Correspondence.

Air Resistance to Moving Bodies.

To the Editor of the SCIENTIFIC AMERICAN:

In concluding an editorial on air resistance to moving bodies, suggested by Murphy's bicycle riding feat, you offer for the special consideration of railroad managers this problem: If a body presenting three square feet of surface to air resistance, and moving at the rate of sixty miles per hour, requires seven horse power for its propulsion, what would be the resistance in horse power to a train moving at the same velocity, but presenting 400 to 600 square feet of surface? This is not at all difficult, as a mathematical problem, but to my mind it suggests another, which I confess is a "corker." If from 933 to 1,400 horse power is required to overcome the direct air resistance to a train moving sixty miles per hour, and this resistance is about equivalent to the utmost capacity of the locomotive, how are the inertia, frictional and other resistances overcome at this and much higher speeds? The men who formulated the extremely elastic formulæ on which such calculations are based should give their attention to this problem, in which event it is probable that we should soon hear of a solution equally interesting and valuable. But if they have any misgivings as to the accuracy of their calculations, it is suggested that they should not attempt to verify them by any experiments conducted on the pilot of a fast locomotive without first erecting thereon some very substantial fortifications against those delusive seven or more horse powers which otherwise they would be called upon personally to resist. If these gentlemen should unfortunately be afflicted with a physical corpulency to correspond with the inflated generosity of their imaginations, the dangers of the undertaking should certainly deter them from making, in other respects, such a promising experiment in the suffering interests of science.

The simple fact that the bicyclist Murphy was able to ride from 10 to 15 feet in the rear of the car or shield shows conclusively that a body of air enveloping the entire train is swept along with it, at about the same rate of speed, and that, therefore, small projections, window embrasures, and gaps between the cars, add little or nothing to the resistance.

If a bicycle rider, without a pacer, would have to exert seven horse power at sixty miles per hour, it would, at least, be safely within the limits of the accuracy of Mr. Adams' calculations to say that one horse power would be required at 30 miles per hour; but it is known that the best riders are unable to make a sustained effort of much over half a horse power, and if the double of this is demanded for air resistance alone, we must all admit that the rider who makes a record of 25 or 30 miles per hour is the most wonderful phenomenon that nature has ever produced.

W. F. CLEVELAND.

Moncton, N. B., Canada.

[The points raised by our correspondent are well made, and the reductio ad absurdum in the case of the horse power required to drive a bicycle at thirty or draw a train at sixty miles an hour is evident. We know that 1,400 horse power is not exerted by the locomotive in overcoming air resistance, and we know that a bicyclist cannot exert one horse power for more than a few seconds at a time, certainly not for two minutes; nevertheless, assuming that even the lowest tables of wind pressure are correct and working upon the 33,000 foot-pounds basis, as we did in the editorial referred to, these impossible results inevitably follow. As a matter of fact, there is a crying need to-day for careful investigation of the subject of wind pressure and air resistance, not so much to determine the disturbances of the atmosphere when agitated by moving bodies, as the exact pressures developed. The impossible results arrived at in working on our present basis of wind pressure prove that our tables are altogether too high; and if they are too high, we are putting tons of weight into our bridges, roofs and framed structures subject to wind stress, which represent simply a clumsy waste of material. The other point raised in this letter is taken up in our editorial column.—ED.]

Air Resistance.

To the Editor of the SCIENTIFIC AMERICAN:

Your valuable paper of July 15 to hand yesterday, and contents of article headed "Murphy's Ride a Hint to the Railroads," noted.

It seems to me that you leave one factor out of all your calculations, namely, the suction or inrush of wind behind the train. You only credit the engine and car with one-half of their work. They not only cleared the way for Murphy; they created a 60-mile per hour wind behind him to carry him along. This new factor will cancel all your previous figures, as, according to them, Murphy had seven horse power of wind at his back.

That the frontage of engines, etc., offer some resistance to the air, there can be no doubt; but it is insignificant in comparison to the results of your figures. I will venture to say that if Murphy had taken his feet off his pedals after he had attained his maximum speed he would have finished just as soon as he did.

A few years ago, I followed a trolley car across the meadows between Rutherford and Jersey City, at a distance of some 20 to 30 feet. The car stopped unexpectedly (to me) to hail another car coming in an opposite direction. With all the back pressure I could exert I could not stop quick enough to avoid smashing my wheel, and I only saved myself by getting out from behind the car. ROBERT MANCHLIN.

New Holland, Pa., July 15, 1899.

[Our correspondent is confusing a 60-mile per hour train with a 60-mile per hour wind. The pressure on a stationary square yard of surface exposed to a 60-mile wind is the same as the pressure on a square yard of surface moving at 60 miles per hour through still air. According to our correspondent's theories, if he took shelter from a 60-mile per hour wind behind a square yard of board fence, he would find a 60-mile wind (or suction as he terms it) blowing him against the fence on the lee side of it. As a matter of fact, the air on the lee side of the fence would be still or "dead" air, just as (according to Murphy) there was still or as he called it "dead" air behind the shield.—ED.]

THE PARIS EXPOSITION MEDAL.

Our engravings give an admirable idea of the appearance of the new medal which will be given to the most deserving exhibitors at the great Exposition which will open its doors next year in Paris. The medal is of bronze, $2\frac{1}{16}$ inches in diameter, and is the work of the French sculptor, M. Georges Lemaire. It consists of a female figure, modeled in considerable relief, holding in her right hand a branch, while with her left hand she sustains an airy bit of drapery. The wording is simply "L'Exposition de Paris," and the sun with conventionalized rays at her left has the figures "1900" imprinted across it. The figure is seated on the capital of a column which is almost hidden by the ample folds of the drapery, which are excellently

THE MEDAL OF THE PARIS EXPOSITION OF 1900.

handled. At her feet is a scroll, a palette, and a lyre, typifying the fine arts.

The reverse of the medal is made up of a cartouche which is to receive the name of the recipient of the medal. At one side and secured by a banderole is a sheaf, presumably of corn, typifying agriculture. Below, at the center, is an airship, at its right is a telegraph pole, and at the left a battleship bristling with fighting tops, conning towers, and turrets. The lower part of the composition is made up by the usual cog wheels, anvil, governor, etc., which have served, from time immemorial, for works of this kind. There is also a camera, telephone, a globe, books, and an alembic. The obverse of the medal is very handsome, but the reverse consists of a confused jumble of conventional representations of various arts, manufactures, and discoveries, and can hardly be called very successful. The medal will be warmly appreciated by its recipients, and we trust that the American exhibitors will take away their full share of them.

The Arctic Club.

The Arctic Club of America is the name of a unique club which has headquarters in New York city. It was organized by the members of Dr. Cook's Arctic expedition of 1894 on the ill-fated ship "Portia," which was sunk so recently. The members of the expedition had been wrecked off the southwest coast of Greenland, their ship being the "Miranda," the sister ship of the "Portia," that ran upon the reefs off the coast of Greenland, the magnificent collections being lost. The party was rescued by a little Gloucester fishing schooner, and when they reached Halifax they embarked for New York on the "Portia." The members of the expedition met together on September 8, 1894, and organized the club, whose active members should consist of all persons upon the passenger list of the "Miranda" on her cruise. Prof. W. H. Brewer, of Yale University, was made president. It was decided that an annual dinner be given by the club. The first banquet took place December 7 of the same year. Since that time the scope of the club has been widened, and it now embraces among its members nearly every prominent Arctic explorer in the United States, and even Dr. Nansen is one of its honorary vice-presidents. The objects of the club are to promote a live interest in Arctic matters and to disseminate accounts of the results of expeditions. The club has a banner of its own, which is now being borne toward the north pole by Lieut. Peary, Walter Wellman, and others, and the members of the club are living in hopes that their banner will soon float above the pole, the goal of all Arctic explorers.

Automobile News.

A service of motor vehicles has been started between Rosas and Figueras, in Spain, a distance of twelve miles. The vehicles are of eight horse power and have a seating accommodation for nine passengers.

The New England Electrical Vehicle Transportation Company has made a beginning in the automobile business in Boston by putting five carriages in service. Within a month it is expected there will be thirty more.

It is expected that an automobile fête will be held at Pau, France, next February.

Sixty-seven motor cars started on July 16 to race around France, a distance of some fourteen hundred and fifty miles. It is expected that the trip will occupy nine days, with two intervals of a day each.

The first electric cart of the firemen of Paris is now running on the streets and has already begun its work of saving life and property. It is a handsome vehicle, with a seat in front for several firemen, and a horizontal steering wheel. Back of this is a "dos-a-dos" arrangement which will permit of seating several firemen. Between these seats is a box for hose. The batteries are carried underneath, and scaling ladders are carried at the side.

The Illinois Electric Vehicle Company will soon be in a position to begin operations. At first only a few vehicles will be operated, but the number will be increased as fast as they can be obtained from the manufacturers. The demand for electric carriages is so great that the manufacturing companies cannot furnish an adequate supply.

Some time in the fall electric automobile street sweeping machines will be used in Paris, and the old clumsy lust machines will be done away with. The motor s in front, while underneath and behind is a tank or water, and the sprinkling device in the rear and he sweepers, which can be raised out of contact with he pavement whenever desired. The new machine an be run back and forth over a street to sprinkle it. t will then return and sweep the dirt in piles and electrically-driven carts will carry away the dirt after it as been heaped in piles.

The French electric wagon Jeantaud recently made a trip of eighty-five miles in seven and a quarter hours, without recharging the battery.

Test of the New Naval 4-inch Gun.

A new type of 4 inch, 50-caliber gun for the navy has just been tested at the Indian Head Proving Ground, giving excellent results. With a charge of 17 pounds of perforated grain navy smokeless powder, a muzzle velocity of 2,991 foot-seconds was obtained, with a muzzle energy of 2,049 foot-tons, with a chamber pressure of 16·95 tons per square inch. With a charge of 16¾ pounds a muzzle velocity of 2,937 foot-seconds was obtained, with a muzzle energy of 1 972 foot-tons.

The gun was designed for 3,000 foot-seconds muzzle velocity within the limits of 17 tons pressure per square inch, and there is no doubt but that, with a powder of the proper grain, the requirements will be easily fulfilled. The weight of the new gun is 2·72 tons, while that of the old type 4-inch gun is 1·5 tons. The old type gun, with smokeless powder, has a muzzle velocity of 2,200 foot-seconds, and a muzzle energy of 1,108 foot-tons. The muzzle energy of the new gun is, therefore, 78 per cent greater than that of the old.

The old gun has a muzzle energy of 738 foot-tons per ton of gun; the new gun has a muzzle energy of 750 foot-tons per ton of gun. The old gun has 92 foot-tons muzzle energy per inch of shot's circumference, and the new gun has 170 foot-tons muzzle energy per inch of shot's circumference. The old gun has a muzzle energy of 33·5 foot-tons per pound of projectile, and the new gun has a muzzle energy of 62 foot-tons per pound of projectile.

A new type of mount for the heavy 4-inch gun was also tested and worked in a thoroughly satisfactory manner during the firing of the thirty-five rounds to which the gun was subjected.

The new monitors, in addition to their 12-inch turret guns, will each have an auxiliary battery of four of the new 4-inch guns.

The Ordnance Bureau of the navy is much gratified with the performance of the new gun, as the larger calibers of the new high powered gun now being manufactured for the battleships of the "Maine" class and the monitors are designed practically on the same lines as the 4-inch gun just tested. The next new gun to be tested will be one of 6-inch caliber, and it will be interesting to note its performance, as a new 6-inch gun manufactured by Vickers Sons & Maxim, of England, will soon be fired at Indian Head.