terior of the tube, the arrangement being such that the bolts and iron work are wholly covered by the cement and carefully protected from the corrosive effects of the water. The exterior of a tube thus made would present a solid surface of hydraulic cement.

EDITORIAL CORRESPONDENCE.

Moorish and Spanish Andalusia—Cordova and its Christianized Mosque—Seville, its Cathedral and other sights—Malaga, its Climate, Beggars and Dry River—A Trip to Granada in a Dilligence—Curious Sights—Splendid Scenery—The Alhambra.

MALAGA, Dec. 14, 1867.

Andalusia, about which poets have sung and historians have written so much, comprises eight of the principal provinces of Southwestern Spain, and contains its most ancient and interesting cities. The country is also most oriental in its character, and possesses some fine scenery, and luxuriates in an abundance of tropical productions. The venerable olive with its scragged trunk and pale green leaves, the orange, the lemon, the graceful palm, the mournful cypress, and the mulberry, impart to the whole country a charming variety and loveliness. The aloe and cactus are abundant, and are planted in hedgerows along the railways, and sometimes for the division of farm lands. The valleys are sheltered by ragged, desolate mountains of gray granite, treeless and shrubless, and by brown hills, with intervening gullies,which often resemble vast buttresses or ridges of dirt thrown up by human hand to support some structure or earthwork. The vine is extensively cultivated upon these hills, and what adds much to the picturesque character of the scene are the white houses of the peasants, which are often perched upon these ridges like a dovecot upon the top of a barn. The villages are usually built upon a steep hill, or rugged crag, with moldering battlements and ruined watch tower, within which the people, in olden times, congregated for mutual protection in times of civil wars or against the roving bands of freebooters which, unhappily, are not extinct to this day. We have been in Spain upwards of a month, during which time it has rained but two days and one night. The sky is usually cloudless, resembling in color that our of beautiful October. The sunrisings are exquisite; the sunsettings brilliant beyond description. To compensate for the absence of rain, which rarely ever exceeds thirty-five days in a year, the nightly dews are said to be abundant, especially near the Mediterranean, and the land is channeled into watercourses for irrigation, and irrigating wells, worked by mules, are very numerous. The water is usually raised into tanks by the rudest possible contrivances, and then emptied into conduits, which are frequently built up of brick or stone, on an incline,and carefully cemented, so that the water can easily be carried to refresh any part of the land. The labor connected with this general irrigation of land is prodigious, but without all this care, Andalusia would soon become a sterile waste—forsaken and tenantless. Barns are seldom seen in Spain as there is but little hay raised. The land is chiefly devoted to the raising of grain,which is threshed upon a circular brick or stone threshing floor, by means of a heavy wooden boat or drag having pieces of flint inserted in the bottom. This machine is dragged about over the grain by mules, and thus, by the joint operation of stone-boat and mule's feet, the grain is got out, and afterward winnowed by natural currents of air.

The Moors once inhabited this whole region, and there still exist abundant evidences of their taste, civilization, and learning. They came over from Africa upwards of a thousand years ago, and expelled the Goth from the land, driving him Northward, so that at one time even Madrid was an outpost of the conquering Arab.

The dull old city of Cordova may possibly contain forty thousand inhabitants, but what must it have been in the days of its pomp and pride as the Moorish capitol! History, or tradition—which is often a clue to correct historical data—says that in the 10th century, under the dynasty of the Moorish princes, Cordova and its suburbs contained 300,000 inhabitants, 600 mosques, 50 hospitals, 800 public schools, 900 baths, and a library of 600,000 volumes. The arts and sciences were cultivated with assiduous care,and Moslems though they were, they never practised the *auto de fe*, nor encouraged the horrors of Inquisition. On the contrary it was their custom always to respect the liberty of religion, and to inscribe upon the doorpost the declaration of "impartial justice." The Cathedral, or more properly speaking, the Christianized Mosque of Cordova is doubtless the finest specimen in Europe of the true temple of Islam. Its proportions are vast,massive, simple, elegant, and impressive. It has not the overpowering sublimity of Gothic Cathedrals, owing to the fact that all Moorish structures were intended to impress a lowly humility upon the minds of its believers, and as a natural consequence, this cathedral mosque, though covering more ground than St. Peter's, at Rome, resembles a vast undercroft to some gigantic building above it. The interior is divided into nineteen naves, resting upon one thousand variegated marble columns, which support the Moorish or horseshoe arches. Spanish daub and whitewash have obliterated much of the rich Arabesque ornamentation, but enough still remains to testify to the exquisite taste and skill of the Moorish artificers. There are forty-five chapels in the cathedral, but the only ones worthy of notice are those that were left by the exiled Moors. The Sanctuary of the Mosque still remains, and its marble pavement mutely bears witness how faithfully the the Moslem performed his religious vows by going around it upon his bended knees. Recently a most touching scene occurred in this little sanctuary, on the occasion of a visit of a Prince of Morocco, who went on his knees seven times around it, praying, and weeping like a child. The gorgeous workmanship of his ancestors had been stripped of its brilliant decorations by a people who could not even read the Arabic inscriptions. The cathedral is surrounded upon three sides by some ecclesiastical buildings and a high wall, inclosing a fine large court which contains some beautiful palms, and a grove of noble orange trees, upwards of three hundred years old, and now fruitful even in their old age. In the center stands the very cistern that was used for ablutions by the Moors in the 10th century. Every day this beautiful court is thronged by priests, who smoke, and sun their sleek black garments, and by hideous beggars who watch and wait and annoy all visitors by their piteous cries and dissembled prayers. Such beggary and distorted misery I never before saw in any other country; and who can wonder that it should be so, when so many idle, well dressed priests are permitted to eat up the substance and hard earnings of the people. The revenue of the Cathedral of Seville supports, as I was informed, over one hundred priests, with a correspoding heavy distribution among the other twenty-six churches of the city. The Archbishop lives like a prince, and the poor people support all this idleness and extravagance in the name of religion. The streets of Cordova are very narrow, and the houses are usually two stories high, having patios or interior courts, paved with marble, after the Moorish style, provided, also, with galleries and fountains to shelter and cool in warm weather. Oranges, lemons, banannas, and rare plants and flowers are usually cultivated in these courts, and are always to be seen through grated iron doors—a most cheerful and refreshing sight. Moorish mills and other remains abound in Cordova, but their glory has departed, never to return. The beautiful Guadalquiver runs under an old stone bridge, the piers of which were built by Octavius Cæsar.

It is five hours' journey by rail from Cordova to Seville, which is perhaps the most interesting city in Spain. It stands upon the Guadalquiver, and the surrounding plains teem with the luxurious productions of the country. Like Cordova, it is ancient and Moorish; but by reason of its commerce, Seville appears to be an improving, busy, prosperous city. The chief attraction of all Spanish cities seems, first, to center in the old Cathedrals, and in this particular, Seville stands unrivalled in Spain, and second only to Rome, which disputes all competition. The Cathedral of Seville occupies the spot where the ancient Romans once had a Temple to Venus. This was substituted by an elegant Moorish Mosque, of which nothing now remains. The present edifice is Gothic, of the best period in Spain, and combines majesty, simplicity, and and elegance. I always make it a rule to visit the Cathedral at the hour of Morning Prayer, when the first light of heaven begins to stream through the richly painted windows, and the incense from the altars is diffusing its cloudy vapors. At such an hour there is present a sort of mysterious influence which increases the effect upon the mind to a wonderful degree, and especially so in the Cathedral, the interior of which is truly vast in all its proportions of length, breadth, and hight, and where unity and harmony seem to pervade every part. The only apparent defect—and it is a serious one—is that the high chapel and choir have since been built in the central nave, thus breaking the view and sadly marring the interior effect. People who do such things are unworthy to have so fine an edifice. The pavement of the church is laid in black and white marble, and beneath a large monumental slab is buried Fernando, a son of Christopher Columbus, who bequeathed a splendid library to the city, and was esteemed a man of piety and much learning. There are also some splendid pictures by Murillo, who lived and died in Seville, but, most unfortunately, their beauties are partially concealed by the sombre walls of the cathedral chapels. The Sacristy of the church is by far the richest in Spain, and contains valuable paintings, besides tons of silver and gold and other precious relics, some of which put the faith of skeptics to a pretty severe test. St. Ferdinand, the king who expelled the Moors from Seville, Beatrix, his wife, Alonzo, the Learned, and Donna Maria de Padilla, the celebrated mistress of Don Pedro, the Cruel, are buried in the chapel. The Moorish Giralda, or tower stands separated from the cathedral, and is a most exquisite structure. Its ascent is easily made, up thirty-four inclines, which a horse could easily traverse, and from the top the view of the city, plain, and distant mountains is truly glorious. Seville has a fine Moorish Alcazar, or Calif's Palace, which, in spite of the tinkering of Spanish Kings, still retains much of its former splendor, and certainly nothing can exceed its charming oriental gardens with their loaded orange and lemon trees, rare flowers, fountains, and long Moorish galleries which overhang them. The Alcazar is now the property of the Duke of Montpensier, son of Louis Phillipe, who has a splendid palace and orangery adjoining. The residence of the late Barber of Seville is pointed out, but the goodwill of his business seems to have departed with him,as the house is now occupied for domestic purposes. The famous *roué*, Don Juan, of Lord Byron's voluptuous pen, also lived here and died in the hospital La Caridad, which was built by Don Mauara, a wealthy profligate young nobleman. It is said that Don Juan died a "perfect example of piety, humanity, and abnegation." His frail humanity lies buried in in a room adjoining the chapel, where are preserved a model of his head, also, his sword, spoon, and fork; and upon a marble slab, over his remains, are inscribed the words, "Here lies the body of the worst man that ever lived. All pray for me." A sad inscription and a sad commentary upon an ill-spent life. The chapel of La Caridad contains the masterpieces of Murillo: Moses smiting the rock, and Christ feeding the multitude. Also, a most extraordinary picture, painted by Valdes Leal, called the "Dead Prelate." When Murillo looked at it, he said to the artist, "One cannot look at your picture without holding his nose;" to which the artist replied, "You have taken all the flesh and left me to work on bones." It is a curious picture to adorn the walls of a church, but it possesses a religious idea in the prelate's hat and robes, and that is enough to inspire the reverential awe of these benighted people. The small picture gallery has several fine Murillos—all religious subjects, and it is a pity that so many of this master's great works should be buried up in old Spanish towns, where few can ever see and appreciate them. An Englishman, who was here with us, said that he intended to propose to his government to swap off Gibralter for the works of the Spanish Masters. He thought it would be a profitable bargain to give up a big rock of expense for something really worth having. The ideal God of Spain, however, would depart with these truly noble pictures.

The Government Tobacco Factory, in Seville, employs 5000 women. The sight is the most singular spectacle of humanity to be met with anywhere. The girls earn about 50 cts. per day, and are supplied with a dinner in the building at a cost of four cents per head. They are of all ages and colors, and work chiefly in one immense hall. There were little babies lying in tobacco baskets; some were nursing, others being attended by larger children. Also, pet dogs and cats, and a general jumbling up of all sorts of things. The snuff is pounded in a wooden mill that resembled an old-fashioned fulling mill, and worked by mules blindfolded, possibly to keep the snuff out of their eyes, or to prevent them from being frightened by the ugly old mill which they are employed to grind. Persons fond of tobacco (and these girls are fond of it), may here see how their favorite weed is prepared, and of what stuff it is made. It is said that a very romantic marriage of love took place a few days ago—the union of an old tobacco maker of 102 with a tobacco damsel of 15 years. The centenarian had saved a little money, and was at a loss to know how he could bestow it in case he should ever die, therefore he fell in love with the maid and she fell in love with him—no doubt.

Near to Seville there are remains of a ruin where the three Roman Emperors, Trojan, Adrian, and Theodosius were born, besides many other things of substantial or vapory interest. But I must leave Seville after mentioning a single fact or two. It is the custom, in some of these old cities to employ a species of Nocturnal Muezzin to patrol the streets at night and call out the time and situation of things. They perform their duties in a sort of sing-song style which is often quite musical. Not knowing exactly what was going on under our window, we half imagined that we were being serenaded once in fifteen minutes; but,after a while, we found out what it all meant,and moreover, that our "Muezzin" was frequently employed to alarm the house whenever travelers wished to to get off early to the cars. The Spaniards are slow, but somehow their trains all start early. One night there was a sick person in the house, and a band of religious singers, bearing the crucifix and some banners, came under the windows and sung a sweet, plaintive song, or prayer, for his recovery. It was most singularly touching, and it is to be hoped that the pious exercise, so carefully performed, reached the ear of heaven.

We left Seville with some regret. It is a beautiful, balmy spot, and we much enjoyed its delicious sunshine under the orange groves in the public plazas. To reach Malaga from Seville it is necessary to return to Cordova and thence proceed by rail on a branch line. It is a good day's work, but some portion of the route passes through a country quite remarkable for its savage grandeur. The Sierras are several times pierced by tunnels, and the valleys are crossed by high embankments, the road descending by heavy gradients to the segmental shaped valley which lies back of the city of Malaga. Here the Mediterranean first appears to us, calm and beautiful as a lake upon a summer evening and, here also is found a climate more uniform than that of any other part of Europe. The thermometer in mid-summer rarely ever rises to 85°, while in winter it seldom sinks below 45°, the mean annual range being 49°, which is many degrees less than any other city on the continent. For example the mean temperature of Pau is 68°, Rome, 62°, Nice, 60°. Malaga is therefore a resort for invalids who require a uniform temperature, but to my mind existence might become a serious burden if it had to depend upon a permanent abode in a place so far out of the way of every body and every thing. The city though possessing upward of 90,000 inhabitants contains very little to interest a stranger, while to add to the discomfort, the hotels have more show than substance and their open doors are thronged by beggars who never give up their importunities so long as you are in sight. Just on the outskirts of the city there is a well kept and well arranged Protestant cemetery—to us a sort of hallowed spot of kindred dust, as it contains the remains of some of our countrymen who have either been wrecked upon the coast or have come hither to seek for the healing gilead which they vainly sought for elsewhere.

Malaga is cut in twain by a most extraordinary river called the Guadalmedina which, according to the map, has a tail up in the Sierras and a mouth in the sea. The river is carefully walled in and spanned by fine bridges, and is navigable for omnibuses and other wheeled vehicles up for a considerable distance. It is as dry as the Valley of bones depicted by the prophet Ezekiel. Nevertheless it is subject to fits, and upon one occasion when in a paroxysm of fury, the floods came down so violently that a number of houses were carried away. Just how all this came to pass is one of those Spanish riddles which sadly puzzles the unlearned traveler. Spanish rivers, like Spanish towns, are usually either dried up or are in very reduced circumstances.

Our trip to Granada partook very much of a warlike expedition. We started off in the morning at 6 o'clock upon an old dilligence, drawn by six mules and two horses on the lead. A heavy broad-beamed Wall street banker had se-

cured in advance the four seats upon the top or *banquette*, and three gentlemen of our party were invited to share with him the privilege, and how four of us contrived to sit within such confined limits is still one of the mysteries connected with the laws of compressibility and elasticity of matter. The seats on the inside were arranged on the sides like those in a city omnibus, and were occupied by three ladies, four gentlemen, beside two Spanish brutes, dressed like gentlemen, who, regardless of the comfort of others, insisted upon smoking their dirty cigarettes. One of the leading horses was skillfully ridden by a lively little Spaniard who guided the team, and sounded the horn to warn our approach. Another lively young Spaniard armed with a heavy cudgel, fulfilled the office of team whipper, and most unmercifully did he perform his duty. I never before saw such cruelty, and as I witnessed the brutal and continued flagellations to which the toiling animals were subjected, I sighed for our own benevolent Bergh, and wished that he might be here to apply the workings of his Humane Society to inhuman Spaniards. The chief driver occupied a seat below us, and his duty seemed to consist in uttering a very peculiar yell which alone would have frightened even a lazy mule. At his side sat a dark-visaged man in uniform who had a pair of revolvers stuck into his russet-top boots; and behind, standing upon the step, was planted an armed guard.

Thus wedged and discomforted, we started on our expedition, "armed and equipped as the law directs," the mules upon the keen jump, horn blowing, cudgel flying, guard yelling, we whipped around the street corners, up the mysterious dry river to the foot of the Sierra, whence we began to ascend its steeps by winding and devious paths. I imagine that even Don Quixote and Sancho Panza would have fled at our approach. The road was patrolled by armed guards, and even the workmen employed to keep it in repair were fortified with gun, cutlass and ammunition. Travelers on horse and mule back, carried guns strapped across their saddles, and everything betokened some real or imaginary danger; but we pursued our journey in peace, and for some hours in sight of the city of Malaga and the Mediterranean. From our elevated position we beheld the full glory of one of those Spanish sunrisings, which are said to exceed in splendor those seen in any other portion of Europe. For ten hours we traversed mountain, hill, and valley. No trees, no fences, but the whole scene most extraordinary, curious,—often wild, savage, and desolate. The roadway was lined with heavily laden mules and donkeys, sometimes with camp chairs strapped upon their backs, for women to ride, the meek little beast led by some modern Joseph on a flight toward Egypt, and women with water jugs upon their heads like those carried by Rebecca when she went to the well.

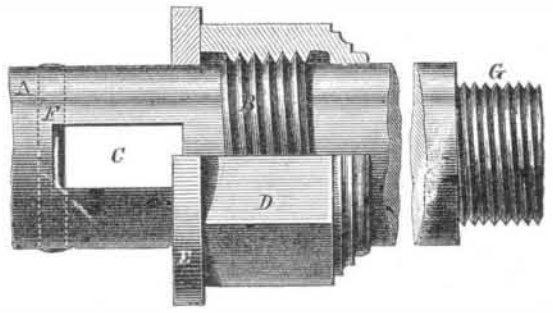
The costume of the men peasants of Audalusia is very peculiar. The hat is conical shaped, with a wide rim rolled over to form a sort of concentric channel, which would certainly be an awkward thing in a rainy country. The jacket is usually short, and made up sometimes of velvet, but more frequently, like Joseph's coat, of many colors. The breeches worn at this season of the year are of sheep skin, wool side out, and tied together by tapes, with a red flannel bandage wrapped about the waist, and over the shoulders they wear a heavy, fancy colored manta, or shawl, with the fold almost invariably thrown across the right shoulder. The leggins are of russet leather, nicely laced about the calf, and as for shoes, it is difficult to describe them. Most generally the shoe is simply a sandal made of canvas, with a braided mat for the sole, fastened to the foot by black lacings, and worn without stockings; but the poor classes tie their feet up in pieces of old hats, rags, carpets, and possibly cabbage leaves, for certainly I never before saw such a combination of material applied to human feet.

In ten hours we reached the old town of Loja, having in the mean time changed our animals three times. Here we took an inland railway, and after a ride of two hours across the splendid Vega, we reached the old city of Granada, and lodged ourselves under the very walls of the Alhambra—the Hotel of Seven Floors. We saw the Alhambra by moonlight, as Irving described it, also the Sierra Nevadas, lifting their sparkling, snowy crests high above this ancient city of the Moors. The sight was glorious indeed, and a visit to this historic and legendary spot, filled full of glorious deeds, "a sad but elegent memento of a brave, intelligent, and graceful people, who conquered, ruled, and passed away." The Alhambra of Irving is so familiar to all readers that I forbear to attempt even a feeble description; but I will say, to the shame and dishonor of the Spanish Government, that this beautiful gem of Moorish pride and consummate art will soon be reduced to a shapeless mass, unless the long projected restoration is at once carried forward. Granada is full of old Moorish habitations and remains. Its Gipsies still burrow like rabbits in the hillside. Its old Cathedral, a noble pile, contains the remains of Ferdinand, Isabella, Philip le Bel, and Crazy Jane, and, *sic transit gloria*, there is also the Cartuje, a vast monastery, which occupied the skill and labor and begging of three hundred monks for a period of thirty-six years,—now empty, save by a single old skeleton monk, who feebly answers the bell, the sound of which rings through those vast halls and corridors, like the curfew that tolls the knell of departing time. As we passed into the chapel, there sat the poor old monk, gazing as if in sad memory over the departed and departing glories of this beautiful monastery. The gilding, the sculpture, the precious marbles, the highly polished agates, the exquisite inlaying of silver, pearl, tortoise shell and ebony, together with the magnificent "Holy of Holys," all done by the exiled monks, is a combination of interior finish and skill which has no superior.

We left Granada and returned by the same route to Malaga, and on our arrival we were notified by the landlord that we could only stop one night, as all his house was taken for the next day, to accommodate the Archduke of Austria and suite; therefore, making a virtue of our seeming necessity, we are to be up and off the next morning for Valencia, with the prospect of a thirty-six hours ride. S. H. W.

Securing Cutters in Boring Bars.

MESSRS. EDITORS:—I noticed on page 408, No. 26, Vol. XVII., an article on an "Improved Method of Securing Cutters on Boring Bars." I herewith inclose a device which I consider superior to the one illustrated in the above-named paper. It consists of the usual bar, A, with a thread, B, cut thereon, directly above the slot, C, which receives the tool. On this thread a hexagonal nut, D, is screwed, which reaches nearly to the slot. A ring, E, bored sufficiently to slip over the bar easily, is slipped close to the nut, and is of such thickness that the outer edge reaches a little beyond the top of the slot. Through the bottom of the slot a steel pin, F, is passed, at right angles to the direction of the slot, one-half of the pin projecting above the bottom of the slot. The pin answers to the point of a set screw, which being backed by the ring and nut, holds the tool as firmly as in a lathe or planer.



After a little use without the pin the bottom of the slot would be likely to become uneven, or a little unevenness in the forging of the tool would give the tool a tendency to cant. The nut being squared on the arbor, the ring evenly turned, and the pin inserted, the tool will always be held firm and true. The use of the ring prevents the bottom edge of the nut from becoming jammed and uneven, which could not be prevented if allowed to come in contact with the tool; the ring to remain stationary and the nut to turn upon its upper face. which will always keep the nut true. If in use the ring should become uneven, it can easily be replaced. The pin can be hardened, and the ring, and the bottom of the nut case-hardened. A thread, G, may be cut on one end of the arbor, that it may be used in the spindle of an upright drill, or it can be used with a dog in a lathe. In the one referred to above, the tool requires two notches, which prevent the tool from being used except for a given size; also the edges of the nut when set against the tool will soon become uneven, which prevent the tool from being held true and firm.

In the one herein described the tool can be raised to suit conveniences. Where a tool is required for certain jobs, a notch may be cut in the bottom of the tool and fitting the steel pin, which will always bring it in the same position. It will also be less liable to break than if a square notch were cut. The position of the nut, D, is such that the diameter of the ring, E, appears more than that of the nut, but the diagonal of the nut is equal to the diameter of the ring.

JOHN A. BROWN.

Boston, Mass.

Steam Expansion.

MESSRS. EDITORS:—The expansion of steam is in proportion to its temperature above 212° heat. Any good engine working steam to a quarter of stroke, cutting off and expanding to near half stroke, will form a vacuum on the steam side of the piston the remainder of the stroke. Steam cannot exist in a temperature below 212°. Steam cannot expand below 212° heat, when it instantly changes to vacuum, and then goes lower down the scale of temperature. I affirm that steam of 75 lbs. of pressure cannot expand to twice its bulk without going below 212° heat. The temperature which corresponds to 75 lbs. of steam is about 304°. Expand this temperature to double its bulk, and you have 152°, which is below the atmospheric line of 212°. Divide the steam cylinder in the middle, divide half the cylinder into 152 parts by lines representing the degrees of heat, count down from 304 until you hit 212, and you cannot expand any further. You have expanded $\frac{92}{152}$°, and left 60 which are below the line of 212. This is the correct theory of the expansion of steam. But air expands under an entirely different law. A small percentage of air mixed with steam in a high pressure engine helps its expansion. But in a condensing engine it does more hurt than good, for it goes to the condenser. My assertions are that steam of 75 lbs. pressure will expand to $\frac{92}{152}$ of its bulk, and all other pressures expand according to temperature above 212°.

By publishing this you will cause many engineers to examine their cylinder cocks at different grades of cutting off, and thereby explode the old theories. GEORGE B. SISSON.

Buffalo, N. Y.

Safeguards to Railway Travel.

MESSRS. EDITORS:—Among the many suggestions now put forth to avoid such accidents as lately occurred at Angola, I see a double track advocated, with a double tread to the wheels, the flange being in the center of the face. The objection to this plan is the inevitable packing of earth, snow, etc., in the narrow space between the rails, thus increasing the danger it is proposed to obviate. Permit me through your columns to suggest the use of a double-flanged wheel, which will be much cheaper than the double-tread wheel, and require no change in the track. Each wheel should have a flange on the outside of the rail, as well as on the inside, and with such cars the entire flange might be broken from each side of every wheel on one side of the train, and the train would still be as safe as the ordinary single-flange wheels. The absence of a piece of the flange six inches or less in length from an ordinary wheel would certainly throw the car from the track whenever the centrifugal force in turning a curve should throw the car to that side of the track on which the defective wheel was running. With the double-flange wheel, one sound wheel on each axle is enough to insure the safety of the train. An obstruction which causes one wheel to mount the rail may throw off a single-flange car, but could do no harm to the double-flange wheels.

In regard to heating cars by hot water, would the flood of scalding water from the broken pipes have been any more merciful to the victims of the Angola holocaust? I admit that the bodies would have been recognizable, and perhaps a few might have been saved, but cannot something better be invented?

Knowing that the ventilation of such subjects through your widely circulated journal has the effect of stimulating invention, and ultimately of accomplishing the desired result, I take the liberty of making the above suggestions, which to me are new, but I hardly dare hope to be patentable.

Buffalo, N. Y. CALVIN E. TOWN.

On the Day Line Question.

We are in receipt of a number of communications on the "day line," a subject that must become of some importance to us in a national point of view, in regard to our recent acquisition of territory on the north-western coast of this continent, and which will undoubtedly receive the attention of congress. Among some half a dozen letters, some facts contained in one from J. M. C., of Ohio, may be presented. He says:—

"The first English missionaries to Tahiti passed round the Cape of Good Hope to the east, and the American missionaries to Hawaii passed round Cape Horn to the west. As a necessary consequence there was a difference of one day and night in the reckoning of time; and hence for over fifty-five years there has existed, and still exists, in the Pacific Ocean this singular fact: two groups of islands, lying on nearly the same degree of longitude, and not further apart than New York and London, whose inhabitants, although christianized, continue to observe the Christian Sabbath on different days of the week.

"This singular fact is thus explained: The succession of day and night is caused by the revolution of the earth on its axis from west to east. Now if a person should travel round the earth in the direction of its motion, he would gain an *apparent* revolution of the sun, or exactly one day and night. But if he should go in the opposite direction, he would *apparently* lose one day and night. Therefore, if two persons should start from the same point and travel round the earth in opposite directions, and meet again at the point from which they started, they would differ exactly two days in their reckoning of time, the one being one day ahead and the other one day behind those who had remained stationary.

"There are some additional facts connected with islands in the Pacific ocean. If you go west to the Sandwich Islands, you will find them keeping the Sabbath on the same day with yourselves. If then you pass almost directly south to the Society Islands you will find that their Sabbath had occurred the day before yours. But if you should go east round the earth to these islands the case would be reversed. How these islands will ever be made to observe the same day for Sabbath is a question yet unsettled. However, I think the above is sufficient to show that the 'day line' is in the Pacific Ocean."

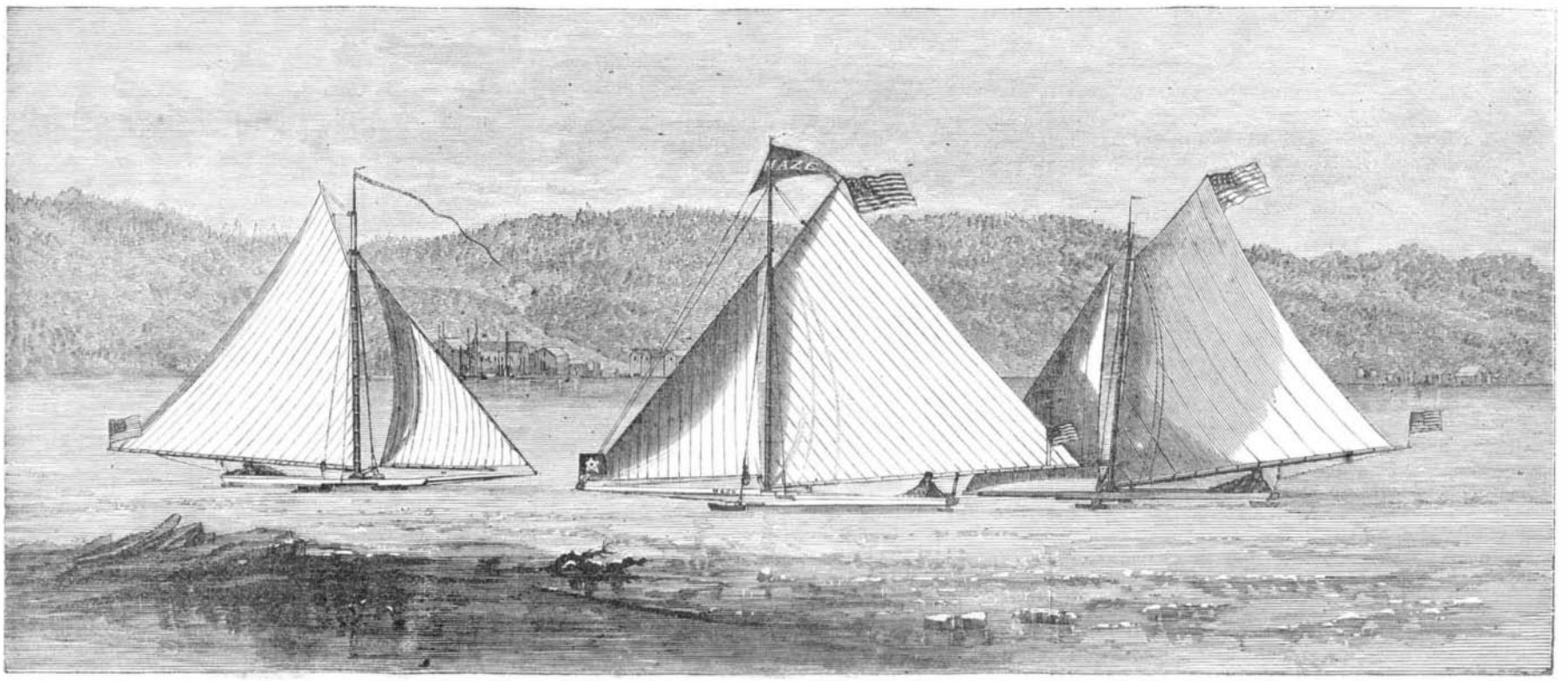
Singular Discovery.

A singular discovery has just been made at Chagny, France, by some workmen engaged in digging the foundations of a railway shed. At the depth of about nine meters, in a stratum of clay and ferruginous oxides, remains of proboscidians (elephants, rhinoceroses, etc.), were brought to light, comprising several black teeth and a formidable tusk in large fragments, which, on being put together, constituted a length of seven feet. The depth at which this was found was still six meters higher than the level of the most considerable inundations of the Dheune, and in an undisturbed stratum. *Galignani* says: "So far there is nothing absolutely extraordinary; but who would have thought of finding, underneath the bed containing these fossils of the tertiary period, an aqueduct of the most primitive kind and of human workmanship? Yet such was the case, the only instance of the kind on record. It is explained by M. Termaux, who relates the circumstance, by supposing, what seems indeed to have been the fact, that the tertiary fragments above alluded to had been washed into the trench by a violent inundation, and thus filled up the aqueduct. The latter is about eighty centimeters in depth, sixty centimeters broad at the bottom, and only forty in breadth at the upper surface. It is not easy to account for this principle of making the conduit narrower at the top than at the bottom; at all events, the small dimensions of the cavity were evidently caused by the want of proper tools, as to this day the negroes of Africa, in their miserable attempts at what might be termed public works, remove as little earth as possible. However that may be, the discovery of this aqueduct does not by any means authorize us to carry the antiquity of man as far back as the tertiary period; for, although the aqueduct lies under a stratum of tertiary materials, this stratum does not belong to the place, but was transported thither later."

Navigating the Ice---Exciting Winter Sport.

Ice sports are not limited to the pastime of skating; sailing over the glassy surface where there is plenty of "sea room" and wind, is not less exciting than skating, and entails none of its labor and after weariness. The speed that can be attained by ice boats is something marvellous; a rate of over 60 miles per hour being not uncommon. A year ago one boat on the Hudson made eight miles in less than six minutes. The ice boat is exceedingly simple in construction and the hull can be built at a merely nominal cost; but in fittings and decorations there is ample room for expenditure and show, and some of those on the Hudson are marvels of beauty and very costly.

A boat, however, can be made of a few planks, three skate irons, a mast and sail, at a cost of a few dollars, which will carry the navigator at a speed rivaling that of the swiftest birds and far outstripping the locomotive. The boat is V-shaped, composed of three planks, two forming the arms of the V and one connecting them at the wide end. Under the two ends are skate irons hung on pivots to allow swing, and another at the intersection of the two arms. By the latter the craft is steered. The rigging may be of any style desired; usually sloop or yacht rig. These boats sail admirably on the wind, their broad base holding them up almost into the "wind's eye." They may be numbered on the Hudson by scores; something over a hundred being owned by the various clubs and private persons. Very exciting regattas take place on this river during the winter season when the condition of the ice and state of the wind invites. Attempts have been made, we believe, to utilize these ice boats for passenger and freight travel, but we are not aware that they have as yet been successful, although we see no reason why they may not be made so.



VIEW OF ICE BOATS ON THE HUDSON RIVER.

Facts for the People About Gas.

Under this heading a late number of the *American Gas Light Journal* furnishes some practical advice concerning the management of gas, and some simple facts the knowledge of which may save our readers much dissatisfaction, annoyance and useless expense:

"It is a common occurrence for consumers to complain of the excessive cost and deficiency of light. To the inaccuracy of the meter they generally attribute the first, and to the poor quality of gas the latter condition is usually charged; when, in reality, the fault will generally be found to rest with the consumers themselves, through their own ignorance and mismanagement.

"Whenever light is obtained from gas at a greater cost than necessary, it is just as much a loss as to permit any other valuable commodity to run to waste. And a proper knowledge of the conditions that cause unnecessary loss, will place in our hands the means requisite to avoid and prevent it.

"BURNERS.—There is no part connected with the consumption of gas, whereby the best results are obtained in the quality of light and economy of gas, of more importance than the burners.

"It would be difficult to convince the majority of gas consumers, who have not given the subject attention, how remarkably the light derived from gas is reduced by improperly constructed burners; or where the pressure or the flames are unsuitably adjusted. Owing to these circumstances, the amount of gas consumed is disproportionate to the light obtained, and the account of the consumer is much increased. In fact, there is no exaggeration in stating that a large proportion of the consumers, through their own mismanagement, pay twice as much as there is any occasion for, considering the amount of light obtained, all of which could be saved by using a proper burner, and a correct adjustment and control of the pressure.

"The most important requisites for good burners are that the orifices where the gas issues should be perfectly regular in size, and of a proper size to permit it to issue with a very low pressure. And these conditions should be adhered to, whatever the kind of burner may be, whether the argand, bats-wing, fish-tail or single jet, etc.

"If the orifices are too small a high pressure is required to expel the gas, and the light is diminished just in proportion to the increased pressure. In such burners the flame will have a blueish tinge, and the lower part will be of a deep blue color, giving but little light in proportion to the gas consumed. As an example, an argand of fifteen holes passing five feet of gas at 1·10th pressure, yielding a light of 12 candles will, if the orifices are reduced, to pass the same amount of gas per hour at 5-10ths pressure, only give the light of six candles—a loss of 30 per cent. Hence we see that the light to be obtained from a given quantity and quality of gas is entirely dependent on the burner employed. This demonstrates the necessity of having proper burners, and shows clearly how by negligences on this point, the consumer may find his gas bills increase, in what appears to him a very mysterious manner.

"SIZE OF FLAME.—It is a mistake to suppose that the amount of light obtained will be in proportion to the quantity of gas issuing from a burner. There is a particular point in the consumption of any class of burner where the maximum of light is derived, and any deviation from this entails loss.

"As an example, if an argand burner consumes five feet per hour, giving the light of 12 candles, be reduced, so that only three-fourths of that quantity is burned, then the light instead of being equal to nine candles, the theoretical proportion, will be six candles only, being a positive loss of 36 per cent. This reduction may be continued with even greater proportionate losses. A five-feet bat-wing or fish-tail burner will give a maximum of light in proportion to the gas consumed, compared with any less sized burner, and it will be found in practice the larger sized burners are the most economical. The large sizes giving as high as 200 to 300 per cent advantage in light as compared with the smallest sizes.

"As an example; a bats-wing burner consuming two feet per hour gives the light of two and a quarter candles only, while a burner consuming seven and one half feet per hour gives the light of twenty-two candles, the pressure being uniformly four tenths of an inch.

"The knowledge of these facts is of importance to the consumer, who may, in his endeavor to economize, obtain results directly opposite to his anticipations. It is more economical to have one good large gas light than several small ones.

"GLOBES, GLASSES, ETC.—Although chimneys are essential to argand burners, and globes also in many places where fish-tail burners are used, and the ornamental effect is pleasant, still they are detrimental to the diffusion of the light of gas. A clean glass globe obstructs about 12 per cent; A clean globe engraved with flowers about 24 per cent; a globe ground all over about 40 per cent; an opal globe about 60 per cent.

Hence is apparent the folly of using elaborately engraved and ground globes or shades, where it is desirable to economize. If engraved at all, the upper portion should be embellished, while the lower part should be left clear for the free passage of light.

Curious Facts About Spiders.

Some very curious observations regarding spiders have lately been communicated to the French Academy of Sciences by Father Babaz, who has been fifteen years engaged in these researches. It happened one day, as he was reading in a garden, that a small spider suddenly lighted upon his book, and crawled over the very line he was reading. He tried to blow it away, but instead of letting itself be carried away by the blast, it raised its abdomen, and swung itself up to a leaf overhead. This appeared strange, as there was no thread to be seen. Our observer caught the spider again, put it upon his book, and repeated the experiment, which ended in the same result. He caught it once more, and this time placed himself directly in the sun, with the insect on a level with his eyes. In this position he at length discovered the evolution performed by the little creature. On receiving the blast, it raised its abdomen, and in so doing projected a thread of inconceivable tenuity to a considerable distance and, raising itself in the air, disappeared from view. This unexpected discovery induced Father Babaz to examine the question thoroughly; every spider that came in his way had to contribute something toward his researches, and in this way he at length ascertained a fact hitherto unknown to naturalists, viz: that most spiders possess not only the faculty of spinning a thread, but also that of projecting one or several, sometimes of a length of five or six meters, which they use to traverse distances with, and affix their thread to a second point for the support of their web. They even seem to have the power of directing the extremity of the ejaculated thread to a given point; they seem to feel for the place where is most desirable to fix it. Certain spiders, the Thomisa Bufo, for instance, will eject a bunch of threads which curling up in the air, and shining in the sun with various hues, give the insect the appearance of a peacock displaying its tail. But this is not all; spiders can fly and swim in the air, though they are heavier even than alcohol. To perform this feat they turn their back to the ground, and keep their legs closely folded up on their body, and in this posture sail about with perfect ease. Their flight is often very rapid, especially in the beginning, and they will sometimes escape from the observer's hand quite suddenly, and soar up high in the air.

How to Shave Without a Razor.

In looking over some old English patents, we came across the following amusing document, to which we suppose the Great Seal of the realm, consisting of a pound of bees wax, was attached, by means of red tape, in the usual manner. The inventor ought to have included the right to clean hogs before killing, in this manner.

Specification of the Patent granted to Marcus Hymans, of Exeter street, Covent Garden, in the county of Middlesex, England; for a Composition for Shaving without the Use of Razor, Soap or Water. Dated February 7, 1804.

To all to whom these presents shall come, etc. Now know ye, that in compliance with the said proviso, I, the said Marcus Hymans, do hereby declare, that the said composition for shaving, as aforesaid, is prepared and used in the manner following—that is to say: Mix one pint and a half of clear lime-water, two ounces of gum-arabic, half an ounce of isinglass, an eighth of an ounce of cochineal, a quarter of an ounce of turmeric-root (made into powder), an eighth of an ounce of roach allum, an eighth of an ounce of salt of tartar, and an eighth of an ounce of cream of tartar, together; boil them for one hour at least (stirring up the mixture during the whole time of boiling, and being careful not to let it boil over), clear it through a sieve; then add two pounds and a half of iron pumice-stone, finely pulverized; mix the whole together, with the hands, into one cake, by the assistance of the white of two eggs, well stirred up. Then divide the cake, so made, into twelve smaller cakes; dry them in the open air for three days; put them into an oven of moderate heat for twenty-four hours, when they will be completely dry and fit for use. Apply them with a gentle friction to the beard, and they will produce the complete effect of shaving

In witness whereof, etc.

EIGHTEEN million letters were collected from the lamp-post boxes of New York last year, and about the same number were delivered by carriers.

THE black pepper tree has been successfully raised to bearing maturity in many parts of California.