weight of a lineal yard of any section of bar is found by multiplying the square inches in the section by ten.

It is generally found that large masses of forged iron do not possess the relative strength of smaller ones, from being irregular in texture. Rolling improves the toughness more than hammering does, the latter processes hardening it, but at the same time rendering it more brittle.

Wrought iron can be case-hardened by heating it for some days in contact with bone dust or other animal substance containing carbon; by this process the surface becomes converted into steel by the absorption of carbon.

If heat is applied to wrought iron, its strength is not affected as long as the temperature does not rise above 350° Fahr., but beyond that *it* begins to lose strength. When the temperature is reduced very low, the metal becomes less flexible and more brittle, so that its deflection under a given load is diminished, but at the same time its liability to fracture is increased.

The decay of iron arises from the joint action of air and water, the oxygen from which combines with the metal and forms a hydrated sesquioxide, called rust.

THE PNEUMATIC DESPATCH.

It is now nearly seven years since a pneumatic tube was first laid in the very heart of London, and its working proved to be perfectly successful. Notwithstanding this, the fact remains that the great public carriers—the railway companies—and the Post Office authorities have not yet availed themselves of the manifest advantages offered by this system for the rapid transmission of small parcels and mail bags. It is true that for some time the only available route was that from the North Western Railway at Euston square to the station of the Pneumatic Despatch Company in Holborn. It may have been that the value of the system was impaired by the southern termination of the tube being in a locality possessing but few advantages for those who were likely to be the principal users of the system. But the terminal point was never intended to be in Holborn, nor is it, inasmuch as a line of tube—long ago commenced—has recently been completed between the Holborn station and the General Post Office. The possible drawback to which we have referred, does not, therefore, now exist—if it ever did,—a clear route having been established between Euston square and St. Martin's le Grand. Descriptions of the pneumatic tube and the apparatus for working it were given by the press in November, 1865, when the first section was opened. It will be as well, however, now that the works have been finished, if we briefly refer to them again. This will be the more necessary, as the details have been slightly altered in one or two instances. The pneumatic tube is formed in two sections, with a station in Holborn. The first section—that between Euston and Holborn—is 3,080 yards in length, and is laid with easy gradients. The section between Holborn and the Post Office is 1,658 yards in length, and on it two gradients of 1 in 15 occur. [The total length is almost three miles.] The station at Holborn is placed at right angles to the direction of the tube, so that all through trains must reverse there. This is effected by allowing a train on its arrival to run from one tube up an incline, down which it quickly descends by gravity, and is turned on to the pair of rails leading to the other tube. This shunting is effected very rapidly, occupying only about half a minute. The tube is of the horse shoe section, the internal dimensions being 4 feet 6 inches vertically, and 4 feet horizontally. The pneumatic cars or trucks are 10 feet 4 inches long, and the ends present an outline conforming to that of the interior of the tube, the edges of the ends being bound in an elastic medium, so as to form pistons when in the tube. The cars weigh about one tun each.

The machinery by which the transit of the carriers is effected was designed and constructed by Messrs. James Watt & Co., and is placed in the rear of the Holborn station. It consists of an engine having a pair of 24 inch cylinders with 20 inch stroke. A fan 22 feet in diameter is geared at 2 to 1 with the engine, and is worked continuously, the alternate action of pressure and exhaustion being governed by valves. The ordinary working speed of the fan is 160 revolutions per minute, which gives a pressure of about 6 ounces per square inch. Trains are drawn by exhaustion from Euston square and the Post Office, and are propelled by pressure to those points. The doors of the tubes are arranged at Holborn and the Post Office on the principle of lock gates, being hinged vertically and hung in pairs.

Such is in general terms the machinery of the Pneumatic Despatch Company, the working of which was illustrated to a number of scientific gentlemen and others on Monday last. Among those present were the Duke of Buckingham and Chandos (Chairman), Mr. John Aird, Mr. G. S. Sidney (Directors of the Pneumatic Company), Mr. W. H. Barlow (Engineer to the Midland Railway Company), Mr. Winter (Engineer to the Post Office), Mr. Giraud, Mr. T. G. Margary (Secretary of the Pneumatic Company), Mr. S. de Wilde (representing Mr. L. Clarke, the Company's engineer), etc. The trials commenced by bringing a single car by exhaustion from the Post Office, the run being accomplished in 3¼ minutes, a rather longer time than usual, but accounted for by the circumstance of the car having been over buffed, the pressure being relieved a little too soon. This car was then coupled to two others, and the three were started on their way to Euston, which point they reached under pressure in 6¼ minutes from the time of leaving Holborn. The train was next brought from Euston by exhaust, the time occupied being 5½ minutes. It was then run into the Post Office tube, and in 2½ minutes from the time of starting it had reached its destination. It was then sent on the return journey, which was accomplished in 3 minutes, as far as Holborn, and in 7 minutes more it had arrived at Euston. The time here was exceptionally long, but the pressure was rather low. Finally the train was brought back from Euston in 5¼ minutes.

Experiments of such short duration as the foregoing, carried out, moreover, without any recent practice by the men in charge, can hardly be taken to represent the results of actual practical working. Some interesting facts, however, in connection with continuous working were established by Mr. W. H. Barlow, who in the early part of the present year instituted a series of careful experiments with the pneumatic tube, which lasted over several days, and showed the difference of power required to work the gradients of the Euston section of the tube as compared with the Post Office section. One feature proved by these experiments was, that whether the tube was closed at both ends or closed at one end and a car inserted and fixed at the other, or whether a train was moving or not, and again whether each tube was put in connection with the fan separately or both were put in connection with the fan at the same time, in all these cases there was—as might be expected—but little variation in the number of strokes required to maintain given pressures.

With regard to the actual weights moved, and speeds obtained, numerous experiments were made by Mr. Barlow on the section between Euston square and Holborn.

The remarkable feature of these experiments is that, with the same number of revolutions per minute of the engine, and the same pressure, a very large increase made in the load produced a comparatively small decrease in the speed.

By increasing the load from two to twelve tuns, the useful effect or weight passed through per minute was increased five times. In the last experiment, by increasing the load from two to twenty tuns, the useful effect was increased about seven and a half times; the pressure of steam and the work performed by the engine remained about the same, whether a weight of two tuns was passing through at 17·3 miles per hour, or twenty tuns at 13·15 miles per hour. The experiments made by Mr. Barlow upon the section of tube between Holborn and the Post Office showed that, notwithstanding the gradient of 1 in 15, the heaviest loads were those which produced the best commercial results.

The working expenses are estimated at £50 per week, working 12 hours per day, and the repairs at £500 per annum, an allowance which Mr. Barlow considers to be ample. He, moreover, observes that if sufficient traffic could be found to render it desirable, the carrying power of the apparatus could be greatly increased.

Seeing then that there exists in good working order a rapid and efficient means of transit between Euston square on the one hand, and the Post Office and the receiving houses of the principal carriers in London on the other, there can hardly be a doubt that these means will soon be utilized by those parties whom they would so clearly benefit. Useful as the system appears to be as at present arranged, it could be rendered infinitely more useful by a slight extension. It already has one of its *termini* at the North Western Railway, and we know of nothing to prevent its further extension eastwards to the Midland and Great Northern Railway stations. Such Such a step would appear to be most desirable, and we should think that the two last named companies would find it greatly to their interest to enter into working arrangements with the Pneumatic Despatch Company. This would afford a ready solution to the difficulty which the Company now experiences in obtaining sufficient traffic to start their line. Were such arrangements as we have suggested carried out, the additional length of tube would be forthwith constructed, and from what we have seen of the satisfactory nature of the working of the system, it would thereafter be rapidly extended in all directions under the metropolis and its suburbs.—*Engineering, Aug.* 23.

New Method of Telegraphing.

A patent recently granted to J. H. and J. W. Rogers, of Peekskill, N. Y., covers the following method of telegraphing:

The inventors provide a thin and narrow conducting tape or strip of metal, on which they emboss the message in the Morse characters, and this strip they draw through a transmitting instrument, which is so arranged that a metallic pen, or *stylus*, which is in communication with one pole of the battery, will only touch the upper surface of the characters, as the strip passes along through the machine. The under surface of the strip or tape is in communication with the other pole of the battery; consequently whenever the *stylus* comes in contact with an embossed character or signal, the electrical circuit is closed and a signal, corresponding to the embossed signal, is transmitted over the line wire, to the receiving instrument at the opposite end. The receiving instrument may be made on the plan of the Morse instrument, and is intended to be so arranged that it will indent or emboss the signals, as fast as received, upon a metallic strip like that used in first sending the message. Several advantages attend this method of telegraphing and recording. The transmission of messages once formed can be much more rapidly effected than heretofore.

The means for forming the raised letters on the conducting tape are, or may be, substantially the same as those now employed in printing telegraphic messages on the Morse system—that is to say, by the ordinary needle or recording pin of the register. The forming of the raised letters can consequently be effected at any suitable distance by the ordinary telegraphic appliances, and thus supply the place of repeaters. If, for example, in sending a message to California from New York, the wire beyond Chicago should be engaged, then (assuming the wire to be disengaged from New York to Chicago) the automatic repeater is of no use until the wire beyond Chicago can transmit its message; but the improved tape catches and holds the message at Chicago until the wire beyond may be used, and thus from fresh batteries repeats the messages from New York on to California at least ten times as rapidly as an automatic repeater could, leaving the wire from Chicago back to New York free for other messages to New York; which the ordinary automatic repeater cannot do, acting simultaneously, as it must, with the New York manipulations.

Again, to say nothing of the automatic repeaters, all the messages arriving at a central office—as, for example, the Western Union in New York—may be delivered there on the tape by each distant manipulation of other offices, instantaneously, and all these may be transmitted on to their destinations by turning a wheel, whereas now an expert must forward each message to which the wires beyond New York were not opened.

Japanese Fans.

In summer time the climate of Japan is generally moist, hot and oppressive, the air on the hottest days being not unfrequently stagnant as well; the consequence is that the use of the fan is universal, and in bamboo and Japanese paper are found materials most admirably adapted for the purpose of their manufacture. The artistic faculty of the Japanese embellishes their fans with designs that commend themselves by their exquisite fidelity to Nature; a few simple touches realize pictures which many a foreign artist could not approach; the Japanese are born draftsmen, and their sense of the contrast of colors intuitive; hence even the very commonest fans are generally very interesting to look at, and are almost never vulgar. The excellence of this branch of native manufacture, and the excessive cheapness of production, says the Japan *Herald*, are fast securing a foreign trade in them of no mean magnitude. Within the last year one commercial house shipped some three millions of them to America, and another firm is just shipping away, in one vessel, a million more to the same country, where it has become a common practice to deposit a fan in each sitting in churches and chapels, for the use of members of the congregation. There are some extensive factories at Yedo devoted to fan making, giving employment to hundreds of hands. The fans being wholly produced by manual labor, no machinery is employed.

A Tame Wasp.

At a recent meeting of the British Association, in Brighton, in the section of zoology and botany, Sir John Lubbock exhibited a tame wasp which had been in his possession for about three months, which he brought with him from the Pyrenees. The wasp was of a social kind, and he took it in its nest formed of twenty-seven cells, in which there were fifteen eggs, and had the wasp been allowed to remain there, by this time there would have been quite a little colony of wasps. None of the eggs, however, came to maturity, and the wasp had laid no eggs since it has been in his possession. The wasp was now quite tame, though at first it was rather too ready with its sting. It now ate sugar from his hand and allowed him to stroke it. The wasp had every appearance of health and happiness; and although it enjoyed an "outing" occasionally, it readily returned to its bottle, which it seemed to regard as a home. This was the first tame wasp kept by itself he had ever heard of.

Bullock's Blood as a Medicine.

In the practice of medicine, as in other worldly matters, certain things are in fashion for a certain time. Bleeding and mercury have had their day; cod liver oil and chloral hydrate are already on the wane; alcohol and bullock's blood are now in vogue among the Parisians—the former for fevers and all inflammatory affections, and the latter for anæmia and pulmonary phthisis. It is said to be a curious sight in Paris to see the number of patients of both sexes and of all ranks and ages who flock to the slaughter house every morning to drink of the still fuming blood of the oxen slaughtered for the table. According to M. Boussingault, of all nutritive substances the blood of animals contains the greatest quantity of iron, and it is this which gives value to the new medicine.

Elevations in Colorado.—Collated by Professor C. Thomas, of the United States Geological Survey.

Names of Points.	Altitude above the sea. Feet.	Names of Points.	Altitude above the sea. Feet.
Mount Harvard (Whitney)	14,270	Jones's Pass	12,400
Gray's Peak	14,145	Argentine Pass	13,100
Mount Lincoln	14,123	Georgia Gulch Pass	11,487
Mount Yale	14,078	Ute Pass	11,200
Pike's Peak (Parry)	14,216	Vaughn's Pass (estimated)	11,500
Long's Peak	14,066	Hot Springs (Idaho City)	7,050
Barry's Peak	13,133	Hot Springs (Middle Park)	7,726
Mount Flora	12,878	Soda Springs (near Pike's Peak)	6,515
Mount Wright (E. Berthoud's Pass)	11,800	Gold Hill	8,636
Cherry Creek Divide	7,575	Bergen's Ranch (Jefferson Co.)	7,752
Denver	5,817	Jefferson, South Park	9,842
Golden City	5,882	Tarryall	9,943
Mount Vernon	6,479	Foot Berthoud's Pass	9,325
Golden Gate	6,226	Osborn's Lake	8,821
Junction N. and S. Clear Creeks	6,466	Velie's Peak	13,456
Black Hawk	7,543	Mount Audubon	13,402
Central City	8,043	Timber Line (Parry).	
Missouri City	9,073	On Pike's Peak	12,000
Head Virginia Cañon	9,600	On Snowy Range	11,800
Idaho	7,149	On Mount Audubon	11,325
Georgetown	8,245	On Long's Peak	10,500
Berthoud Pass	10,896	On Wind River Mountains	10,100
Boulder Pass	11,610	On Gilbert's Peak (Uinta Mountains. Hayden's Survey)	11,100

FOREIGNERS IN JAPANESE EMPLOY.—From the *Nishi Shinjishi*, the Yedo newspaper printed in Japanese, we glean that the Public Works Department of that country employs 161 foreigners, at an aggregate cost of 29,621 dollars a month. They consist of French, 36 persons; English, 111; Swiss, 1; Chinese, 6; Manillese, 4; Indian, 1; and Americans, 2.

PLATING WITH NICKEL.—This may be effected by placing the object to be plated, whether of iron, steel, copper, bronze, zinc or lead, in a boiling neutral solution of zinc chloride containing a salt of nickel, and granulated zinc. If the zinc solution is acid, the coat of nickel is dull. A plating of cobalt may be made in the same manner.