by means of large windows. The sofas are upholstered in blue figured velvet, and arranged in bays, while the windows are curtained in blue and gold tapestry, the general appearance being that of a homelike drawing room.

The first-class dining saloon, which is situated on the lower deck, has seating accommodation for one hundred persons at a time; the framing of this apartment is in yellow pine artistically painted, while the upholstery is in figured velvet harmonizing in color with the general decorative design of the saloon. As the total number of passengers that may be carried by the steamer is 1,500, another dining saloon is provided at the forward part of the vessel to supplement the main saloon when she is crowded. A saloon is also placed forward for the convenience of second class passengers. In addition there is a handsome boudoir for ladies, besides private cabins and private dining accommodation. The promenade deck, already alluded to, is fitted with comfortable seats, which are designed so as to serve as life rafts in an emergency. An installation of electric lighting is provided, and an elaborate system of ventilation. For handiness in navigating the upper Thames a bow rudder and suitable steering gear are fitted, while powerful steam steering gear is provided for the main rudder and controlled from the flying bridge.

The Walton Belle is propelled by a set of direct action, triple expansion, diagonal, surface condensing engines, with cylinders 20½ in., 30 in. and 43 in. and a 60 in. stroke. In order to secure both lightness and strength, cast and ingot steel, to the exclusion of cast

very definite conclusion. There is also a difference of opinion as to what part of the body has to bear the greatest strain. According to some physicians, the heart is brought into excessive action, while others hold just the contrary, that the work is rendered easier for that organ, by the task required of the other muscles, mainly those of the thigh, the cardiac spasms resulting more easily owing to the impulse given to the circulation. These advocates of cycling, moreover, state that, while other athletic exercises requiring great efforts and muscular work produce on the one hand an accumulation of carbonic acid gas, and on the other, through the frequent closing of the glottis, shortness of breath, in cycling there is no accumulation of carbon dioxide, the product of the combustion caused by the muscular work. The movement being distributed evenly over the body, the work is comparatively small, while the blood is freely supplied with oxygen by the frequent inhalations.

These details are given by Dr. Jennings. But the remarks surely do not quite apply in the case of prolonged or very rapid wheeling.

However, let us return to the subject of our illustrations. Photographs were taken of the limbs of these professionals, to establish whether they showed any analogous development. One glance at the cuts will convince the reader that such is not the case. Beside the fine anatomy of Jaap Eden, Lamberjack, for instance, shows no very remarkable build. Many non-cyclists have as good thighs as Fournier, Gougoltz and Fischer. As for Huret, a stayer, strayed into the number of these sprinters, it is not his legs that distinguish

BRASS FACING ZINC HALF TONES AND THE METAL MOUNTING OF SUCH BLOCKS.

By E. L. ECTRO.

As the unprotected surface of a zinc half tone is very liable to damage, many remedies have from time to time been suggested and tried. It has been found that a thin coating of brass has proved of great service in this direction, and an easy and simple way of depositing this alloy is here given.

Of the merits or otherwise of the hot or cold process it is not necessary to say much. Each bath has its adherents, and as both a hot and a cold bath formula is given in this paper, the worker can choose that which suits him best, as, with the exception of making up the solutions, the working is practically the same in both instances.

COLD BATH FORMULA.

Zinc carbonate.....	10 parts.
Copper carbonate ..	10 "
Soda carbonate.....	20 "
Soda bisulphite.....	20 "
Potassium cyanide.	20 "
Arsenious acid (white arsenic).....	1 "
Water.....	1,000 "

To make up the solution proceed as follows: Take twelve parts of sulphate of copper and twelve parts sulphate of zinc and dissolve them in water, then add carbonate of soda, already dissolved, to the solution. This precipitates the copper and zinc in the form of carbonates, a greenish colored powder. Allow the

JAAP EDEN.

FISCHER.

PIETTE.

LAMBERJACK.

GOUGOLTZ.

HURET.

FOURNIER.

LEGS OF RACING CYCLISTS.

and wrought iron, have been used wherever practicable in the machinery. The engine has three cranks, which arrangement tends to steadiness of motion. The high pressure and intermediate cylinders are fitted with piston valves and the low pressure cylinder with a double ported slide valve, all being worked by Brock's valve gear, which insures uniformity of lead at all grades of expansion. The reversing is effected by Brown's combined steam and hand gear, all the levers being brought to the starting platform.

Steam is supplied from a multitubular boiler, working at a steam pressure of 160 pounds, and constructed in accordance with the Board of Trade requirements. Forced draught arrangements are fitted in a closed stokehold, the air being supplied by a fan driven from a Bumstead engine. Denny & Company's patent spark arrester is fitted in the funnel.

The trial runs between the Cloch and Cumbræ lights on the Firth of Clyde gave a mean speed of 17.09 knots, as compared with the contract requirement of 16½ knots.

For our engraving and the foregoing particulars we are indebted to The Engineer.

LEGS OF RACING CYCLISTS.

OUR illustrations show the front and rear views respectively of the legs of some well known professional cyclists. For years sporting journals have debated the question as to what is the form of musculature most desirable for a cyclist's legs, without arriving at any

him from the rest. One characteristic common to all is the abnormal development of the crural biceps and triceps, noticeable particularly in Jaap Eden. In him it becomes almost a professional deformity.

It is a pity that this reproduction in black and white cannot give fully the tint of the limbs. They are all spotted and scarred; on Lamberjack we notice a plaster at the knee. These are trophies from occasional collisions, such as occur on all racing tracks.

There seems to be no precise indication from which we can judge what is the ideal cyclist's leg. Medical men express no opinion on the question. Chappy Warburton, the famous trainer of Linton, Michael and Champion, alone has the confidence to make any assertion with regard to that question.

The professional cyclist, he says, must be an athlete. Any man who has had success in any branch of sports which requires endurance will also have triumphs on the track. Thus Eden was formerly a great skater. As for his bodily conformation, the cyclist should be built somewhat like a dog: a wide chest, in which the lungs can work freely; the lower limbs should present long, powerful levers, as in a greyhound. Zimmermann, the great American champion, had remarkably long thighs.

So much for the opinion of professionals. Our cycling readers may make their own observations from the two cuts which we borrow from L'illustration, and form their own opinion accordingly. We will say no more, but leave them to study these assorted human limbs.

precipitate to settle, and pour off the supernatant liquor. Wash the precipitate, and then mix it with the carbonate and bisulphite of soda in 900 parts water. Next dissolve the cyanide and arsenic in the remaining 100 parts water and pour this into the first solution. The bath is now ready for use.

HOT BATH FORMULA.

Copper acetate.....	14 parts.
Zinc chloride.....	14 "
Potassium cyanide.....	30 "
Soda bisulphite.....	28 "
Ammonia.....	16 "
Water.....	1,000 "

Dissolve the cyanide and bisulphite in 800 parts water and add to it the other ingredients dissolved in the remaining 200 parts water. This solution is used at a temperature of about 120 deg. Fah. The vessel for containing this solution may be of iron lined with brass, and the temperature maintained by hot water, gas, fire, or steam. The cold bath can be used in an ordinary earthenware vessel, or, if the work runs large, a wooden tank lined with gutta-percha will answer admirably.

The anodes should be of good stout brass. They should occasionally be removed from the solution to be cleaned, and the connections generally seen to. Care should also be taken to prevent any of the solution getting upon the hands or clothes; if such should happen, it should be immediately washed off with water. A pair of Bunsen cells in series will be required to

deposit the metal. The cells and the method of connecting them were fully described in the issue for October, 1896, but for those readers who have mislaid that number a few brief notes are here given. The Bunsen cell consists of an outer earthenware jar containing a 10 per cent. solution of sulphuric acid. Into this a zinc cylinder amalgamated with mercury is placed. A porous pot with a block of carbon in it is filled with pure commercial nitric acid, and then placed within the cylinder of zinc, and the battery is complete.—The Process Photogram.

RAPID PROCESSES OF UNLOADING ARTILLERY MATERIAL FROM CARS.

THE ordnance department is just now studying some rapid processes of unloading a battery from a train upon an open track and with its own resources. It is possible that, during the course of a war, a battery of artillery may have to be taken off a train in the open country without the aid of any of the arrangements and accessories that are found at stations for assisting in such an operation. The destruction of a track, the occupation of a station by the enemy and an unexpected attack are so many circumstances under which the artillery would have to be unloaded from the train under such conditions; so, in recent times, much attention has been paid to this question. Several processes have been studied and put to the test in France as well as in other countries. The one that appears destined to be adopted by us is that proposed by Capt. Barthelemy.

The photographs herewith reproduced represent different phases of the unloading of a battery by this method. These photographs were taken during the course of experiments made at Fontainebleau by one of the flying batteries of the seventh division of cavalry.

Capt. Barthelemy's system is based upon the following principles: (1) The utilization of the hind ladder of the forage wagon or of the artillery wagon separated from its forecarriage as an inclined plane for unloading the horses; (2) the descent of the fore and hind carriages of each wagon separately by manual labor, and, when either of them is about to touch the ground, the receiving of its hubs in some kind of support that will allow the wheels to come into contact with the earth without shock.

The unloading of the wagons of a battery will, of course, begin with the one that is to serve as a descent for the horses.

The best of the vehicles to use for this purpose is the forage wagon, which, on account of its length, gives a very gentle slope.

The artillery wagon, which gives a steeper slope, is used only in case of the absence of the forage wagon. After the wagon that is to be used as an inclined plane has been taken off the car, its fore carriage is removed, and there is thus obtained a very convenient gangway, so to speak, that just reaches the level of the floor of the wagons. Upon the floor of the wagon there is spread straw and sand, in order to render its surface less slippery.

Fig. 1 represents an unloading of horses effected by means of a battery wagon. The party that made the experiment during which our photographs were taken had no forage wagon at its disposal.

As the hind carriage of an artillery wagon is connected with the fore carriage by means of a short pole, it is the latter that rests upon the earth when the two parts are detached. The men seen at the two sides of the wagon are there to prevent any motion during the descent of the horses and to keep its upper part in close contact with the floor of the car. Further to the left is seen a man with a shovel ready to throw sand upon the floor as soon as the horse has been disembarked.

Fig. 3 represents the unloading of a fore carriage. By means of ropes possessed by the battery, the wheels have been tied, so that it will be impossible for them to revolve.

Two men placed upon the other side of the truck hold back the descending wheels by means of a rope. This rope makes one revolution around the axle of the truck, and this gives the two men considerable of a purchase. Ten other men cause the wagon to advance while holding it.

The accessory supports mentioned above have been prepared in advance and are as follows: With a forage rope there is formed a sort of sling which is placed upon the point of one of the large pickets that are carried under the artillery wagons and that are used for attaching horses to by means of ropes during a bivouac.

As soon as the axle of the fore or hind carriage that is descending reaches a distance from the earth a little greater than the height of the picket supports, one of the latter is fixed by its sling to each axle. The axle continuing to descend, the supports touch the earth. Then, instead of continuing to descend vertically, it pivots around the two points of the supports that rest upon the ground, and the tires of the wheels touch the latter without any shock.

The descent of the hind carriage of a wagon is effected in the same manner, with the difference that, as soon as it is possible, it is connected with the fore carriage that has already been unloaded.

Fig. 4 shows the descent of a hind carriage. The picket supports are here already fixed to the hubs. A gunner standing on each side holds each of the supports exactly vertical, in order that no sliding may occur when the carriage pivots around the bearing point of the supports.

All the wagons of the battery except the ammunition ones are unloaded as we have just explained. As the fore and hind carriages of the ammunition wagons cannot be separated, the latter have to be unloaded in their entirety.

In order to perform this operation everything is taken out of the wagon, and then its fore carriage is made to pass over the edge of the truck, while a sufficient number of men to balance it get on behind, so as to allow the front wheels to touch the ground without shock. The descent is effected entirely by manual power. Fig. 2 clearly shows the mechanism of this operation.

The unloading whose phases are here reproduced, and which included that of eighteen wagons and two hundred horses, took about two hours.—La Nature.

WIND PRESSURES ON HIGH BUILDINGS.*

WE have been particularly requested to lay before our readers an abstract of the long, but very valuable, paper on wind pressure prepared by Mr. Julius Baier, Assoc. Mem. A. S. C. E., but it has seemed best to us to print the following copious extracts from his paper rather than a briefer abstract:

The storm of May 27, 1896, entered St. Louis from the west, progressed eastwardly through the city at some distance south of the central business section, crossed the Mississippi River and continued in a northeasterly direction through East St. Louis.

The anemometer record shows the passage of 13 miles of wind in about 12 minutes; of this, a little over $6\frac{1}{2}$ miles passed in five minutes, a rate of about 80 miles an hour observed, giving, when properly corrected, an actual velocity of about 62 miles per hour. The gene-

level, at a point where the broken and uprooted trees show the full force of the storm. A straw thatched roof held in a light wire netting and perched on six uprights planted in the earth, and stiffened by a few rustic braces, would seem a most inviting mark for the wind, but except for some damage due to the falling limbs of adjacent trees, it stands uninjured.

Any formula expressing the relation between the pressure and velocity of the wind must be based on the assumption that the air flows in a uniform current. All experiments in the open air show that the actual conditions are far different, and the great diversity in the observed results is due largely to the continued and rapid fluctuations in the velocity of the winds.

As a result of these observations Professor Langley reaches the conclusion that "the wind is not even an approximately uniform moving mass of air, but consists of a succession of very brief pulsations of varying am-

FIG. 1.—ARRANGEMENTS EMPLOYED FOR DISEMBARKING HORSES.

ral direction was toward the south, into the storm center.

A general inspection of the buildings brings out the following average characteristic features. The extreme force of the wind was generally confined to upper stories and roofs. The intensity of this force must have been extremely variable, not only as exerted on adjacent properties, but on a single building. There was very general evidence of the destructive force being exerted from the inside.

The total number of buildings destroyed or seriously damaged by the storm in the city of St. Louis, as shown by the records in the assessors' office, is 7,263. Of these, 321 were totally wrecked. The number of houses slightly damaged that can be repaired at an average cost of \$75 is 1,249, making a total of 8,515.

The general maximum destruction covers an area from 4,000 feet to 6,000 feet wide and nearly three miles long, lying immediately south of the central part of the city in St. Louis and extending across the river into East St. Louis.

Throughout the path of the storm the buildings and wreckage show evidence of extreme and sudden variations in the intensity of the wind pressure. A striking example of this is a little pavilion left standing in Lafayette Park on a slight elevation above the general

plitude, and that, relatively to the mean movement of the wind, these are of varying directions."

Regarding the direct effect of wind pressure on buildings, some suggestive results were obtained by Professor Kernot* with an apparatus devised to determine the relative pressures of the wind on flat plates, cubes, cylinders and other forms similar to those employed in ordinary construction. A steady jet of air 10 by 12 inches in cross section was directed against small models supported on a very delicately arranged carriage running on an accurately leveled surface plate, the force exerted being measured by a delicate spring balance. From a large number of experiments made with this apparatus he found that the pressure on sloping roofs agreed with the results of theory only when the air could blow freely underneath. With the model of a roof placed on a wall, as in an ordinary building, the air was deflected upward and greatly reduced the pressure on the roof; the effect was more marked when a parapet was used. In the case of a roof of 30° pitch, with a parapet 0.16 the height of the roof, the pressure was actually reversed, the roof having a slight tendency to lift. Experiments were tried as to the effect of the wind blowing in at the open end of a building having the sides and other end completely closed, and it was found that there was an internal pressure, tending to lift the roof and force out the sides,

* Extracts from a paper by Julius Baier, Assoc. M. Am. Soc. C. E., read before the American Society of Civil Engineers, and published in the Journal of that Society.

* Engineering Record, February 10, 1894.

FIG. 2.—METHOD OF LETTING DOWN AN AMMUNITION WAGON.