and two angles being given, a very simple operation in plane trigonometry. In astronomical observation there are always some determinate errors, arising from refraction and other causes, which may, however, be readily corrected, and do not affect the general principle of the method as above illustrated.

In calculating the distance of the sun from the earth, the stations, from which the observations are made, can be so placed that the semidiameter of the earth becomes one side of a triangle. The parallax of the sun was thus calculated from the transits of 1761 and 1769, and found to be 8·65 seconds angular measurement, and the distance of the sun was hence determined to be 95,173,000 English miles, as given above. Subsequent calculation by Encke made the parallax to be 8·5776 seconds.

It will be seen that the correctness of these results depends upon the accuracy of the observations upon which the mathematical calculations were based. That these were not accurate, seems probable from the fact that there is every reason to believe, from the sun's parallax, as more recently determined, that the distance as originally computed is wrong by at least 4,000,000 miles.

Many hypotheses have been made as to the origin of such a grave mistake—some attributing the error to confounding a part of the planet with its penumbra, and others to mistakes in the computation, but these are of little importance. The time is approaching when the problem can be reworked, and, with the improved apparatus now possessed by astronomers, and the wonderful advances made in methods of observation, it may well be hoped that this time a reliable result will be obtained. The *Standard* (London) says of the extensive preparations now initiating for the observation of the coming transits, that "the Astronomer Royal is doing good service in preparing betimes for the great event. Though it may seem a long time to look forward to, to those who are unacquainted with the amount of preparation required for such observations, those who know the difficulty of procuring a large number of first-rate instruments, unless plenty of time is allowed, will know that there is really no time to be lost, especially if, as we should hope would be the case, all the expeditions sent out are provided with precisely similar instruments and apparatus. It is imperative upon the government to put no obstacle in the way of carrying out these observations in the most perfect manner. England must not be behind the Continent, at any rate. If any amount of failure takes place, it will not be from want of preparation on Mr. Airy's part. At the late meeting of the Royal Astronomical Society he showed that there was nothing indefinite about his ideas; he had already prepared careful maps both for observing the ingress and egress of the planet. He showed the importance of sending expeditions to several places, because, among other considerations, a thousand obstacles might interfere with the observations in any particular place. There are places which, if weather, etc., are favorable, will be admirable for all purposes, but, as in the case of Kerguelin Island, the chances are very much against a clear atmosphere. Captain Toynbee said that this island is seldom to be found on account of the fog. If practicable, no expedition will be of the importance of one sent to the South Pole, that is, as near to it as possible. At the South Pole the effect of parallax will be the greatest—that is to say, the position of Venus will vary to the greatest extent on the sun's disk. The Astronomer Royal in his maps suggests two points, one in Enderby's Land, but here the sun would be too low for it to be a certainly advantageous position—he greatly preferred a point in the Antarctic Continent, where Sir James Ross landed. As a place for observation nothing could be better. The only point is, Will the severity of the climate admit of the expedition? Captain Richards, the hydrographer to the Admiralty, spoke well upon it. He showed that if properly fitted out and provided with good huts, clothing, and food, there would be no further objection to the place than must stand in the way of any Arctic expedition. Those, however, who joined in it would have to make up their minds to one thing, namely, that they would have to spend a year upon the spot; for that it was unapproachable at anything near the time when the transit will take place. To show, however, that he did not consider this in any way fatal to the position as a station for observation, he said that he should much like to be one of the party himself. In this he was fully borne out by Captain Davis, who landed there with Sir James Ross. So that we may hope that this, at least, will be one station, and that the government will not postpone till too late the preparations to make it as favorable for the comfort of the spirited observers who will join in the expedition as for the objects of the enterprise. It may possibly be advisable to send out an exploring party previously, though Captain Davis did not seem to think that it would be necessary. The first great difficulty in all places will be to get the absolute longitude. No ordinary nautical longitude will be of the slightest value. Observations necessary can be made at many places easily accessible, as far as England is concerned, as at Alexandria, where the telegraph will be of great use; at many places, too, in the United States, where we can safely leave the work to Americans. We may especially do the same in the case of the Russians, where the exact longitude of Orsk, the extremity of the great arc of longitude extending from that place to Valencia, is known to a millionth part of a second, or in other words, to absolute certainty. The other places which are recommended to the English government are—Mauritius for one reason, and Madagascar for another. If, however, it should be thought unnecessary to fix both of these spots, then an intermediate station—viz., on the Island of Bourbon, would be preferable. If the Astronomer Royal can show that the two stations would be of considerable advantage, we hope that no financial reasons will prevent his wishes being carried out. Above all things we would urge upon the authorities the importance of making up their minds as to the instruments to be used, and in losing no time in having them put in hand. There is one more point worth noticing. How far photography can be depended on as to accuracy in helping to discover the sun's distance is not easy to answer off-hand; but certainly it is not to be doubted that much useful and interesting information may be secured by its means; and it is highly desirable that at none of the stations its use should be neglected. This part of the question is not, however, of the same pressing importance as the fixing of the stations suitable for observing the ingress and egress of the planet, and of the preparation in good time of the instruments and apparatus required."

Our readers will now be prepared to appreciate the importance of this subject, and to understand why its discussion is likely to occupy, to a large extent, the attention of the scientific press for a considerable time to come.

GALVANIZED IRON WATER PIPES.

In the opinion of some, the use of galvanized iron for water pipes, conveying water for drinking and culinary purposes, is injurious. Others take opposite ground in regard to this matter, and express themselves strongly in favor of such pipes. Our opinion upon the question has been asked by parties interested.

The use of zinc as a coating for the surface of iron pipes is not merely mechanical. Being more readily oxidizable than iron it produces an electric state in the latter metal which protects parts not covered perfectly as well as other portions of the pipe. The oxide which forms upon zinc is insoluble in pure water. Acids dissolve it readily, and when hydrated, as is the case in water pipes, solutions of the caustic fixed alkalies and solutions of ammonia will dissolve it.

Whether the oxide which forms upon the surface of galvanized iron pipes will be dissolved, depends therefore entirely on the character of the water, flowing through them. Rain water contains more or less ammonia when first precipitated. The oxide upon a galvanized iron roof would of course be dissolved to a certain extent, during a rain storm, a fact that has been noticed in connection not only with this material but with roofs of sheet zinc.

It is probably rare that water does not contain traces of free ammonia, or salts, the acid of which has a greater affinity for the oxide of zinc than the base with which it is combined. In such cases we should expect to detect traces of the zinc in water which has remained for any length of time in the pipes.

There are waters, doubtless, which could be passed through such pipes without the slightest danger of becoming charged with the poisonous oxide, and before their adoption an examination and analysis of the water should be made.

But while we have no doubt that in many cases, it would not be proper to employ galvanized iron pipes, we do not think that in a large majority of cases, the possible evils which attend their use, would be likely to prove serious. A great deal of exaggeration is to be expected upon the part of those who deal in pipes of other materials, and whose interest it is, to excite the fears of the public in regard to any wares that damage their particular trade. People are too apt to become excited by newspaper statements upon such subjects as these, and alarm themselves needlessly. If the fact exists that water flowing through galvanized iron pipes is impregnated with zinc, a simple chemical test by a competent person will readily determine it.

All metallic pipes in use are open to some objections. A great deal has been said upon the danger of using lead pipes, but the injury that has resulted from their use has undoubtedly been over-estimated. Lead poisoning is by far more subtle than zinc poisoning, and as its effects may follow without premonitory symptoms of sufficient extent to excite suspicion, we think them fully as dangerous as galvanized iron pipes under most circumstances.

A material for water pipes, cheap, durable, and capable of resisting the chemical action of all waters fit for household use is a long sought for desideratum. Until it is found we must do the best we can with such materials as we possess. Glass has been proposed and used to a considerable extent, but there are practical difficulties, which will probably prevent its ever being generally adopted.

The matter may be summed up by saying that the circumstances of any particular case can only determine whether galvanized iron pipes, are safe or otherwise. For most cases we think their use admissible.

VELOCIPEDE NOTES.

The Paris correspondent of the London *Orchestra* writes:

"I see a playful statement made by one of the Paris correspondents of the daily press—in an ultra-waggish mood, I presume—to the effect that the Customs returns here show £40,000, or a million francs, as the value of velocipedes exported to the United Kingdom in the course of a year. During some weeks past I have made bicycle statistics a particular study, and I have learned enough to convince me that the above figure must cover (with plenty to spare) the value of the total manufactures. Nine-tenths of these, to speak with moderation, are for home use; and of the exports, by far the greater number go to the United States. Every manufacturer—and manufacturers have sprung up like mushrooms—has his hands full. Any man whose productions are trustworthy, has to enter his orders, and demand a month or six weeks' delay—an elastic convention stretching indefinitely.

"Velocipedes have become a rage. Everybody talks of them. Athletes and gymnasts led the way, and now you see them in the hands of old, young, serious, and gay. *Employés de commerce* ride down to business on them in the morning, and home at night. They stable them during the day in obscure nooks of warehouses, in yards, or cupboards. They fly over the ground at race-horse speed, and their hobby horse takes no more expensive feed than the occasional *goutte* in the patent greaser. Thus they economize time and omnibus fares. The faculty have pronounced it a sanitary exercise, and lo! the obese are seen in shoals on iron horses bringing down the superfluous pound or so at eight miles an hour—and they for the most part, like their patent wheels, provide their own grease—an increasing supply that gathers in globules on their brows and streams down their glowing faces. Ergo, the bicycle supersedes Banting, for of a surety it is more congenial to the *fat* to do deeds of daring in the pigskin than to go off their sugar.

"The house of Michaux et Cie., of the Champs Elysees, have already one hundred and fifty workmen going as hard as they can. Now Michaux, the king of the trade, can barely produce five a day. 'What!' cries the critical reader, 'one hundred and fifty workmen to make five velocipedes in a day; a very queer speculation for Michaux' Not at all. His velocipedes sell for three hundred and fifty francs in the plainest form, to five hundred francs in polished iron, with the patent improvements. They are really models of perfection, but they cost as much as a horse.

"They very politely told me '*Nous donnons delecons gratuites à tout acquereur*,' and if I purchased an instrument of their London agent, I was welcome to my free lessons in their *manége*. They led me into a spacious riding school, I should say three or four hundred feet long by a hundred wide. It was a dazzling sight. You are in an ordinary warehouse, a door is opened, and a field of thirty hunters bursts on your view, all dashing madly to cover! There are riders of every kind—more tyros than proficients of course. One young man of twenty, or under, at once fixed my attention; a fearless fellow this that can perform more daring tricks than a Prussian rough rider. He starts it on at a desperate pace and leaps into the saddle as it flies—out again—a run and he's up again *en amazone*, working one pedal only—off again—a run and he jumps back—on to his knees—and then he's standing bolt upright, like a circus rider; and all the while his velocipede is dashing away at the rate of a London Hansom. He slackens his space to breathe awhile, and then 'again he urges on his wild career.' He dashes full at the fence, and you shrink in your boots for a brief second, thinking he has lost command of his velocipede, but he turns off at a right angle when within an inch or less of the paling. I asked the gatekeeper of the *manége* who this was. 'It is the fils Michaux,' was the reply, 'and if he would only go to the Palais de Crystal, to run in the race on Easter Monday, your compatriots wouldn't stand a chance." Thus I had to learn the doings of Sydenham from the Champ Elysees. I learned too that Michaux meant to send over a first-rate man—he was shown me—and one second only to the daring son of the house, to uphold the honor of France in the contest at the Crystal Palace. It is a plucky thing to do, and (patriotism apart) I wish them every success.

"'You see that young fellow in the gray suit,' said the gatekeeper to me in a whisper, pointing out a tall, English-looking youth of fourteen; 'that's the cousin of the Prince Imperial. The Prince has given him a velocipede fit for a gamin of eight years, and he has come to get it changed. That tall gentleman *decoré*, no beard, is Monsieur ——;' then *sotto voce* the name of a public character that rather astonished me; 'that little disdainful-looking boy is a Spaniard, the Marquis de'—(I forget what—suppose we say Carrabbas). In fact, nobles, notables, and princes were plentiful in Michaux' *manége*, and there was proof positive that the highest in the land incline to the bicycle."

One of the peculiarities of velocipedestrianism in this country is the large inventive talent displayed in framing names for it. Velocipedestrianism, velocipedestrian, velocipedist, velocipeder, velocipedism, velocipedian, velocipeddler, velocipediana, are some of the names applied to riding, riders, and items on the velocipede.

People who want to establish a velocipede rink can call it by any of the following names: Amphicyclotheatron, gymnacyclidium, velocipedrome, or bicyclocurriculum. Monocycle, bicycle, tricycle, quadricycle, are terms used to indicate the number of wheels. But we have seen one name, that in classical beauty and richness of conception, seems to us to eclipse all competitors. The machine which rejoices in this appellation is a water velocipede, and it is called "Tachypodoscaph." Greek scholars will understand this to mean "a swift foot-boat," or, as Artemus Ward would have said, "words to that effect." In view of this amazing fertility of language would it not be well for some enterprising publisher to print a velocipedictionary?

Pickering's Velocipedist says: "We have had so many inquiries in regard to the monocycle, or one-wheel velocipede, that we have determined to get up one, which shall be clear of many of the objections which are urged against those we have so far seen. We shall have it completed in time to give an engraving of it in our next number. We think that we can dispense entirely with the use of not only the steering arms, but even the cranks, although it is worked by the feet; and we consider that the same machine will be adapted for either boys or men, short or tall persons—and even ladies. It may be easily mastered (we think), and in case the rider falls, the machine will not fall on him; in fact, it will not be capable of falling on its side; and further, it will not infringe any known patent. Still further, it is not a wheelbarrow."

Mr. Benton, master mechanic of the Terre Haute & St. Louis Railroad, has invented a railroad velocipede, and has made passenger train time on the same, making about twenty miles an hour between Litchfield and St. Louis, a distance of fifty-five miles. An Ohio inventor also proposes to make a veloci-