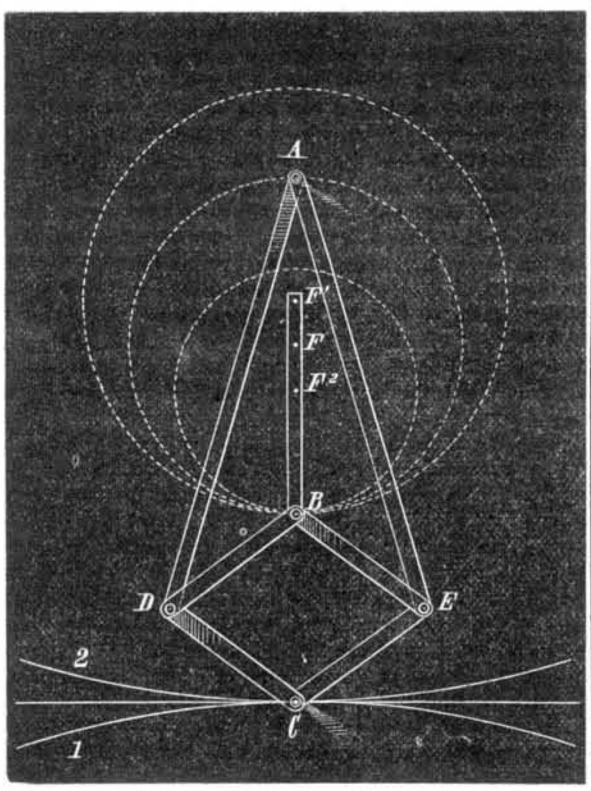
A NEW PARALLEL MOTION.

Parallel motion is the conversion of circular motion into rectilinear or the contrary, the best if not the most familiar example of which is found in the action of the beam and piston of the ordinary steam engine. Watt's parallel motion is to be found, in principle, embodied in almost every device of the kind; but that it is not mathematically exact, has long since been proved.

Professor Sylvester, in a recent lecture, a report of which we find in *Iron*, states that an absolutely perfect parallel motion has been discovered by M. Veaucellier, a young French officer of engineers, who gave to it the name of compound compass. The invention is illustrated in the annexed engraving, from which the reader can readily construct a model for himself in order to verify its action. It consists simply of six pieces jointed together, and A is the fulcrum around which the entire apparatus moves. B is the power point, and C the weight point. The figure formed by the four short arms, between B, C, D, and E, is the rhomb, and A D and D E, the connections. The form of the rhomb and the actual length of the connectors is immaterial, the only conditions being that the latter are equal, and that the three points, A B C, lie always in the same line, no matter what the position of the machine may be. A moment's consideration will show that if the near point, B, be brought to A, the further point, C, will recede, so that the path followed by C, when it is moved, will be inverse to that of B in respect to A. If by any means the point, B, be made to travel in a determinate course, the curve described by C will be equally definite and invariable. At B, the bar, B F, is added, forming the radius of a circle, which B will describe about F F^1 F^2, as centers. If now the center of this circle be fixed at F^2, so that the circumference falls inside the point, A, then C will describe the external or convex circle, marked 1. If the radius be lengthened so as to reach F^1, and to be greater than half the distance, A B, then the orbit of B will contain A within it, and C will move in an arc of a circle concave to A, marked 2. It requires no mathematical reasoning to show,



for it is self-evident, that the curves thus described will grow flatter and flatter the nearer the center of the circle of B is to the actual center of the line, A B; and as Nature never acts *per saltum*, there must be a point in the process of change from one kind of curve to the other where the inverse path of C ceases to be a curve, when it theoretically describes two arcs of infinite radius, each looking to a center infinitely distant: in other words, a straight line. This clearly cannot happen when the radius, B, is either greater or less than half of A B, and therefore it can only be when F actually coincides with the center of A B. But in this case B, in its orbit, will evidently pass through A, and, by geometrical laws, the inverse, described by C, will be a straight line, so that the result is not merely practically but theoretically a perfect parallel motion. It gives us the means of converting circular into rectilinear motion with perfect accuracy, without friction and without any necessity of packing or any other faulty contrivances which have been inseparable from every system hitherto desired for the purpose of producing the same result.

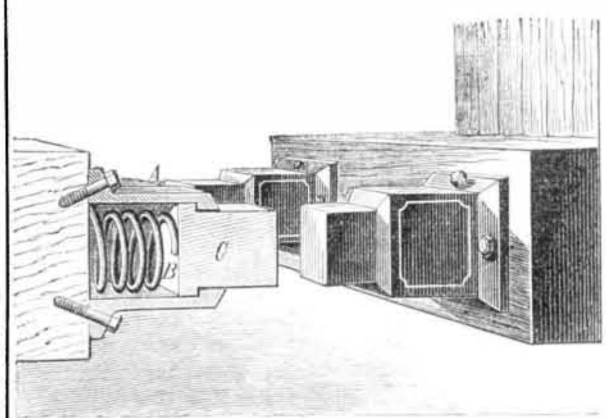
Absorption of Hydrogen by Gray Pig Iron.

Mr. John Parry lately read a paper before the Iron and Steel Institute on the above subject, also on the probable absorption of zinc, cobalt, cadmium, bismuth, and magnesium, by gray pig iron heated in vacuo, in vapors of the same. This was exclusively a chemical paper; and so far as the experiments detailed can be as yet considered conclusive, it adds, to our previous knowledge of the strange absorbent and occluding power of iron for gases, that it possesses the like power in reference to a number of metallic vapors, among which that of metallic arsenic is remarkable from the circumstance stated by the author, that its vapor when once absorbed is not again evolved upon heating the iron.

BY the new postal treaty, letters of half an ounce may be sent from the United States to France for 9 cents.

IMPROVED CAR BUMPER.

Mr. Richard Lloyd, 265 Walker street, Cleveland, Ohio, has patented, April 28, 1874, through the Scientific American Patent Agency, a novel bumper for railroad cars, which is claimed to be more durable and elastic than those now in use. Our engraving exhibits the device in perspective and also in section.



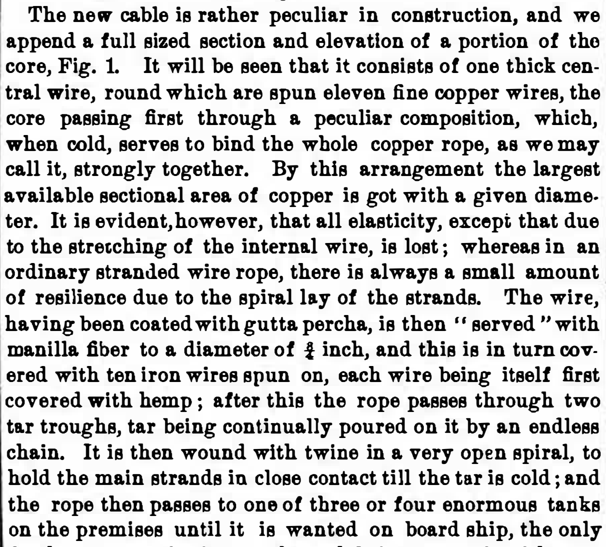
A is a shell of cast iron, surrounded by a flange by which it is bolted to the timber of the car truck. Within the shell is a spiral or rubber spring, B, and on the interior of the former is a shoulder, with which the head of the bumper block, C, projects sufficiently to engage. The head and shoulder are held in contact with each other by the spring except when the cars come together; then the spring is compressed. The two bumpers, thus coming in contact, prevent the violent concussion and jar, alike disagreeable to passengers and destructive to the vehicles. The shell and block may be of any form and size. The device is stated to be cheap and durable, and may be easily applied to any car. Further information may be obtained by addressing the inventor as above.

THE NEW ATLANTIC TELEGRAPH CABLE—HOW IT WAS MADE.

As the new Atlantic telegraphic cable, which is to extend from Ireland direct to the United States, landing on the New Hampshire coast, is nearly completed and is soon to be laid, we have thought that our readers would be interested in knowing just how the great conductor was manufactured. We take the following description from the *Engineer*. The cable was made at the works of Messrs. Siemens Brothers, Charlton (near London), England.

The new cable is rather peculiar in construction, and we append a full sized section and elevation of a portion of the core, Fig. 1. It will be seen that it consists of one thick central wire, round which are spun eleven fine copper wires, the core passing first through a peculiar composition, which, when cold, serves to bind the whole copper rope, as we may call it, strongly together. By this arrangement the largest available sectional area of copper is got with a given diameter. It is evident, however, that all elasticity, except that due to the stretching of the internal wire, is lost; whereas in an ordinary stranded wire rope, there is always a small amount of resilience due to the spiral lay of the strands. The wire, having been coated with gutta percha, is then "served" with manilla fiber to a diameter of ⅝ inch, and this is in turn covered with ten iron wires spun on, each wire being itself first covered with hemp; after this the rope passes through two tar troughs, tar being continually poured on it by an endless chain. It is then wound with twine in a very open spiral, to hold the main strands in close contact till the tar is cold; and the rope then passes to one of three or four enormous tanks on the premises until it is wanted on board ship, the only further preparation it goes through being to coat it with powdered chalk to prevent the coils from adhering to each other by the aid of the sticky tar. We need hardly say that during

FIG. 1



the whole process of manufacture testing is carried on almost continuously, so that a fault cannot escape detection.

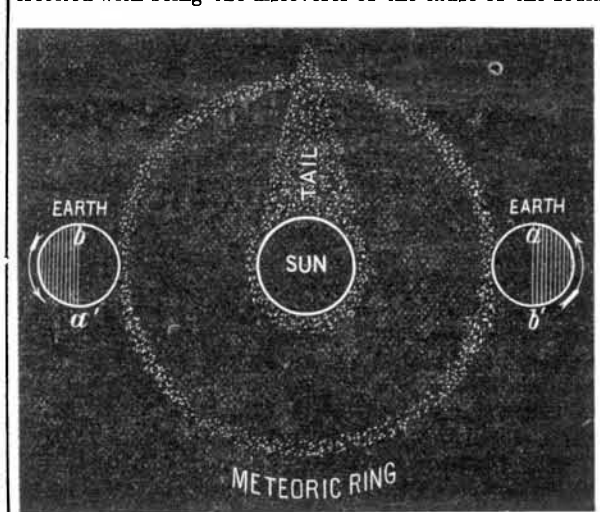
We cannot leave the subject, however, without describing the way in which india rubber is used to cover cables, as the process is exquisite and totally different from that employed when gutta percha is used. At the time of our visit some cable was being made, for what locality we do not know. The core consisted of six thin copper wires, spun together with a long twist; all the wires were tinned separately before spinning. The india rubber, which comes over to this country in large lumps or bottles, is masticated and washed, and worked between rollers, in a way too well known now to need description. It is finally reduced to a thin sheet, a little thicker than the air balls sold as children's toys in the streets. Strips of this, about ⅛ inch wide, are cut out and wound on a reel or bobbin; this is mounted on a spindle on a disk, as in the annexed sketch: A is a piece of iron tubing about 3 feet long, revolving on bearings at B and C, and fitted with a disk, F, which carries the inclined stud, which can be shifted on F. This supports the bobbin, G, round which is wound the strip of india rubber, H, a thumb screw adjusting the resistance of G. The wire is shown at I, and passes from one reel to another down the tube, A; at K a long slot is made in the tube, through which the strip of india rubber passes. It is obvious that if the wire is prevented from rotating, and proceeds from coil to coil, while A and F rotate round it, that the strip of india rubber will be wound off G and on the core. In this way the core receives its first coat. For the second, it passes through an elegant little machine, the principle of which is sketched in Figs. 3 and 4. Here C is the core, with its first coat of india rubber put on as just described; B B are two small rollers through which it passes, and D D are two strips of thin india rubber about ⅜ inch wide, one over, the other under, the wire. These are drawn in with the wire, which next passes between the edges of the grooved disks, A A. These compress the edges of the rubber and coat the wire equally. If there were nothing more the wire would appear as in Fig. 5, two fins of rubber, A A, sticking out at each side. It will be seen, however, from Fig. 4, that the lower disk has a thick edge, against which rotates the sharp cutting disk, *x*; this shears off the superabundant fin, A A, Fig. 5, and so the wire comes out coated with three coatings—for it passes through two machines like Fig. 3—pink, round, and smooth, and ready to be served with canvas for use.

Correspondence.

The Zodiacal Light.

To the Editor of the Scientific American:

On page 320 of your current volume, Professor Wright is credited with being the discoverer of the cause of the zodiacal light.



It seems that he has satisfied himself of the fact that the said light is "derived from the sun" and reflected to us from solid or meteoric material, "small bodies," as he calls them. Now I told your readers all that, and much more, over five years ago, as can be seen in your issue of January 8, 1869. Then I stated substantially what I say now: That the zodiacal light is not on two sides of the sun, neither is it all around the sun, nor is it a solar atmosphere, nor a nebulous vapor; but, on the contrary, it is ever on one side of the sun only, his hinder side, if you will, and is purely meteoric.

I said, further, that the said light was and is a longitudinal appendage or tail of the sun, and is so long that it stretches some 37,000,000 miles beyond the earth's orbit. I said also that the earth either passes through it or by it, on about the 14th of every November. In addition to that, I say now that the earth passes through it every 33 years, and by it, at more or less distance from it, in the intervening years, the cause being that the plane of the terrestrial orbit is but slightly out of the plane of the solar orbit.

Professor Wright is doing for me, in his practical way, in reference to the zodiacal light theory, what Professor Agassiz did in reference to my glacial epoch theory: he is proving my theory to be true; but that he is the discoverer of the theory, I claim, is not the fact.

That the zodiacal light is solar light reflected to the earth from meteorites, is undoubtedly the fact. But one thing remains to be settled; it is this: Is the zodiacal light a ring or a longitudinal tail of meteors?

The zodiacal light is seen after sundown, in this latitude in April and May; and before sunrise in October and November. If it were a ring, it could be seen at evening and morning of both periods. Any person can prove the fact by a diagram such as the one annexed.

In the figure, a a' represents morning, b b', evening. From which it may be seen that, at a, a person could see the tail. but while at a', he could not see it. So while at b he could see it, but at b' he could not see it. At the same time, if the