OUR SPECIAL CORRESPONDENCE.

The most Peculiar Feature of the Texan Climate—Great Value of Railroads—Immense Distances—Extensive Trade—Windmills Wanted—Live-oak—The Inhabitants Remarkably Pious—A Curious Coincidence—The "Scientific American" Everywhere.

KELLUM SPRINGS, Texas, June 15, 1860.

MESSRS. EDITORS:—In a general view of Texas the most striking feature is the extreme dryness of the climate, and this is perhaps the most important peculiarity in its immediate bearing on the prospects of mechanics here. A season in which there is sufficient rain to produce good corn and other crops throughout the State is an exception to the general rule. This will confine the cultivation principally to cotton, which has a long and deep piercing root, enabling it to bear drouth remarkably well, and to the winter grains, which make most of their growth in the Spring and Fall, when the rains are abundant. As only a portion of the State is a good wheat country, the tendency of all things is to direct the agricultural force more and more exclusively to the cultivation of cotton. This great breadth of new land is an inviting outlet to the emigration from the old cotton States, and is being so rapidly filled by this kind of immigration that lands are rising here faster perhaps than anywhere else in the country. Now, this almost exclusive devotion of the agriculture to the cultivation of cotton has a controlling influence over the industrial operations of the country in many respects. In the first place, it makes the exchange of property large in proportion to the aggregate product. On inquiring where the flour was ground which I was eating for supper in Madison county, I was told that it was bought in New Orleans. "You have to haul your flour a long distance," I remarked.

"Oh no," was the sober reply, "only 115 miles."

This large amount of exchanges is a good thing for the traders. One man in Houston, we were assured, sells $700,000 worth of goods per annum. As all the cotton must be transported to the sea-shore, and the merchandize required in exchange for it, from the seashore back all over the State, the amount of labor devoted to transportation is very large, and an immense trade is carried on in wagons, many of which are made in Philadelphia. There is probably no State which will be so much benefited by railroads as Texas. These are being rapidly extended, a portion of the ten millions received from the general government being devoted to this purpose.

As it is very desirable for the people to raise sufficient corn, potatoes, &c., for their own use, they are considering the plan of irrigating fields for this purpose. The almost constant breeze affords ample power, and some windmills have been ordered from the North, and will soon be in operation, pumping water over this thirsty ground. The thing wanted is a cheap and simple apparatus, not to cost over $25, with pump included, and requiring no mechanical skill to erect it. If any of your readers have such a mill, let him advertize it at once in your paper, and if there is none, let one be invented forthwith. I venture the prophecy that within ten years, thousands of windmills will be erected in Texas for the purpose of irrigation.

Gov. Houston has stated publicly that Texas contains more live oak than all the balance of the world. But this, like many other of the resources of this great State, is wholly undeveloped. But the vigorous population which is pouring in, combined with the railroads which are spreading their branches over the State, will soon unfold its latent mines of wealth.

It may surprise you to learn that the inhabitants of Texas are the most religious of any in the Union. The Methodists are the most numerous sect, and it has seemed to me as if all the people of the State are members of that ubiquitous church. Of course, there are a few rowdies who shoot one another occasionally, but these constitute a very small fraction indeed of the inhabitants, who, I am inclined to think, taken as a whole, are as religious and as moral also as those of any part of the world.

As I was sitting on the piazza, last evening, conversing with an intelligent school-teacher, he observed the three bright planets which are now seen nightly slowly descending the western sky, and remarked, "I saw in the *Saturday Evening Post* a very simple direction for telling the time of night by the stars."

"Well," said I, "that is a curious coincidence. I wrote that article myself for the SCIENTIFIC AMERICAN. Was it not credited?"

"No," he said, "I believe it was by a correspondent."

But by a more complete account, I found that it was the *very* article which I wrote for your paper. They have the SCIENTIFIC AMERICAN here, and, indeed, I find it wherever I go. B.

[The attention of our correspondent and that of our Texan readers is directed to two inventions described in the present number of the SCIENTIFIC AMERICAN, namely, the "American Windmill" and the "American Pump," which seem adapted to the requirements of Texan agriculturists.—EDS.

THE STRENGTH OF CAST-IRON COLUMNS.

MESSRS. EDITORS:—My attention has been recently called to a communication made to the American Academy of Arts and Sciences, within a few months, by Professor Treadwell, of Cambridge, on the subject of cast-iron columns. This communication, which was published at length in the newspapers, contains errors too serious to be passed by in silence, especially when emanating, uncontradicted, from so distinguished a body as the above-named institution. The terrible catastrophe at Lawrence, where the yielding of a single cast-iron column sent a thrill of horror through our nation, shows how important it is that this subject should be correctly presented to the public. Not having seen any correction of the errors in the communication alluded to above, I take advantage of your extensive circulation to point them out, and present the matter in its true light.

After giving a history of the theoretical and experimental investigations which have been made for the determination of formulæ, indicating the strength of any column, the above-named author concludes, by attaching the greatest importance to the formulæ deduced by Hodgkinson from extensive experiments. Thus far we have no objections to offer; the error creeps in with the attempt to use these formulæ. Hodgkinson, in his experiments, recognized three kinds of fracture which are liable to occur in case of iron columns.

When a column is very short, its length not exceeding two diameters, fracture occurs by the *crushing* of the particles. In this case the weight necessary to produce fracture does not vary with the length of the column, but depends solely on the area of the cross section of the column, and the strength of the iron per square inch to resist compression. Let w represent the weight in tuns (of 2240 pounds each) necessary to fracture such a column; D, the external diameter of the column in inches; and d its internal diameter in inches. For cast iron we may take, as an average value, the weight necessary to crush a square inch at sixty tuns. Using these values we shall have for round columns, $w = 60 \times 3.1416 \times (D^2 - d^2) \div 4$.

Second, When a column is very long, its length exceeding thirty diameters, fracture occurs by *bending*. If W represent the weight in tuns necessary to fracture such a column; D and d its external and internal diameters in inches, and l its length in *feet;* we shall have for round columns, according to Hodgkinson's formulæ, $W = 44{\cdot}16 \times [(D^{3.55} - d_{3.55}) \div 7^{1.7}]$ The crushing weight varies directly as the difference of 3.55th power of the diameters and inversely as the 1·7th power of the length.

Third, When the length of a column exceeds two diameters, but does not exceed thirty diameters (limits within which almost all columns do lie and all ought to lie) its fracture occurs by *a combination of crushing and bending*. B representing the weight in tuns necessary to fracture such a column, we shall have for round columns, according to Hodgkinson's formula, $B = W w \div (W + \frac{3}{4} w)$, the values of w and W, being determined in the manner already indicated. The errors in the communication of Professor Treadwell have arisen from the use of the formula $w = 44.16 \times [(D^{3.55} - d^{3.55}) \div 71.7]$; as if it were universal in its application, and not limited to those columns whose lengths *exceed* thirty diameters. The effect of this error would be to give to all columns *under* thirty diameters in length a value for their strength greater than they really possess, and in case of very short columns much greater. Take, for illustration, a column 6 feet long, having an external diameter of 12 inches, and an internal diameter of 10 inches. According to the formula recommended by Professor Treadwell, the breaking weight of such a column would be 6,782 tuns (of 2,240 pounds each), which corresponds to a weight of nearly 200 tuns on each square inch of the iron! One-third of such a strain would crush a column two feet high. But the formula which I have here indicated gives, for the actual breaking weight of such a column, 1618 tuns, or less than a quarter of that given by Professor Treadwell; and this shows the enormous errors that would arise from the use of the formula given by him in the case of ordinary columns.

The exact weight that would break the column, if it broke by *crushing* = 2,073 tuns; if it broke by *bending* = 6,782 tuns; but if it broke by *a combination of crushing and bending*, the actual breaking weight = 1618 tuns. While these values are determined acccording to the best formulæ now known, it must still be admitted that the whole subject of the strength of iron columns demands much additional investigation. J. W. S.

Rochester, July 2, 1860.

P. S.—To show the absurdities into which compilers of "handbooks" are led by attempting to apply formulæ of the use of which they are totally ignorant, I will mention that Haslett's "Mechanics and Engineers' Book of Reference" states "the ultimate breaking weight of an iron column, one foot high and 24 inches in diameter, is 4,122,530 tuns." This is over 9,000 tuns per square inch!—150 times the breaking weight of iron! Public safety demands that such egregious errors should be pointed out.

BALLOONS USEFULLY APPLIED.

A recent number of the Newcastle (England) *Chronicle* contains some interesting observations on meteorological observations in balloons. It appears that a committee of the Kew Observatory recently resolved to institute a series of balloon ascents with a view of investigating "such meteorological and physical phenomena as require the presence of an observer at a great hight in the atmosphere." The object to which special attention was devoted was the determination of the temperature and hygrometric condition of the air at different elevations above the earth's surface, Besides this, the observers were furnished with means of procuring specimens of the air at different hights for the purpose of analysis, and of examining, if opportunity offered, whether the light reflected from the upper surface of the clouds was polarized. The instruments required for the investigation were a mountain barometer, dry and wet thermometers, an aspirator (or elastic apparatus to draw the air of the different strata past the bulbs of the thermometers, &c.,) Regnault's condensing hygrometer, a polariscope and glass tubes (furnished with stop-cocks) from which the air had been exhausted. Two observers took part in the work, in the first ascents, in addition to the aeronaut who managed the balloon. The car was an oblong basket of wicker-work, about 6 feet long, 3 feet wide, and 2½ feet deep. The ascents were made with Mr. C. Green's balloon, well-known as the "Royal Nassau," with which that gentleman had made upward of 500 ascents with perfect safety. The first ascent took place on the 17th of August, 1859, under considerable difficulties. No remarkable event occurred during the journey, which extended over 57 miles, the balloon having traveled at the rate of 38 miles an hour. The second ascent took place on the 26th of August. The third ascent took place on the 21st of October, when, in consequence of their being only two persons in the car, a great altitude was attained. The polariscope, used at an altitude of 4,000 feet above the clouds, indicated that the reflected light from the clouds next the sun showed no trace of polarization, the light of the sky being strongly polarized. The fourth ascent took place on the 10th of November. On this occasion an elevation of 22,930 feet above the level of the sea was attained; the balloon traveling at the rate of 50 miles an hour. The effect of the diminished pressure of the air was felt somewhat inconveniently, and much breathlessness and fatigue were experienced after slight muscular exertion. The descent was rapid, in consequence of the discovery that the direction of the balloon was seaward. On the days of the various ascents many observers in different parts of the country made corresponding meteorological observations at hourly intervals, and these were arranged in a tabular form by Colonel Sykes, the secretary to the association. From elaborate tables prepared by the aeronaut, Mr. Welsh, and completed by Colonel Sykes, it appears that there is a steady decrease of temperature in passing through the lower stratum of air up to about 4,000 feet; above the decrease is arrested, and a uniform temperature appears to prevail in the zone of atmosphere above for a distance of 2,000 feet, above which the temperature again falls in a regular ratio to altitude. This increase of cold is coincident with an abrupt diminution of vapor. A decided rise of temperature was always noticed on entering a cloud, and for a space of 600 feet above it, after which the decrease and elevation proceeded as before. The regular progression of decrease of temperature with elevation can, therefore, be no longer maintained. The interruption in the decrease of temperature was invariably accompanied by a large and abrupt fall in the temperature of the dew point, or by actual condensation of the vapor. From the analysis of the samples of air, it appears that the composition of the atmosphere, as regards the proportion of oxygen and nitrogen, scarcely varies more as we ascend through the first half of that atmosphere (for at an altitude of about 3½ miles one half of the atmosphere lies beneath the aeronaut) then it is found to vary at different spots upon the surface. There is indeed no sensible difference in the composition of the air at the surface and at the greatest hight accessible to man.

SAILING OF THE ARCTIC EXPEDITION.

On Saturday, the 7th inst., the Arctic expedition of Dr. Hayes sailed from the port of Boston. The event excited a great deal of interest, and drew together quite a large crowd on the wharf, while the decks of the vessel were crowded with a large number of distinguished individuals, among whom was Governor N. P. Banks, who has evinced a readiness at all times to advance the progress of the expedition. The vessel and all its outfit were formally presented to Dr. Hayes, and he was assured by the Boston committee of their entire confidence in his integrity, ability and honesty. Dr. Hayes, in accepting the gift of the vessel, and the honor and trust conferred upon him, made an eloquent speech, during which he was frequently interrupted by expressions of kindly sentiments on the part of gentlemen present; and the doctor took this occasion to introduce the officers and crew to those present, and complimented them on their courage in joining him in his journey.

The following is a list of the officers and crew:—Commander, Dr. Isaac J. Hayes; astronomer and second in command, August Sontag; sailing master, S. P. McCormick; mate, H. W. Dodge; captain's clerk, G. F. Knorr; assistant astronomer, Henry G. Radcliff; carpenter, Gibson Caruthers; cabin boy, Colen C. Starr; steward, Frank L. Harris; cook, John Williams; crew, Charles McCormick, William Miller, Harvey S. Heywood, Thos. F. Browne, John McDonald and Thomas Bowman. The expedition carries no surgeon other than the commander. There will be neither an artist nor a photographist on board, although the vessel has a splendid set of photographic instruments, which will undoubtedly be used by Mr. Sontag, who is a very good artist.

VOLCANOES OF THE NORTHWEST.

The following interesting article is from the Des Moines (Iowa) *Commonwealth*:—"Mount Baker and Mount St. Helens, in Washington territory, are active volcanoes; the former smokes considerably, and occasionally shows a red light at night. St. Helens smokes a very little, the smoke in the day-time resembling a thin column of white steam. There has been no eruption of St. Helens since 1842, at which time it covered the country with ashes to the Dalles, distant one hundred miles. Great streams of hardened
various places in Mount St. Helens and Mount Adams, and probably near the other sister volcanic peaks. Mount St. Helens and Mount Baker are the only active volcanoes on the American soil, unless Mount Shasta (which sometimes smokes a little, but not enough for the smoke to be seen from the foot of the mountain) be added to them. Mounts Hood, Rainer, Jefferson and Adams were undoubtedly volcanoes once, but they are now extinct. In a paper contributed by George Gibbs to the documents relating to the survey for a northern Pacific railroad, he says the Indians have a characteristic tale relating to Mounts Hood and St. Helens, that they were formerly man and wife, but they quarreled, and threw fire at each other, and that St. Helens was the victor, since when Mount Hood has been afraid, while Mount Helens, having a stout heart, still burns. There was still a further tradition among the Indians, when the writer was in Oregon, that Mount Hood and Mount St. Helens, were connected by a continuous ridge or chain, and that the Columbia river, which runs between them, had a subterranean passage at the point known as the 'Cascades.' The Columbia then had a smooth, even course, under an immense arch of the mountain, but that unfortunate matrimonial difficulty above referred to did not end in throwing fire; they also broke down the conjugal arch, which fell with a thundering crash into the river, and formed the 'Cascades.' The 'Cascades" are from one to two miles in length, and have a fall of about twenty feet per mile. Their appearance would indicate that there might be some truth in the tradition, and that it occurred at no very distant period —perhaps within the last century. The opinion is sustained by the geological formation above the 'Cascades,' where the river spreads out and becomes a lake, some twenty miles in length and several in breadth. The bottom of the lake in many places is covered with a heavy growth of timber standing upright, in the exact condition it grew, no doubt, and reaching to the top of the water, say from 20 to 30 feet. The tops of the trees have long since disappeared, making the surface of the lake, at low water, look like a clearing full of stumps. On examination, the wood was found to be quite sound below the water. An answer to the question, how long has the forest been submerged? might also fix the period when these volcanoes became extinct."

THE WORKING OF STEAM ENGINES.

MESSRS. EDITORS:—Having recently noticed an article on the working of steam engines (in the SCIENTIFIC AMERICAN), I thought a word or two of my own experience might not be amiss; and as in the last 10 years' experience I have often gained many useful lessons from the columns of your valuable paper, my own may benefit some of the novices now in the field. In the first place, I advocate a cut-off valve (of which there are a great many now in use) and a high pressure of steam, so as to get the benefit of expansion. But the common trouble is that what is gained by the expansion is lost by the increased friction on the valve; so that what we now want is an *anti-friction valve*. You mention the fact that the piston rings are too cumbrous. I agree with you precisely; having run engines with rings large enough for machines of twice the capacity. Then the process for setting the packing is behind the age, as, with the old plan, it is impossible to have the bearing of the ring evenly divided. But I think this is on the point of being overcome by the use of a new spring, manufactured in this city, and called the "letter Z packing spring," which consists of a number of small springs bent the shape of a flat letter Z, and placed between the piston head and the ring; the head being made round, instead of the skeleton shape. The springs being placed close together make the bearing exactly even on the whole surface; and as fast as the cylinder wears, the springs take up the spaces, thereby doing away with the labor of setting-out packing until the rings become worn out or too small. In these days, when *engineers* are manufactured at an hour's notice, this is quite an object, as it removes the most intricate duty of the engineer—the setting of his packing. Another great fault of engines is the smallness of the exhaust pipe, which I agree with you should be a great deal larger than the induction valve. C. R.

Albany, N. Y., July 14, 1860.

A WONDERFUL CAVE.

MESSRS. EDITORS:—According to promise, I herein give you another report concerning the cave at this place. Since my first *winter* visit, detailed in a previous letter (published on page 211, Vol. II., of the SCIENTIFIC AMERICAN), I have made frequent visits to the cave; but as there has been but little alteration, I have delayed a regular report until now. On June 23d, at about 10 A. M., a friend and I started on a *midsummer* trip. crossed the river in a boat and commenced the ascent of the bluff as usual; it being very steep and, upon the whole, like the river Jordan—"a hard road to travel." All difficulties, however, being surmounted, we arrived at the mouth of the cave, and sat down to rest awhile and cool ourselves; looking at the thermometer, we found it stood at 80°. Here we found several pieces of candle and one old candlestick left by other visitors. We then commenced the descent; and as we walked, crawled and slid along, it began to grow cold quite fast—it seemed like going out of a warm room into the cold atmosphere of a *winter* morning. We soon began to see the frost on the walls, sparkling in the light of our lamps like millions of diamonds. This one sight is worth as much as all the natural exhibitions of every-day life to every lover of the beautiful. As we came to our first stopping-place we began to find *ice*, from a mere film up to *six or eight inches thick*. This part of the cave is in the shape of a wedge with the small end up; it being about six feet wide at the base, the sides drawing together overhead about 20 feet high—the one side covered with ice (clear as crystal) and the other with sparkling frost. Now we hung the thermometer on the wall and waited the result; the mercury going down gradually to 30°, where it remained. We also had a little water in a cup, and after leaving it on the rock for about 10 minutes, it became skimmed over with ice. There is not near the usual amount of ice in the cave that there usually is at this season of the year; and no doubt it is owing to the dryness of the season. The present spring and summer, so far, has been very dry in Decorah; and I have noticed that the more rain we have, the more ice forms in and around the mouth of the cave. Two years ago, there was so much ice in the first 50 or 60 feet of the cave that we had to cut steps in it with a hatchet to get down with safety. A great quantity of rain fell during that season. J. W. H.

Decorah, Iowa, July 3, 1860.

"YELLOW JACK" BANISHED FROM THE CRESCENT CITY.

MESSRS. EDITORS:—It is with much regret that I observe a paragraph at the close of the letter of your correspondent, "B," dated Columbus, Ky., May 27, 1860, and published on page 386, Vol. II., SCIENTIFIC AMERICAN, in which it is stated that "the yellow fever had already made its appearance in New Orleans." This, no doubt, was written inadvertently and without inquiry, and probably the writer of it has been better informed before this; but coming, as it will, before the eyes of over a hundred thousand readers, it is calculated to do our city much injury. I have a large interest in this city, and am sorry that your journal should be the means of giving currency to so great an error, for to this day—one month from the time that your correspondent received his information—we have not had a single case of yellow fever. S. E. M.

New Orleans, La., June 25, 1860.

MYSTERIOUS MUSIC ON THE GULF SHORE.—The mystic music sometimes heard at the mouth of the Passagoula river, on a still night, is one of the wonders of our coast. It is not confined, however, to the Passagoula river, but has often been heard at other places. At the mouth of the Bayou Coq del Inde and other inlets opening into the Gulf along the coast of our own country, the curious listener, lying idle in his boat, with lifted oars, when every other sound is hushed, may sometimes hear its strains coming apparently from beneath the waters, like the soft notes of distant Eolian harps. We have always supposed that this phenomenon, whatever its origin might be, natural or supernatural, was peculiar to our own coast. It appears, however, from Sir Emerson Tenant's recent work on Ceylon, something very like it is known at Battialloa, in that island, and it is attributed to rather less poetical and mysterious origin—that it is a peculiar species of shell-fish. They are said to be heard at night, and most distinctly when the moon is nearest the full.—*Mobile Herald*.

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MANGANIC ACID.—A paper has been communicated to the Paris Academy of Sciences by Dr. Phipson, in which the author shows that the metal manganese, by uniting with oxygen, forms only one acid—manganic acid—analogous to chromic acid; and that the so-called "permanganic acid" does not exist. The salt so extensively used now in chemical laboratories, and known as "permanganate of potash," is shown to be *bimanganate* of potash, corresponding to bi-chromate, or anhydrous bi-sulphate of potash. This is an important discovery in mineral chemistry.