exterior walls of our projectile, which atmospheric friction must have made almost red hot. But this heat must soon diminish, because we are already far beyond the regions of the atmosphere, so that instead of smothering we shall be shortly in danger of freezing."

"What?" asked Ardan, much bewildered. "We are already far beyond the limits of the terrestrial atmosphere! Why do you think so?"

"The most puzzling part of the thing to me," went on M'Nicholl, giving his experience with the utmost gravity, "was why English sounded so like French. If it was simple incomprehensible gibberish, I could readily blame the state of my ears for it. But the idea that my bothered ears could turn a mere confused, muzzled, buzzing reverberation into a sweet, harmonious, articulate, though unintelligible, human language, made me sure that I was fast becoming crazy, if I was not so already."

"Ha! ha! ha!" roared Ardan, laughing till the tears came. "Now I understand why the poor Captain made me no reply all the time, and looked at me with such a hapless woe-begone expression of countenance. The fact is, Barbican, that shock was too much both for M'Nicholl and myself. You are the only man among us whose head is fire-proof, blast-proof, and powder-proof. I really believe a burglar would have greater difficulty in blowing your head-piece open than in bursting one of those famous American safes your papers make such a fuss about. A wonderful head, the Boss's, isn't it M'Nicholl?"

"Yes," said the Captain, as slowly as if every word were a gem of the profoundest thought, "the Boss has a fearful and a wonderful head!"

"But now to business!" cried the versatile Ardan, "Why do you think, Barbican, that we are at present beyond the limits of the terrestrial atmosphere?"

"For a very simple reason," said Barbican, pointing to the chronometer; "it is now more than seven minutes after 11. We must, therefore, have been in motion more than twenty minutes. Consequently, unless our initial velocity has been very much diminished by the friction, we must have long before this completely cleared the fifty miles of atmosphere enveloping the earth."

"Correct," said the Captain, cool as a cucumber, because once more in complete possession of all his senses; "but how much do you think the initial velocity to have been diminished by the friction?"

"By a third, according to my calculations," replied Barbican, "which I think are right. Supposing our initial velocity, therefore, to have been 12,000 yards per second, by the time we quitted the atmosphere it must have been reduced to 8,000 yards per second. At that rate, we must have gone by this time--"

"Then, Mac, my boy, you've lost your two bets!" interrupted Ardan. "The

"No," replied Barbican, promptly. "I heard no report whatever."

His answer was ready, but his look was quite as disconcerted as Ardan's.

"Well, friend Barbican and friend Michael," said the Captain, very drily as he leered wickedly at both, "put that and that together and tell me what you make of it."

"It's a fact!" exclaimed Barbican, puzzled, but not bewildered. "Why did we not hear that report?"

"Too hard for me," said Ardan. "Give it up!"

The three friends gazed at each other for a while with countenances expressive of much perplexity. Barbican appeared to be the least self-possessed of the party. It was a complete turning of the tables from the state of things a few moments ago. The problem was certainly simple enough, but for that very reason the more inexplicable. If they were moving the explosion must have taken place; but if the explosion had taken place, why had they not heard the report?

Barbican's decision soon put an end to speculation.

"Conjecture being useless," said he, "let us have recourse to facts. First, let us see where we are. Drop the deadlights!"

This operation, simple enough in itself and being immediately undertaken by the whole three, was easily accomplished. The screws fastening the bolts by which the external plates of the deadlights were solidly pinned, readily yielded to the pressure of a powerful wrench. The bolts were then driven outwards, and the holes which had contained them were immediately filled with solid plugs of India rubber. The bolts once driven out, the external plates dropped by their own weight, turning on a hinge, like portholes, and the strong plate-glass forming the light immediately showed itself. A second light exactly similar, could be cleared away on the opposite side of the Projectile; a third, on the summit of the dome, and a fourth, in the centre of the bottom. The travellers could thus take observations in four different directions, having an opportunity of gazing at the firmament through the side lights, and at the Earth and the Moon through the lower and the upper lights of the Projectile.

Ardan and the Captain had commenced examining the floor, previous to

that he could not understand those Americans. Even Indians would have surprised him by an exhibition of such stoicism. After indulging in silent wonder for a minute or two, he joined his companions who were now busy looking out at the starry sky.

"Where is the Moon?" he asked. "How is it that we cannot see her?"

"The fact of our not seeing her," answered Barbican, "gives me very great satisfaction in one respect; it shows that our Projectile was shot so rapidly out of the Columbiad that it had not time to be impressed with the slightest revolving motion--for us a most fortunate matter. As for the rest--see, there is Cassiopeia, a little to the left is Andromeda, further down is the great square of Pegasus, and to the southwest Fomalhaut can be easily seen swallowing the Cascade. All this shows we are looking west and consequently cannot see the Moon, which is approaching the zenith from the east. Open the other light--But hold on! Look here! What can this be?"

The three travellers, looking westwardly in the direction of Alpherat, saw a brilliant object rapidly approaching them. At a distance, it looked like a dusky moon, but the side turned towards the Earth blazed with a bright light, which every moment became more intense. It came towards them with prodigious velocity and, what was worse, its path lay so directly in the course of the Projectile that a collision seemed inevitable. As it moved onward, from west to east, they could easily see that it rotated on its axis, like all heavenly bodies; in fact, it somewhat resembled a Moon on a small scale, describing its regular orbit around the Earth.

"Mille tonnerres!" cried Ardan, greatly excited; "what is that? Can it be another projectile?" M'Nicholl, wiping his spectacles, looked again, but made no reply. Barbican looked puzzled and uneasy. A collision was quite possible, and the results, even if not frightful in the highest degree, must be extremely deplorable. The Projectile, if not absolutely dashed to pieces, would be diverted from its own course and dragged along in a new one in obedience to the irresistible attraction of this furious asteroid.

Barbican fully realized that either alternative involved the complete failure of their enterprise. He kept perfectly still, but, never losing his presence of mind, he curiously looked on the approaching object with a gladiatorial eye, as if seeking to detect some unguarded point in his terrible adversary. The Captain was equally silent; he looked like a man who had fully made up his mind to regard every possible contingency with the most stoical indifference. But Ardan's tongue, more fluent than ever, rattled away incessantly.

more of them!"

"They are pretty numerous," replied Barbican; "but they are so small and they move with such enormous velocity that they are very seldom seen. Petit, the Director of the Observatory of Toulouse, who these last years has devoted much time and care to the observation of bolides, has calculated that the very one we have just encountered moves with such astonishing swiftness that it accomplishes its revolution around the Earth in about 3 hours and 20 minutes!"

"Whew!" whistled Ardan, "where should we be now if it had struck us!"

"You don't mean to say, Barbican," observed M'Nicholl, "that Petit has seen this very one?"

"So it appears," replied Barbican.

"And do all astronomers admit its existence?" asked the Captain.

"Well, some of them have their doubts," replied Barbican--

"If the unbelievers had been here a minute or two ago," interrupted Ardan, "they would never express a doubt again."

"If Petit's calculation is right," continued Barbican, "I can even form a very good idea as to our distance from the Earth."

"It seems to me Barbican can do what he pleases here or elsewhere," observed Ardan to the Captain.

"Let us see, Barbican," asked M'Nicholl; "where has Petit's calculation placed us?"

"The bolide's distance being known," replied Barbican, "at the moment we met it we were a little more than 5 thousand miles from the Earth's surface."

"Five thousand miles already!" cried Ardan, "why we have only just started!"

"Let us see about that," quietly observed the Captain, looking at his chronometer, and calculating with his pencil. "It is now 10 minutes past eleven; we have therefore been 23 minutes on the road. Supposing our initial velocity of 10,000 yards or nearly seven miles a second, to have been kept up, we should by this time be about 9,000 miles from the Earth; but by

forgetting our dear old Mother, the Earth. What ungrateful children! Let me feast my eyes once more on the blessed old creature!"

Barbican, to satisfy his companion's desire, immediately commenced to clear away the disc which covered the floor of the Projectile and prevented them from getting at the lower light. This disc, though it had been dashed to the bottom of the Projectile with great violence, was still as strong as ever, and, being made in compartments fastened by screws, to dismount it was no easy matter. Barbican, however, with the help of the others, soon had it all taken apart, and put away the pieces carefully, to serve again in case of need. A round hole about a foot and a half in diameter appeared, bored through the floor of the Projectile. It was closed by a circular pane of plate-glass, which was about six inches thick, fastened by a ring of copper. Below, on the outside, the glass was protected by an aluminium plate, kept in its place by strong bolts and nuts. The latter being unscrewed, the bolts slipped out by their own weight, the shutter fell, and a new communication was established between the interior and the exterior.

Ardan knelt down, applied his eye to the light, and tried to look out. At first everything was quite dark and gloomy.

"I see no Earth!" he exclaimed at last.

"Don't you see a fine ribbon of light?" asked Barbican, "right beneath us? A thin, pale, silvery crescent?"

"Of course I do. Can that be the Earth?"

"Terra Mater herself, friend Ardan. That fine fillet of light, now hardly visible on her eastern border, will disappear altogether as soon as the Moon is full. Then, lying as she will be between the Sun and the Moon, her illuminated face will be turned away from us altogether, and for several days she will be involved in impenetrable darkness."

"And that's the Earth!" repeated Ardan, hardly able to believe his eyes, as he continued to gaze on the slight thread of silvery white light, somewhat resembling the appearance of the "Young May Moon" a few hours after sunset.

Barbican's explanation was quite correct. The Earth, in reference to the Moon or the Projectile, was in her last phase, or octant as it is called, and showed a sharp-horned, attenuated, but brilliant crescent strongly relieved by the black background of the sky. Its light, rendered a little bluish by the

Whilst the travellers were profoundly absorbed in the contemplation of this wondrous sight, a sparkling shower of shooting stars suddenly flashed over the Earth's dark surface, making it for a moment as bright as the external ring. Hundreds of bolides, catching fire from contact with the atmosphere, streaked the darkness with their luminous trails, overspreading it occasionally with sheets of electric flame. The Earth was just then in her perihelion, and we all know that the months of November and December are so highly favorable to the appearance of these meteoric showers that at the famous display of November, 1866, astronomers counted as many as 8,000 between midnight and four o'clock.

Barbican explained the whole matter in a few words. The Earth, when nearest to the sun, occasionally plunges into a group of countless meteors travelling like comets, in eccentric orbits around the grand centre of our solar system. The atmosphere strikes the rapidly moving bodies with such violence as to set them on fire and render them visible to us in beautiful star showers. But to this simple explanation of the famous November meteors Ardan would not listen. He preferred believing that Mother Earth, feeling that her three daring children were still looking at her, though five thousand miles away, shot off her best rocket-signals to show that she still thought of them and would never let them out of her watchful eye.

For hours they continued to gaze with indescribable interest on the faintly luminous mass so easily distinguishable among the other heavenly bodies. Jupiter blazed on their right, Mars flashed his ruddy light on their left, Saturn with his rings looked like a round white spot on a black wall; even Venus they could see almost directly under them, easily recognizing her by her soft, sweetly scintillant light. But no planet or constellation possessed any attraction for the travellers, as long as their eyes could trace that shadowy, crescent-edged, diamond-girdled, meteor-furrowed spheroid, the theatre of their existence, the home of so many undying desires, the mysterious cradle of their race!

Meantime the Projectile cleaved its way upwards, rapidly, unswervingly, though with a gradually retarding velocity. As the Earth sensibly grew darker, and the travellers' eyes grew dimmer, an irresistible somnolency slowly stole over their weary frames. The extraordinary excitement they had gone through during the last four or five hours, was naturally followed by a profound reaction.

"Captain, you're nodding," said Ardan at last, after a longer silence than usual; "the fact is, Barbican is the only wake man of the party, because he is

CHAPTER III - THEY MAKE THEMSELVES AT HOME AND FEEL QUITE COMFORTABLE.

This curious explanation given, and its soundness immediately recognized, the three friends were soon fast wrapped in the arms of Morpheus. Where in fact could they have found a spot more favorable for undisturbed repose? On land, where the dwellings, whether in populous city or lonely country, continually experience every shock that thrills the Earth's crust? At sea, where between waves or winds or paddles or screws or machinery, everything is tremor, quiver or jar? In the air, where the balloon is incessantly twirling, oscillating, on account of the ever varying strata of different densities, and even occasionally threatening to spill you out? The Projectile alone, floating grandly through the absolute void, in the midst of the profoundest silence, could offer to its inmates the possibility of enjoying slumber the most complete, repose the most profound.

There is no telling how long our three daring travellers would have continued to enjoy their sleep, if it had not been suddenly terminated by an unexpected noise about seven o'clock in the morning of December 2nd, eight hours after their departure.

This noise was most decidedly of barking.

"The dogs! It's the dogs!" cried Ardan, springing up at a bound.

"They must be hungry!" observed the Captain.

"We have forgotten the poor creatures!" cried Barbican.

"Where can they have gone to?" asked Ardan, looking for them in all directions.

At last they found one of them hiding under the sofa. Thunderstruck and perfectly bewildered by the terrible shock, the poor animal had kept close in its hiding place, never daring to utter a sound, until at last the pangs of hunger had proved too strong even for its fright.

They readily recognized the amiable Diana, but they could not allure the shivering, whining animal from her retreat without a good deal of coaxing. Ardan talked to her in his most honeyed and seductive accents, while trying to pull her out by the neck.

proportions of a perfect circle.

"By Jove," suddenly exclaimed Ardan, "why didn't we start at the moment of Full Earth?--that is when our globe and the Sun were in opposition?"

"Why should we!" growled M'Nicholl.

"Because in that case we should be now looking at the great continents and the great seas in a new light--the former glittering under the solar rays, the latter darker and somewhat shaded, as we see them on certain maps. How I should like to get a glimpse at those poles of the Earth, on which the eye of man has never yet lighted!"

"True," replied Barbican, "but if the Earth had been Full, the Moon would have been New, that is to say, invisible to us on account of solar irradiation. Of the two it is much preferable to be able to keep the point of arrival in view rather than the point of departure."

"You're right, Barbican," observed the Captain; "besides, once we're in the Moon, the long Lunar night will give us plenty of time to gaze our full at yonder great celestial body, our former home, and still swarming with our fellow beings."

"Our fellow beings no longer, dear boy!" cried Ardan. "We inhabit a new world peopled by ourselves alone, the Projectile! Ardan is Barbican's fellow being, and Barbican M'Nicholl's. Beyond us, outside us, humanity ends, and we are now the only inhabitants of this microcosm, and so we shall continue till the moment when we become Selenites pure and simple."

"Which shall be in about eighty-eight hours from now," replied the Captain.

"Which is as much as to say--?" asked Ardan.

"That it is half past eight," replied M'Nicholl.

"My regular hour for breakfast," exclaimed Ardan, "and I don't see the shadow of a reason for changing it now."

The proposition was most acceptable, especially to the Captain, who frequently boasted that, whether on land or water, on mountain summits or in the depths of mines, he had never missed a meal in all his life. In escaping from the Earth, our travellers felt that they had by no means escaped from the laws of humanity, and their stomachs now called on them

"That's clear enough," said the Captain, "but another consideration, I'm free to say, rather perplexes me. Since our Earth lies between us and the Sun, why don't we see the sunlight forming a great ring around the globe, in other words, instead of the full Sun that we plainly see there below, why do we not witness an annular eclipse?"

"Your cool, clear head has not yet quite recovered from the shock, my dear Captain," replied Barbican, with a smile. "For two reasons we can't see the ring eclipse: on account of the angle the Moon's orbit makes with the Earth, the three bodies are not at present in a direct line; we, therefore, see the Sun a little to the west of the earth; secondly, even if they were exactly in a straight line, we should still be far from the point whence an annular eclipse would be visible."

"That's true," said Ardan; "the cone of the Earth's shadow must extend far beyond the Moon."

"Nearly four times as far," said Barbican; "still, as the Moon's orbit and the Earth's do not lie in exactly the same plane, a Lunar eclipse can occur only when the nodes coincide with the period of the Full Moon, which is generally twice, never more than three times in a year. If we had started about four days before the occurrence of a Lunar eclipse, we should travel all the time in the dark. This would have been obnoxious for many reasons."

"One, for instance?"

"An evident one is that, though at the present moment we are moving through a vacuum, our Projectile, steeped in the solar rays, revels in their light and heat. Hence great saving in gas, an important point in our household economy."

In effect, the solar rays, tempered by no genial medium like our atmosphere, soon began to glare and glow with such intensity, that the Projectile under their influence, felt like suddenly passing from winter to summer. Between the Moon overhead and the Sun beneath it was actually inundated with fiery rays.

"One feels good here," cried the Captain, rubbing his hands.

"A little too good," cried Ardan. "It's already like a hot-house. With a little garden clay, I could raise you a splendid crop of peas in twenty-four hours. I hope in heaven the walls of our Projectile won't melt like wax!"

The air supply proved also to be quite satisfactory. The Reiset and Regnault apparatus for producing oxygen contained a supply of chlorate of potash sufficient for two months. As the productive material had to be maintained at a temperature of between 7 and 8 hundred degrees Fahr., a steady consumption of gas was required; but here too the supply far exceeded the demand. The whole arrangement worked charmingly, requiring only an odd glance now and then. The high temperature changing the chlorate into a chloride, the oxygen was disengaged gradually but abundantly, every eighteen pounds of chlorate of potash, furnishing the seven pounds of oxygen necessary for the daily consumption of the inmates of the Projectile.

Still--as the reader need hardly be reminded--it was not sufficient to renew the exhausted oxygen; the complete purification of the air required the absorption of the carbonic acid, exhaled from the lungs. For nearly 12 hours the atmosphere had been gradually becoming more and more charged with this deleterious gas, produced from the combustion of the blood by the inspired oxygen. The Captain soon saw this, by noticing with what difficulty Diana was panting. She even appeared to be smothering, for the carbonic acid--as in the famous Grotto del Cane on the banks of Lake Agnano, near Naples--was collecting like water on the floor of the Projectile, on account of its great specific gravity. It already threatened the poor dog's life, though not yet endangering that of her masters. The Captain, seeing this state of things, hastily laid on the floor one or two cups containing caustic potash and water, and stirred the mixture gently: this substance, having a powerful affinity for carbonic acid, greedily absorbed it, and after a few moments the air was completely purified.

The others had begun by this time to check off the state of the instruments. The thermometer and the barometer were all right, except one self-recorder of which the glass had got broken. An excellent aneroid barometer, taken safe and sound out of its wadded box, was carefully hung on a hook in the wall. It marked not only the pressure of the air in the Projectile, but also the quantity of the watery vapor that it contained. The needle, oscillating a little beyond thirty, pointed pretty steadily at " Fair . "

The mariner's compasses were also found to be quite free from injury. It is, of course, hardly necessary to say that the needles pointed in no particular direction, the magnetic pole of the Earth being unable at such a distance to exercise any appreciable influence on them. But when brought to the Moon, it was expected that these compasses, once more subjected to the influence of the current, would attest certain phenomena. In any case, it would be

a very important service as soon as the Projectile, having passed the point of neutral attraction between the Earth and the Moon, would begin to fall with accelerated velocity towards the Lunar surface. This descent, though--thanks to the respective volumes of the attracting bodies--six times less rapid than it would have been on the surface of the Earth, would still be violent enough to dash the Projectile into a thousand pieces. But Barbican confidently expected by means of his powerful rockets to offer very considerable obstruction to the violence of this fall, if not to counteract its terrible effects altogether.

The inspection having thus given general satisfaction, the travellers once more set themselves to watching external space through the lights in the sides and the floor of the Projectile.

Everything still appeared to be in the same state as before. Nothing was changed. The vast arch of the celestial dome glittered with stars, and constellations blazed with a light clear and pure enough to throw an astronomer into an ecstasy of admiration. Below them shone the Sun, like the mouth of a white-hot furnace, his dazzling disc defined sharply on the pitch-black back-ground of the sky. Above them the Moon, reflecting back his rays from her glowing surface, appeared to stand motionless in the midst of the starry host.

A little to the east of the Sun, they could see a pretty large dark spot, like a hole in the sky, the broad silver fringe on one edge fading off into a faint glimmering mist on the other--it was the Earth. Here and there in all directions, nebulous masses gleamed like large flakes of star dust, in which, from nadir to zenith, the eye could trace without a break that vast ring of impalpable star powder, the famous Milky Way, through the midst of which the beams of our glorious Sun struggle with the dusky pallor of a star of only the fourth magnitude.

Our observers were never weary of gazing on this magnificent and novel spectacle, of the grandeur of which, it is hardly necessary to say, no description can give an adequate idea. What profound reflections it suggested to their understandings! What vivid emotions it enkindled in their imaginations! Barbican, desirous of commenting the story of the journey while still influenced by these inspiring impressions, noted carefully hour by hour every fact that signalized the beginning of his enterprise. He wrote out his notes very carefully and systematically, his round full hand, as business-like as ever, never betraying the slightest emotion.

The Captain was quite as busy, but in a different way. Pulling out his

CHAPTER IV - A CHAPTER FOR THE CORNELL GIRLS.

No incident worth recording occurred during the night, if night indeed it could be called. In reality there was now no night or even day in the Projectile, or rather, strictly speaking, it was always night on the upper end of the bullet, and always day on the lower. Whenever, therefore, the words night and day occur in our story, the reader will readily understand them as referring to those spaces of time that are so called in our Earthly almanacs, and were so measured by the travellers' chronometers.

The repose of our friends must indeed have been undisturbed, if absolute freedom from sound or jar of any kind could secure tranquillity. In spite of its immense velocity, the Projectile still seemed to be perfectly motionless. Not the slightest sign of movement could be detected. Change of locality, though ever so rapid, can never reveal itself to our senses when it takes place in a vacuum, or when the enveloping atmosphere travels at the same rate as the moving body. Though we are incessantly whirled around the Sun at the rate of about seventy thousand miles an hour, which of us is conscious of the slightest motion? In such a case, as far as sensation is concerned, motion and repose are absolutely identical. Neither has any effect one way or another on a material body. Is such a body in motion? It remains in motion until some obstacle stops it. Is it at rest? It remains at rest until some superior force compels it to change its position. This indifference of bodies to motion or rest is what physicists call inertia .

Barbican and his companions, therefore, shut up in the Projectile, could readily imagine themselves to be completely motionless. Had they been outside, the effect would have been precisely the same. No rush of air, no jarring sensation would betray the slightest movement. But for the sight of the Moon gradually growing larger above them, and of the Earth gradually growing smaller beneath them, they could safely swear that they were fast anchored in an ocean of deathlike immobility.

Towards the morning of next day (December 3), they were awakened by a joyful, but quite unexpected sound.

"Cock-a-doodle! doo!" accompanied by a decided flapping of wings.

The Frenchman, on his feet in one instant and on the top of the ladder in another, attempted to shut the lid of a half open box, speaking in an angry but suppressed voice:

"Nothing simpler," answered Barbican.

"Could you have done it yourself?" asked the Frenchman.

"Without the slightest difficulty. The Captain and myself could have readily solved the problem, only the reply from the University saved us the trouble."

"Well, Barbican, dear boy," observed Ardan, "all I've got to say is, you might chop the head off my body, beginning with my feet, before you could make me go through such a calculation."

"Simply because you don't understand Algebra," replied Barbican, quietly.

"Oh! that's all very well!" cried Ardan, with an ironical smile. "You great $x+y$ men think you settle everything by uttering the word Algebra!"

"Ardan," asked Barbican, "do you think people could beat iron without a hammer, or turn up furrows without a plough?"

"Hardly."

"Well, Algebra is an instrument or utensil just as much as a hammer or a plough, and a very good instrument too if you know how to make use of it."

"You're in earnest?"

"Quite so."

"And you can handle the instrument right before my eyes?"

"Certainly, if it interests you so much."

"You can show me how they got at the initial velocity of our Projectile?"

"With the greatest pleasure. By taking into proper consideration all the elements of the problem, viz.: (1) the distance between the centres of the Earth and the Moon, (2) the Earth's radius, (3) its volume, and (4) the Moon's volume, I can easily calculate what must be the initial velocity, and that too by a very simple formula."

"Let us have the formula."

"Which means?" asked Ardan.

"It means," said the Captain, now taking part in the discussion, "that the half of v prime squared minus v squared equals gr multiplied by r over x minus one plus m prime over m multiplied by r over d minus x minus r over d minus r ... that is--"

"That is," interrupted Ardan, in a roar of laughter, " x straddles on y , making for z and jumping over p ! Do you mean to say you understand the terrible jargon, Captain?"

"Nothing is clearer, Ardan."

"You too, Captain! Then of course I must give in gracefully, and declare that the sun at noon-day is not more palpably evident than the sense of Barbican's formula."

"You asked for Algebra, you know," observed Barbican.

"Rock crystal is nothing to it!"

"The fact is, Barbican," said the Captain, who had been looking over the paper, "you have worked the thing out very well. You have the integral equation of the living forces, and I have no doubt it will give us the result sought for."

"Yes, but I should like to understand it, you know," cried Ardan: "I would give ten years of the Captain's life to understand it!"

"Listen then," said Barbican. "Half of v prime squared less v squared, is the formula giving us the half variation of the living force."

"Mac pretends he understands all that!"

"You need not be a Solomon to do it," said the Captain. "All these signs that you appear to consider so cabalistic form a language the clearest, the shortest, and the most logical, for all those who can read it."

"You pretend, Captain, that, by means of these hieroglyphics, far more incomprehensible than the sacred Ibis of the Egyptians, you can discover the velocity at which the Projectile should start?"

"Most undoubtedly," replied the Captain, "and, by the same formula I can

falling towards the centre of the Earth. Clear?"

"That I comprehend."

"Now I represent by x the varying distance that separates the Projectile from the centre of the Earth, and by v prime its velocity at that distance."

"That I comprehend."

"Finally, v is its velocity when quitting our atmosphere."

"Yes," chimed in the Captain, "it is for this point, you see, that the velocity had to be calculated, because we know already that the initial velocity is exactly the three halves of the velocity when the Projectile quits the atmosphere."

"That I don't comprehend," cried the Frenchman, energetically.

"It's simple enough, however," said Barbican.

"Not so simple as a simpleton," replied the Frenchman.

"The Captain merely means," said Barbican, "that at the instant the Projectile quitted the terrestrial atmosphere it had already lost a third of its initial velocity."

"So much as a third?"

"Yes, by friction against the atmospheric layers: the quicker its motion, the greater resistance it encountered."

"That of course I admit, but your v squared and your v prime squared rattle in my head like nails in a box!"

"The usual effect of Algebra on one who is a stranger to it; to finish you, our next step is to express numerically the value of these several symbols. Now some of them are already known, and some are to be calculated."

"Hand the latter over to me," said the Captain.

"First," continued Barbican: " r , the Earth's radius is, in the latitude of Florida, about 3,921 miles. d , the distance from the centre of the Earth to the centre of the Moon is 56 terrestrial radii, which the Captain calculates to

"Therefore," continued Barbican,

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

"And now," exclaimed M'Nicholl, sharpening his pencil; "in order to obtain the velocity of the Projectile when leaving the atmosphere, we have only to make a slight calculation."

The Captain, who before clerking on a Mississippi steamboat had been professor of Mathematics in an Indiana university, felt quite at home at the work. He rained figures from his pencil with a velocity that would have made Marston stare. Page after page was filled with his multiplications and divisions, while Barbican looked quietly on, and Ardan impatiently stroked his head and ears to keep down a rising head-ache.

"Well?" at last asked Barbican, seeing the Captain stop and throw a somewhat hasty glance over his work.

"Well," answered M'Nicholl slowly but confidently, "the calculation is made, I think correctly; and v , that is, the velocity of the Projectile when quitting the atmosphere, sufficient to carry it to the neutral point, should be at least ..."

"How much?" asked Barbican, eagerly.

"Should be at least 11,972 yards the first second."

"What!" cried Barbican, jumping off his seat. "How much did you say?"

"11,972 yards the first second it quits the atmosphere."

"Oh, malediction!" cried Barbican, with a gesture of terrible despair.

"What's the matter?" asked Ardan, very much surprised.

"Enough is the matter!" answered Barbican excitedly. "This velocity having been diminished by a third, our initial velocity should have been at least ..."

"17,958 yards the first second!" cried M'Nicholl, rapidly flourishing his pencil.

"But the Cambridge Observatory having declared that 12,000 yards the first

CHAPTER V - THE COLDS OF SPACE.

How could they imagine that the Observatory men had committed such a blunder? Barbican would not believe it possible. He made the Captain go over his calculation again and again; but no flaw was to be found in it. He himself carefully examined it, figure after figure, but he could find nothing wrong. They both took up the formula and subjected it to the strongest tests; but it was invulnerable. There was no denying the fact. The Cambridge professors had undoubtedly blundered in saying that an initial velocity of 12,000 yards a second would be enough to carry them to the neutral point. A velocity of nearly 18,000 yards would be the very lowest required for such a purpose. They had simply forgotten to allow a third for friction.

The three friends kept profound silence for some time. Breakfast now was the last thing thought of. Barbican, with teeth grating, fingers clutching, and eye-brows closely contracting, gazed grimly through the window. The Captain, as a last resource, once more examined his calculations, earnestly hoping to find a figure wrong. Ardan could neither sit, stand nor lie still for a second, though he tried all three. His silence, of course, did not last long.

"Ha! ha! ha!" he laughed bitterly. "Precious scientific men! Villainous old hombogues! The whole set not worth a straw! I hope to gracious, since we must fall, that we shall drop down plumb on Cambridge Observatory, and not leave a single one of the miserable old women, called professors, alive in the premises!"

A certain expression in Ardan's angry exclamation had struck the Captain like a shot, and set his temples throbbing violently.

"Must fall!" he exclaimed, starting up suddenly. "Let us see about that! It is now seven o'clock in the morning. We must have, therefore, been at least thirty-two hours on the road, and more than half of our passage is already made. If we are going to fall at all, we must be falling now! I'm certain we're not, but, Barbican, you have to find it out!"

Barbican caught the idea like lightning, and, seizing a compass, he began through the floor window to measure the visual angle of the distant Earth. The apparent immobility of the Projectile allowed him to do this with great exactness. Then laying aside the instrument, and wiping off the thick drops of sweat that bedewed his forehead, he began jotting down some figures on a

"Talking of goose reminds me of breakfast," cried Ardan; "I assure you, my fright has not taken away my appetite!"

"Yes," continued Barbican. "Captain, you're quite right. Our initial velocity very fortunately was much greater than what our Cambridge friends had calculated for us!"

"Hang our Cambridge friends and their calculations!" cried Ardan, with some asperity; "as usual with your scientific men they've more brass than brains! If we're not now bed-fellows with the oysters in the Gulf of Mexico, no thanks to our kind Cambridge friends. But talking of oysters, let me remind you again that breakfast is ready."

The meal was a most joyous one. They ate much, they talked more, but they laughed most. The little incident of Algebra had certainly very much enlivened the situation.

"Now, my boys," Ardan went on, "all things thus turning out quite comfortable, I would just ask you why we should not succeed? We are fairly started. No breakers ahead that I can see. No rock on our road. It is freer than the ships on the raging ocean, aye, freer than the balloons in the blustering air. But the ship arrives at her destination; the balloon, borne on the wings of the wind, rises to as high an altitude as can be endured; why then should not our Projectile reach the Moon?"

"It will reach the Moon!" nodded Barbican.

"We shall reach the Moon or know for what!" cried M'Nicholl, enthusiastically.

"The great American nation must not be disappointed!" continued Ardan.

"They are the only people on Earth capable of originating such an enterprise! They are the only people capable of producing a Barbican!"

"Hurrah!" cried M'Nicholl.

"That point settled," continued the Frenchman, "another question comes up to which I have not yet called your attention. When we get to the Moon, what shall we do there? How are we going to amuse ourselves? I'm afraid our life there will be awfully slow!"

His companions emphatically disclaimed the possibility of such a thing.

"Who says they have not done so?" asked Barbican, coolly.

"Attempting such a communication," observed the Captain, "would certainly be much easier for them than for us, principally for two reasons. First, attraction on the Moon's surface being six times less than on the Earth's, a projectile could be sent off more rapidly; second, because, as this projectile need be sent only 24 instead of 240 thousand miles, they could do it with a quantity of powder ten times less than what we should require for the same purpose."

"Then I ask again," said the Frenchman; "why haven't they made such an attempt?"

"And I reply again," answered Barbican. "How do you know that they have not made such an attempt?"

"Made it? When?"

"Thousands of years ago, before the invention of writing, before even the appearance of Man on the Earth."

"But the bullet?" asked Ardan, triumphantly; "Where's the bullet? Produce the bullet!"

"Friend Michael," answered Barbican, with a quiet smile, "you appear to forget that the 5/6 of the surface of our Earth is water. 5 to 1, therefore, that the bullet is more likely to be lying this moment at the bottom of the Atlantic or the Pacific than anywhere else on the surface of our globe. Besides, it may have sunk into some weak point of the surface, at the early epoch when the crust of the Earth had not acquired sufficient solidity."

"Captain," said Ardan, turning with a smile to M'Nicholl; "no use in trying to catch Barby; slippery as an eel, he has an answer for everything. Still I have a theory on the subject myself, which I think it no harm to ventilate. It is this: The Selenites have never sent us any projectile at all, simply because they had no gunpowder: being older and wiser than we, they were never such fools as to invent any.--But, what's that? Diana howling for her breakfast! Good! Like genuine scientific men, while squabbling over nonsense, we let the poor animals die of hunger. Excuse us, Diana; it is not the first time the little suffer from the senseless disputes of the great."

So saying he laid before the animal a very toothsome pie, and contemplated

thing to be done is to get rid of the body. We can't keep it here with us forty-eight hours longer."

"Of course not," replied the Captain, "nor need we; our lights, being provided with hinges, can be lifted back. What is to prevent us from opening one of them, and flinging the body out through it!"

The President of the Gun Club reflected a few minutes; then he spoke:

"Yes, it can be done; but we must take the most careful precautions."

"Why so?" asked Ardan.

"For two simple reasons," replied Barbican; "the first refers to the air enclosed in the Projectile, and of which we must be very careful to lose only the least possible quantity."

"But as we manufacture air ourselves!" objected Ardan.

"We manufacture air only partly, friend Michael," replied Barbican. "We manufacture only oxygen; we can't supply nitrogen--By the bye, Ardan, won't you watch the apparatus carefully every now and then to see that the oxygen is not generated too freely. Very serious consequences would attend an immoderate supply of oxygen--No, we can't manufacture nitrogen, which is so absolutely necessary for our air and which might escape readily through the open windows."

"What! the few seconds we should require for flinging out poor Satellite?"

"A very few seconds indeed they should be," said Barbican, very gravely.

"Your second reason?" asked Ardan.

"The second reason is, that we must not allow the external cold, which must be exceedingly great, to penetrate into our Projectile and freeze us alive."

"But the Sun, you know--"

"Yes, the Sun heats our Projectile, but it does not heat the vacuum through which we are now floating. Where there is no air there can neither be heat nor light; just as wherever the rays of the Sun do not arrive directly, it must be both cold and dark. The temperature around us, if there be anything that can be called temperature, is produced solely by stellar radiation. I need not

greater than our mean summer temperature. But this heat, fully capable of turning the rocks into glass and the oceans into vapor, before proceeding to such extremity, must have first formed a thick interposing ring of clouds, and thus considerably modified the excessive temperature. Therefore, between the extreme cold of the aphelion and the excessive heat of the perihelion, by the great law of compensation, it is probable that the mean temperature would be tolerably endurable."

"At how many degrees is the temperature of the interplanetary space estimated?" asked M'Nicholl.

"Some time ago," replied Barbican, "this temperature was considered to be very low indeed--millions and millions of degrees below zero. But Fourrier of Auxerre, a distinguished member of the Académie des Sciences, whose Mémoires on the temperature of the Planetary spaces appeared about 1827, reduced these figures to considerably diminished proportions. According to his careful estimation, the temperature of space is not much lower than 70 or 80 degrees Fahr. below zero."

"No more?" asked Ardan.

"No more," answered Barbican, "though I must acknowledge we have only his word for it, as the Mémoire in which he had recorded all the elements of that important determination, has been lost somewhere, and is no longer to be found."

"I don't attach the slightest importance to his, or to any man's words, unless they are sustained by reliable evidence," exclaimed M'Nicholl. "Besides, if I'm not very much mistaken, Pouillet--another countryman of yours, Ardan, and an Academician as well as Fourrier--esteems the temperature of interplanetary spaces to be at least 256° Fahr. below zero. This we can easily verify for ourselves this moment by actual experiment."

"Not just now exactly," observed Barbican, "for the solar rays, striking our Projectile directly, would give us a very elevated instead of a very low temperature. But once arrived at the Moon, during those nights fifteen days long, which each of her faces experiences alternately, we shall have plenty of time to make an experiment with every condition in our favor. To be sure, our Satellite is at present moving in a vacuum."

"A vacuum?" asked Ardan; "a perfect vacuum?"

"Well, a perfect vacuum as far as air is concerned."

as Barbican recommended, with the utmost care and dispatch, so as to lose as little as possible of the internal air, which, by its great elasticity, would violently strive to escape. The bolts of the floor-light, which was more than a foot in diameter, were carefully unscrewed, while Ardan, a good deal affected, prepared to launch his dog's body into space. The glass, worked by a powerful lever which enabled it to overcome the pressure of the enclosed air, turned quickly on its hinges, and poor Satellite was dropped out. The whole operation was so well managed that very little air escaped, and ever afterwards Barbican employed the same means to rid the Projectile of all the litter and other useless matter by which it was occasionally encumbered.

The evening of this third of December wore away without further incident. As soon as Barbican had announced that the Projectile was still winging its way, though with retarded velocity, towards the lunar disc, the travellers quietly retired to rest.

stop it--what would be the consequence of the sudden halt?"

"But," replied Barbican, "I don't understand what obstacle it could have met powerful enough to stop it."

"Suppose some obstacle, for the sake of argument," said Ardan.

"Suppose what can't be supposed," replied the matter-of-fact Barbican, "what cannot possibly be supposed, unless indeed the original impulse proved too weak. In that case, the velocity would have decreased by degrees, but the Projectile itself would not have suddenly stopped."

"Suppose it had struck against some body in space."

"What body, for instance?"

"Well, that enormous bolide which we met."

"Oh!" hastily observed the Captain, "the Projectile would have been dashed into a thousand pieces and we along with it."

"Better than that," observed Barbican; "we should have been burned alive."

"Burned alive!" laughed Ardan. "What a pity we missed so interesting an experiment! How I should have liked to find out how it felt!"

"You would not have much time to record your observations, friend Michael, I assure you," observed Barbican. "The case is plain enough. Heat and motion are convertible terms. What do we mean by heating water? Simply giving increased, in fact, violent motion to its molecules."

"Well!" exclaimed the Frenchman, "that's an ingenious theory any how!"

"Not only ingenious but correct, my dear friend, for it completely explains all the phenomena of caloric. Heat is nothing but molecular movement, the violent oscillation of the particles of a body. When you apply the brakes to the train, the train stops. But what has become of its motion? It turns into heat and makes the brakes hot. Why do people grease the axles? To hinder them from getting too hot, which they assuredly would become if friction was allowed to obstruct the motion. You understand, don't you?"

"Don't I though?" replied Ardan, apparently in earnest. "Let me show you how thoroughly. When I have been running hard and long, I feel myself

compensates sufficiently for the heat that he is continually giving forth. It has been calculated--"

"Good Lord deliver us!" cried Ardan, putting his hands to his ears: "here comes Tyndall and Thomson again!"

--"It has been calculated," continued Barbican, not heeding the interruption, "that the shock of every bolide drawn to the Sun's surface by gravity, must produce there an amount of heat equal to that of the combustion of four thousand blocks of coal, each the same size as the falling bolide."

"I'll wager another cent that our bold savants calculated the heat of the Sun himself," cried Ardan, with an incredulous laugh.

"That is precisely what they have done," answered Barbican referring to his memorandum book; "the heat emitted by the Sun," he continued, "is exactly that which would be produced by the combustion of a layer of coal enveloping the Sun's surface, like an atmosphere, 17 miles in thickness."

"Well done! and such heat would be capable of--?"

"Of melting in an hour a stratum of ice 2400 feet thick, or, according to another calculation, of raising a globe of ice-cold water, 3 times the size of our Earth, to the boiling point in an hour."

"Why not calculate the exact fraction of a second it would take to cook a couple of eggs?" laughed Ardan. "I should as soon believe in one calculation as in the other.--But--by the by--why does not such extreme heat cook us all up like so many beefsteaks?"

"For two very good and sufficient reasons," answered Barbican. "In the first place, the terrestrial atmosphere absorbs the 4/10 of the solar heat. In the second, the quantity of solar heat intercepted by the Earth is only about the two billionth part of all that is radiated."

"How fortunate to have such a handy thing as an atmosphere around us," cried the Frenchman; "it not only enables us to breathe, but it actually keeps us from sizzling up like griskins."

"Yes," said the Captain, "but unfortunately we can't say so much for the Moon."

"Oh pshaw!" cried Ardan, always full of confidence. "It's all right there too!"

pulling out his tablets, "Let a represent the horizontal parallax, and b the half of the Sun's apparent diameter--"

"Ouch!" cried the Frenchman, making a wry face, "here comes Mr. x square riding to the mischief on a pair of double zeros again! Talk English, or Yankee, or Dutch, or Greek, and I'm your man! Even a little Arabic I can digest! But hang me, if I can endure your Algebra!"

"Well then, talking Yankee," replied Barbican with a smile, "the mean distance of the Moon from the Earth being sixty terrestrial radii, the length of the conic shadow, in consequence of atmospheric refraction, is reduced to less than forty-two radii. Consequently, at the moment of an eclipse, the Moon is far beyond the reach of the real shadow, so that she can see not only the border rays of the Sun, but even those proceeding from his very centre."

"Oh then," cried Ardan with a loud laugh, "we have an eclipse of the Sun at the moment when the Sun is quite visible! Isn't that very like a bull, Mr. Philosopher Barbican?"

"Yet it is perfectly true notwithstanding," answered Barbican. "At such a moment the Sun is not eclipsed, because we can see him: and then again he is eclipsed because we see him only by means of a few of his rays, and even these have lost nearly all their brightness in their passage through the terrestrial atmosphere!"

"Barbican is right, friend Michael," observed the Captain slowly: "the same phenomenon occurs on earth every morning at sunrise, when refraction shows us

' the Sun new ris'n Looking through the horizontal misty
air, Shorn of his beams. '"

"He must be right," said Ardan, who, to do him justice, though quick at seeing a reason, was quicker to acknowledge its justice: "yes, he must be right, because I begin to understand at last very clearly what he really meant. However, we can judge for ourselves when we get there.--But, apropos of nothing, tell me, Barbican, what do you think of the Moon being an ancient comet, which had come so far within the sphere of the Earth's attraction as to be kept there and turned into a satellite?"

"Well, that is an original idea!" said Barbican with a smile.

"No!" cried Ardan in surprise. "Bless us! How rapidly the time passes when we are engaged in scientific conversation! Ouf! I'm getting decidedly too learned! I feel as if I had swallowed a library!"

"I feel," observed M'Nicholl, "as if I had been listening to a lecture on Astronomy in the Star course."

"Better stir around a little more," said the Frenchman; "fatigue of body is the best antidote to such severe mental labor as ours. I'll run up the ladder a bit." So saying, he paid another visit to the upper portion of the Projectile and remained there awhile whistling Malbrouk, whilst his companions amused themselves in looking through the floor window.

Ardan was coming down the ladder, when his whistling was cut short by a sudden exclamation of surprise.

"What's the matter?" asked Barbican quickly, as he looked up and saw the Frenchman pointing to something outside the Projectile.

Approaching the window, Barbican saw with much surprise a sort of flattened bag floating in space and only a few yards off. It seemed perfectly motionless, and, consequently, the travellers knew that it must be animated by the same ascensional movement as themselves.

"What on earth can such a consarn be, Barbican?" asked Ardan, who every now and then liked to ventilate his stock of American slang. "Is it one of those particles of meteoric matter you were speaking of just now, caught within the sphere of our Projectile's attraction and accompanying us to the Moon?"

"What I am surprised at," observed the Captain, "is that though the specific gravity of that body is far inferior to that of our Projectile, it moves with exactly the same velocity."

"Captain," said Barbican, after a moment's reflection, "I know no more what that object is than you do, but I can understand very well why it keeps abreast with the Projectile."

"Very well then, why?"

"Because, my dear Captain, we are moving through a vacuum, and because all bodies fall or move--the same thing--with equal velocity through a vacuum, no matter what may be their shape or their specific gravity. It is

Satellite's body, flying like a rocket through space, and rising higher and higher in close company with the rapidly ascending Projectile!

apprehended, the lunar atmosphere was confined exclusively to the low lands.

"Besides," as Ardan observed, "a plain is a more suitable landing place than a mountain. A Selenite deposited on the top of Mount Everest or even on Mont Blanc, could hardly be considered, in strict language, to have arrived on Earth."

"Not to talk," added M'Nicholl, "of the comfort of the thing! When you land on a plain, there you are. When you land on a peak or on a steep mountain side, where are you? Tumbling over an embankment with the train going forty miles an hour, would be nothing to it."

"Therefore, Captain Barbican," cried the Frenchman, "as we should like to appear before the Selenites in full skins, please land us in the snug though unromantic North. We shall have time enough to break our necks in the South."

Barbican made no reply to his companions, because a new reflection had begun to trouble him, to talk about which would have done no good. There was certainly something wrong. The Projectile was evidently heading towards the northern hemisphere of the Moon. What did this prove? Clearly, a deviation resulting from some cause. The bullet, lodged, aimed, and fired with the most careful mathematical precision, had been calculated to reach the very centre of the Moon's disc. Clearly it was not going to the centre now. What could have produced the deviation? This Barbican could not tell; nor could he even determine its extent, having no points of sight by which to make his observations. For the present he tried to console himself with the hope that the deviation of the Projectile would be followed by no worse consequence than carrying them towards the northern border of the Moon, where for several reasons it would be comparatively easier to alight. Carefully avoiding, therefore, the use of any expression which might needlessly alarm his companions, he continued to observe the Moon as carefully as he could, hoping every moment to find some grounds for believing that the deviation from the centre was only a slight one. He almost shuddered at the thought of what would be their situation, if the bullet, missing its aim, should pass the Moon, and plunge into the interplanetary space beyond it.

As he continued to gaze, the Moon, instead of presenting the usual flatness of her disc, began decidedly to show a surface somewhat convex. Had the Sun been shining on her obliquely, the shadows would have certainly thrown the great mountains into strong relief. The eye could then bury itself

flavor, crowned the repast. Their vicinity to the Moon and their incessant glancing at her surface did not prevent the travellers from touching each other's glasses merrily and often. Ardan took occasion to remark that the lunar vineyards--if any existed--must be magnificent, considering the intense solar heat they continually experienced. Not that he counted on them too confidently, for he told his friends that to provide for the worst he had supplied himself with a few cases of the best vintages of Médoc and the Côte d'Or, of which the bottles, then under discussion, might be taken as very favorable specimens.

The Reiset and Regnault apparatus for purifying the air worked splendidly, and maintained the atmosphere in a perfectly sanitary condition. Not an atom of carbonic acid could resist the caustic potash; and as for the oxygen, according to M'Nicholl's expression, "it was A prime number one!"

The small quantity of watery vapor enclosed in the Projectile did no more harm than serving to temper the dryness of the air: many a splendid salon in New York, London, or Paris, and many an auditorium, even of theatre, opera house or Academy of Music, could be considered its inferior in what concerned its hygienic condition.

To keep it in perfect working order, the apparatus should be carefully attended to. This, Ardan looked on as his own peculiar occupation. He was never tired regulating the tubes, trying the taps, and testing the heat of the gas by the pyrometer. So far everything had worked satisfactorily, and the travellers, following the example of their friend Marston on a previous occasion, began to get so stout that their own mothers would not know them in another month, should their imprisonment last so long. Ardan said they all looked so sleek and thriving that he was reminded forcibly of a nice lot of pigs fattening in a pen for a country fair. But how long was this good fortune of theirs going to last?

Whenever they took their eyes off the Moon, they could not help noticing that they were still attended outside by the spectre of Satellite's corpse and by the other refuse of the Projectile. An occasional melancholy howl also attested Diana's recognition of her companion's unhappy fate. The travellers saw with surprise that these waifs still seemed perfectly motionless in space, and kept their respective distances apart as mathematically as if they had been fastened with nails to a stone wall.

"I tell you what, dear boys;" observed Ardan, commenting on this curious phenomenon; "if the concussion had been a little too violent for one of us that night, his survivors would have been seriously embarrassed in trying to

"I don't ask the question with any idea of backing out," observed the Captain quietly; "as a matter of purely scientific inquiry, I repeat my question: how are we to return?"

"I don't know," replied Barbican promptly.

"For my part," said Ardan; "if I had known how to get back, I should have never come at all!"

"Well! of all the answers!" said the Captain, lifting his hands and shaking his head.

"The best under the circumstances," observed Barbican; "and I shall further observe that such a question as yours at present is both useless and uncalled for. On some future occasion, when we shall consider it advisable to return, the question will be in order, and we shall discuss it with all the attention it deserves. Though the Columbiad is at Stony Hill, the Projectile will still be in the Moon."

"Much we shall gain by that! A bullet without a gun!"

"The gun we can make and the powder too!" replied Barbican confidently. "Metal and sulphur and charcoal and saltpetre are likely enough to be present in sufficient quantities beneath the Moon's surface. Besides, to return is a problem of comparatively easy solution: we should have to overcome the lunar attraction only--a slight matter--the rest of the business would be readily done by gravity."

"Enough said on the subject!" exclaimed Ardan curtly; "how to get back is indefinitely postponed! How to communicate with our friends on the Earth, is another matter, and, as it seems to me, an extremely easy one."

"Let us hear the very easy means by which you propose to communicate with our friends on Earth," asked the Captain, with a sneer, for he was by this time a little out of humor.

"By means of bolides ejected from the lunar volcanoes," replied the Frenchman without an instant's hesitation.

"Well said, friend Ardan," exclaimed Barbican. "I am quite disposed to acknowledge the feasibility of your plan. Laplace has calculated that a force five times greater than that of an ordinary cannon would be sufficient to send a bolide from the Moon to the Earth. Now there is no cannon that can

"Hurrah for Secretary Marston!" cried the Captain, with an enthusiasm almost equal to Ardan's.

"Hurrah for my dear friend Marston!" cried Barbican, hardly less excited than his comrades.

Our old acquaintance, Marston, of course could not have heard the joyous acclamations that welcomed his name, but at that moment he certainly must have felt his ears most unaccountably tingling. What was he doing at the time? He was rattling along the banks of the Kansas River, as fast as an express train could take him, on the road to Long's Peak, where, by means of the great Telescope, he expected to find some traces of the Projectile that contained his friends. He never forgot them for a moment, but of course he little dreamed that his name at that very time was exciting their vividest recollections and their warmest applause.

In fact, their recollections were rather too vivid, and their applause decidedly too warm. Was not the animation that prevailed among the guests of the Projectile of a very unusual character, and was it not becoming more and more violent every moment? Could the wine have caused it? No; though not teetotallers, they never drank to excess. Could the Moon's proximity, shedding her subtle, mysterious influence over their nervous systems, have stimulated them to a degree that was threatening to border on frenzy? Their faces were as red as if they were standing before a hot fire; their breathing was loud, and their lungs heaved like a smith's bellows; their eyes blazed like burning coals; their voices sounded as loud and harsh as that of a stump speaker trying to make himself heard by an inattentive or hostile crowd; their words popped from their lips like corks from Champagne bottles; their gesticulating became wilder and in fact more alarming--considering the little room left in the Projectile for muscular displays of any kind.

But the most extraordinary part of the whole phenomenon was that neither of them, not even Barbican, had the slightest consciousness of any strange or unusual ebullition of spirits either on his own part or on that of the others.

"See here, gentlemen!" said the Captain in a quick imperious manner--the roughness of his old life on the Mississippi would still break out--"See here, gentlemen! It seems I'm not to know if we are to return from the Moon. Well!--Pass that for the present! But there is one thing I must know!"

to tell him! It is only your duty! One day you found us both in St. Helena woods, where we had no more idea of going to the Moon than of sailing to the South Pole! There you twisted us both around your finger, and induced us to follow you blindly on the most formidable journey ever undertaken by man! And now you refuse to tell us what it was all for!"

"I don't refuse, dear old Barbican! To you, at least, I can't refuse anything!" cried Ardan, seizing his friend's hands and wringing them violently. Then letting them go and suddenly starting back, "you wish to know," he continued in resounding tones, "why we have followed out the grandest idea that ever set a human brain on fire! Why we have undertaken a journey that for length, danger, and novelty, for fascinating, soul-stirring and delirious sensations, for all that can attract man's burning heart, and satisfy the intensest cravings of his intellect, far surpasses the vividest realities of Dante's passionate dream! Well, I will tell you! It is to annex another World to the New One! It is to take possession of the Moon in the name of the United States of America! It is to add a thirty-ninth State to the glorious Union! It is to colonize the lunar regions, to cultivate them, to people them, to transport to them some of our wonders of art, science, and industry! It is to civilize the Selenites, unless they are more civilized already than we are ourselves! It is to make them all good Republicans, if they are not so already!"

"Provided, of course, that there are Selenites in existence!" sneered the Captain, now sourer than ever, and in his unaccountable excitement doubly irritating.

"Who says there are no Selenites?" cried Ardan fiercely, with fists clenched and brows contracted.

"I do!" cried M'Nicholl stoutly; "I deny the existence of anything of the kind, and I denounce every one that maintains any such whim as a visionary, if not a fool!"

Ardan's reply to this taunt was a desperate facer, which, however, Barbican managed to stop while on its way towards the Captain's nose. M'Nicholl, seeing himself struck at, immediately assumed such a posture of defence as showed him to be no novice at the business. A battle seemed unavoidable; but even at this trying moment Barbican showed himself equal to the emergency.

"Stop, you crazy fellows! you ninnyhammers! you overgrown babies!" he exclaimed, seizing his companions by the collar, and violently swinging them

wild, insensate, furious, delirious, paroxysmatical. No Orphic festivals on Mount Cithaeron ever raged more wildly. No Bacchic revels on Mount Parnassus were ever more corybantic. Diana, demented by the maddening example, joined in the orgie, howling and barking frantically in her turn, and wildly jumping as high as the ceiling of the Projectile. Then came new accessions to the infernal din. Wings suddenly began to flutter, cocks to crow, hens to cluck; and five or six chickens, managing to escape out of their coop, flew backwards and forwards blindly, with frightened screams, dashing against each other and against the walls of the Projectile, and altogether getting up as demoniacal a hullabaloo as could be made by ten thousand bats that you suddenly disturbed in a cavern where they had slept through the winter.

Then the three companions, no longer able to withstand the overpowering influence of the mysterious force that mastered them, intoxicated, more than drunk, burned by the air that scorched their organs of respiration, dropped at last, and lay flat, motionless, senseless as dabs of clay, on the floor of the Projectile.

It took nearly an hour for the air to become pure enough to allow the lungs their natural play. Slowly and by degrees, the travellers recovered from their intoxication; they had actually to sleep off the fumes of the oxygen as a drunkard has to sleep off the effects of his brandy. When Ardan learned that he was responsible for the whole trouble, do you think the information disconcerted him? Not a bit of it. On the contrary, he was rather proud of having done something startling, to break the monotony of the journey; and to put a little life, as he said, into old Barbican and the grim Captain, so as to get a little fun out of such grave philosophers.

After laughing heartily at the comical figure cut by his two friends capering like crazy students at the Closerie des Lilas, he went on moralizing on the incident:

"For my part, I'm not a bit sorry for having partaken of this fuddling gas. It gives me an idea, dear boys. Would it not be worth some enterprising fellow's while to establish a sanatorium provided with oxygen chambers, where people of a debilitated state of health could enjoy a few hours of intensely active existence! There's money in it, as you Americans say. Just suppose balls or parties given in halls where the air would be provided with an extra supply of this enrapturing gas! Or, theatres where the atmosphere would be maintained in a highly oxygenated condition. What passion, what fire in the actors! What enthusiasm in the spectators! And, carrying the idea a little further, if, instead of an assembly or an audience, we should oxygenize towns, cities, a whole country--what activity would be infused into the whole people! What new life would electrify a stagnant community! Out of an old used-up nation we could perhaps make a bran-new one, and, for my part, I know more than one state in old Europe where this oxygen experiment might be attended with a decided advantage, or where, at all events, it could do no harm!"

The Frenchman spoke so glibly and gesticulated so earnestly that M'Nicholl once more gravely examined the stop-cock; but Barbican damped his enthusiasm by a single observation.

"Friend Michael," said he, "your new and interesting idea we shall discuss at a more favorable opportunity. At present we want to know where all these cocks and hens have come from."

"These cocks and hens?"

"Yes."

tension of the coil is independent of attraction, would have readily given the exact equivalent of the loss.

Attraction or weight, according to Newton's well known law, acting in direct proportion to the mass of the attracting body and in inverse proportion to the square of the distance, this consequence clearly follows: Had the Earth been alone in space, or had the other heavenly bodies been suddenly annihilated, the further from the Earth the Projectile would be, the less weight it would have. However, it would never entirely lose its weight, as the terrestrial attraction would have always made itself felt at no matter what distance. But as the Earth is not the only celestial body possessing attraction, it is evident that there may be a point in space where the respective attractions may be entirely annihilated by mutual counteraction. Of this phenomenon the present instance was a case in point. In a short time, the Projectile and its contents would for a few moments be absolutely and completely deprived of all weight whatsoever.

The path described by the Projectile was evidently a line from the Earth to the Moon averaging somewhat less than 240,000 miles in length. According as the distance between the Projectile and the Earth was increasing, the terrestrial attraction was diminishing in the ratio of the square of the distance, and the lunar attraction was augmenting in the same proportion.

As before observed, the point was not now far off where, the two attractions counteracting each other, the bullet would actually weigh nothing at all. If the masses of the Earth and the Moon had been equal, this should evidently be found half way between the two bodies. But by making allowance for the difference of the respective masses, it was easy to calculate that this point would be situated at the 9/10 of the total distance, or, in round numbers, at something less than 216,000 miles from the Earth.

At this point, a body that possessed no energy or principle of movement within itself, would remain forever, relatively motionless, suspended like Mahomet's coffin, being equally attracted by the two orbs and nothing impelling it in one direction rather than in the other.

Now the Projectile at this moment was nearing this point; if it reached it, what would be the consequence?

To this question three answers presented themselves, all possible under the circumstances, but very different in their results.

1. Suppose the Projectile to possess velocity enough to pass the neutral

them with as much surprise as if they had never uttered a scientific reason to account for it. They saw that, no longer subject to the ordinary laws of nature, they were now entering the realms of the marvellous. They felt that their bodies were absolutely without weight. Their arms, fully extended, no longer sought their sides. Their heads oscillated unsteadily on their shoulders. Their feet no longer rested on the floor. In their efforts to hold themselves straight, they looked like drunken men trying to maintain the perpendicular. We have all read stories of some men deprived of the power of reflecting light and of others who could not cast a shadow. But here reality, no fantastic story, showed you men who, through the counteraction of attractive forces, could tell no difference between light substances and heavy substances, and who absolutely had no weight whatever themselves!

"Let us take graceful attitudes!" cried Ardan, "and imagine we are playing tableaux ! Let us, for instance, form a grand historical group of the three great goddesses of the nineteenth century. Barbican will represent Minerva or Science ; the Captain, Bellona or War ; while I, as Madre Natura, the newly born goddess of Progress , floating gracefully over you both, extend my hands so, fondly patronizing the one, but grandly ordering off the other, to the regions of eternal night! More on your toe, Captain! Your right foot a little higher! Look at Barbican's admirable pose! Now then, prepare to receive orders for a new tableau! Form group à la Jardin Mabille! Presto! Change!"

In an instant, our travellers, changing attitudes, formed the new group with tolerable success. Even Barbican, who had been to Paris in his youth, yielding for a moment to the humor of the thing, acted the naïf Anglais to the life. The Captain was frisky enough to remind you of a middle-aged Frenchman from the provinces, on a hasty visit to the capital for a few days' fun. Ardan was in raptures.

"Oh! if Raphael could only see us!" he exclaimed in a kind of ecstasy. "He would paint such a picture as would throw all his other masterpieces in the shade!"

"Knock spots out of the best of them by fifty per cent!" cried the Captain, gesticulating well enough à l'étudiant , but rather mixing his metaphors.

"He should be pretty quick in getting through the job," observed Barbican, the first as usual to recover tranquillity. "As soon as the Projectile will have passed the neutral point--in half an hour at longest--lunar attraction will draw us to the Moon."

the complete success of the enterprise, the Captain and the Frenchman cordially shook hands with Barbican, all kept congratulating each other on their good fortune as long as the bottle lasted.

They could not talk enough about the wonderful phenomenon lately witnessed; the chief point, the neutralization of the law of gravity, particularly, supplied them with an inexhaustible subject. The Frenchman, as usual, as enthusiastic in his fancy, as he was fanciful in his enthusiasm, got off some characteristic remarks.

"What a fine thing it would be, my boys," he exclaimed, "if on Earth we could be so fortunate as we have been here, and get rid of that weight that keeps us down like lead, that rivets us to it like an adamant chain! Then should we prisoners become free! Adieu forever to all weariness of arms or feet! At present, in order to fly over the surface of the Earth by the simple exertion of our muscles or even to sustain ourselves in the air, we require a muscular force fifty times greater than we possess; but if attraction did not exist, the simplest act of the will, our slightest whim even, would be sufficient to transport us to whatever part of space we wished to visit."

"Ardan, you had better invent something to kill attraction," observed M'Nicholl drily; "you can do it if you try. Jackson and Morton have killed pain by sulphuric ether. Suppose you try your hand on attraction!"

"It would be worth a trial!" cried Ardan, so full of his subject as not to notice the Captain's jeering tone; "attraction once destroyed, there is an end forever to all loads, packs and burdens! How the poor omnibus horses would rejoice! Adieu forever to all cranes, derricks, capstans, jack-screws, and even hotel-elevators! We could dispense with all ladders, door steps, and even stair-cases!"

"And with all houses too," interrupted Barbican; "or, at least, we should dispense with them because we could not have them. If there was no weight, you could neither make a wall of bricks nor cover your house with a roof. Even your hat would not stay on your head. The cars would not stay on the railway nor the boats on the water. What do I say? We could not have any water. Even the Ocean would leave its bed and float away into space. Nay, the atmosphere itself would leave us, being detained in its place by terrestrial attraction and by nothing else."

"Too true, Mr. President," replied Ardan after a pause. "It's a fact. I acknowledge the corn, as Marston says. But how you positive fellows do knock holes into our pretty little creations of fancy!"

"Not from such planets as Mercury , Venus or Mars anyhow, friend Michael," observed Barbican. "But the inhabitants of Jupiter , Saturn , Uranus, or Neptune , if they bear the same proportion to their planet that we do ours, must certainly be regular Brobdignagians."

"Let us keep severely away from all planets of the latter class then," said Ardan. "I never liked to play the part of Lilliputian myself. But how about the Sun, Barbican? I always had a hankering after the Sun!"

"The Sun's volume is about 1-1/3 million times greater than that of the Earth, but his density being only about 1/4, the attraction on his surface is hardly 30 times greater than that of our globe. Still, every proportion observed, the inhabitants of the Sun can't be much less than 150 or 160 feet in height."

" Mille tonnerres! " cried Ardan, "I should be there like Ulysses among the Cyclops! I'll tell you what it is, Barbican; if we ever decide on going to the Sun, we must provide ourselves before hand with a few of your Rodman's Columbiads to frighten off the Solarians!"

"Your Columbiads would not do great execution there," observed M'Nicholl; "your bullet would be hardly out of the barrel when it would drop to the surface like a heavy stone pushed off the wall of a house."

"Oh! I like that!" laughed the incredulous Ardan.

"A little calculation, however, shows the Captain's remark to be perfectly just," said Barbican. "Rodman's ordinary 15 inch Columbiad requires a charge of 100 pounds of mammoth powder to throw a ball of 500 pounds weight. What could such a charge do with a ball weighing 30 times as much or 15,000 pounds? Reflect on the enormous weight everything must have on the surface of the Sun! Your hat, for instance, would weigh 20 or 30 pounds. Your cigar nearly a pound. In short, your own weight on the Sun's surface would be so great, more than two tons, that if you ever fell you should never be able to pick yourself up again!"

"Yes," added the Captain, "and whenever you wanted to eat or drink you should rig up a set of powerful machinery to hoist the eatables and drinkables into your mouth."

"Enough of the Sun to-day, boys!" cried Ardan, shrugging his shoulders; "I don't contemplate going there at present. Let us be satisfied with the Moon! There, at least, we shall be of some account!"

partitions. These buffers were still good, and, gravity being as yet almost imperceptible, to put them once more in order and adjust them to the disc was not a difficult task.

The travellers set to work at once and soon accomplished it. The different pieces were put together readily--a mere matter of bolts and screws, with plenty of tools to manage them. In a short time the repaired disc rested on its steel buffers, like a table on its legs, or rather like a sofa seat on its springs. The new arrangement was attended with at least one disadvantage. The bottom light being covered up, a convenient view of the Moon's surface could not be had as soon as they should begin to fall in a perpendicular descent. This, however, was only a slight matter, as the side lights would permit the adventurers to enjoy quite as favorable a view of the vast regions of the Moon as is afforded to balloon travellers when looking down on the Earth over the sides of their car.

The disc arrangement was completed in about an hour, but it was not till past twelve o'clock before things were restored to their usual order. Barbican then tried to make fresh observations regarding the inclination of the Projectile; but to his very decided chagrin he found that it had not yet turned over sufficiently to commence the perpendicular fall: on the contrary, it even seemed to be following a curve rather parallel with that of the lunar disc. The Queen of the Stars now glittered with a light more dazzling than ever, whilst from an opposite part of the sky the glorious King of Day flooded her with his fires.

The situation began to look a little serious.

"Shall we ever get there!" asked the Captain.

"Let us be prepared for getting there, any how," was Barbican's dubious reply.

"You're a pretty pair of suspenders," said Ardan cheerily (he meant of course doubting hesitators, but his fluent command of English sometimes led him into such solecisms). "Certainly we shall get there--and perhaps a little sooner than will be good for us."

This reply sharply recalled Barbican to the task he had undertaken, and he now went to work seriously, trying to combine arrangements to break the fall. The reader may perhaps remember Ardan's reply to the Captain on the day of the famous meeting in Tampa.

Towards three o'clock every preparation was made, every possible precaution taken, and now our bold adventurers had nothing more to do than watch and wait.

The Projectile was certainly approaching the Moon. It had by this time turned over considerably under the influence of attraction, but its own original motion still followed a decidedly oblique direction. The consequence of these two forces might possibly be a tangent, line approaching the edge of the Moon's disc. One thing was certain: the Projectile had not yet commenced to fall directly towards her surface; its base, in which its centre of gravity lay, was still turned away considerably from the perpendicular.

Barbican's countenance soon showed perplexity and even alarm. His Projectile was proving intractable to the laws of gravitation. The unknown was opening out dimly before him, the great boundless unknown of the starry plains. In his pride and confidence as a scientist, he had flattered himself with having sounded the consequence of every possible hypothesis regarding the Projectile's ultimate fate: the return to the Earth; the arrival at the Moon; and the motionless dead stop at the neutral point. But here, a new and incomprehensible fourth hypothesis, big with the terrors of the mystic infinite, rose up before his disturbed mind, like a grim and hollow ghost. After a few seconds, however, he looked at it straight in the face without wincing. His companions showed themselves just as firm. Whether it was science that emboldened Barbican, his phlegmatic stoicism that propped up the Captain, or his enthusiastic vivacity that cheered the irrepressible Ardan, I cannot exactly say. But certainly they were all soon talking over the matter as calmly as you or I would discuss the advisability of taking a sail on the lake some beautiful evening in July.

Their first remarks were decidedly peculiar and quite characteristic. Other men would have asked themselves where the Projectile was taking them to. Do you think such a question ever occurred to them? Not a bit of it. They simply began asking each other what could have been the cause of this new and strange state of things.

"Off the track, it appears," observed Ardan. "How's that?"

"My opinion is," answered the Captain, "that the Projectile was not aimed true. Every possible precaution had been taken, I am well aware, but we all know that an inch, a line, even the tenth part of a hair's breadth wrong at the start would have sent us thousands of miles off our course by this time."

not prepared to meet the future with a bold and manly heart. It was his inability to answer his own question that rendered him uneasy. What had switched them off? He would have given worlds for an answer, but his brain sorely puzzled sought one in vain.

In the mean time, the Projectile continued to turn its side rather than its base towards the Moon; that is, to assume a lateral rather than a direct movement, and this movement was fully participated in by the multitude of the objects that had been thrown outside. Barbican could even convince himself by sighting several points on the lunar surface, by this time hardly more than fifteen or eighteen thousand miles distant, that the velocity of the Projectile instead of accelerating was becoming more and more uniform. This was another proof that there was no perpendicular fall. However, though the original impulsive force was still superior to the Moon's attraction, the travellers were evidently approaching the lunar disc, and there was every reason to hope that they would at last reach a point where, the lunar attraction at last having the best of it, a decided fall should be the result.

The three friends, it need hardly be said, continued to make their observations with redoubled interest, if redoubled interest were possible. But with all their care they could as yet determine nothing regarding the topographical details of our radiant satellite. Her surface still reflected the solar rays too dazzlingly to show the relief necessary for satisfactory observation.

Our travellers kept steadily on the watch looking out of the side lights, till eight o'clock in the evening, by which time the Moon had grown so large in their eyes that she covered up fully half the sky. At this time the Projectile itself must have looked like a streak of light, reflecting, as it did, the Sun's brilliancy on the one side and the Moon's splendor on the other.

Barbican now took a careful observation and calculated that they could not be much more than 2,000 miles from the object of their journey. The velocity of the Projectile he calculated to be about 650 feet per second or 450 miles an hour. They had therefore still plenty of time to reach the Moon in about four hours. But though the bottom of the Projectile continued to turn towards the lunar surface in obedience to the law of centripetal force, the centrifugal force was still evidently strong enough to change the path which it followed into some kind of curve, the exact nature of which would be exceedingly difficult to calculate.

The careful observations that Barbican continued to take did not however

"Right again, Captain," observed Barbican. "But just remember an observation of your own made this very afternoon: an inch, a line, even the tenth part of a hair's breadth wrong at the beginning, in a journey of 240 thousand miles, would be sufficient to make us miss the Moon!"

could not make out the topographical details of the Moon with any satisfaction by their unaided vision. The eye indeed could easily enough catch the rugged outline of these vast depressions improperly called "Seas," but it could do very little more. Its powers of adjustability seemed to fail before the strange and bewildering scene. The prominence of the mountains vanished, not only through the foreshortening, but also in the dazzling radiation produced by the direct reflection of the solar rays. After a short time therefore, completely foiled by the blinding glare, the eye turned itself unwillingly away, as if from a furnace of molten silver.

The spherical surface, however, had long since begun to reveal its convexity. The Moon was gradually assuming the appearance of a gigantic egg with the smaller end turned towards the Earth. In the earlier days of her formation, while still in a state of mobility, she had been probably a perfect sphere in shape, but, under the influence of terrestrial gravity operating for uncounted ages, she was drawn at last so much towards the centre of attraction as to resemble somewhat a prolate spheroid. By becoming a satellite, she had lost the native perfect regularity of her outline; her centre of gravity had shifted from her real centre; and as a result of this arrangement, some scientists have drawn the conclusion that the Moon's air and water have been attracted to that portion of her surface which is always invisible to the inhabitants of the Earth.

The convexity of her outline, this bulging prominence of her surface, however, did not last long. The travellers were getting too near to notice it. They were beginning to survey the Moon as balloonists survey the Earth. The Projectile was now moving with great rapidity--with nothing like its initial velocity, but still eight or nine times faster than an express train. Its line of movement, however, being oblique instead of direct, was so deceptive as to induce Ardan to flatter himself that they might still reach the lunar surface. He could never persuade himself to believe that they should get so near their aim and still miss it. No; nothing might, could, would or should induce him to believe it, he repeated again and again. But Barbican's pitiless logic left him no reply.

"No, dear friend, no. We can reach the Moon only by a fall, and we don't fall. Centripetal force keeps us at least for a while under the lunar influence, but centrifugal force drives us away irresistibly."

These words were uttered in a tone that killed Ardan's last and fondest hope.

* * * * *

retrospective glance on the former Observers of the Moon.

The first of these was Galileo. His slight telescope magnified only thirty times, still, in the spots flecking the lunar surface, like the eyes checkering a peacock's tail, he was the first to discover mountains and even to measure their heights. These, considering the difficulties under which he labored, were wonderfully accurate, but unfortunately he made no map embodying his observations.

A few years afterwards, Hevel of Dantzic, (1611-1688) a Polish astronomer--more generally known as Hevelius, his works being all written in Latin--undertook to correct Galileo's measurements. But as his method could be strictly accurate only twice a month--the periods of the first and second quadratures--his rectifications could be hardly called successful.

Still it is to the labors of this eminent astronomer, carried on uninterruptedly for fifty years in his own observatory, that we owe the first map of the Moon. It was published in 1647 under the name of *Selenographia*. He represented the circular mountains by open spots somewhat round in shape, and by shaded figures he indicated the vast plains, or, as he called them, the seas, that occupied so much of her surface. These he designated by names taken from our Earth. His map shows you a Mount Sinai the midst of an Arabia, an *Ætna* in the centre of a Sicily, Alps, Apennines, Carpathians, a Mediterranean, a Palus Mæolis, a Pontus Euxinus, and a Caspian Sea. But these names seem to have been given capriciously and at random, for they never recall any resemblance existing between themselves and their namesakes on our globe. In the wide open spot, for instance, connected on the south with vast continents and terminating in a point, it would be no easy matter to recognize the reversed image of the Indian Peninsula, the Bay of Bengal, and Cochin China. Naturally, therefore, these names were nearly all soon dropped; but another system of nomenclature, proposed by an astronomer better acquainted with the human heart, met with a success that has lasted to the present day.

This was Father Riccioli, a Jesuit, and (1598-1671) a contemporary of Hevelius. In his *Astronomia Reformata*, (1665), he published a rough and incorrect map of the Moon, compiled from observations made by Grimaldi of Ferrara; but in designating the mountains, he named them after eminent astronomers, and this idea of his has been carefully carried out by map makers of later times.

A third map of the Moon was published at Rome in 1666 by Dominico

optician's; to the clear and correct map prepared by Lecouturier and Chapuis in 1860; to the many beautiful pictures of the Moon in various phases of illumination obtained by the Messrs. Bond of Harvard University; to Rutherford's (of New York) unparalleled lunar photographs; and finally to Nasmyth and Carpenter's wonderful work on the Moon, illustrated by photographs of her surface in detail, prepared from models at which they had been laboring for more than a quarter of the century.

Of all these maps, pictures, and projections, Barbican had provided himself with only two--Beer and Maedler's in German, and Lecouturier and Chapuis' in French. These he considered quite sufficient for all purposes, and certainly they considerably simplified his labors as an observer.

His best optical instruments were several excellent marine telescopes, manufactured especially under his direction. Magnifying the object a hundred times, on the surface of the Earth they would have brought the Moon to within a distance of somewhat less than 2400 miles. But at the point to which our travellers had arrived towards three o'clock in the morning, and which could hardly be more than 12 or 1300 miles from the Moon, these telescopes, ranging through a medium disturbed by no atmosphere, easily brought the lunar surface to within less than 13 miles' distance from the eyes of our adventurers.

Therefore they should now see objects in the Moon as clearly as people can see the opposite bank of a river that is about 12 miles wide.

[Footnote A: In our Map of the Moon, prepared expressly for this work, we have so far improved on Beer and Maedler as to give her surface as it appears to the naked eye: that is, the north is in the north; only we must always remember that the west is and must be on the right hand .]

[Footnote B: In our Map the *Mappa Selenographica* is copied as closely and as fully as is necessary for understanding the details of the story. For further information the reader is referred to Nasmyth's late magnificent work: the MOON.]

possible that the Selenites have planted their flag on at least one of their poles, whereas the Parrys and Franklins of England, the Kanes and the Wilkeses of America, the Dumont d'Urville and the Lamberts of France, have so far met with obstacles completely insurmountable, while in search of those unknown points of our terrestrial globe.

The islands--the next feature on the Moon's surface--are exceedingly numerous. Generally oblong or circular in shape and almost as regular in outline as if drawn with a compass, they form vast archipelagoes like the famous group lying between Greece and Asia Minor, which mythology has made the scene of her earliest and most charming legends. As we gaze at them, the names of Naxos, Tenedos, Milo, and Carpathos rise up before our mind's eye, and we begin looking around for the Trojan fleet and Jason's Argo. This, at least, was Ardan's idea, and at first his eyes would see nothing on the map but a Grecian archipelago. But his companions, sound practical men, and therefore totally devoid of sentiment, were reminded by these rugged coasts of the beetling cliffs of New Brunswick and Nova Scotia; so that, where the Frenchman saw the tracks of ancient heroes, the Americans saw only commodious shipping points and favorable sites for trading posts--all, of course, in the purest interest of lunar commerce and industry.

To end our hasty sketch of the continental portion of the Moon, we must say a few words regarding her orthography or mountain systems. With a fair telescope you can distinguish very readily her mountain chains, her isolated mountains, her circuses or ring formations, and her rills, cracks and radiating streaks. The character of the whole lunar relief is comprised in these divisions. It is a surface prodigiously reticulated, upheaved and depressed, apparently without the slightest order or system. It is a vast Switzerland, an enormous Norway, where everything is the result of direct plutonic action. This surface, so rugged, craggy and wrinkled, seems to be the result of successive contractions of the crust, at an early period of the planet's existence. The examination of the lunar disc is therefore highly favorable for the study of the great geological phenomena of our own globe. As certain astronomers have remarked, the Moon's surface, though older than the Earth's, has remained younger. That is, it has undergone less change. No water has broken through its rugged elevations, filled up its scowling cavities, and by incessant action tended continuously to the production of a general level. No atmosphere, by its disintegrating, decomposing influence has softened off the rugged features of the plutonic mountains. Volcanic action alone, unaffected by either aqueous or atmospheric forces, can here be seen in all its glory. In other words the Moon looks now as our Earth did endless ages ago, when "she was void and empty and when darkness sat upon the face of the deep;" eons of ages ago,

forth no real illumination to guide our stumbling feet, whose sun-tipped pinnacles have less substance than a dream, whose enchanting waters all evaporate before we can lift a cup-full to our parched lips! Showers, storms, fogs, rainbows--is not the whole mortal life of man comprised in these four words?

Now turn to the hemisphere on the right, the women's side, and you also discover "seas," more numerous indeed, but of smaller dimensions and with gentler names, as more befitting the feminine temperament. First comes Mare Serenitatis , the Sea of Serenity, so expressive of the calm, tranquil soul of an innocent maiden. Near it is Lacus Somniorum , the Lake of Dreams, in which she loves to gaze at her gilded and rosy future. In the southern division is seen Mare Nectaris , the Sea of Nectar, over whose soft heaving billows she is gently wafted by Love's caressing winds, "Youth on the prow and Pleasure at the helm." Not far off is Mare Fecunditatis , the Sea of Fertility, in which she becomes the happy mother of rejoicing children. A little north is Mare Crisium , the Sea of Crises where her life and happiness are sometimes exposed to sudden, and unexpected dangers which fortunately, however, seldom end fatally. Far to the left, near the men's side, is Mare Vaporum , the Sea of Vapors, into which, though it is rather small, and full of sunken rocks, she sometimes allows herself to wander, moody, and pouting, and not exactly knowing where she wants to go or what she wants to do. Between the two last expands the great Mare Tranquillitatis , the Sea of Tranquillity, into whose quiet depths are at last absorbed all her simulated passions, all her futile aspirations, all her unglutted desires, and whose unruffled waters are gliding on forever in noiseless current towards Lacus Mortis , the Lake of Death, whose misty shores

"In ruthless, vast, and gloomy woods are girt."

So at least Ardan mused as he stooped over Beer and Maedler's map. Did not these strange successive names somewhat justify his flights of fancy? Surely they had a wonderful variety of meaning. Was it by accident or by forethought deep that the two hemispheres of the Moon had been thus so strangely divided, yet, as man to woman, though divided still united, and thus forming even in the cold regions of space a perfect image of our terrestrial existence? Who can say that our romantic French friend was altogether wrong in thus explaining the astute fancies of the old astronomers?

His companions, however, it need hardly be said, never saw the "seas" in that light. They looked on them not with sentimental but with geographical

mean latitude of 15° south and a longitude of 35° west. Southwest from Mare Tranquillitatis, lies Mare Fecunditatis, the Sea of Fertility, the greatest in this hemisphere, as it occupies an extent of more than 300 thousand square miles, its latitude being 3° south and its longitude 50° west. Far away to the north, on the borders of the Mare Frigoris, or Icy Sea, is seen the small Mare Humboldtianum, or Humboldt Sea, with a surface of about 10 thousand square miles. Corresponding to this in the southern hemisphere lies the Mare Australe, or South Sea, whose surface, as it extends along the western rim, is rather difficult to calculate. Finally, right in the centre of the lunar disc, where the equator intersects the first meridian, can be seen Sinus Medii, the Central Gulf, the common property therefore of all the hemispheres, the northern and southern, as well as of the eastern and western.

Into these great divisions the surface of our satellite resolved itself before the eyes of Barbican and M'Nicholl. Adding up the various measurements, they found that the surface of her visible hemisphere was about 7-1/2 millions of square miles, of which about the two thirds comprised the volcanoes, the mountain chains, the rings, the islands--in short, the land portion of the lunar surface; the other third comprised the "seas," the "lakes," the "marshes," the "bays" or "gulfs," and the other divisions usually assigned to water.

To all this deeply interesting information, though the fruit of observation the closest, aided and confirmed by calculation the profoundest, Ardan listened with the utmost indifference. In fact, even his French politeness could not suppress two or three decided yawns, which of course the mathematicians were too absorbed to notice.

In their enthusiasm they tried to make him understand that though the Moon is 13-1/2 times smaller than our Earth, she can show more than 50 thousand craters, which astronomers have already counted and designated by specific names.

"To conclude this portion of our investigation therefore," cried Barbican, clearing his throat, and occupying Ardan's right ear,--"the Moon's surface is a honey combed, perforated, punctured--"

"A fistulous, a rugose, salebrous,--" cut in the Captain, close on the left.

--"And highly cribriform superficies--" cried Barbican.

--"A sieve, a riddle, a colander--" shouted the Captain.

CHAPTER XII - A BIRD'S EYE VIEW OF THE LUNAR MOUNTAINS.

I am rather inclined to believe myself that not one word of Ardan's rhapsody had been ever heard by Barbican or M'Nicholl. Long before he had spoken his last words, they had once more become mute as statues, and now were both eagerly watching, pencil in hand, spyglass to eye, the northern lunar hemisphere towards which they were rapidly but indirectly approaching. They had fully made up their minds by this time that they were leaving far behind them the central point which they would have probably reached half an hour ago if they had not been shunted off their course by that inopportune bolide.

About half past twelve o'clock, Barbican broke the dead silence by saying that after a careful calculation they were now only about 875 miles from the Moon's surface, a distance two hundred miles less in length than the lunar radius, and which was still to be diminished as they advanced further north. They were at that moment ten degrees north of the equator, almost directly over the ridge lying between the Mare Serenitatis and the Mare Tranquillitatis. From this latitude all the way up to the north pole the travellers enjoyed a most satisfactory view of the Moon in all directions and under the most favorable conditions. By means of their spyglasses, magnifying a hundred times, they cut down this distance of 875 miles to about 9. The great telescope of the Rocky Mountains, by its enormous magnifying power of 48,000, brought the Moon, it is true, within a distance of 5 miles, or nearly twice as near; but this advantage of nearness was considerably more than counterbalanced by a want of clearness, resulting from the haziness and refractiveness of the terrestrial atmosphere, not to mention those fatal defects in the reflector that the art of man has not yet succeeded in remedying. Accordingly, our travellers, armed with excellent telescopes--of just power enough to be no injury to clearness,--and posted on unequalled vantage ground, began already to distinguish certain details that had probably never been noticed before by terrestrial observers. Even Ardan, by this time quite recovered from his fit of sentiment and probably infected a little by the scientific enthusiasm of his companions, began to observe and note and observe and note, alternately, with all the sangfroid of a veteran astronomer.

"Friends," said Barbican, again interrupting a silence that had lasted perhaps ten minutes, "whither we are going I can't say; if we shall ever revisit the Earth, I can't tell. Still, it is our duty so to act in all respects as if these labors of ours were one day to be of service to our fellow-creatures. Let

"Where are we now?" asked Ardan.

"Over the northern shores of the Mare Nubium," replied Barbican. "But we are still too far off to see with any certainty what they are like. What is the Mare itself? A sea, according to the early astronomers? a plain of solid sand, according to later authority? or an immense forest, according to De la Rue of London, so far the Moon's most successful photographer? This gentleman's authority, Ardan, would have given you decided support in your famous dispute with the Captain at the meeting near Tampa, for he says very decidedly that the Moon has an atmosphere, very low to be sure but very dense. This, however, we must find out for ourselves; and in the meantime let us affirm nothing until we have good grounds for positive assertion."

Mare Nubium, though not very clearly outlined on the maps, is easily recognized by lying directly east of the regions about the centre. It would appear as if this vast plain were sprinkled with immense lava blocks shot forth from the great volcanoes on the right, Ptolemaeus, Alphonse, Alpetragius and Arzachel. But the Projectile advanced so rapidly that these mountains soon disappeared, and the travellers were not long before they could distinguish the great peaks that closed the "Sea" on its northern boundary. Here a radiating mountain showed a summit so dazzling with the reflection of the solar rays that Ardan could not help crying out:

"It looks like one of the carbon points of an electric light projected on a screen! What do you call it, Barbican?"

"Copernicus," replied the President. "Let us examine old Copernicus!"

This grand crater is deservedly considered one of the greatest of the lunar wonders. It lifts its giant ramparts to upwards of 12,000 feet above the level of the lunar surface. Being quite visible from the Earth and well situated for observation, it is a favorite object for astronomical study; this is particularly the case during the phase existing between Last Quarter and the New Moon, when its vast shadows, projected boldly from the east towards the west, allow its prodigious dimensions to be measured.

After Tycho, which is situated in the southern hemisphere, Copernicus forms the most important radiating mountain in the lunar disc. It looms up, single and isolated, like a gigantic light-house, on the peninsula separating Mare Nubium from Oceanus Procellarum on one side and from Mare Imbrium on the other; thus illuminating with its splendid radiation three

"What can be the cause of this peculiarity?" asked M'Nicholl.

"I can't tell;" answered Barbican, "but, as a conjecture, I should say that it is probably to the comparatively smaller area of the Moon and the more violent character of her volcanic action that the extremely rugged character of her surface is mainly due."

"Why, it's the Campi Phlegraei or the Fire Fields of Naples over again!" cried Ardan suddenly. "There's Monte Barbaro, there's the Solfatara, there is the crater of Astroni, and there is the Monte Nuovo, as plain as the hand on my body!"

"The great resemblance between the region you speak of and the general surface of the Moon has been often remarked;" observed Barbican, "but it is even still more striking in the neighborhood of Theophilus on the borders of Mare Nectaris."

"That's Mare Nectaris, the gray spot over there on the southwest, isn't it?" asked M'Nicholl; "is there any likelihood of our getting a better view of it?"

"Not the slightest," answered Barbican, "unless we go round the Moon and return this way, like a satellite describing its orbit."

By this time they had arrived at a point vertical to the mountain centre. Copernicus's vast ramparts formed a perfect circle or rather a pair of concentric circles. All around the mountain extended a dark grayish plain of savage aspect, on which the peak shadows projected themselves in sharp relief. In the gloomy bottom of the crater, whose dimensions are vast enough to swallow Mont Blanc body and bones, could be distinguished a magnificent group of cones, at least half a mile in height and glittering like piles of crystal. Towards the north several breaches could be seen in the ramparts, due probably to a caving in of immense masses accumulated on the summit of the precipitous walls.

As already observed, the surrounding plains were dotted with numberless craters mostly of small dimensions, except Gay Lussac on the north, whose crater was about 12 miles in diameter. Towards the southwest and the immediate east, the plain appeared to be very flat, no protuberance, no prominence of any kind lifting itself above the general dead level. Towards the north, on the contrary, as far as where the peninsula jutted on Oceanus Procellarum, the plain looked like a sea of lava wildly lashed for a while by a furious hurricane and then, when its waves and breakers and driving ridges

M'Nicholl.

"Correct, Captain," replied the Frenchman; "Barbican has a trick of knocking the bottom out of every weaker vessel. But let us hear what he has to say on the subject himself. What is your theory. Barbican?"

"My theory," said Barbican, "is pretty much the same as that lately presented by an English astronomer, Nasmyth, who has devoted much study and reflection to lunar matters. Of course, I only formulate my theory, I don't affirm it. These streaks are cracks, made in the Moon's surface by cooling or by shrinkage, through which volcanic matter has been forced up by internal pressure. The sinking ice of a frozen lake, when meeting with some sharp pointed rock, cracks in a radiating manner: every one of its fissures then admits the water, which immediately spreads laterally over the ice pretty much as the lava spreads itself over the lunar surface. This theory accounts for the radiating nature of the streaks, their great and nearly equal thickness, their immense length, their inability to cast a shadow, and their invisibility at any time except at or near the Full Moon. Still it is nothing but a theory, and I don't deny that serious objections may be brought against it."

"Do you know, dear boys," cried Ardan, led off as usual by the slightest fancy, "do you know what I am thinking of when I look down on the great rugged plains spread out beneath us?"

"I can't say, I'm sure," replied Barbican, somewhat piqued at the little attention he had secured for his theory.

"Well, what are you thinking of?" asked M'Nicholl.

"Spillikins!" answered Ardan triumphantly.

"Spillikins?" cried his companions, somewhat surprised.

"Yes, Spillikins! These rocks, these blocks, these peaks, these streaks, these cones, these cracks, these ramparts, these escarpments,--what are they but a set of spillikins, though I acknowledge on a grand scale? I wish I had a little hook to pull them one by one!"

"Oh, do be serious, Ardan!" cried Barbican, a little impatiently.

"Certainly," replied Ardan. "Let us be serious, Captain, since seriousness best befits the subject in hand. What do you think of another comparison?"

to dig a well in Stony Hill only nine hundred feet deep. To dig out a single lunar crater would take hundreds and hundreds of years, and even then they should be giants who would attempt it!"

"Why so?" asked Ardan. "In the Moon, where gravity is six times less than on the Earth, the labor of the Selenites can't be compared with that of men like us."

"But suppose a Selenite to be six times smaller than a man like us!" urged M'Nicholl.

"And suppose a Selenite never had an existence at all!" interposed Barbican with his usual success in putting an end to the argument. "But never mind the Selenites now. Observe Eratosthenes as long as you have the opportunity."

"Which will not be very long," said M'Nicholl. "He is already sinking out of view too far to the right to be carefully observed."

"What are those peaks beyond him?" asked Ardan.

"The Apennines," answered Barbican; "and those on the left are the Carpathians."

"I have seen very few mountain chains or ranges in the Moon," remarked Ardan, after some minutes' observation.

"Mountains chains are not numerous in the Moon," replied Barbican, "and in that respect her oreographic system presents a decided contrast with that of the Earth. With us the ranges are many, the craters few; in the Moon the ranges are few and the craters innumerable."

Barbican might have spoken of another curious feature regarding the mountain ranges: namely, that they are chiefly confined to the northern hemisphere, where the craters are fewest and the "seas" the most extensive.

For the benefit of those interested, and to be done at once with this part of the subject, we give in the following little table a list of the chief lunar mountain chains, with their latitude, and respective heights in English feet.

Name.	Degrees of Latitude.	Height.
{ Altai Mountains	17° to 28	13,000ft. Southern {

750 miles, reduced to about 7 by means of their excellent telescopes.

Mare Imbrium , the Sea of Rains here revealed itself in all its vastness to the eyes of the travellers, though it must be acknowledged that the immense depression so called, did not afford them a very clear idea regarding its exact boundaries. Right ahead of them rose Lambert about a mile in height; and further on, more to the left, in the direction of Oceanus Procellarum , Euler revealed itself by its glittering radiations. This mountain, of about the same height as Lambert , had been the object of very interesting calculations on the part of Schroeter of Erfurt. This keen observer, desirous of inquiring into the probable origin of the lunar mountains, had proposed to himself the following question: Does the volume of the crater appear to be equal to that of the surrounding ramparts? His calculations showing him that this was generally the case, he naturally concluded that these ramparts must therefore have been the product of a single eruption, for successive eruptions of volcanic matter would have disturbed this correlation. Euler alone, he found, to be an exception to this general law, as the volume of its crater appeared to be twice as great as that of the mass surrounding it. It must therefore have been formed by several eruptions in succession, but in that case what had become of the ejected matter?

Theories of this nature and all manner of scientific questions were, of course, perfectly permissible to terrestrial astronomers laboring under the disadvantage of imperfect instruments. But Barbican could not think of wasting his time in any speculation of the kind, and now, seeing that his Projectile perceptibly approached the lunar disc, though he despaired of ever reaching it, he was more sanguine than ever of being soon able to discover positively and unquestionably some of the secrets of its formation.

[Footnote C: We must again remind our readers that, in our map, though every thing is set down as it appears to the eye not as it is reversed by the telescope, still, for the reason made so clear by Barbican, the right hand side must be the west and the left the east.]

bluish tinge, somewhat like that given forth by a freshly polished steel plate. These tints, he now saw enough to convince him, proceeded really from the lunar surface, and were not due, as certain astronomers asserted, either to the imperfections of the spy-glasses, or to the interference of the terrestrial atmosphere. His singular opportunity for correct observation allowed him to entertain no doubt whatever on the subject. Hampered by no atmosphere, he was free from all liability to optical illusion. Satisfied therefore as to the reality of these tints, he considered such knowledge a positive gain to science. But that greenish tint--to what was it due? To a dense tropical vegetation maintained by a low atmosphere, a mile or so in thickness? Possibly. But this was another question that could not be answered at present.

Further on he could detect here and there traces of a decidedly ruddy tint. Such a shade he knew had been already detected in the Palus Somnii, near Mare Crisium, and in the circular area of Lichtenberg, near the Hercynian Mountains, on the eastern edge of the Moon. To what cause was this tint to be attributed? To the actual color of the surface itself? Or to that of the lava covering it here and there? Or to the color resulting from the mixture of other colors seen at a distance too great to allow of their being distinguished separately? Impossible to tell.

Barbican and his companions succeeded no better at a new problem that soon engaged their undivided attention. It deserves some detail.

Having passed Lambert, being just over Timocharis, all were attentively gazing at the magnificent crater of Archimedes with a diameter of 52 miles across and ramparts more than 5000 feet in height, when Ardan startled his companions by suddenly exclaiming:

"Hello! Cultivated fields as I am a living man!"

"What do you mean by your cultivated fields?" asked M'Nicholl sourly, wiping his glasses and shrugging his shoulders.

"Certainly cultivated fields!" replied Ardan. "Don't you see the furrows? They're certainly plain enough. They are white too from glistening in the sun, but they are quite different from the radiating streaks of Copernicus. Why, their sides are perfectly parallel!"

"Where are those furrows?" asked M'Nicholl, putting his glasses to his eye and adjusting the focus.

seem to have noticed them. Neither Hevelius, nor Cassini, nor La Hire, nor Herschel, makes a single remark regarding their nature.

It was Schroeter, in 1789, who called the attention of scientists to them for the first time. He had only 11 to show, but Lohrmann soon recorded 75 more. Pastorff, Gruithuysen, and particularly Beer and Maedler were still more successful, but Julius Schmidt, the famous astronomer of Athens, has raised their number up to 425, and has even published their names in a catalogue. But counting them is one thing, determining their nature is another. They are not fortifications, certainly: and cannot be ancient beds of dried up rivers, for two very good and sufficient reasons: first, water, even under the most favorable circumstances on the Moon's surface, could have never ploughed up such vast channels; secondly, these chasms often traverse lofty craters through and through, like an immense railroad cutting.

At these details, Ardan's imagination became unusually excited and of course it was not without some result. It even happened that he hit on an idea that had already suggested itself to Schmidt of Athens.

"Why not consider them," he asked, "to be the simple phenomena of vegetation?"

"What do you mean?" asked Barbican.

"Rows of sugar cane?" suggested M'Nicholl with a snicker.

"Not exactly, my worthy Captain," answered Ardan quietly, "though you were perhaps nearer to the mark than you expected. I don't mean exactly rows of sugar cane, but I do mean vast avenues of trees--poplars, for instance--planted regularly on each side of a great high road."

"Still harping on vegetation!" said the Captain. "Ardan, what a splendid historian was spoiled in you! The less you know about your facts, the readier you are to account for them."

"Ma foi," said Ardan simply, "I do only what the greatest of your scientific men do--that is, guess. There is this difference however between us--I call my guesses, guesses, mere conjecture;--they dignify theirs as profound theories or as astounding discoveries!"

"Often the case, friend Ardan, too often the case," said Barbican.

relation? See that other mighty rill , at least a hundred and fifty miles long, starting directly north of it and pursuing so true a course that it cleaves Archimedes almost cleanly into two. The nearer it lies to the mountain, as you perceive, the greater its width; as it recedes in either direction it grows narrower. Does not everything point out to one great cause of their origin? They are simple crevasses, like those so often noticed on Alpine glaciers, only that these tremendous cracks in the surface are produced by the shrinkage of the crust consequent on cooling. Can we point out some analogies to this on the Earth? Certainly. The defile of the Jordan, terminating in the awful depression of the Dead Sea, no doubt occurs to you on the moment. But the Yosemite Valley , as I saw it ten years ago, is an apter comparison. There I stood on the brink of a tremendous chasm with perpendicular walls, a mile in width, a mile in depth and eight miles in length. Judge if I was astounded! But how should we feel it, when travelling on the lunar surface, we should suddenly find ourselves on the brink of a yawning chasm two miles wide, fifty miles long, and so fathomless in sheer vertical depth as to leave its black profundities absolutely invisible in spite of the dazzling sunlight!"

"I feel my flesh already crawling even in the anticipation!" cried Ardan.

"I shan't regret it much if we never get to the Moon," growled M'Nicholl; "I never hankered after it anyhow!"

By this time the Projectile had reached the fortieth degree of lunar latitude, and could hardly be further than five hundred miles from the surface, a distance reduced to about 5 miles by the travellers' glasses. Away to their left appeared Helicon , a ring mountain about 1600 feet high; and still further to the left the eye could catch a glimpse of the cliffs enclosing a semi-elliptical portion of Mare Imbrium , called the Sinus Iridium , or Bay of the Rainbows.

In order to allow astronomers to make complete observations on the lunar surface, the terrestrial atmosphere should possess a transparency seventy times greater than its present power of transmission. But in the void through which the Projectile was now floating, no fluid whatever interposed between the eye of the observer and the object observed. Besides, the travellers now found themselves at a distance that had never before been reached by the most powerful telescopes, including even Lord Rosse's and the great instrument on the Rocky Mountains. Barbican was therefore in a condition singularly favorable to resolve the great question concerning the Moon's inhabiteness. Nevertheless, the solution still escaped him. He could discover nothing around him but a dreary waste of immense plains,

account of its comparative isolation. See the collection of perfectly formed little craters nestling around its base."

"Barbican," asked M'Nicholl suddenly, "what peak is that which lies almost directly south of Pico ? I see it plainly, but I can't find it on my map."

"I have remarked that pyramidal peak myself," replied Barbican; "but I can assure you that so far it has received no name as yet, although it is likely enough to have been distinguished by the terrestrial astronomers. It can't be less than 4000 feet in height."

"I propose we called it Barbican !" cried Ardan enthusiastically.

"Agreed!" answered M'Nicholl, "unless we can find a higher one."

"We must be before-hand with Schmidt of Athens!" exclaimed Ardan. "He will leave nothing unnamed that his telescope can catch a glimpse of."

"Passed unanimously!" cried M'Nicholl.

"And officially recorded!" added the Frenchman, making the proper entry on his map.

"Salve, Mt. Barbican!" then cried both gentlemen, rising and taking off their hats respectfully to the distant peak.

"Look to the west!" interrupted Barbican, watching, as usual, while his companions were talking, and probably perfectly unconscious of what they were saying; "directly to the west! Now tell me what you see!"

"I see a vast valley!" answered M'Nicholl.

"Straight as an arrow!" added Ardan.

"Running through lofty mountains!" cried M'Nicholl.

"Cut through with a pair of saws and scooped out with a chisel!" cried Ardan.

"See the shadows of those peaks!" cried M'Nicholl catching fire at the sight. "Black, long, and sharp as if cast by cathedral spires!"

"Oh! ye crags and peaks!" burst forth Ardan; "how I should like to catch even

Towards five in the morning, the northern limit of Mare Imbrium was finally passed, and Mare Frigoris spread its frost-colored plains far to the right and left. On the east the travellers could easily see the ring-mountain Condamine, about 4000 feet high, while a little ahead on the right they could plainly distinguish Fontenelle with an altitude nearly twice as great. Mare Frigoris was soon passed, and the whole lunar surface beneath the travellers, as far as they could see in all directions, now bristled with mountains, crags, and peaks. Indeed, at the 70th parallel the "Seas" or plains seem to have come to an end. The spy-glasses now brought the surface to within about three miles, a distance less than that between the hotel at Chamouni and the summit of Mont Blanc. To the left, they had no difficulty in distinguishing the ramparts of Philolaus, about 12,000 feet high, but though the crater had a diameter of nearly thirty miles, the black shadows prevented the slightest sign of its interior from being seen. The Sun was now sinking very low, and the illuminated surface of the Moon was reduced to a narrow rim.

By this time, too, the bird's eye view to which the observations had so far principally confined, decidedly altered its character. They could now look back at the lunar mountains that they had been just sailing over--a view somewhat like that enjoyed by a tourist standing on the summit of Mt. St. Gothard as he sees the sun setting behind the peaks of the Bernese Oberland. The lunar landscapes however, though seen under these new and ever varying conditions, "hardly gained much by the change," according to Ardan's expression. On the contrary, they looked, if possible, more dreary and inhospitable than before.

The Moon having no atmosphere, the benefit of this gaseous envelope in softening off and nicely shading the approaches of light and darkness, heat and cold, is never felt on her surface. There, no twilight ever softly ushers in the brilliant sun, or sweetly heralds the near approach of night's dark shadow. Night follows day, and day night, with the startling suddenness of a match struck or a lamp extinguished in a cavern. Nor can it present any gradual transition from either extreme of temperature. Hot jumps to cold, and cold jumps to hot. A moment after a glacial midnight, it is a roasting noon. Without an instant's warning the temperature falls from 212° Fahrenheit to the icy winter of interstellar space. The surface is all dazzling glare, or pitchy gloom. Wherever the direct rays of the sun do not fall, darkness reigns supreme. What we call diffused light on Earth, the grateful result of refraction, the luminous matter held in suspension by the air, the mother of our dawns and our dusks, of our blushing mornings and our dewy eyes, of our shades, our penumbras, our tints and all the other

Ardan, unwilling to quarrel with his companions, appeared to give in; but he secretly consoled himself by a hope which he had been entertaining for some time, and which now looked like assuming the appearance of a certainty. The Projectile had been lately approaching the Moon's surface so rapidly that it at last seemed actually impossible not to finally touch it somewhere in the neighborhood of the north pole, whose dazzling ridges now presented themselves in sharp and strong relief against the black sky. Therefore he kept silent, but quietly bided his time.

The Projectile moved on, evidently getting nearer and nearer to the lunar surface. The Moon now appeared to the travellers as she does to us towards the beginning of her Second Quarter, that is as a bright crescent instead of a hemisphere. On one side, glaring dazzling light; on the other, cavernous pitchy darkness. The line separating both was broken into a thousand bits of protuberances and concavities, dented, notched, and jagged.

At six o'clock the travellers found themselves exactly over the north pole. They were quietly gazing at the rapidly shifting features of the wondrous view unrolling itself beneath them, and were silently wondering what was to come next, when, suddenly, the Projectile passed the dividing line. The Sun and Moon instantly vanished from view. The next moment, without the slightest warning the travellers found themselves plunged in an ocean of the most appalling darkness!

"You mean it's all the Moon's fault, don't you, in setting herself like a screen between us and the Sun?"

"No, I don't!" cried Ardan, not at all soothed by his friend's patronizing tone, and sticking like a man to his first assertion right or wrong. "I know what I say! It will be all the Sun's fault if we use up our gas!"

"Nonsense!" said M'Nicholl. "It's the Moon, who by her interposition has cut off the Sun's light."

"The Sun had no business to allow it to be cut off," said Ardan, still angry and therefore decidedly loose in his assertions.

Before M'Nicholl could reply, Barbican interposed, and his even voice was soon heard pouring balm on the troubled waters.

"Dear friends," he observed, "a little reflection on either side would convince you that our present situation is neither the Moon's fault nor the Sun's fault. If anything is to be blamed for it, it is our Projectile which, instead of rigidly following its allotted course, has awkwardly contrived to deviate from it. However, strict justice must acquit even the Projectile. It only obeyed a great law of nature in shifting its course as soon as it came within the sphere of that inopportune bolide's influence."

"All right!" said Ardan, as usual in the best of humor after Barbican had laid down the law. "I have no doubt it is exactly as you say; and, now that all is settled, suppose we take breakfast. After such a hard night spent in work, a little refreshment would not be out of place!"

Such a proposition being too reasonable even for M'Nicholl to oppose, Ardan turned on the gas, and had everything ready for the meal in a few minutes. But, this time, breakfast was consumed in absolute silence. No toasts were offered, no hurrahs were uttered. A painful uneasiness had seized the hearts of the daring travellers. The darkness into which they were so suddenly plunged, told decidedly on their spirits. They felt almost as if they had been suddenly deprived of their sight. That thick, dismal savage blackness, which Victor Hugo's pen is so fond of occasionally revelling in, surrounded them on all sides and crushed them like an iron shroud.

It was felt worse than ever when, breakfast being over, Ardan carefully turned off the gas, and everything within the Projectile was as dark as without. However, though they could not see each other's faces, they could hear each other's voices, and therefore they soon began to talk. The most

therefore shedding thirteen times as much light. This would be our Earth. It would pass through all its phases too, exactly like our Satellite. The Selenites would have their New Earth, Full Earth, and Last Quarter. At midnight, grandly illuminated, it would shine with the greatest glory. But that is almost as much as can be said for it. Its futile heat would but poorly compensate for its superior radiance. All the calorie accumulated in the lunar soil during the 354 hours day would have by this time radiated completely into space. An intensity of cold would prevail, in comparison to which a Greenland winter is tropical. The temperature of interstellar space, 250° below zero, would be reached. Our Selenite, heartily tired of the cold pale Earth, would gladly see her sink towards the horizon, waning as she sank, till at last she appeared no more than half full. Then suddenly a faint rim of the solar orb reveals itself on the edge of the opposite sky. Slowly, more than 14 times more slowly than with us, does the Sun lift himself above the lunar horizon. In half an hour, only half his disc is revealed, but that is more than enough to flood the lunar landscape with a dazzling intensity of light, of which we have no counterpart on Earth. No atmosphere refracts it, no hazy screen softens it, no enveloping vapor absorbs it, no obstructing medium colors it. It breaks on the eye, harsh, white, dazzling, blinding, like the electric light seen a few yards off. As the hours wear away, the more blasting becomes the glare; and the higher he rises in the black sky, but slowly, slowly. It takes him seven of our days to reach the meridian. By that time the heat has increased from an arctic temperature to double the boiling water point, from 250° below zero to 500° above it, or the point at which tin melts. Subjected to these extremes, the glassy rocks crack, shiver and crumble away; enormous land slides occur; peaks topple over; and tons of debris, crashing down the mountains, are swallowed up forever in the yawning chasms of the bottomless craters."

"Bravo!" cried Ardan, clapping his hands softly: "our President is sublime! He reminds me of the overture of Guillaume Tell!"

"Souvenir de Marston!" growled M'Nicholl.

"These phenomena," continued Barbican, heedless of interruption and his voice betraying a slight glow of excitement, "these phenomena going on without interruption from month to month, from year to year, from age to age, from eon to eon, have finally convinced me that--what?" he asked his hearers, interrupting himself suddenly.

--"That the existence at the present time--" answered M'Nicholl.

--"Of either animal or vegetable life--" interrupted Ardan.

between the Earth and the Sun. In comparison therefore with the place which she had occupied at her opposition , or when her visible side was fully illuminated, she is nearer to the Sun by double her distance from the Earth, or nearly 480 thousand miles. Therefore, my dear Captain, you can see how when the invisible side of the Moon is turned towards the Sun, she is nearly half a million of miles nearer to him than she had been before. Therefore, her heat should be so much the greater."

"I see it at a glance," said the Captain.

"Whereas--" continued Barbican.

"One moment!" cried Ardan.

"Another interruption!" exclaimed Barbican; "What is the meaning of it, Sir?"

"I ask my honorable friend the privilege of the floor for one moment," cried Ardan.

"What for?"

"To continue the explanation."

"Why so?"

"To show that I can understand as well as interrupt!"

"You have the floor!" exclaimed Barbican, in a voice no longer showing any traces of ill humor.

"I expected no less from the honorable gentleman's well known courtesy," replied Ardan. Then changing his manner and imitating to the life Barbican's voice, articulation, and gestures, he continued: "Whereas, you see, my dear Captain, the period at which the Moon's visible side receives at once its light and heat, is exactly the period of her opposition , that is to say, when she is lying on one side of the Earth and the Sun at the other. In comparison therefore with the point which she had occupied in conjunction , or when her invisible side was fully illuminated, she is farther from the Sun by double her distance from the Earth, or nearly 480,000 miles. Therefore, my dear Captain, you can readily see how when the Moon's invisible side is turned from the Sun, she is nearly half a million miles further from him than she had been before. Therefore her heat should be so much the less."

the eclipse it would not be necessary to quit the dark hemisphere altogether. You are, of course, aware that in consequence of her librations, or noddings, or wobblings, the Moon presents to the eyes of the Earth a little more than the exact half of her disc. She has two motions, one on her path around the Earth, and the other a shifting around on her own axis by which she endeavors to keep the same side always turned towards our sphere. This she cannot always do, as while one motion, the latter, is strictly uniform, the other being eccentric, sometimes accelerating her and sometimes retarding, she has not time to shift herself around completely and with perfect correspondence of movement. At her perigee, for instance, she moves forward quicker than she can shift, so that we detect a portion of her western border before she has time to conceal it. Similarly, at her apogee, when her rate of motion is comparatively slow, she shifts a little too quickly for her velocity, and therefore cannot help revealing a certain portion of her eastern border. She shows altogether about 8 degrees of the dark side, about 4 at the east and 4 at the west, so that, out of her 360 degrees, about 188, in other words, a little more than 57 per cent., about $\frac{4}{7}$ of the entire surface, becomes visible to human eyes. Consequently a Selenite could catch an occasional glimpse of our Earth, without altogether quitting the dark side."

"No matter for that!" cried Ardan; "if we ever become Selenites we must inhabit the visible side. My weak point is light, and that I must have when it can be got."

"Unless, as perhaps in this case, you might be paying too dear for it," observed M'Nicholl. "How would you like to pay for your light by the loss of the atmosphere, which, according to some philosophers, is piled away on the dark side?"

"Ah! In that case I should consider a little before committing myself," replied Ardan, "I should like to hear your opinion regarding such a notion, Barbican. Hey! Do you hear? Have astronomers any valid reasons for supposing the atmosphere to have fled to the dark side of the Moon?"

"Defer that question till some other time, Ardan," whispered M'Nicholl; "Barbican is just now thinking out something that interests him far more deeply than any empty speculation of astronomers. If you are near the window, look out through it towards the Moon. Can you see anything?"

"I can feel the window with my hand; but for all I can see, I might as well be over head and ears in a hogshead of ink."

There it lay below them, a round black spot, hiding the sweet faces of the stars, but otherwise no more distinguishable by the travellers than if they were lying in the depths of the Mammoth Cave of Kentucky. And just think. Only fifteen days before, that dark face had been splendidly illuminated by the solar beams, every crater lustrous, every peak sparkling, every streak glistening under the vertical ray. In fifteen days later, a day light the most brilliant would have replaced a midnight the most Cimmerian. But in fifteen days later, where would the Projectile be? In what direction would it have been drawn by the forces innumerable of attractions incalculable? To such a question as this, even Ardan would reply only by an ominous shake of the head.

We know already that our travellers, as well as astronomers generally, judging from that portion of the dark side occasionally revealed by the Moon's librations, were pretty certain that there is no great difference between her two sides, as far as regards their physical constitutions. This portion, about the seventh part, shows plains and mountains, circles and craters, all of precisely the same nature as those already laid down on the chart. Judging therefore from analogy, the other three-sevenths are, in all probability a world in every respect exactly like the visible face--that is, arid, desert, dead. But our travellers also knew that pretty certain is far from quite certain, and that arguing merely from analogy may enable you to give a good guess, but can never lead you to an undoubted conclusion. What if the atmosphere had really withdrawn to this dark face? And if air, why not water? Would not this be enough to infuse life into the whole continent? Why should not vegetation flourish on its plains, fish in its seas, animals in its forests, and man in every one of its zones that were capable of sustaining life? To these interesting questions, what a satisfaction it would be to be able to answer positively one way or another! For thousands of difficult problems a mere glimpse at this hemisphere would be enough to furnish a satisfactory reply. How glorious it would be to contemplate a realm on which the eye of man has never yet rested!

Great, therefore, as you may readily conceive, was the depression of our travellers' spirits, as they pursued their way, enveloped in a veil of darkness the most profound. Still even then Ardan, as usual, formed somewhat of an exception. Finding it impossible to see a particle of the Lunar surface, he gave it up for good, and tried to console himself by gazing at the stars, which now fairly blazed in the spangled heavens. And certainly never before had astronomer enjoyed an opportunity for gazing at the heavenly bodies under such peculiar advantages. How Fraye of Paris, Chacornac of Lyons, and Father Secchi of Rome would have envied him!

difficult, if not actually impossible.

The Captain, as the oldest man in the party, claimed the privilege of saying he could stand it no longer. Striking a light, he consulted the thermometer and cried out:

"Seventeen degrees below zero, centigrade! that is certainly low enough to make an old fellow like me feel rather chilly!"

"Just one degree and a half above zero, Fahrenheit!" observed Barbican; "I really had no idea that it was so cold."

His teeth actually chattered so much that he could hardly articulate; still he, as well as the others, disliked to entrench on their short supply of gas.

"One feature of our journey that I particularly admire," said Ardan, trying to laugh with freezing lips, "is that we can't complain of monotony. At one time we are frying with the heat and blinded with the light, like Indians caught on a burning prairie; at another, we are freezing in the pitchy darkness of a hyperborean winter, like Sir John Franklin's merry men in the Bay of Boothia. Madame La Nature, you don't forget your devotees; on the contrary, you overwhelm us with your attentions!"

"Our external temperature may be reckoned at how much?" asked the Captain, making a desperate effort to keep up the conversation.

"The temperature outside our Projectile must be precisely the same as that of interstellar space in general," answered Barbican.

"Is not this precisely the moment then," interposed Ardan, quickly, "for making an experiment which we could never have made as long as we were in the sunshine?"

"That's so!" exclaimed Barbican; "now or never! I'm glad you thought of it, Ardan. We are just now in the position to find out the temperature of space by actual experiment, and so see whose calculations are right, Fourier's or Pouillet's."

"Let's see," asked Ardan, "who was Fourier, and who was Pouillet?"

"Baron Fourier, of the French Academy, wrote a famous treatise on Heat, which I remember reading twenty years ago in Penington's book store," promptly responded the Captain; "Pouillet was an eminent professor of

"Why not?" asked M'Nicholl; "we saw them all outside not long ago."

"But we can't see them outside now," answered Barbican; "that may be accounted for, I know, by the darkness, but it may be also by the fact of their not being there at all. In a case like this, we can't rely on uncertainties. Therefore, to make sure of not losing our thermometer, we shall fasten it with a string and easily pull it in whenever we like."

This advice being adopted, the window was opened quickly, and the instrument was thrown out at once by M'Nicholl, who held it fastened by a short stout cord so that it could be pulled in immediately. The window had hardly been open for longer than a second, yet that second had been enough to admit a terrible icy chill into the interior of the Projectile.

"Ten thousand ice-bergs!" cried Ardan, shivering all over; "it's cold enough to freeze a white bear!"

Barbican waited quietly for half an hour; that time he considered quite long enough to enable the instrument to acquire the temperature of the interstellar space. Then he gave the signal, and it was instantly pulled in.

It took him a few moments to calculate the quantity of mercury that had escaped into the little diaphragm attached to the lower part of the instrument; then he said:

"A hundred and forty degrees, centigrade, below zero!"

"Two hundred and twenty degrees, Fahrenheit, below zero!" cried M'Nicholl; "no wonder that we should feel a little chilly!"

"Pouillet is right, then," said Barbican, "and Fourier wrong."

"Another victory for Sorbonne over the Academy!" cried Ardan. "Vive la Sorbonne! Not that I'm a bit proud of finding myself in the midst of a temperature so very distingué --though it is more than three times colder than Hayes ever felt it at Humboldt Glacier or Nevenoff at Yakoutska. If Madame the Moon becomes as cold as this every time that her surface is withdrawn from the sunlight for fourteen days, I don't think, boys, that her hospitality is much to hanker after!"

Where were they now, at eight o'clock in the morning of the day called in America the sixth of December? Near the Moon, very certainly; near enough, in fact, for them to perceive easily in the dark the great round screen which she formed between themselves and the Projectile on one side, and the Earth, Sun, and stars on the other. But as to the exact distance at which she lay from them--they had no possible means of calculating it. The Projectile, impelled and maintained by forces inexplicable and even incomprehensible, had come within less than thirty miles from the Moon's north pole. But during those two hours of immersion in the dark shadow, had this distance been increased or diminished? There was evidently no stand-point whereby to estimate either the Projectile's direction or its velocity. Perhaps, moving rapidly away from the Moon, it would be soon out of her shadow altogether. Perhaps, on the contrary, gradually approaching her surface, it might come into contact at any moment with some sharp invisible peak of the Lunar mountains--a catastrophe sure to put a sudden end to the trip, and the travellers too.

An excited discussion on this subject soon sprang up, in which all naturally took part. Ardan's imagination as usual getting the better of his reason, he maintained very warmly that the Projectile, caught and retained by the Moon's attraction, could not help falling on her surface, just as an aerolite cannot help falling on our Earth.

"Softly, dear boy, softly," replied Barbican; "aerolites can help falling on the Earth, and the proof is, that few of them do fall--most of them don't. Therefore, even granting that we had already assumed the nature of an aerolite, it does not necessarily follow that we should fall on the Moon."

"But," objected Ardan, "if we approach only near enough, I don't see how we can help--"

"You don't see, it may be," said Barbican, "but you can see, if you only reflect a moment. Have you not often seen the November meteors, for instance, streaking the skies, thousands at a time?"

"Yes; on several occasions I was so fortunate."

"Well, did you ever see any of them strike the Earth's surface?" asked Barbican.

"I can't say I ever did," was the candid reply, "but--"

"Well, these shooting stars," continued Barbican, "or rather these wandering

"The hyperbola," continued the Captain, not minding Ardan's antics, "the hyperbola is a curve of the second order, formed from the intersection of a cone by a plane parallel to its axis, or rather parallel to its two generatrices, constituting two separate branches, extending indefinitely in both directions."

"Oh, what an accomplished scientist I'm going to turn out, if only left long enough at your feet, illustrious maestro !" cried Ardan, with effusion. "Only figure it to yourselves, boys; before the Captain's lucid explanations, I fully expected to hear something about the high curves and the low curves in the back of an Ancient Thomas! Oh, Michael, Michael, why didn't you know the Captain earlier?"

But the Captain was now too deeply interested in a hot discussion with Barbican to notice that the Frenchman was only funning him. Which of the two curves had been the one most probably taken by the Projectile? Barbican maintained it was the parabolic; M'Nicholl insisted that it was the hyperbolic. Their tempers were not improved by the severe cold, and both became rather excited in the dispute. They drew so many lines on the table, and crossed them so often with others, that nothing was left at last but a great blot. They covered bits of paper with x 's and y 's, which they read out like so many classic passages, shouting them, declaiming them, drawing attention to the strong points by gesticulation so forcible and voice so loud that neither of the disputants could hear a word that the other said. Possibly the very great difference in temperature between the external air in contact with their skin and the blood coursing through their veins, had given rise to magnetic currents as potential in their effects as a superabundant supply of oxygen. At all events, the language they soon began to employ in the enforcement of their arguments fairly made the Frenchman's hair stand on end.

"You probably forget the important difference between a directrix and an axis," hotly observed Barbican.

"I know what an abscissa is, any how!" cried the Captain. "Can you say as much?"

"Did you ever understand what is meant by a double ordinate?" asked Barbican, trying to keep cool.

"More than you ever did about a transverse and a conjugate!" replied the Captain, with much asperity.

heard, and keeping a tight hold both on the cord and the ruler. "This thing has gone far enough! Come. Stop your talk, and answer me a few questions. What do you want of this cord, Barbican?"

"To describe a parabolic curve!"

"And what are you going to do with the ruler, M'Nicholl!"

"To help draw a true hyperbola!"

"Promise me, Barbican, that you're not going to lasso the Captain!"

"Lasso the Captain! Ha! ha! ha!"

"You promise, M'Nicholl, that you're not going to brain the President!"

"I brain the President! Ho! ho! ho!"

"I want merely to convince him that it is a parabola!"

"I only want to make it clear as day that it is hyperbola!"

"Does it make any real difference whether it is one or the other?" yelled Ardan.

"The greatest possible difference--in the Eye of Science."

"A radical and incontrovertible difference--in the Eye of Science!"

"Oh! Hang the Eye of Science--will either curve take us to the Moon?"

"No!"

"Will either take us back to the Earth?"

"No!"

"Will either take us anywhere that you know of?"

"No!"

"Why not?"

By this time, also, all observations through the windows had become exceedingly difficult. The internal moisture condensed so thick and congealed so hard on the glass that nothing short of continued friction could keep up its transparency. But this friction, however laborious they might regard it at other times, they thought very little of just now, when observation had become far more interesting and important than ever.

If the Moon had any atmosphere, our travellers were near enough now to strike any meteor that might be rushing through it. If the Projectile itself were floating in it, as was possible, would not such a good conductor of sound convey to their ears the reflexion of some lunar echo, the roar of some storm raging among the mountains, the rattling of some plunging avalanche, or the detonations of some eructating volcano? And suppose some lunar Etna or Vesuvius was flashing out its fires, was it not even possible that their eye could catch a glimpse of the lurid gleam? One or two facts of this kind, well attested, would singularly elucidate the vexatious question of a lunar atmosphere, which is still so far from being decided. Full of such thoughts and intensely interested in them, Barbican, M'Nicholl and Ardan, patient as astronomers at a transit of Venus, watched steadily at their windows, and allowed nothing worth noticing to escape their searching gaze.

Ardan's patience first gave out. He showed it by an observation natural enough, for that matter, to a mind unaccustomed to long stretches of careful thought:

"This darkness is absolutely killing! If we ever take this trip again, it must be about the time of the New Moon!"

"There I agree with you, Ardan," observed the Captain. "That would be just the time to start. The Moon herself, I grant, would be lost in the solar rays and therefore invisible all the time of our trip, but in compensation, we should have the Full Earth in full view. Besides--and this is your chief point, no doubt, Ardan--if we should happen to be drawn round the Moon, just as we are at the present moment, we should enjoy the inestimable advantage of beholding her invisible side magnificently illuminated!"

"My idea exactly, Captain," said Ardan. "What is your opinion on this point, Barbican?"

"My opinion is as follows:" answered Barbican, gravely. "If we ever repeat this journey, we shall start precisely at the same time and under precisely the same circumstances. You forget that our only object is to reach the

Shifting it certainly was. While the path it described as it swung blindly through the darkness, could not be laid down by any chart for want of a starting point, Barbican and his companions soon became aware of a decided modification of its relative position with regard to the Moon's surface. Instead of its side, as heretofore, it now presented its base to the Moon's disc, and its axis had become rigidly vertical to the lunar horizon. Of this new feature in their journey, Barbican had assured himself by the most undoubted proof towards four o'clock in the morning. What was the cause? Gravity, of course. The heavier portion of the Projectile gravitated towards the Moon's centre exactly as if they were falling towards her surface.

But were they falling? Were they at last, contrary to all expectations, about to reach the goal that they had been so ardently wishing for? No! A sight-point, just discovered by M'Nicholl, very soon convinced Barbican that the Projectile was as far as ever from approaching the Moon, but was moving around it in a curve pretty near concentric.

M'Nicholl's discovery, a luminous gleam flickering on the distant verge of the black disc, at once engrossed the complete attention of our travellers and set them to divining its course. It could not possibly be confounded with a star. Its glare was reddish, like that of a distant furnace on a dark night; it kept steadily increasing in size and brightness, thus showing beyond a doubt how the Projectile was moving--in the direction of the luminous point, and not vertically falling towards the Moon's surface.

"It's a volcano!" cried the Captain, in great excitement; "a volcano in full blast! An outlet of the Moon's internal fires! Therefore she can't be a burnt out cinder!"

"It certainly looks like a volcano," replied Barbican, carefully investigating this new and puzzling phenomenon with his night-glass. "If it is not one, in fact, what can it be?"

"To maintain combustion," commenced Ardan syllogistically and sententiously, "air is necessary. An undoubted case of combustion lies before us. Therefore, this part of the Moon must have an atmosphere!"

"Perhaps so," observed Barbican, "but not necessarily so. The volcano, by decomposing certain substances, gunpowder for instance, may be able to furnish its own oxygen, and thus explode in a vacuum. That blaze, in fact, seems to me to possess the intensity and the blinding glare of objects burning in pure oxygen. Let us therefore be not over hasty in jumping at the

excited. "What a pair of beauties you are! Say, Barbican! What thundering thing is coming at us now?"

"Another bolide," answered Barbican, his eye as calm as ever, though a faint tremor was quite perceptible in his voice.

"A bolide? Burning in vacuo ? You are joking!"

"I was never more in earnest," was the President's quiet reply, as he looked through his closed fingers.

He knew exactly what he was saying. The dazzling glitter did not deceive him. Such a meteor seen from the Earth could not appear much brighter than the Full Moon, but here in the midst of the black ether and unsoftened by the veil of the atmosphere, it was absolutely blinding. These wandering bodies carry in themselves the principle of their incandescence. Oxygen is by no means necessary for their combustion. Some of them indeed often take fire as they rush through the layers of our atmosphere, and generally burn out before they strike the Earth. But others, on the contrary, and the greater number too, follow a track through space far more distant from the Earth than the fifty miles supposed to limit our atmosphere. In October, 1844, one of these meteors had appeared in the sky at an altitude calculated to be at least 320 miles; and in August, 1841, another had vanished when it had reached the height of 450 miles. A few even of those seen from the Earth must have been several miles in diameter. The velocity with which some of them have been calculated to move, from east to west, in a direction contrary to that of the Earth, is astounding enough to exceed belief--about fifty miles in a second. Our Earth does not move quite 20 miles in a second, though it goes a thousand times quicker than the fastest locomotive.

Barbican calculated like lightning that the present object of their alarm was only about 250 miles distant from them, and could not be less than a mile and a quarter in diameter. It was coming on at the rate of more than a mile a second or about 75 miles a minute. It lay right in the path of the Projectile, and in a very few seconds indeed a terrible collision was inevitable. The enormous rate at which it grew in size, showed the terrible velocity at which it was approaching.

You can hardly imagine the situation of our poor travellers at the sight of this frightful apparition. I shall certainly not attempt to describe it. In spite of their singular courage, wonderful coolness, extraordinary fortitude, they were now breathless, motionless, almost helpless; their muscles were tightened to their utmost tension; their eyes stared out of their sockets; their

each other into still smaller fragments, one of which, grazing the Projectile, jarred it so violently that the very window at which the travellers were standing, was cracked by the shock. Our friends felt, in fact, as if they were the objective point at which endless volleys of blazing shells were aimed, any of them powerful enough, if it only hit them fair, to make as short work of the Projectile as you could of an egg-shell. They had many hairbreadth escapes, but fortunately the cracking of the glass proved to be the only serious damage of which they could complain.

This extraordinary illumination lasted altogether only a few seconds; every one of its details was of a most singular and exciting nature--but one of its greatest wonders was yet to come. The ether, saturated with luminous matter, developed an intensity of blazing brightness unequalled by the lime light, the magnesium light, the electric light, or any other dazzling source of illumination with which we are acquainted on earth. It flashed out of these asteroids in all directions, and downwards, of course, as well as elsewhere. At one particular instant, it was so very vivid that Ardan, who happened to be looking downwards, cried out, as if in transport:

"Oh!! The Moon! Visible at last!"

And the three companions, thrilling with indescribable emotion, shot a hasty glance through the openings of the coruscating field beneath them. Did they really catch a glimpse of the mysterious invisible disc that the eye of man had never before lit upon? For a second or so they gazed with enraptured fascination at all they could see. What did they see, what could they see at a distance so uncertain that Barbican has never been able even to guess at it? Not much. Ardan was reminded of the night he had stood on the battlements of Dover Castle, a few years before, when the fitful flashes of a thunder storm gave him occasional and very uncertain glimpses of the French coast at the opposite side of the strait. Misty strips long and narrow, extending over one portion of the disc--probably cloud-scuds sustained by a highly rarefied atmosphere--permitted only a very dreamy idea of lofty mountains stretching beneath them in shapeless proportions, of smaller reliefs, circuses, yawning craters, and the other capricious, sponge-like formations so common on the visible side. Elsewhere the watchers became aware for an instant of immense spaces, certainly not arid plains, but seas, real oceans, vast and calm, reflecting from their placid depths the dazzling fireworks of the weird and wildly flashing meteors. Farther on, but very darkly as if behind a screen, shadowy continents revealed themselves, their surfaces flecked with black cloudy masses, probably great forests, with here and there a--

CHAPTER XVI - THE SOUTHERN HEMISPHERE.

Exceedingly narrow and exceedingly fortunate had been the escape of the Projectile. And from a danger too the most unlikely and the most unexpected. Who would have ever dreamed of even the possibility of such an encounter? And was all danger over? The sight of one of these erratic bolides certainly justified the gravest apprehensions of our travellers regarding the existence of others. Worse than the sunken reefs of the Southern Seas or the snags of the Mississippi, how could the Projectile be expected to avoid them? Drifting along blindly through the boundless ethereal ocean, her inmates, even if they saw the danger, were totally powerless to turn her aside. Like a ship without a rudder, like a runaway horse, like a collapsed balloon, like an iceberg in an Atlantic storm, like a boat in the Niagara rapids, she moved on sullenly, recklessly, mechanically, mayhap into the very jaws of the most frightful danger, the bright intelligences within no more able to modify her motions even by a finger's breadth than they were able to affect Mercury's movements around the Sun.

But did our friends complain of the new perils now looming up before them? They never thought of such a thing. On the contrary, they only considered themselves (after the lapse of a few minutes to calm their nerves) extremely lucky in having witnessed this fresh glory of exuberant nature, this transcendent display of fireworks which not only cast into absolute insignificance anything of the kind they had ever seen on Earth, but had actually enabled them by its dazzling illumination to gaze for a second or two at the Moon's mysterious invisible disc. This glorious momentary glance, worth a whole lifetime of ordinary existence, had revealed to mortal ken her continents, her oceans, her forests. But did it also convince them of the existence of an atmosphere on her surface whose vivifying molecules would render life possible? This question they had again to leave unanswered--it will hardly ever be answered in a way quite satisfactory to human curiosity. Still, infinite was their satisfaction at having hovered even for an instant on the very verge of such a great problem's solution.

It was now half-past three in the afternoon. The Projectile still pursued its curving but otherwise unknown path over the Moon's invisible face. Had this path been disturbed by that dangerous meteor? There was every reason to fear so--though, disturbance or no disturbance, the curve it described should still be one strictly in accordance with the laws of Mechanical Philosophy. Whether it was a parabola or a hyperbola, however, or whether it was disturbed or not, made very little difference as, in any case, the

"The Sun?" asked M'Nicholl and Ardan in some astonishment.

"Yes, dear friends; it is the Sun himself that you now see; these summits that you behold him gilding are the mountains that lie on the Moon's southern rim. We are rapidly nearing her south pole."

"After doubling her north pole!" cried Ardan; "why, we must be circumnavigating her!"

"Exactly; sailing all around her."

"Hurrah! Then we're all right at last! There's nothing more to fear from your hyperbolas or parabolas or any other of your open curves!"

"Nothing more, certainly, from an open curve, but every thing from a closed one."

"A closed curve! What is it called? And what is the trouble?"

"An eclipse it is called; and the trouble is that, instead of flying off into the boundless regions of space, our Projectile will probably describe an elliptical orbit around the Moon--"

--"What!" cried M'Nicholl, in amazement, "and be her satellite for ever!"

"All right and proper," said Ardan; "why shouldn't she have one of her own?"

"Only, my dear friend," said Barbican to Ardan, "this change of curve involves no change in the doom of the Projectile. We are as infallibly lost by an ellipse as by a parabola."

"Well, there was one thing I never could reconcile myself to in the whole arrangement," replied Ardan cheerfully; "and that was destruction by an open curve. Safe from that, I could say, 'Fate, do your worst!' Besides, I don't believe in the infallibility of your ellipsis. It may prove just as unreliable as the hyperbola. And it is no harm to hope that it may!"

From present appearances there was very little to justify Ardan's hope. Barbican's theory of the elliptic orbit was unfortunately too well grounded to allow a single reasonable doubt to be expressed regarding the Projectile's fate. It was to gravitate for ever around the Moon--a sub-satellite. It was a new born individual in the astral universe, a microcosm, a little world in itself, containing, however, only three inhabitants and even these destined

incredulously.

"There are several well known methods of approaching this problem," replied Barbican; "and as these methods, though founded on different principles, bring us constantly to the same result, we may pretty safely conclude that our calculations are right. We have no time, just now to draw diagrams, but, if I express myself clearly, you will no doubt easily catch the general principle."

"Go ahead!" answered Ardan. "Anything but Algebra."

"We want no Algebra now," said Barbican, "It can't enable us to find principles, though it certainly enables us to apply them. Well. The Sun at a certain altitude shines on one side of a mountain and flings a shadow on the other. The length of this shadow is easily found by means of a telescope, whose object glass is provided with a micrometer. This consists simply of two parallel spider threads, one of which is stationary and the other movable. The Moon's real diameter being known and occupying a certain space on the object glass, the exact space occupied by the shadow can be easily ascertained by means of the movable thread. This space, compared with the Moon's space, will give us the length of the shadow. Now, as under the same circumstances a certain height can cast only a certain shadow, of course a knowledge of the one must give you that of the other, and vice versa. This method, stated roughly, was that followed by Galileo, and, in our own day, by Beer and Maedler, with extraordinary success."

"I certainly see some sense in this method," said Ardan, "if they took extraordinary pains to observe correctly. The least carelessness would set them wrong, not only by feet but by miles. We have time enough, however, to listen to another method before we get into the full blaze of the glorious old Sol."

"The other method," interrupted M'Nicholl laying down his telescope to rest his eyes, and now joining in the conversation to give himself something to do, "is called that of the tangent rays. A solar ray, barely passing the edge of the Moon's surface, is caught on the peak of a mountain the rest of which lies in shadow. The distance between this starry peak and the line separating the light from the darkness, we measure carefully by means of our telescope. Then--"

"I see it at a glance!" interrupted Ardan with lighting eye; "the ray, being a tangent, of course makes right angles with the radius, which is known: consequently we have two sides and one angle--quite enough to find the

Then seeing Barbican shake his head ominously and his countenance become more and more depressed, this true friend tried to brighten him up a bit by feigning to take deep interest in a subject that to him was absolutely the driest in the world.

"Meer and Baedler--I mean Beer and Maedler," he went on, "must have measured at least forty or fifty mountains to their satisfaction."

"Forty or fifty!" exclaimed Barbican. "They measured no fewer than a thousand and ninety-five lunar mountains and crater summits with a perfect success. Six of these reach an altitude of upwards of 18,000 feet, and twenty-two are more than 15,000 feet high."

"Which is the highest in the lot?" asked Ardan, keenly relishing Barbican's earnestness.

"Doerfel in the southern hemisphere, the peak of which I have just pointed out, is the highest of the lunar mountains so far measured," replied Barbican. "It is nearly 25,000 feet high."

"Indeed! Five thousand feet lower than Mount Everest--still for a lunar mountain, it is quite a respectable altitude."

"Respectable! Why it's an enormous altitude, my dear friend, if you compare it with the Moon's diameter. The Earth's diameter being more than 3-1/2 times greater than the Moon's, if the Earth's mountains bore the same ratio to those of the Moon, Everest should be more than sixteen miles high, whereas it is not quite six."

"How do the general heights of the Himalayahs compare with those of the highest lunar mountains?" asked Ardan, wondering what would be his next question.

"Fifteen peaks in the eastern or higher division of the Himalayahs, are higher than the loftiest lunar peaks," replied Barbican. "Even in the western, or lower section of the Himalayahs, some of the peaks exceed Doerfel."

"Which are the chief lunar mountains that exceed Mont Blanc in altitude?" asked Ardan, bravely suppressing a yawn.

"The following dozen, ranged, if my memory does not fail me, in the exact order of their respective heights," replied Barbican, never wearied in answering such questions: "Newton, Curtius, Casatus, Rheita, Short,

CHAPTER XVII - TYCHO.

It was now exactly six o'clock in the evening. The Sun, completely clear of all contact with the lunar disc, steeped the whole Projectile in his golden rays. The travellers, vertically over the Moon's south pole, were, as Barbican soon ascertained, about 30 miles distant from it, the exact distance they had been from the north pole--a proof that the elliptic curve still maintained itself with mathematical rigor.

For some time, the travellers' whole attention was concentrated on the glorious Sun. His light was inexpressibly cheering; and his heat, soon penetrating the walls of the Projectile, infused a new and sweet life into their chilled and exhausted frames. The ice rapidly disappeared, and the windows soon resumed their former perfect transparency.

"Oh! how good the pleasant sunlight is!" cried the Captain, sinking on a seat in a quiet ecstasy of enjoyment. "How I pity Ardan's poor friends the Selenites during that night so long and so icy! How impatient they must be to see the Sun back again!"

"Yes," said Ardan, also sitting down the better to bask in the vivifying rays, "his light no doubt brings them to life and keeps them alive. Without light or heat during all that dreary winter, they must freeze stiff like the frogs or become torpid like the bears. I can't imagine how they could get through it otherwise."

"I'm glad we're through it anyhow," observed M'Nicholl. "I may at once acknowledge that I felt perfectly miserable as long as it lasted. I can now easily understand how the combined cold and darkness killed Doctor Kane's Esquimaux dogs. It was near killing me. I was so miserable that at last I could neither talk myself nor bear to hear others talk."

"My own case exactly," said Barbican--"that is," he added hastily, correcting himself, "I tried to talk because I found Ardan so interested, but in spite of all we said, and saw, and had to think of, Byron's terrible dream would continually rise up before me:

"The bright Sun was extinguished, and the Stars Wandered all darkling
in the eternal space, Rayless and pathless, and the icy Earth Swung
blind and blackening in the Moonless air. Morn came and went, and came
and brought no day! And men forgot their passions in the dread Of this

unless when thoroughly convinced, was a great triumph for Ardan, who, as the gracious reader doubtless remembers, had had a famous dispute with M'Nicholl on that very subject at Tampa.[D] His eyes brightened and a smile of pleasure played around his lips, but, with a great effort at self-restraint, he kept perfectly silent and would not permit himself even to look in the direction of the Captain. As for M'Nicholl, he was apparently too much absorbed in Doerfel and Leibnitz to mind anything else.

These mountains rose from plains of moderate extent, bounded by an indefinite succession of walled hollows and ring ramparts. They are the only chains met in this region of ridge-brimmed craters and circles; distinguished by no particular feature, they project a few pointed peaks here and there, some of which exceed four miles and a half in height. This altitude, however, foreshortened as it was by the vertical position of the Projectile, could not be noticed just then, even if correct observation had been permitted by the dazzling surface.

Once more again before the travellers' eyes the Moon's disc revealed itself in all the old familiar features so characteristic of lunar landscapes--no blending of tones, no softening of colors, no graduation of shadows, every line glaring in white or black by reason of the total absence of refracted light. And yet the wonderfully peculiar character of this desolate world imparted to it a weird attraction as strangely fascinating as ever.

Over this chaotic region the travellers were now sweeping, as if borne on the wings of a storm; the peaks defiled beneath them; the yawning chasms revealed their ruin-strewn floors; the fissured cracks untwisted themselves; the ramparts showed all their sides; the mysterious holes presented their impenetrable depths; the clustered mountain summits and rings rapidly decomposed themselves: but in a moment again all had become more inextricably entangled than ever. Everything appeared to be the finished handiwork of volcanic agency, in the utmost purity and highest perfection. None of the mollifying effects of air or water could here be noticed. No smooth-capped mountains, no gently winding river channels, no vast prairie-lands of deposited sediment, no traces of vegetation, no signs of agriculture, no vestiges of a great city. Nothing but vast beds of glistening lava, now rough like immense piles of scoriae and clinker, now smooth like crystal mirrors, and reflecting the Sun's rays with the same intolerable glare. Not the faintest speck of life. A world absolutely and completely dead, fixed, still, motionless--save when a gigantic land-slide, breaking off the vertical wall of a crater, plunged down into the soundless depths, with all the fury too of a crashing avalanche, with all the speed of a Niagara, but, in the total absence of atmosphere, noiseless as a feather, as a snow flake, as a

and semblance of order in the arrangement of these rocks, but this, of course, they looked on as a mere freak of nature, like the Lurlei Rock, the Giant's Causeway, or the Old Man of the Franconia Mountains. Ardan, however, would not accept such an easy mode of getting rid of a difficulty.

"See the ruins on that bluff," he exclaimed; "those steep sides must have been washed by a great river in the prehistoric times. That was the fortress. Farther down lay the city. There are the dismantled ramparts; why, there's the very coping of a portico still intact! Don't you see three broken pillars lying beside their pedestals? There! a little to the left of those arches that evidently once bore the pipes of an aqueduct! You don't see them? Well, look a little to the right, and there is something that you can see! As I'm a living man I have no difficulty in discerning the gigantic buttments of a great bridge that formerly spanned that immense river!"

Did he really see all this? To this day he affirms stoutly that he did, and even greater wonders besides. His companions, however, without denying that he had good grounds for his assertion on this subject or questioning the general accuracy of his observations, content themselves with saying that the reason why they had failed to discover the wonderful city, was that Ardan's telescope was of a strange and peculiar construction. Being somewhat short-sighted, he had had it manufactured expressly for his own use, but it was of such singular power that his companions could not use it without hurting their eyes.

But, whether the ruins were real or not, the moments were evidently too precious to be lost in idle discussion. The great city of the Selenites soon disappeared on the remote horizon, and, what was of far greater importance, the distance of the Projectile from the Moon's disc began to increase so sensibly that the smaller details of the surface were soon lost in a confused mass, and it was only the lofty heights, the wide craters, the great ring mountains, and the vast plains that still continued to give sharp, distinctive outlines.

A little to their left, the travellers could now plainly distinguish one of the most remarkable of the Moon's craters, Newton, so well known to all lunar astronomers. Its ramparts, forming a perfect circle, rise to such a height, at least 22,000 feet, as to seem insurmountable.

"You can, no doubt, notice for yourselves," said Barbican, "that the external height of this mountain is far from being equal to the depth of its crater. The enormous pit, in fact, seems to be a soundless sea of pitchy black, the bottom of which the Sun's rays have never reached. There, as Humboldt

the greatest in the Moon, but many others measure more than a hundred miles across."

"Dear boys," said Ardan, half to himself, half to the others, "only imagine the delicious state of things on the surface of the gentle Moon when these craters, brimming over with hissing lava, were vomiting forth, all at the same time, showers of melted stones, clouds of blinding smoke, and sheets of blasting flame! What an intensely overpowering spectacle was here presented once, but now, how are the mighty fallen! Our Moon, as at present beheld, seems to be nothing more than the skinny spectre left after a brilliant display of fireworks, when the spluttering crackers, the glittering wheels, the hissing serpents, the revolving suns, and the dazzling stars, are all 'played out', and nothing remains to tell of the gorgeous spectacle but a few blackened sticks and half a dozen half burned bits of pasteboard. I should like to hear one of you trying to explain the cause, the reason, the principle, the philosophy of such tremendous cataclysms!"

Barbican's only reply was a series of nods, for in truth he had not heard a single word of Ardan's philosophic explosion. His ears were with his eyes, and these were obstinately bent on the gigantic ramparts of Clavius, formed of concentric mountain ridges, which were actually leagues in depth. On the floor of the vast cavity, could be seen hundreds of smaller craters, mottling it like a skimming dish, and pierced here and there by sharp peaks, one of which could hardly be less than 15,000 feet high.

All around, the plain was desolate in the extreme. You could not conceive how anything could be barrenner than these serrated outlines, or gloomier than these shattered mountains--until you looked at the plain that encircled them. Ardan hardly exaggerated when he called it the scene of a battle fought thousands of years ago but still white with the hideous bones of overthrown peaks, slaughtered mountains and mutilated precipices!

"Hills amid the air encountered hills, Hurled to and fro in jaculation dire,"

murmured M'Nicholl, who could quote you Milton quite as readily as the Bible.

"This must have been the spot," muttered Barbican to himself, "where the brittle shell of the cooling sphere, being thicker than usual, offered greater resistance to an eruption of the red-hot nucleus. Hence these piled up buttresses, and these orderless heaps of consolidated lava and ejected scoriæ."

four thousand times nearer! No wonder that with smoked glasses, they endeavored to soften off its effulgent glare! Then in hushed silence, or at most uttering at intervals a few interjections expressive of their intense admiration, they remained for some time completely engrossed in the overwhelming spectacle. For the time being, every sentiment, impression, thought, feeling on their part, was concentrated in the eye, just as at other times under violent excitement every throb of our life is concentrated in the heart.

Tycho belongs to the system of lunar craters that is called radiating, like Aristarchus or Copernicus, which had been already seen and highly admired by our travellers at their first approach to the Moon. But it is decidedly the most remarkable and conspicuous of them all. It occupies the great focus of disruption, whence it sends out great streaks thousands of miles in length; and it gives the most unmistakable evidence of the terribly eruptive nature of those forces that once shattered the Moon's solidified shell in this portion of the lunar surface.

Situated in the southern latitude of 43° by an eastern longitude of 12° , Tycho's crater, somewhat elliptical in shape, is 54 miles in diameter and upwards of 16,000 feet in depth. Its lofty ramparts are buttressed by other mountains, Mont Blancs in size, all grouped around it, and all streaked with the great divergent fissures that radiate from it as a centre.

Of what this incomparable mountain really is, with all these lines of projections converging towards it and with all these prominent points of relief protruding within its crater, photography has, so far, been able to give us only a very unsatisfactory idea. The reason too is very simple: it is only at Full Moon that Tycho reveals himself in all his splendor. The shadows therefore vanishing, the perspective foreshortenings disappear and the views become little better than a dead blank. This is the more to be regretted as this wonderful region is well worthy of being represented with the greatest possible photographic accuracy. It is a vast agglomeration of holes, craters, ring formations, a complicated intersection of crests--in short, a distracting volcanic network flung over the blistered soil. The ebullitions of the central eruption still evidently preserve their original form. As they first appeared, so they lie. Crystallizing as they cooled, they have stereotyped in imperishable characters the aspect formerly presented by the whole Moon's surface under the influences of recent plutonic upheaval.

Our travellers were far more fortunate than the photographers. The distance separating them from the peaks of Tycho's concentric terraces was not so considerable as to conceal the principal details from a very satisfactory view.

without a moment's delay!"

"It couldn't hold the half of them!" observed Barbican drily.

with mighty power at the period of Tycho's own upheaval."

"How do you like that theory, Barbican," asked the Captain.

"It's not a particle better than Herschel's," was the reply; "no volcanic action could project rocks to a distance of six or seven hundred miles, not to talk of laying them down so regularly that we can't detect a break in them."

"Happy thought!" cried Ardan suddenly; "it seems to me that I can tell the cause of these radiating streaks!"

"Let us hear it," said Barbican.

"Certainly," was Ardan's reply; "these streaks are all only the parts of what we call a 'star,' as made by a stone striking ice; or by a ball, a pane of glass."

"Not bad," smiled Barbican approvingly; "only where is the hand that flung the stone or threw the ball?"

"The hand is hardly necessary," replied Ardan, by no means disconcerted; "but as for the ball, what do you say to a comet?"

Here M'Nicholl laughed so loud that Ardan was seriously irritated. However, before he could say anything cutting enough to make the Captain mind his manners, Barbican had quickly resumed:

"Dear friend, let the comets alone, I beg of you; the old astronomers fled to them on all occasions and made them explain every difficulty--"

--"The comets were all used up long ago--" interrupted M'Nicholl.

--"Yes," went on Barbican, as serenely as a judge, "comets, they said, had fallen on the surface in meteoric showers and crushed in the crater cavities; comets had dried up the water; comets had whisked off the atmosphere; comets had done everything. All pure assumption! In your case, however, friend Michael, no comet whatever is necessary. The shock that gave rise to your great 'star' may have come from the interior rather than the exterior. A violent contraction of the lunar crust in the process of cooling may have given birth to your gigantic 'star' formation."

"I accept the amendment," said Ardan, now in the best of humor and looking triumphantly at M'Nicholl.

"I'm not very sorry for it," said Ardan cheerfully; "neither to be baked like a pie in an oven nor roasted like a fat goose before a fire is the kind of death I should like to die of."

"Yet from such a death you would suffer no more than your friends the Selenites are exposed to every day of their lives," said the Captain, evidently determined on getting up an argument.

"I understand the full bearing of your allusion, my dear Captain," replied Ardan quickly, but not at all in a tone showing that he was disposed to second M'Nicholl's expectations.

He was, in fact, fast losing all his old habits of positivism. Latterly he had seen much, but he had reflected more. The deeper he had reflected, the more inclined he had become to accept the conclusion that the less he knew. Hence he had decided that if M'Nicholl wanted an argument it should not be with him. All speculative disputes he should henceforth avoid; he would listen with pleasure to all that could be urged on each side; he might even skirmish a little here and there as the spirit moved him; but a regular pitched battle on a subject purely speculative he was fully determined never again to enter into.

"Yes, dear Captain," he continued, "that pointed arrow of yours has by no means missed its mark, but I can't deny that my faith is beginning to be what you call a little 'shaky' in the existence of my friends the Selenites. However, I should like to have your square opinion on the matter. Barbican's also. We have witnessed many strange lunar phenomena lately, closer and clearer than mortal eye ever rested on them before. Has what we have seen confirmed any theory of yours or confounded any hypothesis? Have you seen enough to induce you to adopt decided conclusions? I will put the question formally. Do you, or do you not, think that the Moon resembles the Earth in being the abode of animals and intelligent beings? Come, answer, messieurs . Yes, or no?"

"I think we can answer your question categorically," replied Barbican, "if you modify its form a little."

"Put the question any way you please," said Ardan; "only you answer it! I'm not particular about the form."

"Good," said Barbican; "the question, being a double one, demands a double answer. First: Is the Moon inhabitable? Second: Has the Moon ever been inhabited? "

have had the privilege of observing the lunar continents at a distance of not more than one-third of a mile, we have never yet caught sight of the first thing moving on her surface. The presence of humanity, even of the lowest type, would have revealed itself in some form or other, by boundaries, by buildings, even by ruins. Now what have we seen? Everywhere and always, the geological works of nature ; nowhere and never, the orderly labors of man . Therefore, if any representatives of animal life exist in the Moon, they must have taken refuge in those bottomless abysses where our eyes were unable to track them. And even this I can't admit. They could not always remain in these cavities. If there is any atmosphere at all in the Moon, it must be found in her immense low-lying plains. Over those plains her inhabitants must have often passed, and on those plains they must in some way or other have left some mark, some trace, some vestige of their existence, were it even only a road. But you both know well that nowhere are any such traces visible: therefore, they don't exist; therefore, no lunar inhabitants exist--except, of course, such a race of beings, if we can imagine any such, as could exist without revealing their existence by movement ."

"That is to say," broke in Ardan, to give what he conceived a sharper point to Barbican's cogent arguments, "such a race of beings as could exist without existing!"

"Precisely," said Barbican: "Life without movement, and no life at all, are equivalent expressions."

"Captain," said Ardan, with all the gravity he could assume, "have you anything more to say before the Moderator of our little Debating Society gives his opinion on the arguments regarding the question before the house?"

"No more at present," said the Captain, bidding his time.

"Then," resumed Ardan, rising with much dignity, "the Committee on Lunar Explorations, appointed by the Honorable Baltimore Gun Club, solemnly assembled in the Projectile belonging to the aforesaid learned and respectable Society, having carefully weighed all the arguments advanced on each side of the question, and having also carefully considered all the new facts bearing on the case that have lately come under the personal notice of said Committee, unanimously decides negatively on the question now before the chair for investigation--namely, 'Is the Moon inhabitable?' Barbican, as chairman of the Committee, I empower you to duly record our solemn decision-- No, the Moon is not inhabitable ."

only liquid, at the period when the Moon, already hardened by cooling, began to become inhabitable."

"Most undoubtedly is good!" observed Ardan admiringly.

"At this period," continued the learned Captain, "an atmosphere surrounded her. The waters, shut in by this gaseous envelope, could no longer evaporate. Under the combined influences of air, water, light, and solar heat as well as internal heat, vegetation began to overspread the continents by this time ready to receive it, and most undoubtedly--I mean--a--incontestably--it was at this epoch that life manifested itself on the lunar surface. I say incontestably advisedly, for Nature never exhausts herself in producing useless things, and therefore a world, so wonderfully inhabitable, must of necessity have had inhabitants."

"I like of necessity too," said Ardan, who could never keep still; "I always did, when I felt my arguments to be what you call a little shaky."

"But, my dear Captain," here observed Barbican, "have you taken into consideration some of the peculiarities of our Satellite which are decidedly opposed to the development of vegetable and animal existence? Those nights and days, for instance, 354 hours long?"

"I have considered them all," answered the brave Captain. "Days and nights of such an enormous length would at the present time, I grant, give rise to variations in temperature altogether intolerable to any ordinary organization. But things were quite different in the era alluded to. At that time, the atmosphere enveloped the Moon in a gaseous mantle, and the vapors took the shape of clouds. By the screen thus formed by the hand of nature, the heat of the solar rays was tempered and the nocturnal radiation retarded. Light too, as well as heat, could be modified, tempered, and genialized if I may use the expression, by the air. This produced a healthy counterpoise of forces, which, now that the atmosphere has completely disappeared, of course exists no longer. Besides--friend Ardan, you will excuse me for telling you something new, something that will surprise you--"

--"Surprise me, my dear boy, fire away surprising me!" cried Ardan. "I like dearly to be surprised. All I regret is that you scientists have surprised me so much already that I shall never have a good, hearty, genuine surprise again!"

--"I am most firmly convinced," continued the Captain, hardly waiting for Ardan to finish, "that, at the period of the Moon's occupancy by living

the Moon exactly as they do at present on the Earth."

"Nothing can be clearer!" resumed the brave Captain, once more rushing to the charge. "Besides, even without this alternation of days and nights, life on the lunar surface was quite possible."

"Of course it was possible," said Ardan; "everything is possible except what contradicts itself. It is possible too that every possibility is a fact; therefore, it is a fact. However," he added, not wishing to press the Captain's weak points too closely, "let all these logical niceties pass for the present. Now that you have established the existence of your humanity in the Moon, the Chair would respectfully ask how it has all so completely disappeared?"

"It disappeared completely thousands, perhaps millions, of years ago," replied the unabashed Captain. "It perished from the physical impossibility of living any longer in a world where the atmosphere had become by degrees too rare to be able to perform its functions as the great resuscitating medium of dependent existences. What took place on the Moon is only what is to take place some day or other on the Earth, when it is sufficiently cooled off."

"Cooled off?"

"Yes," replied the Captain as confidently and with as little hesitation as if he was explaining some of the details of his great machine-shop in Philadelphia; "You see, according as the internal fire near the surface was extinguished or was withdrawn towards the centre, the lunar shell naturally cooled off. The logical consequences, of course, then gradually took place: extinction of organized beings; and then extinction of vegetation. The atmosphere, in the meantime, became thinner and thinner--partly drawn off with the water evaporated by the terrestrial attraction, and partly sinking with the solid water into the crust-cracks caused by cooling. With the disappearance of air capable of respiration, and of water capable of motion, the Moon, of course, became uninhabitable. From that day it became the abode of death, as completely as it is at the present moment."

"That is the fate in store for our Earth?"

"In all probability."

"And when is it to befall us?"

"Just as soon as the crust becomes cold enough to be uninhabitable."

"True!" said Ardan. "The Chair, thankful for being called to order, would respectfully remind the house that the question before it is: Has the Moon been inhabited? Affirmative has been heard. Negative is called on to reply. Mr. Barbican has the parole ."

But Mr. Barbican was unwilling just then to enter too deeply into such an exceedingly difficult subject. "The probabilities," he contented himself with saying, "would appear to be in favor of the Captain's speculations. But we must never forget that they are speculations--nothing more. Not the slightest evidence has yet been produced that the Moon is anything else than 'a dead and useless waste of extinct volcanoes.' No signs of cities, no signs of buildings, not even of ruins, none of anything that could be reasonably ascribed to the labors of intelligent creatures. No sign of change of any kind has been established. As for the agreement between the Moon's rotation and her revolution, which compels her to keep the same face constantly turned towards the Earth, we don't know that it has not existed from the beginning. As for what is called the effect of volcanic agency upon her surface, we don't know that her peculiar blistered appearance may not have been brought about altogether by the bubbling and spitting that blisters molten iron when cooling and contracting. Some close observers have even ventured to account for her craters by saying they were due to pelting showers of meteoric rain. Then again as to her atmosphere--why should she have lost her atmosphere? Why should it sink into craters? Atmosphere is gas, great in volume, small in matter; where would there be room for it? Solidified by the intense cold? Possibly in the night time. But would not the heat of the long day be great enough to thaw it back again? The same trouble attends the alleged disappearance of the water. Swallowed up in the cavernous cracks, it is said. But why are there cracks? Cooling is not always attended by cracking. Water cools without cracking; cannon balls cool without cracking. Too much stress has been laid on the great difference between the nucleus and the crust : it is really impossible to say where one ends and the other begins. In fact, no theory explains satisfactorily anything regarding the present state of the Moon's surface. In fact, from the day that Galileo compared her clustering craters to 'eyes on a peacock's tail' to the present time, we must acknowledge that we know nothing more than we can actually see, not one particle more of the Moon's history than our telescopes reveal to our corporal eyes!"

"In the lucid opinion of the honorable and learned gentleman who spoke last," said Ardan, "the Chair is compelled to concur. Therefore, as to the second question before the house for deliberation, Has the Moon been ever inhabited? the Chair gets out of its difficulty, as a Scotch jury does when it has not evidence enough either way, by returning a solemn verdict of Not

reliefs grew more and more blurred and the outlines dimmer and dimmer. Even the great mountain profiles began to fade away, the dazzling colors to grow duller, the jet black shadows greyer, and the general effect mistier.

At last, the distance had become so great that, of this lunar world so wonderful, so fantastic, so weird, so mysterious, our travellers by degrees lost even the consciousness, and their sensations, lately so vivid, grew fainter and fainter, until finally they resembled those of a man who is suddenly awakened from a peculiarly strange and impressive dream.

"The velocity will be either sufficient to carry us past the dead point, or it will not: sufficient, we shall keep on, just as we are now, gravitating forever around the Moon--"

--"Hypothesis number two will have at least one point in its favor," interrupted as usual the incorrigible Ardan; "it can't be worse than hypothesis number one!"

--"Insufficient," continued Barbican, laying down the law, "we shall rest forever motionless on the dead point of the mutually neutralizing attractions."

"A pleasant prospect!" observed Ardan: "from the worst possible to no better! Isn't it, Barbican?"

"Nothing to say," was Barbican's only reply.

"Have you nothing to say either, Captain?" asked Ardan, beginning to be a little vexed at the apparent apathy of his companions.

"Nothing whatever," replied M'Nicholl, giving point to his words by a despairing shake of his head.

"You don't mean surely that we're going to sit here, like bumps on a log, doing nothing until it will be too late to attempt anything?"

"Nothing whatever can be done," said Barbican gloomily. "It is vain to struggle against the impossible."

"Impossible! Where did you get that word? I thought the American schoolboys had cut it out of their dictionaries!"

"That must have been since my time," said Barbican smiling grimly.

"It still sticks in a few old copies anyhow," drawled M'Nicholl drily, as he carefully wiped his glasses.

"Well! it has no business here!" said Ardan. "What! A pair of live Yankees and a Frenchman, of the nineteenth century too, recoil before an old fashioned word that hardly scared our grandfathers!"

"What can we do?"

"No."

"Not even by lightening it, as a heavily laden ship is lightened, by throwing cargo overboard?"

"What can we throw overboard? We have no ballast like balloon-men."

"I should like to know," interrupted M'Nicholl, "what would be the good of throwing anything at all overboard. Any one with a particle of common sense in his head, can see that the lightened Projectile should only move the quicker!"

"Slower, you mean," said Ardan.

"Quicker, I mean," replied the Captain.

"Neither quicker nor slower, dear friends," interposed Barbican, desirous to stop a quarrel; "we are floating, you know, in an absolute void, where specific gravity never counts."

"Well then, my friends," said Ardan in a resigned tone that he evidently endeavored to render calm, "since the worst is come to the worst, there is but one thing left for us to do!"

"What's that?" said the Captain, getting ready to combat some new piece of nonsense.

"To take our breakfast!" said the Frenchman curtly.

It was a resource he had often fallen back on in difficult conjunctures. Nor did it fail him now.

Though it was not a project that claimed to affect either the velocity or the direction of the Projectile, still, as it was eminently practicable and not only unattended by no inconvenience on the one hand but evidently fraught with many advantages on the other, it met with decided and instantaneous success. It was rather an early hour for breakfast, two o'clock in the morning, yet the meal was keenly relished. Ardan served it up in charming style and crowned the dessert with a few bottles of a wine especially selected for the occasion from his own private stock. It was a Tokay Imperial of 1863, the genuine Essenz, from Prince Esterhazy's own wine cellar, and the best brain stimulant and brain clearer in the world, as every connoisseur knows.

around the unknown star that serves as a pivot for our whole solar system. How can our Baltimore Gun Club Projectile then escape the universal law?

"Now what is the consequence of this law? If the orbit were a circle, the satellite would always preserve the same distance from its primary, and its velocity should therefore be constant. But the orbit being an ellipse, and the attracting body always occupying one of the foci, the satellite must evidently lie nearer to this focus in one part of its orbit than in another. The Earth when nearest to the Sun, is in her perihelion; when most distant, in her aphelion. The Moon, with regard to the Earth, is similarly in her perigee, and her apogee. Analogous expressions denoting the relations of the Projectile towards the Moon, would be periselene and aposelene. At its aposelene the Projectile's velocity would have reached its minimum; at the periselene, its maximum. As it is to the former point that we are now moving, clearly the velocity must keep on diminishing until that point is reached. Then, if it does not die out altogether, it must spring up again, and even accelerate as it reapproaches the Moon. Now the great trouble is this: If the Aposelenetic point should coincide with the point of lunar attraction, our velocity must certainly become nil, and the Projectile must remain relatively motionless forever!"

"What do you mean by 'relatively motionless'?" asked M'Nicholl, who was carefully studying the situation.

"I mean, of course, not absolutely motionless," answered Barbican; "absolute immobility is, as you are well aware, altogether impossible, but motionless with regard to the Earth and the--"

"By Mahomet's jackass!" interrupted Ardan hastily, "I must say we're a precious set of imbéciles!"

"I don't deny it, dear friend," said Barbican quietly, notwithstanding the unceremonious interruption; "but why do you say so just now?"

"Because though we are possessed of the power of retarding the velocity that takes us from the Moon, we have never thought of employing it!"

"What do you mean?"

"Do you forget the rockets?"

"It's a fact!" cried M'Nicholl. "How have we forgotten them?"

--"But I now begin to see a possibility, nay, a very decided probability, of our being able to attain the great end at last!"

"Bravo!" cried Ardan.

"Hurrah!" cried M'Nicholl.

"Yes! my brave boys!" cried Barbican as enthusiastically as his companions; "all's not over yet by a long shot!"

What had brought about this great revulsion in the spirits of our bold adventurers? The breakfast? Prince Esterhazy's Tokay? The latter, most probably. What had become of the resolutions they had discussed so ably and passed so decidedly a few hours before? Was the Moon inhabited? No! Was the Moon habitable? No! Yet in the face of all this--or rather as coolly as if such subjects had never been alluded to--here were the reckless scientists actually thinking of nothing but how to work heaven and earth in order to get there!

One question more remained to be answered before they played their last trump, namely: "At what precise moment would the Projectile reach the neutral point?"

To this Barbican had very little trouble in finding an answer. The time spent in proceeding from the south pole to the dead point being evidently equal to the time previously spent in proceeding from the dead point to the north pole--to ascertain the former, he had only to calculate the latter. This was easily done. To refer to his notes, to check off the different rates of velocity at which they had readied the different parallels, and to turn these rates into time, required only a very few minutes careful calculation. The Projectile then was to reach the point of neutral attraction at one o'clock in the morning of December 8th. At the present time, it was five o'clock in the morning of the 7th; therefore, if nothing unforeseen should occur in the meantime, their great and final effort was to be made about twenty hours later.

The rockets, so often alluded to as an idea of Ardan's and already fully described, had been originally provided to break the violence of the Projectile's fall on the lunar surface; but now the dauntless travellers were about to employ them for a purpose precisely the reverse. In any case, having been put in proper order for immediate use, nothing more now remained to be done till the moment should come for firing them off.

already awake and discussing the situation in whispers.

The Projectile, they were remarking, was still pursuing its way from the Moon, and turning its conical point more and more in her direction. This latter phenomenon, though as puzzling as ever, Barbican regarded with decided pleasure: the more directly the conical summit pointed to the Moon at the exact moment, the more directly towards her surface would the rockets communicate their reactionary motion.

Nearly seventeen hours, however, were still to elapse before that moment, that all important moment, would arrive.

The time began to drag. The excitement produced by the Moon's vicinity had died out. Our travellers, though as daring and as confident as ever, could not help feeling a certain sinking of heart at the approach of the moment for deciding either alternative of their doom in this world--their fall to the Moon, or their eternal imprisonment in a changeless orbit. Barbican and M'Nicholl tried to kill time by revising their calculations and putting their notes in order; Ardan, by feverishly walking back and forth from window to window, and stopping for a second or two to throw a nervous glance at the cold, silent and impassive Moon.

Now and then reminiscences of our lower world would flit across their brains. Visions of the famous Gun Club rose up before them the oftenest, with their dear friend Marston always the central figure. What was his bustling, honest, good-natured, impetuous heart at now? Most probably he was standing bravely at his post on the Rocky Mountains, his eye glued to the great Telescope, his whole soul peering through its tube. Had he seen the Projectile before it vanished behind the Moon's north pole? Could he have caught a glimpse of it at its reappearance? If so, could he have concluded it to be the satellite of a satellite! Could Belfast have announced to the world such a startling piece of intelligence? Was that all the Earth was ever to know of their great enterprise? What were the speculations of the Scientific World upon the subject? etc., etc.

In listless questions and desultory conversation of this kind the day slowly wore away, without the occurrence of any incident whatever to relieve its weary monotony. Midnight arrived, December the seventh was dead. As Ardan said: " Le Sept Decembre est mort; vive le Huit! " In one hour more, the neutral point would be reached. At what velocity was the Projectile now moving? Barbican could not exactly tell, but he felt quite certain that no serious error had slipped into his calculations. At one o'clock that night, nil the velocity was to be, and nil it would be!

by the vibration of the Projectile to the internal air. But Ardan saw through the window a long thin flash, which vanished in a second. At the same moment, the three friends became instantaneously conscious of a slight shock experienced by the Projectile.

They looked at each other, speechless, breathless, for about as long as it would take you to count five: the silence so intense that they could easily hear the pulsation of their hearts. Ardan was the first to break it.

"Are we falling or are we not?" he asked in a loud whisper.

"We're not!" answered M'Nicholl, also hardly speaking above his breath. "The base of the Projectile is still turned away as far as ever from the Moon!"

Barbican, who had been looking out of the window, now turned hastily towards his companions. His face frightened them. He was deadly pale; his eyes stared, and his lips were painfully contracted.

"We are falling!" he shrieked huskily.

"Towards the Moon?" exclaimed his companions.

"No!" was the terrible reply. "Towards the Earth!"

" Sacré! " cried Ardan, as usually letting off his excitement in French.

"Fire and fury!" cried M'Nicholl, completely startled out of his habitual sang froid .

"Thunder and lightning!" swore the usually serene Barbican, now completely stunned by the blow. "I had never expected this!"

Ardan was the first to recover from the deadening shock: his levity came to his relief.

"First impressions are always right," he muttered philosophically. "The moment I set eyes on the confounded thing, it reminded me of the Bastille; it is now proving its likeness to a worse place: easy enough to get into, but no redemption out of it!"

There was no longer any doubt possible on the subject. The terrible fall had begun. The Projectile had retained velocity enough not only to carry it beyond the dead point, but it was even able to completely overcome the

universe should make ample amends for missing the Moon!"

M'Nicholl fixed his eyes on Barbican admiringly, feebly muttering with hardly moving lips:

"Grit to the marrow! Grit to the marrow!"

Barbican, head bowed in reverence, arms folded across his breast, meekly and uncomplainingly uttered with sublime resignation:

"Thy will be done!"

"Amen!" answered his companions, in a loud and fervent whisper.

* * * * *

They were soon falling through the boundless regions of space with inconceivable rapidity!

new improvement in sounding gear. The English, the French, and even our own, are nothing but modifications of that fundamental principle. Exceedingly clever fellow!"

"Bottom!" sang out one of the men standing near the derrick and watching the operations.

The Captain and the Lieutenant immediately advanced to question him.

"What's the depth, Coleman?" asked the Lieutenant.

"21,762 feet," was the prompt reply, which Brownson immediately inscribed in his note-book, handing a duplicate to the Captain.

"All right, Lieutenant," observed the Captain, after a moment's inspection of the figures. "While I enter it in the log, you haul the line aboard. To do so, I need hardly remind you, is a task involving care and patience. In spite of all our gallant little donkey engine can do, it's a six hours job at least. Meanwhile, the Chief Engineer had better give orders for firing up, so that we may be ready to start as soon as you're through. It's now close on to four bells, and with your permission I shall turn in. Let me be called at three. Good night!"

"Goodnight, Captain!" replied Brownson, who spent the next two hours pacing backward and forward on the quarter deck, watching the hauling in of the sounding line, and occasionally casting a glance towards all quarters of the sky.

It was a glorious night. The innumerable stars glittered with the brilliancy of the purest gems. The ship, hove to in order to take the soundings, swung gently on the faintly heaving ocean breast. You felt you were in a tropical clime, for, though no breath fanned your cheek, your senses easily detected the delicious odor of a distant garden of sweet roses. The sea sparkled with phosphorescence. Not a sound was heard except the panting of the hard-worked little donkey-engine and the whirr of the line as it came up taut and dripping from the ocean depths. The lamp, hanging from the mast, threw a bright glare on deck, presenting the strongest contrast with the black shadows, firm and motionless as marble. The 11th day of December was now near its last hour.

The steamer was the *Susquehanna*, a screw, of the United States Navy, 4,000 in tonnage, and carrying 20 guns. She had been detached to take soundings between the Pacific coast and the Sandwich Islands, the initiatory

Nineteenth Century, worthy of the Great Republic, and eminently worthy of the illustrious CYRUS W. himself!

As already mentioned, the Susquehanna lay a few hundred miles south of San Diego, or, to be more accurate, in 27° 7' North Latitude and 118° 37' West Longitude (Greenwich).

It was now a little past midnight. The Moon, in her last quarter, was just beginning to peep over the eastern horizon. Lieutenant Brownson, leaving the quarter deck, had gone to the forecastle, where he found a crowd of officers talking together earnestly and directing their glasses towards her disc. Even here, out on the ocean, the Queen of the night, was as great an object of attraction as on the North American Continent generally, where, that very night and that very hour, at least 40 million pairs of eyes were anxiously gazing at her. Apparently forgetful that even the very best of their glasses could no more see the Projectile than angulate Sirius, the officers held them fast to their eyes for five minutes at a time, and then took them away only to talk with remarkable fluency on what they had not discovered.

"Any sign of them yet, gentlemen?" asked Brownson gaily as he joined the group. "It's now pretty near time for them to put in an appearance. They're gone ten days I should think."

"They're there, Lieutenant! not a doubt of it!" cried a young midshipman, fresh from Annapolis, and of course "thoroughly posted" in the latest revelations of Astronomy. "I feel as certain of their being there as I am of our being here on the forecastle of the Susquehanna !"

"I must agree with you of course, Mr. Midshipman," replied Brownson with a slight smile; "I have no grounds whatever for contradicting you."

"Neither have I," observed another officer, the surgeon of the vessel. "The Projectile was to have reached the Moon when at her full, which was at midnight on the 5th. To-day was the 11th. This gives them six days of clear light--time enough in all conscience not only to land safely but to install themselves quite comfortably in their new home. In fact, I see them there already--"

"In my mind's eye, Horatio!" laughed one of the group. "Though the Doc wears glasses, he can see more than any ten men on board."

--"Already"--pursued the Doctor, heedless of the interruption. " Scene , a stony valley near a Selenite stream; the Projectile on the right, half buried in

"This is all nonsense," said the Doctor. "What's the use of a man writing to you if he can't send you what he writes?"

"What's the use of his sending it to you if he can have it read without that trouble?" answered the little Midshipman in a confident tone. "Is there not a telescope at Long's Peak? Doesn't it bring the Moon within a few miles of the Rocky Mountains, and enable us to see on her surface, objects as small as nine feet in diameter? Well! What's to prevent Barbican and his friends from constructing a gigantic alphabet? If they write words of even a few hundred yards and sentences a mile or two long, what is to prevent us from reading them? Catch the idea now, eh?"

They did catch the idea, and heartily applauded the little Middy for his smartness. Even the Doctor saw a certain kind of merit in it, and Brownson acknowledged it to be quite feasible. In fact, expanding on it, the Lieutenant assured his hearers that, by means of large parabolic reflectors, luminous groups of rays could be dispatched from the Earth, of sufficient brightness to establish direct communication even with Venus or Mars, where these rays would be quite as visible as the planet Neptune is from the Earth. He even added that those brilliant points of light, which have been quite frequently observed in Mars and Venus, are perhaps signals made to the Earth by the inhabitants of these planets. He concluded, however, by observing that, though we might by these means succeed in obtaining news from the Moon, we could not possibly send any intelligence back in return, unless indeed the Selenites had at their disposal optical instruments at least as good as ours.

All agreed that this was very true, and, as is generally the case when one keeps all the talk to himself, the conversation now assumed so serious a turn that for some time it was hardly worth recording.

At last the Chief Engineer, excited by some remark that had been made, observed with much earnestness:

"You may say what you please, gentlemen, but I would willingly give my last dollar to know what has become of those brave men! Have they done anything? Have they seen anything? I hope they have. But I should dearly like to know. Ever so little success would warrant a repetition of the great experiment. The Columbiad is still to the good in Florida, as it will be for many a long day. There are millions of men to day as curious as I am upon the subject. Therefore it will be only a question of mere powder and bullets if a cargo of visitors is not sent to the Moon every time she passes our zenith.

indescribable. For some time the utmost confusion reigned on deck. With eyes too dazzled to see, ears still ringing with the frightful combination of unearthly sounds, faces splashed with floods of sea water, and noses stifled with clouds of scalding steam, the crew of the *Susquehanna* could hardly realize that their marvellous escape by a few feet from instant and certain destruction was an accomplished fact, not a frightful dream. They were still engaged in trying to open their eyes and to get the hot water out of their ears, when they suddenly heard the trumpet voice of Captain Bloomsbury crying, as he stood half dressed on the head of the cabin stairs:

"What's up, gentlemen? In heaven's name, what's up?"

The little Midshipman had been knocked flat by the concussion and stunned by the uproar. But before any body else could reply, his voice was heard, clear and sharp, piercing the din like an arrow:

"It's **THEY**, Captain! Didn't I tell you so?"

"Their stock may not be run out yet!" was the ready reply. "Their air apparatus is still on hand."

"They're burned to a cinder!" shrieked the crowd.

"They had not time to be burned!" answered the Band of Hope. "The Projectile did not get hot till it reached the atmosphere, through which it tore in a few seconds."

"If they're neither burned nor smothered nor killed by the shock, they're sure to be drowned!" persisted the crowd, with redoubled lamentations.

"Fish 'em up first!" cried the Hopeful Band. "Come! Let's lose no time! Let's fish 'em up at once!"

The cries of Hope prevailed. The unanimous opinion of a council of the officers hastily summoned together by the Captain was to go to work and fish up the Projectile with the least possible delay. But was such an operation possible? asked a doubter. Yes! was the overwhelming reply; difficult, no doubt, but still quite possible. Certainly, however, such an attempt was not immediately possible as the *Susquehanna* had no machinery strong enough or suitable enough for a piece of work involving such a nicety of detailed operations, not to speak of its exceeding difficulty. The next unanimous decision, therefore, was to start the vessel at once for the nearest port, whence they could instantly telegraph the Projectile's arrival to the Baltimore Gun Club.

But what was the nearest port? A serious question, to answer which in a satisfactory manner the Captain had to carefully examine his sailing charts. The neighboring shores of the California Peninsula, low and sandy, were absolutely destitute of good harbors. San Diego, about a day's sail directly north, possessed an excellent harbor, but, not yet having telegraphic communication with the rest of the Union, it was of course not to be thought of. San Pedro Bay was too open to be approached in winter. The Santa Barbara Channel was liable to the same objection, not to mention the trouble often caused by kelp and wintry fogs. The bay of San Luis Obispo was still worse in every respect; having no islands to act as a breakwater, landing there in winter was often impossible. The harbor of the picturesque old town of Monterey was safe enough, but some uncertainty regarding sure telegraphic communications with San Francisco, decided the council not to venture it. Half Moon Bay, a little to the north, would be just as risky, and in moments like the present when every minute was worth a day, no risk involving the slightest loss of time could be ventured.

Seven hundred and fifty miles of smooth waters presented no very difficult task to a fast traveller like the *Susquehanna*, yet it was not till two days and a-half afterwards that she sighted the Golden Gate. As usual, the coast was foggy; neither Point Lobos nor Point Boneta could be seen. But Captain Bloomsbury, well acquainted with every portion of this coast, ran as close along the southern shore as he dared, the fog-gun at Point Boneta safely directing his course. Here expecting to be able to gain a few hours time by signalling to the outer telegraph station on Point Lobos, he had caused to be painted on a sail in large black letters: "THE MOONMEN ARE BACK!" but the officers in attendance, though their fog-horn could be easily heard--the distance not being quite two miles--were unfortunately not able to see it. Perhaps they did see it, but feared a hoax.

Giving the Fort Point a good wide berth, the *Susquehanna* found the fog gradually clearing away, and by half-past three the passengers, looking under it, enjoyed the glorious view of the Contra Costa mountains east of San Francisco, which had obtained for this entrance the famous and well deserved appellation of the Golden Gate. In another half hour, they had doubled Black Point, and were lying safely at anchor between the islands of Alcatraz and Yerba Buena. In less than five minutes afterwards the Captain was quickly lowered into his gig, and eight stout pairs of arms were pulling him rapidly to shore.

The usual crowd of idlers had collected that evening on the summit of Telegraph Hill to enjoy the magnificent view, which for variety, extent, beauty and grandeur, is probably unsurpassed on earth. Of course, the inevitable reporter, hot after an item, was not absent. The *Susquehanna* had hardly crossed the bar, when they caught sight of her. A government vessel entering the bay at full speed, is something to look at even in San Francisco. Even during the war, it would be considered rather unusual. But they soon remarked that her bowsprit was completely broken off. Very unusual. Something decidedly is the matter. See! The vessel is hardly anchored when the Captain leaves her and makes for Megg's Wharf at North Point as hard as ever his men can pull! Something must be the matter--and down the steep hill they all rush as fast as ever their legs can carry them to the landing at Megg's Wharf.

The Captain could hardly force his way through the dense throng, but he made no attempt whatever to gratify their ill dissembled curiosity.

"Carriage!" he cried, in a voice seldom heard outside the din of battle.

In a moment seventeen able-bodied cabmen were trying to tear him limb

Susquehanna to keep a full head of steam up night and day so as to be ready to give instant execution to orders received at any moment.

The Observatory authorities at Cambridge held a special meeting that very evening, where, with all the serene calmness so characteristic of learned societies, they discussed the scientific points of the question in all its bearings. But, before committing themselves to any decided opinion, they unanimously resolved to wait for the development of further details.

At the rooms of the Gun Club in Baltimore there was a terrible time. The kind reader no doubt remembers the nature of the dispatch sent one day previously by Professor Belfast from the Long's Peak observatory, announcing that the Projectile had been seen but that it had become the Moon's satellite, destined to revolve around her forever and ever till time should be no more. The reader is also kindly aware by this time that such dispatch was not supported by the slightest foundations in fact. The learned Professor, in a moment of temporary cerebral excitation, to which even the greatest scientist is just as liable as the rest of us, had taken some little meteor or, still more probably, some little fly-speck in the telescope for the Projectile. The worst of it was that he had not only boldly proclaimed his alleged discovery to the world at large but he had even explained all about it with the well known easy pomposity that "Science" sometimes ventures to assume. The consequences of all this may be readily guessed. The Baltimore Gun Club had split up immediately into two violently opposed parties. Those gentlemen who regularly conned the scientific magazines, took every word of the learned Professor's dispatch for gospel--or rather for something of far higher value, and more strictly in accordance with the highly advanced scientific developments of the day. But the others, who never read anything but the daily papers and who could not bear the idea of losing Barbican, laughed the whole thing to scorn. Belfast, they said, had seen as much of the Projectile as he had of the "Open Polar Sea," and the rest of the dispatch was mere twaddle, though asserted with all the sternness of a religious dogma and enveloped in the usual scientific slang.

The meeting held in the Club House, 24 Monument Square, Baltimore, on the evening of the 13th, had been therefore disorderly in the highest degree. Long before the appointed hour, the great hall was densely packed and the greatest uproar prevailed. Vice-President Wilcox took the chair, and all was comparatively quiet until Colonel Bloomsbury, the Honorary Secretary in Marston's absence, commenced to read Belfast's dispatch. Then the scene, according to the account given in the next day's Sun, from whose columns we condense our report, actually "beggared description." Roars, yells, cheers, counter-cheers, clappings, hissings, stampings, squallings,

infallible in all. Who can contradict you, if you only wrap up your assertions in specious phrases that not one man in a million attempts to ascertain the real meaning of? We like so much to be saved the trouble of thinking, that it is far easier and more comfortable to be led than to contradict, to fall in quietly with the great flock of sheep that jump blindly after their leader than to remain apart, making one's self ridiculous by foolishly attempting to argue. Real argument, in fact, is very difficult, for several reasons: first, you must understand your subject well, which is hardly likely; secondly, your opponent must also understand it well, which is even less likely; thirdly, you must listen patiently to his arguments, which is still less likely; and fourthly, he must listen to yours, the least likely of all. If a quack advertises a panacea for all human ills at a dollar a bottle, a hundred will buy the bottle, for one that will try how many are killed by it. What would the investigator gain by charging the quack with murder? Nobody would believe him, because nobody would take the trouble to follow his arguments. His adversary, first in the field, had gained the popular ear, and remained the unassailable master of the situation. Our love of "Science" rests upon our admiration of intellect, only unfortunately the intellect is too often that of other people, not our own.

The very sound of Belfast's phrases, for instance, "satellite," "lunar attraction," "immutable path of its orbit," etc, convinced the greater part of the "intelligent" community that he who used them so flippantly must be an exceedingly great man. Therefore, he had completely proved his case. Therefore, the great majority of the ladies and gentlemen that regularly attend the scientific lectures of the Peabody Institute, pronounced Barbican's fate and that of his companions to be sealed. Next morning's newspapers contained lengthy obituary notices of the Great Balloon-attics as the witty man of the New York Herald phrased it, some of which might be considered quite complimentary. These, all industriously copied into the evening papers, the people were carefully reading over again, some with honest regret, some deriving a great moral lesson from an attempt exceedingly reprehensible in every point of view, but most, we are sorry to acknowledge, with a feeling of ill concealed pleasure. Had not they always said how it was to end? Was there anything more absurd ever conceived? Scientific men too! Hang such science! If you want a real scientific man, no wind bag, no sham, take Belfast! He knows what he's talking about! No taking him in! Didn't he by means of the Monster Telescope, see the Projectile, as large as life, whirling round and round the Moon? Anyway, what else could have happened? Wasn't it what anybody's common sense expected? Don't you remember a conversation we had with you one day? etc., etc.

censure, they dodge the blame by trying to show that the accident was unavoidable. The Susquehanna's bowsprit had been snapped off, in all probability, by some sudden squall, or, what was still more likely, some little aerolite had struck it and frightened the crew into fits. When answers of this kind did not lead to blows, the case was an exceptional one indeed. The contestants were so numerous and so excited that the police at last began to think of letting them fight it out without any interference. Marshal O'Kane, though ably assisted by his 12 officers and 500 patrolmen, had a terrible time of it. The most respectable men in Baltimore, with eyes blackened, noses bleeding, and collars torn, saw the inside of a prison that night for the first time in all their lives. Men that even the Great War had left the warmest of friends, now abused each other like fishwomen. The prison could not hold the half of those arrested. They were all, however, discharged next morning, for the simple reason that the Mayor and the aldermen had been themselves engaged in so many pugilistic combats during the night that they were altogether disabled from attending to their magisterial duties next day.

Our readers, however, may be quite assured that, even in the wildest whirl of the tremendous excitement around them, all the members of the Baltimore Gun Club did not lose their heads. In spite of the determined opposition of the Belfasters who would not allow the Bloomsbury dispatch to be read at the special meeting called that evening, a few succeeded in adjourning to a committee-room, where Joseph Wilcox, Esq., presiding, our old friends Colonel Bloomsbury, Major Elphinstone, Tom Hunter, Billsby the brave, General Morgan, Chief Engineer John Murphy, and about as many more as were sufficient to form a quorum, declared themselves to be in regular session, and proceeded quietly to debate on the nature of Captain Bloomsbury's dispatch.

Was it of a nature to justify immediate action or not? Decided unanimously in the affirmative. Why so? Because, whether actually true or untrue, the incident it announced was not impossible. Had it indeed announced the Projectile to have fallen in California or in South America, there would have been good valid reasons to question its accuracy. But by taking into consideration the Moon's distance, and the time elapsed between the moment of the start and that of the presumed fall (about 10 days), and also the Earth's revolution in the meantime, it was soon calculated that the point at which the Projectile should strike our globe, if it struck it at all, would be somewhere about 27° north latitude, and 42° west longitude--the very identical spot given in the Captain's dispatch! This certainly was a strong point in its favor, especially as there was positively nothing valid whatever to urge against it.

after he was confessing with groans that it was all a false alarm. Towards morning, Belfast gave up in despair and went to take a sleep; but no sleep for Marston. Though he was now quite alone, the assistants having also retired, he kept on talking incessantly to himself, expressing the most unbounded confidence in the safety of his friends, and the absolute certainty of their return. It was not until some hours after the Sun had risen and the Moon had disappeared behind the snowy peaks of the west, that he at last withdrew his weary eye from the glass through which every image formed by the great reflector was to be viewed. The countenance he turned on Belfast, who had now come back, was rueful in the extreme. It was the image of grief and despair.

"Did you see nothing whatever during the night, Professor?" he asked of Belfast, though he knew very well the answer he was to get.

"Nothing whatever."

"But you saw them once, didn't you?"

"Them! Who?"

"Our friends."

"Oh! the Projectile--well--I think I must have made some oversight."

"Don't say that! Did not Mr. M'Connell see it also?"

"No. He only wrote out what I dictated."

"Why, you must have seen it! I have seen it myself!"

"You shall never see it again! It's shot off into space."

"You're as wrong now as you thought you were right yesterday."

"I'm sorry to say I was wrong yesterday; but I have every reason to believe I'm right to-day."

"We shall see! Wait till to-night!"

"To-night! Too late! As far as the Projectile is concerned, night is now no better than day."

He was on his feet in an instant.

"Say that again!"

"In the Pacific Ocean."

"Hurrah! All right! Old Barbican's not made into mincemeat yet! No, sirree! Let's start!"

"Where for?"

"San Francisco!"

"When?"

"This instant!"

"In the dark?"

"We shall soon have the light of the Moon! Curse her! it's the least she can do after all the trouble she has given us!"

itself. Constantly presenting the sharpest points of contrast between the most savage features of wild barbaric nature on the one hand, and the most touching traits of the sweetest humanity on the other, the story of our Club men's adventures, if only well told, could hardly fail to be highly interesting. But instead of a volume, we can give it only a chapter, and that a short one.

From Julesburg, the last station on the eastern end of the Pacific Railroad, to Cisco, the last station on its western end, the distance is probably about fifteen hundred miles, about as far as Constantinople is from London, or Moscow from Paris. This enormous stretch of country had to be travelled all the way by, at the best, a six horse stage tearing along night and day at a uniform rate, road or no road, of ten miles an hour. But this was the least of the trouble. Bands of hostile Indians were a constant source of watchfulness and trouble, against which even a most liberal stock of rifles and revolvers were not always a reassurance. Whirlwinds of dust often overwhelmed the travellers so completely that they could hardly tell day from night, whilst blasts of icy chill, sweeping down from the snowy peaks of the Rocky Mountains, often made them imagine themselves in the midst of the horrors of an Arctic winter.

The predominant scenery gave no pleasure to the eye or exhilaration to the mind. It was of the dreariest description. Days and days passed with hardly a house to be seen, or a tree or a blade of grass. I might even add, or a mountain or a river, for the one was too often a heap of agglomerated sand and clay cut into unsightly chasms by the rain, and the other generally degenerated into a mere stagnant swamp, its shallowness and dryness increasing regularly with its length. The only houses were log ranches, called Relays, hardly visible in their sandy surroundings, and separate from each other by a mean distance of ten miles. The only trees were either stunted cedars, so far apart, as to be often denominated Lone Trees; and, besides wormwood, the only plant was the sage plant, about two feet high, gray, dry, crisp, and emitting a sharp pungent odor by no means pleasant.

In fact, Barbican and his companions had seen nothing drearier or savager in the dreariest and savagest of lunar landscapes than the scenes occasionally presented to Marston and his friends in their headlong journey on the track of the great Pacific Railroad. Here, boulders, high, square, straight and plumb as an immense hotel, blocked up your way; there, lay an endless level, flat as the palm of your hand, over which your eye might roam in vain in search of something green like a meadow, yellow like a cornfield, or black like ploughed ground--a mere boundless waste of dirty white from the stunted wormwood, often rendered misty with the clouds of smarting alkali dust.

carriages, provisions were always in abundance. Their object being well known, they had the best wishes of every hand on the road. People remained up for them all hours of the night, no matter at what station they were expected. The warmest and most comfortable of meals were always ready for them, for which no charge would be taken on any account. In Utah, a deputation of Mormons galloped alongside them for forty miles to help them over some points of the road that had been often found difficult. The season was the finest known for many years. In short, as an old Californian said as he saw them shooting over the rickety bridge that crossed the Bear River at Corinne: "they had everything in their favor-- luck as well as pluck !"

The rate at which they performed this terrible ride across the Continent and the progress they made each day, some readers may consider worthy of a few more items for the sake of future reference. Discarding the ordinary overland mail stage as altogether too slow for their purpose, they hired at Julesburg a strong, well built carriage, large enough to hold them all comfortably; but this they had to replace twice before they came to their journey's end. Their team always consisted of the best six horses that could be found, and their driver was the famous Hank Monk of California, who, happening to be in Julesburg about that time, volunteered to see them safely landed in Cisco on the summit of the Sierra Nevada. They were enabled to change horses as near as possible every hour, by telegraphing ahead in the morning, during the day, and often far into the hours of night.

Starting from Julesburg early in the morning of the 17th, their first resting place for a few hours at night was Granite Canyon, twenty miles west of Cheyenne, and just at the foot of the pass over the Black Hills. On the 18th, night-fall found them entering St. Mary's, at the further end of the pass between Rattle Snake Hills and Elk Mountain. It was after 5 o'clock and already dark on the 19th, when the travellers, hurrying with all speed through the gloomy gorge of slate formation leading to the banks of the Green River, found the ford too deep to be ventured before morning. The 20th was a clear cold day very favorable for brisk locomotion, and the bright sun had not quite disappeared behind the Wahsatch Mountains when the Club men, having crossed the Bear River, began to leave the lofty plateau of the Rocky Mountains by the great inclined plane marked by the lines of the Echo and the Weber Rivers on their way to the valley of the Great American Desert.

Quitting Castle Rock early on the morning of the 21st, they soon came in sight of the Great Salt Lake, along the northern shores of which they sped all day, taking shelter after night-fall at Terrace, in a miserable log cabin surrounded by piles of drifting sand. The 22d was a terrible day. The sand

"Is that really the case, Captain?" asked all, very agreeably surprised.

"Yes, gentlemen, I am most happy to state that I am quite in earnest."

"Can we start to-morrow?" asked General Morgan. "We have not a moment to spare, you know."

"We can start at noon to-morrow at latest," replied the Captain, "if the foundry men do a little extra work to-night."

"We must start this very day, Captain Bloomsbury," cried Marston resolutely; "Barbican has been lying two weeks and thirteen hours in the depths of the Pacific! If he is still alive, no thanks to Marston! He must by this time have given me up! The grappling irons must be got on board at once, Captain, and let us start this evening!"

At half-past four that very evening, a shot from the Fort and a lowering of the Stars and Stripes from its flagstaff saluted the *Susquehanna*, as she steamed proudly out of the Golden Gate at the lively rate of fifteen knots an hour.

performed at great sea depths, as its distinctive feature, "the regulator," could maintain, what is not done by any other diving armor, a constant equality of pressure on the lungs between the external and the internal air.

But perhaps the most useful article of all was a new form of diving bell called the Nautilus, a kind of submarine boat, capable of lateral as well as vertical movement at the will of its occupants. Constructed with double sides, the intervening chambers could be filled either with water or air according as descent or ascent was required. A proper supply of water enabled the machine to descend to depths impossible to be reached otherwise; this water could then be expelled by an ingenious contrivance, which, replacing it with air, enabled the diver to rise towards the surface as fast as he pleased.

All these and many other portions of the submarine apparatus which had been employed that very year for clearing the channel, lifting the wrecks and recovering the treasure, lay now at San Francisco, unused fortunately on account of the season of the year, and therefore they could be readily obtained for the asking. They had even been generously offered to Captain Bloomsbury, who, in obedience to a telegram from Washington, had kept his crew busily employed for nearly two weeks night and day in transferring them all safely on board the Susquehanna.

Marston was the first to make a careful inspection of every article intended for the operation.

"Do you consider these buoys powerful enough to lift the Projectile, Captain?" he asked next morning, as the vessel was briskly heading southward, at a distance of ten or twelve miles from the coast on their left.

"You can easily calculate that problem yourself, Mr. Marston," replied the Captain. "It presents no difficulty. The Projectile weighs about 20 thousand pounds, or 10 tons?"

"Correct!"

"Well, a pair of these buoys when inflated can raise a weight of 30 tons."

"So far so good. But how do you propose attaching them to the Projectile?"

"We simply let them descend in a state of collapse; the diver, going down with them, will have no difficulty in making a fast connection. As soon as they are inflated the Projectile will come up like a cork."

dead gold fish in an aquarium; or perhaps burned to a cinder, like papers in a "champion" safe after a great fire; or, who knows? perhaps at that very moment the poor fellows were making their last and almost superhuman struggles to burst their watery prison and ascend once more into the cheerful regions of light and air! Alas! How vain must such puny efforts prove! Plunged into ocean depths of three or four miles beneath the surface, subjected to an inconceivable pressure of millions and millions of tons of sea water, their metallic shroud was utterly unassailable from within, and utterly unapproachable from without!

Early on the morning of December 29th, the Captain calculating from his log that they must now be very near the spot where they had witnessed the extraordinary phenomenon, the *Susquehanna* hove to. Having to wait till noon to find his exact position, he ordered the steamer to take a short circular course of a few hours' duration, in hope of sighting the buoy. But though at least a hundred telescopes scanned the calm ocean breast for many miles in all directions, it was nowhere to be seen.

Precisely at noon, aided by his officers and in the presence of Marston, Belfast, and the Gun Club Committee, the Captain took his observations. After a moment or two of the most profound interest, it was a great gratification to all to learn that the *Susquehanna* was on the right parallel, and only about 15 miles west of the precise spot where the Projectile had disappeared beneath the waves. The steamer started at once in the direction indicated, and a minute or two before one o'clock the Captain said they were "there." No sign of the buoy could yet be seen in any direction; it had probably been drifted southward by the Mexican coast current which slowly glides along these shores from December to April.

"At last!" cried Marston, with a sigh of great relief.

"Shall we commence at once?" asked the Captain.

"Without losing the twenty thousandth part of a second!" answered Marston; "life or death depends upon our dispatch!"

The *Susquehanna* again hove to, and this time all possible precautions were taken to keep her in a state of perfect immobility--an operation easily accomplished in these pacific latitudes, where cloud and wind and water are often as motionless as if all life had died out of the world. In fact, as the boats were quietly lowered, preparatory for beginning the operations, the mirror like calmness of sea, sky, and ship so impressed the Doctor, who was of a poetical turn of mind, that he could not help exclaiming to the little

oiled and tested beforehand; the signalling apparatus had been subjected to the rigidest examination; and every portion of the machinery had been proved to be in admirable working order.

The chances of immediate and unforeseen danger, it is true, had been somewhat diminished by all these precautions. The risk, nevertheless, was fearful. The slightest accident or even carelessness might easily lead to the most disastrous consequence.

Five minutes after two o'clock, the manhole being closed, the lamps lit, and everything pronounced all right, the signal for the descent was given, and the Nautilus immediately disappeared beneath the waters. A double anxiety now possessed all on board the *Susquehanna* : the prisoners in the Nautilus were in danger as well as the prisoners in the Projectile. Marston and his friends, however, were anything but disquieted on their own account, and, pencil in hand and noses flattened on the glass plates, they examined carefully everything they could see in the liquid masses through which they were descending.

For the first five hundred feet, the descent was accomplished with little trouble. The Nautilus sank rather slowly, at a uniform rate of a foot to the second. It had not been two minutes under water when the light of day completely disappeared. But for this the occupants were fully prepared, having provided themselves with powerful lamps, whose brilliant light, radiating from polished reflectors, gave them an opportunity of seeing clearly around it for a distance of eight or ten feet in all directions. Owing to the superlatively excellent construction of the Nautilus, also on account of the scaphanders, or suits of diving armor, with which Marston and his friends had clothed themselves, the disagreeable sensations to which divers are ordinarily exposed, were hardly felt at all in the beginning of the descent.

Marston was about to congratulate his companions on the favorable auspices inaugurating their trip, when Murphy, consulting the instrument, discovered to his great surprise that the Nautilus was not making its time. In reply to their signal "faster!" the downward movement increased a little, but it soon relaxed again. Instead of less than two minutes, as at the beginning, it now took twelve minutes to make a hundred feet. They had gone only seven hundred feet in thirty-seven minutes. In spite of repeated signalling, their progress during the next hour was even still more alarming, one hundred feet taking exactly 59 minutes. To shorten detail, it required two hours more to make another hundred feet; and then the Nautilus, after taking ten minutes to crawl an inch further, came to a perfect stand still. The pressure of the water had evidently now become too enormous to allow

back again.

The second descent was quicker than the first, but just as futile. At 1152 feet, the Nautilus positively refused to go a single inch further. Marston looked like a man in a stupor. He made no objection to the signal given by the others to return; he even helped to cut the ropes by which the cannon balls had been attached. Not a single word was spoken by the party, as they slowly rose to the surface. Marston seemed to be struggling against despair. For the first time, the impossibility of the great enterprise seemed to dawn upon him. He and his friends had undertaken a great fight with the mighty Ocean, which now played with them as a giant with a pigmy. To reach the bottom was evidently completely out of their power; and what was infinitely worse, there was nothing to be gained by reaching it. The Projectile was not on the bottom; it could not even have got to the bottom. Marston said it all in a few words to the Captain, as the Clubmen stepped on deck a few hours later:

"Barbican is floating midway in the depths of the Pacific, like Mahomet in his coffin!"

Blindly yielding, however, to the melancholy hope that is born of despair, Marston and his friends renewed the search next day, the 30th, but they were all too worn out with watching and excitement to be able to continue it longer than a few hours. After a night's rest, it was renewed the day following, the 31st, with some vigor, and a good part of the ocean lying between Guadalupe and Benito islands was carefully investigated to a depth of seven or eight hundred feet. No traces whatever of the Projectile. Several California steamers, plying between San Francisco and Panama, passed the Susquehanna within hailing distance. But to every question, the invariable reply one melancholy burden bore:

"No luck!"

All hands were now in despair. Marston could neither eat nor drink. He never even spoke the whole day, except on two occasions. Once, when somebody heard him muttering:

"He's now seventeen days in the ocean!"

The second time he spoke, the words seemed to be forced out of him. Belfast admitted, for the sake of argument, that the Projectile had fallen into the ocean, but he strongly denounced the absurd idea of its occupants being still alive. "Under such circumstances," went on the learned Professor,

They found the whole crew gazing in one direction, and, though speaking in little more than whispers, evidently in a state of extraordinary excitement.

What could all this mean? Was there any ground for hope? The thought sent a pang of delight through Marston's wildly beating heart that almost choked him.

The Captain beckoned to the Club men to take a place on the bridge beside himself. They instantly obeyed, all quietly yielding them a passage.

The vessel was now only about a quarter of a mile distant from the object and therefore near enough to allow it to be distinguished without the aid of a glass.

What! The flag bore the well known Stars and Stripes!

An electric shudder of glad surprise shot through the assembled crowd. They still spoke, however, in whispers, hardly daring to utter their thoughts aloud.

The silence was suddenly startled by a howl of mingled ecstasy and rage from Marston.

He would have fallen off the bridge, had not the others held him firmly. Then he burst into a laugh loud and long, and quite as formidable as his howl.

Then he tore away from his friends, and began beating himself over the head.

"Oh!" he cried in accents between a yell and a groan, "what chuckleheads we are! What numskulls! What jackasses! What double-treble-barrelled gibbering idiots!" Then he fell to beating himself over the head again.

"What's the matter, Marston, for heaven's sake!" cried his friends, vainly trying to hold him.

"Speak for yourself!" cried others, Belfast among the number.

"No exception, Belfast! You're as bad as the rest of us! We're all a set of unmitigated, demoralized, dog-goned old lunatics! Ha! Ha! Ha!"

"Speak plainly, Marston! Tell us what you mean!"

"Queen! How is that for high?"

It was instantly answered by another voice, shriller, louder, quicker, more joyous and triumphant in tone, but slightly tinged with a foreign accent:

"King! My brave Mac! How is that for high?"

The deep, clear, calm voice that spoke next thrilled the listeners outside with an emotion that we shall not attempt to portray. Except that their ears could detect in it the faintest possible emotion of triumph, it was in all respects as cool, resolute, and self-possessed as ever:

"Ace! Dear friends, how is that for high?"

They were quietly enjoying a little game of High-Low-Jack!

How they must have been startled by the wild cheers that suddenly rang around their ocean-prison! How madly were these cheers re-echoed from the decks of the *Susquehanna*! Who can describe the welcome that greeted these long lost, long beloved, long despaired of Sons of Earth, now so suddenly and unexpectedly rescued from destruction, and restored once more to the wonderstricken eyes of admiring humanity? Who can describe the scenes of joy and exuberant happiness, and deep felt gratitude, and roaring rollicking merriment, that were witnessed on board the steamer that night and during the next three days!

As for Marston, it need hardly be said that he was simply ecstatic, but it may interest both the psychologist and the philologist to learn that the expression *How is that for high?* struck him at once as with a kind of frenzy. It became immediately such a favorite tongue morsel of his that ever since he has been employing it on all occasions, appropriate or otherwise. Thanks to his exertions in its behalf all over the country, the phrase is now the most popular of the day, well known and relished in every part of the Union. If we can judge from its present hold on the popular ear it will continue to live and flourish for many a long day to come; it may even be accepted as the popular expression of triumph in those dim, distant, future years when the memory not only of the wonderful occasion of its formation but also of the illustrious men themselves who originated it, has been consigned forever to the dark tomb of oblivion!

So decided, so done.

It was nearly two months before Barbican and his friends could get back to Baltimore. The winter travelling over the Rocky Mountains had been very difficult on account of the heavy snows, and, even when they found themselves in the level country, though they tried to travel as privately as possible, and for the present positively declined all public receptions, they were compelled to spend some time in the houses of the warm friends near whom they passed in the course of their long journey.

The rough notes of their Moon adventures--the only ones that they could furnish just then--circulating like wild fire and devoured with universal avidity, only imparted a keener whet to the public desire to feast their eyes on such men. These notes were telegraphed free to every newspaper in the country, but the longest and best account of the " Journey to the Moon " appeared in the columns of the New York Herald , owing to the fact that Watkins the reporter had had the adventurers all to himself during the whole of the three days' trip of the Susquehanna back to San Francisco. In a week after their return, every man, woman, and child in the United States knew by heart some of the main facts and incidents in the famous journey; but, of course, it is needless to say that they knew nothing at all about the finer points and the highly interesting minor details of the astounding story. These are now all laid before the highly favored reader for the first time. I presume it is unnecessary to add that they are worthy of his most implicit confidence, having been industriously and conscientiously compiled from the daily journals of the three travellers, revised, corrected, and digested very carefully by Barbican himself.

It was, of course, too early at this period for the critics to pass a decided opinion on the nature of the information furnished by our travellers. Besides, the Moon is an exceedingly difficult subject. Very few newspaper men in the country are capable of offering a single opinion regarding her that is worth reading. This is probably also the reason why half-scientists talk so much dogmatic nonsense about her.

Enough, however, had appeared in the notes to warrant the general opinion that Barbican's explorations had set at rest forever several pet theories lately started regarding the nature of our satellite. He and his friends had seen her with their own eyes, and under such favorable circumstances as to be altogether exceptional. Regarding her formation, her origin, her inhabitability, they could easily tell what system should be rejected and what might be admitted. Her past, her present, and her future, had been alike laid bare before their eyes. How can you object to the positive assertion

them a welcome the heartiest and most unanimous that the world has ever yet witnessed.

Evergreens were to deck the lamp-posts; triumphal arches to span the streets; fountains, squirting eau de cologne, to perfume and cool the air; bands, stationed at proper intervals, to play the most inspiring music; and boys and girls from public and private schools, dressed in picturesque attire, to sing songs of joy and glory. The people, seated at the banquetting tables, were to rise and cheer and toast the heroes as they passed; the military companies, in splendid uniforms, were to salute them with presented arms; while the bells pealed from the church towers, the great guns roared from the armories, feux de joie resounded from the ships in the harbor, until the day's wildest whirl of excitement was continued far into the night by a general illumination and a surpassing display of fireworks. Right in the very heart of the city, the slowly moving triumphal car was always to halt long enough to allow the Club men to join the cheering citizens at their meal, which was to be breakfast, dinner or supper according to that part of the day at which the halt was made.

The number of champagne bottles drunk on these occasions, or of the speeches made, or of the jokes told, or of the toasts offered, or of the hands shaken, of course, I cannot now weary my kind reader by detailing, though I have the whole account lying before me in black and white, written out day by day in Barbican's own bold hand. Yet I should like to give a few extracts from this wonderful journal. It is a perfect model of accuracy and system. Whether detailing his own doings or those of the innumerable people he met, Caesar himself never wrote anything more lucid or more pointed. But nothing sets the extraordinary nature of this great man in a better light than the firm, commanding, masterly character of the handwriting in which these records are made. The elegant penmanship all through might easily pass for copper plate engraving--except on one page, dated " Boston, after dinner ," where, candor compels me to acknowledge, the "Solid Men" appear to have succeeded in rendering his iron nerves the least bit wabbly.

The palace car had been so constructed that, by turning a few cranks and pulling out a few bolts, it was transformed at once into a highly decorated and extremely comfortable open barouche. Marston took the seat usually occupied by the driver: Ardan and M'Nicholl sat immediately under him, face to face with Barbican, who, in order that everyone might be able to distinguish him, was to keep all the back seat for himself, the post of honor.

On Monday morning, the fifth of May, a month generally the pleasantest in the United States, the grand national banquet commenced in Baltimore, and

touching sympathy.

The New York Herald reporter, Mr. Watkins, followed them closely everywhere in a palace car of his own, and kept the public fully enlightened regarding every incident worth regarding along the route, almost as soon as it happened. He was enabled to do this by means of a portable telegraphic machine of new and most ingenious construction. Though its motive power was electricity, it could dispense with the ordinary instruments and even with wires altogether, yet it managed to transmit messages to most parts of the world with an accuracy that, considering how seldom it failed, is almost miraculous. The principle actuating it, though guessed at by many shrewd scientists, is still a profound secret and will probably remain so for some time longer, the Herald having purchased the right to its sole and exclusive use for fifteen years, at an enormous cost.

Who shall say that the apotheosis of our three heroes was not worthy of them, or that, had they lived in the old prehistoric times, they would not have taken the loftiest places among the demi-gods?

As the tremendous whirl of excitement began slowly to die away, the more thoughtful heads of the Great Republic began asking each other a few questions:

Can this wonderful journey, unprecedented in the annals of wonderful journeys, ever lead to any practical result?

Shall we ever live to see direct communication established with the Moon?

Will any Air Line of space navigation ever undertake to start a system of locomotion between the different members of the solar system?

Have we any reasonable grounds for ever expecting to see trains running between planet and planet, as from Mars to Jupiter and, possibly afterwards, from star to star, as from Polaris to Sirius?

Even to-day these are exceedingly puzzling questions, and, with all our much vaunted scientific progress, such as "no fellow can make out." But if we only reflect a moment on the audacious go-a-headiveness of the Yankee branch of the Anglo Saxon race, we shall easily conclude that the American people will never rest quietly until they have pushed to its last result and to every logical consequence the astounding step so daringly conceived and so wonderfully carried out by their great countryman Barbican.

emanate all the life, order, dispatch, simplicity, economy, and wonderful harmony which, so far, have so eminently characterized the magnificent project. With all operations for raising the necessary funds--further than by giving some sound practical advice--he positively refused to connect himself (this may be the reason why subscriptions to the Centennial stock are so slow in coming in), but in the proper apportionment of expenses and the strict surveillance of the mechanical, engineering, and architectural departments, his services have proved invaluable. His experience in the vast operations at Stony Hill has given him great skill in the difficult art of managing men. His voice is seldom heard at the meetings, but when it is, people seem to take a pleasure in readily submitting to its dictates.

In wet weather or dry, in hot weather or cold, he may still be seen every day at Fairmount Park, Philadelphia, leisurely strolling from building to building, picking his steps quietly through the bustling crowds of busy workmen, never speaking a word, not even to Marston his faithful shadow, often pencilling something in his pocket book, stopping occasionally to look apparently nowhere, but never, you may be sure, allowing a single detail in the restless panorama around him to escape the piercing shaft of his eagle glance.

He is evidently determined on rendering the great CENTENNIAL of his country a still greater and more wonderful success than even his own world-famous and never to be forgotten JOURNEY through the boundless fields of ether, and ALL AROUND THE MOON!

END.