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 sea-shore 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, $W = 44{\cdot}16 \times [(D^{3.55} - d^{3.55}) \div l^{1.7}]$ 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 $w = 44.16 \times [(D^{3.55} - d^{3.55}) \div l^{1.7}]$; 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