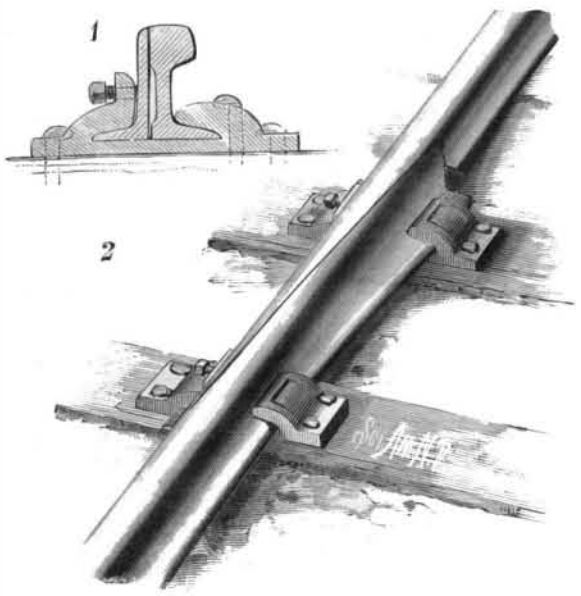
so that they can be folded down against the backs of the compartments when they are not needed. The sections are furnished with lids hinged to each other, the lower one being hinged to the front edge of the bottom of the rear section. By placing the lower lid against its own section and swinging the free end of the upper lid downward and outward, when it may be held at any desired inclination by suitably ar-



LARKIN'S RAILROAD RAIL JOINT.

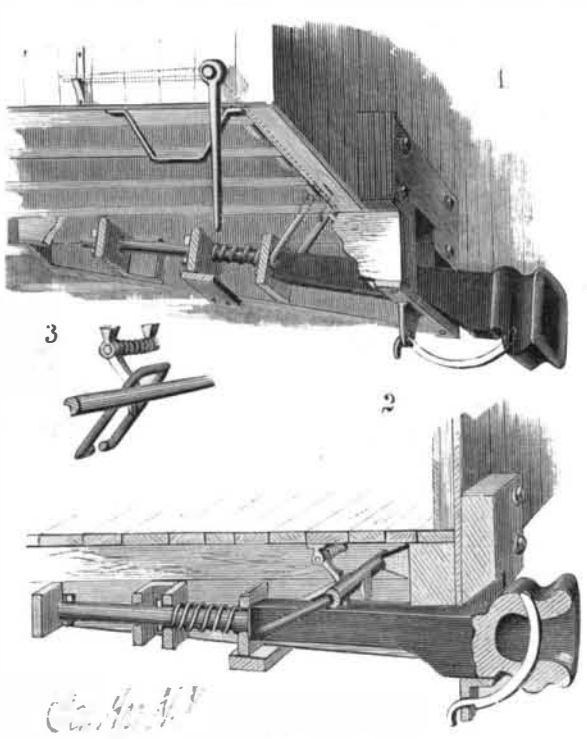
ranged straps, a table may be formed. When the lids are on their respective sections, the trunk may be laid down so as to rest on the back of the lower and front of the upper section, thus forming a support for mattresses or bedding. As trunks, in Mexico, are used extensively as furniture, this one ought to prove a good article of manufacture for that country.

This trunk is the invention of Mr. Henry F. Wulff, of San Antonio, Tex.

IMPROVED CAR COUPLER.

The engraving represents a car coupler that will take up the link as it hangs from the mouth of the drawhead to be coupled, and securely couple the same by pressure of the cars in coming together, without the aid or supervision of an attendant. It can be uncoupled at any time, whether the cars are at rest or in motion, from the platform, top, or side of the car; the uncoupling can be performed under any strain or tension, thus avoiding the necessity of "backing up" the engine for the purpose. It can be uncoupled without immediately separating the cars, and so left, when the cars can be drawn apart at any time thereafter, the coupler always assuming at the instant its position for uncoupling automatically. It may be made to couple to heights varying six inches or more.

As the drawhead is moved inward by the cars coming together, the outer end is raised by a bevel formed on its under side sliding upon a flat crosspiece extending across the lower side of the drawhead opening. A flange projecting downward from the crosspiece is pro-



BUCKMAN'S IMPROVED CAR COUPLER.

vided with an aperture, through which a hook on the lower inner end of the curved coupling pin is passed; as the drawhead moves inward, this pin enters suitable openings in the head and holds the link, as will be understood from Fig. 2. The drawhead is held securely in its inner position by a rectangular frame (Fig. 3), whose lower end is pivoted to the rear part of the drawhead, and whose upper end rests, when coupled, in a longitudinal groove formed in a rod extending across the car, and provided at each end with a handle for turning it, as shown in Fig. 1. The locking link is held securely in place by a cam arm, whose spring presses it against the link. On the cross rod is an arm, which acts, as the rod is turned, to free the end of the locking link when the cars are to be uncoupled. Upon releasing this link, the drawhead can be pulled out a certain distance, and will rest in position (Fig. 1) for coupling.

This invention has been patented by Mr. Thomas E. Buckman, of Jacksonville, Fla.

RAILROAD RAIL JOINT.

Fig. 2 is a perspective view and Fig. 1 a cross section through the joint and one of the chairs of a rail joint invented by Mr. John C. Larkin, of Whitefield, N. H. This joint is designed especially to prevent switch rails from binding, so that they can be set at any time without cutting the ends of the rails. The joint can also be used at any part of the track where it is desired to make allowance for the expansion or creeping of the rails. The rails are by preference made 8 feet long, and the adjacent ends are beveled for a distance of 4 feet, and are placed with their beveled sides overlapping each other. The base flanges of the beveled parts are widened from the beginning of the bevels to the ends of the rails, so that the edges of the flanges will be parallel with the beveled sides of the rails. The beveled parts are placed in chairs firmly spiked to the ties. The rail adjacent to the switch rails is held securely in place by spikes driven through holes in the chairs and recesses in the rails into the ties; this rail is always in such a position as to form a proper joint with the switch rail and allow the latter to be easily set at any time, the movement being wholly confined to the other rail. The arms of the chairs at the side of the movable rail are extended upward along the web of the rail and are provided with set screws, the forward ends of which rest against the rail, so that the wear of the rails can be taken up. The rails are made exactly alike, so that their positions can be reversed when necessary to equalize the wear upon each.

The Change of Foliage.

The immediate cause of the change in the foliage during the fall lies in the lessened action of the breathing organs or pores of the leaves, resulting from a loss of warmth and light due to the shorter days. The natural stimulants to vegetation are withdrawn. Shortly before the fall of the leaf, a very delicate layer of cells starts from the side of the stem and grows downward, completely separating the leaf from any participation in the life circulation of the plant. This explains the smooth surface exposed on separating a mature leaf from its branch. With the cessation of the circulation of the sap, the leaves no longer absorb carbonic acid gas and give off oxygen. The great natural process of deoxidation is arrested, and finally reversed—oxygen is absorbed. The *chlorophyl*, or leaf green, which gave color to the leaves during the earlier part of the season, is now oxidized and changed to *xanthophil*, or leaf yellow, and *erethrophyl*, or leaf red.

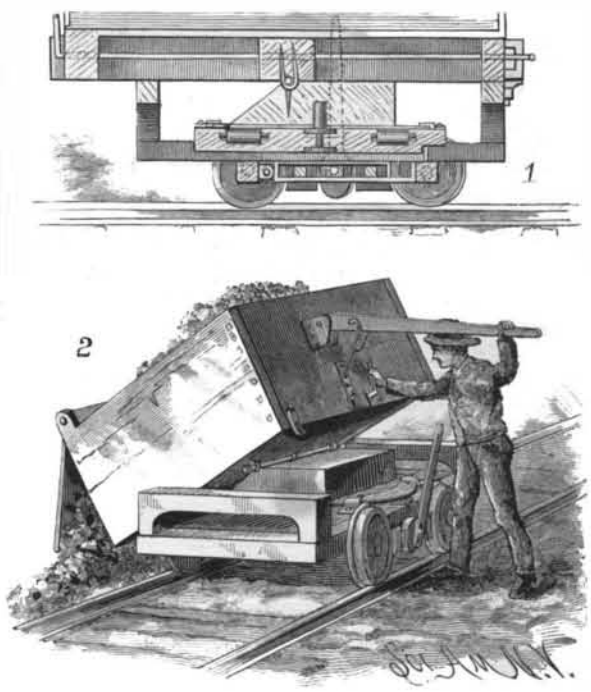
These new salts contribute nothing to the nourishment of the leaf. No carbonic acid is absorbed from the atmosphere, and the leaf soon dies and falls to the ground. The difference in the coloring of the leaves depends upon the local conditions, which hasten, modify, or retard this chemical reaction. In the so-called evergreens, no transverse cell formation takes place, and the leaf is never separated from the circulation of the main tree. They also evaporate less in proportion to their leaf surface than ordinary trees. Their more sluggish circulation is less dependent upon climatic influences.

Right and Left Handed.

A right-handed man is a man who takes hold of a hoe, a rake, a spade, or a fork, with the right hand down and the left hand up, or nearest the body. A man who habitually puts his left hand down, or, for instance, the man who places his right hand on the top of a spade, and grasps the handle or shake with his left hand, is a left-handed man. And so with an ax. A right-handed man and left-handed man can work together in chopping down a tree. If they were both right-handed or both left-handed, they could not do this unless one chopped on one side of the tree and the other on the other side. And so it is in loading earth into a wagon. If the men stand face to face, one should be left-handed and the other right-handed. In hoeing a row of corn, the right-handed man will walk on the left side of the row, while the left-handed man will walk on the right side of it.

DUMPING CAR.

The improved dumping car herewith illustrated unloads either sidewise or endwise, and is so constructed that the car and load cannot be thrown off the track when running on an uneven surface. The truck bed is provided with a pin projecting into the bed plate, and with friction rollers on which a disk, projecting a short distance beyond the bed plate, rests. One side of the bedplate is inclined, as shown in both drawings. To facilitate unloading, the front end of the car is a trifle wider than the rear. The car body is attached to a frame consisting of side and end beams and a center beam; the latter is hinged to the upper edge of the incline, and the side beams rest on the end beams of the truck frame, as shown in the sectional view, Fig. 1. At the front end of the body is a hinged door, which can be locked or unlocked from the rear by a bent rod. Secured to either the side or rear is a handle, by which the body can be turned on the pin. The brake shoes are operated by cams placed on the ends of a central rod moved by a lever.



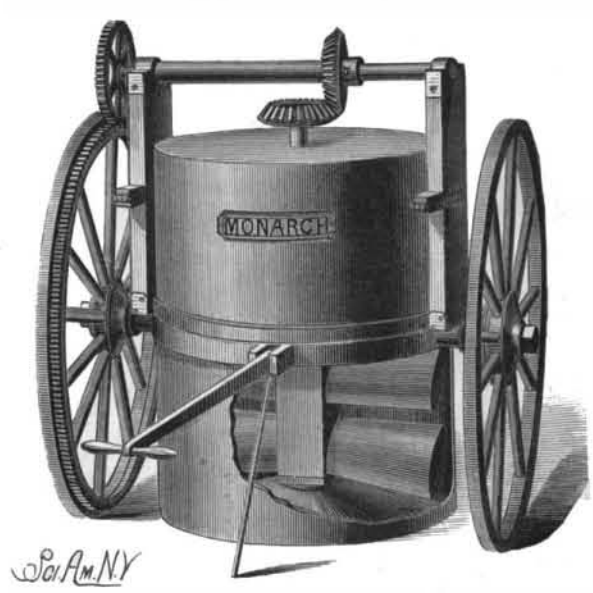
COOK & SUMMERS' DUMPING CAR.

The load is dumped sidewise by unlocking the car frame, unfastening the hinged door by turning the bent rod downward, and then swinging the car body at right angles—to the position shown in Fig. 1—by means of the handle. As soon as the car frame has cleared the end beams of the truck frame, it will tip over on to the incline, as shown in Fig. 2. The load can be dumped endwise by lifting the rear end of the car upward, using the front axle as the pivotal center; the rear wheels remain on the track, as the rear axle is hinged to the front one by a frame. By removing the car body, frame, and bed plate, the truck can be used as a timber car.

This invention has been patented by Mr. S. W. Cook and Henry Summers, of Bozeman, Montana.

THE "MONARCH" CHURN.

The operation of this churn will be readily understood by reference to the accompanying illustration, by which it will be seen that, on simply drawing it across the floor or the ground, motion is communicated to cog wheels operating the dasher. The blades of the dasher are set at an angle, to effect a thorough agitation of the cream, and the lower edges of the lower blades are made to conform to a conical shape of the bottom, formed around the step in which the upright dasher shaft rests. The body of the churn, which is prefer bly of sheet metal, is so supported that but-



PHILLIPS' IMPROVED CHURN.

termilk can be conveniently drawn off at a stopper in the bottom, and it is so hung that it may be readily swung and locked in place for churning, or readily thrown out of such position, to facilitate filling with cream or removing the butter.

This invention has been patented by Mr. Ezra O. Phillips, of Coopersville, Mich.

The Camera as a Detective.

Practical reformers, who have been trying to abolish low concert saloons and other vicious resorts in New York city, have met with opposition from the very people who are presumably their helpers. About some of these places there is sufficient of the ward politician's influence to make even the policeman a consenting party; and consequently he is sometimes quite oblivious to violations of the law which are plain enough to everybody else. This state of affairs has led the reformers to turn to the more reliable testimony offered by a good photograph. The saloons are brilliantly lighted by electricity as a rule, and the reformer, armed with a pocket camera and instantaneous photographic plates, has succeeded in taking over a hundred views of the saloons and streets in front of them after one o'clock in the morning, when the law provides that they shall be closed. A number of the photographs contain clock dials, which thus offer their testimony as to the hour.

Loss of Imported Soles.

Among the freight on board the steamship Gallia, during a recent westward passage, was a consignment of 500 live soles sent over by the National Fish Culture Association of Great Britain. On reaching New York, however, not one of the fish was alive, for the shippers had neglected to place any sand in the bottom of the tank, into which the fish could have burrowed and had a comparatively tranquil passage. As it was, they were pitched from side to side in the bare tank, and were literally beaten to death during a severe storm encountered on the second day out. The agent of the American Fish Commission had arranged for the transfer of the soles to the piscicultural establishment at Wood's Holl, and was greatly disappointed to be obliged to consign them to New York Harbor. The next consignment will probably be sanded.

Transplanting Trees and Shrubs.

My experience of many years, says William Smythe in the *Gardeners' Chronicle*, of transplanting work with evergreen shrubs proves the advantage of early autumn planting. The soil at this season has a higher temperature during the next two months, and there is more humidity in the atmosphere than in the spring or during the winter. I have always thought trees and shrubs of all kinds succeed best when transplanted in the months of September and October. The roots are then quickly developed, and the injury and check caused by transplanting are soon rectified, the plants becoming re-established before winter sets in. Where alterations and new plantations are contemplated, every available means should be used to complete the work as early as possible. Where large specimen trees or shrubs have to be removed, they should have been prepared twelve months previously by cutting a trench completely round and partially underneath them, so as to sever all the roots at a proportionate distance from the stem, according to the size and nature of the tree.

Many trees which furnish fibrous roots plentifully will succeed with a comparatively small ball of earth, but others, especially the Coniferæ and many tender kinds of evergreens, require a larger ball and greater care to insure success. Great care and attention should be given by refilling the trench with rich, light soil, so that the trees may more easily form a mass of fresh roots, which can be much easier removed without injury in transplanting. Having prepared the trees, the site to which it is intended to remove them should next be considered. One thing important is to provide thorough drainage, as without this few trees or shrubs will succeed where the subsoil is not sufficiently porous. To prevent water stagnating at the roots, drains of rubble or stones should be used for the purpose, about a foot below the bottom of each hole, and it is advisable to get out good, large holes, and as deep as requisite for the subjects to be operated on. The soil that I find suitable for most kinds of trees and shrubs is a good, light, turfy loam; the more turf, the better.

Having made all preparations beforehand, and having the proper mechanical arrangements in readiness for conveying the tree to its intended position, care should be taken not to injure the roots in transit, and in placing it again in position; the roots should be laid out straight at various levels, and afterward covered with fine soil, which should be well washed down with an abundance of water, and then the soil should be filled in and well rammed, and made quite firm all round the tree; a good mulching of long manure, 5 inches thick, should be spread over the surface; the tree should be staked and tied firmly. The operation will be complete if the above instructions are carefully carried out, and early autumn planting, and greater care in the operations of transplanting trees and shrubs, will succeed, and be sure to give satisfaction.

MICROSCOPIC EXAMINATION OF CILIATED ORGANISMS BY INTERMITTENT LIGHT.

BY GEORGE M. HOPKINS.

Every observing person has noticed that moving objects appear stationary when viewed by a flash of light; examples of this are seen during every thunder storm occurring in the night. The wheels of a carriage, a moving animal, or any moving thing, seen by the light of the lightning, appears perfectly stationary, the duration of the light being so brief as to admit of only an inappreciable movement of the body while illumination lasts.

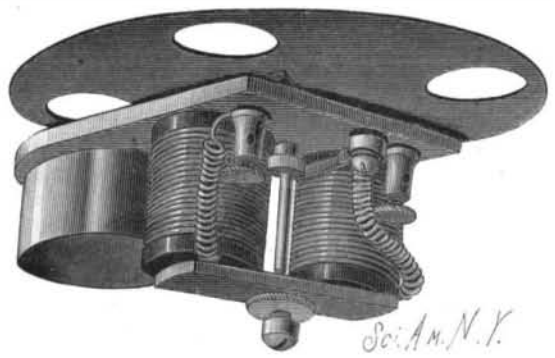


Fig. 1.—LIGHT INTERRUPTER FOR THE MICROSCOPE.

If by any means a regular succession of light flashes be produced, the moving body will be seen in as many different positions as there are flashes of light. If a body rotating rapidly on a fixed axis be viewed by light flashes occurring once during each revolution of the body, only one image will be observed, and this will result from a succession of impressions upon the retina, which by the persistence of vision become blended into one continuous image. In this case no movement of the body will be apparent; but if the flashes of light succeed each other ever so little slower than the rotatory period of the revolving body, the body will appear to move slowly forward, while in reality it is moving rapidly; and should the light flashes succeed each other more rapidly than the revolutions of the revolving body, the body will appear to move slowly backward, or in a direction opposite to that in which it is really turning. These curious effects are also produced when the number of the light flashes is a multiple of the number of revolutions, or *vice versa*.

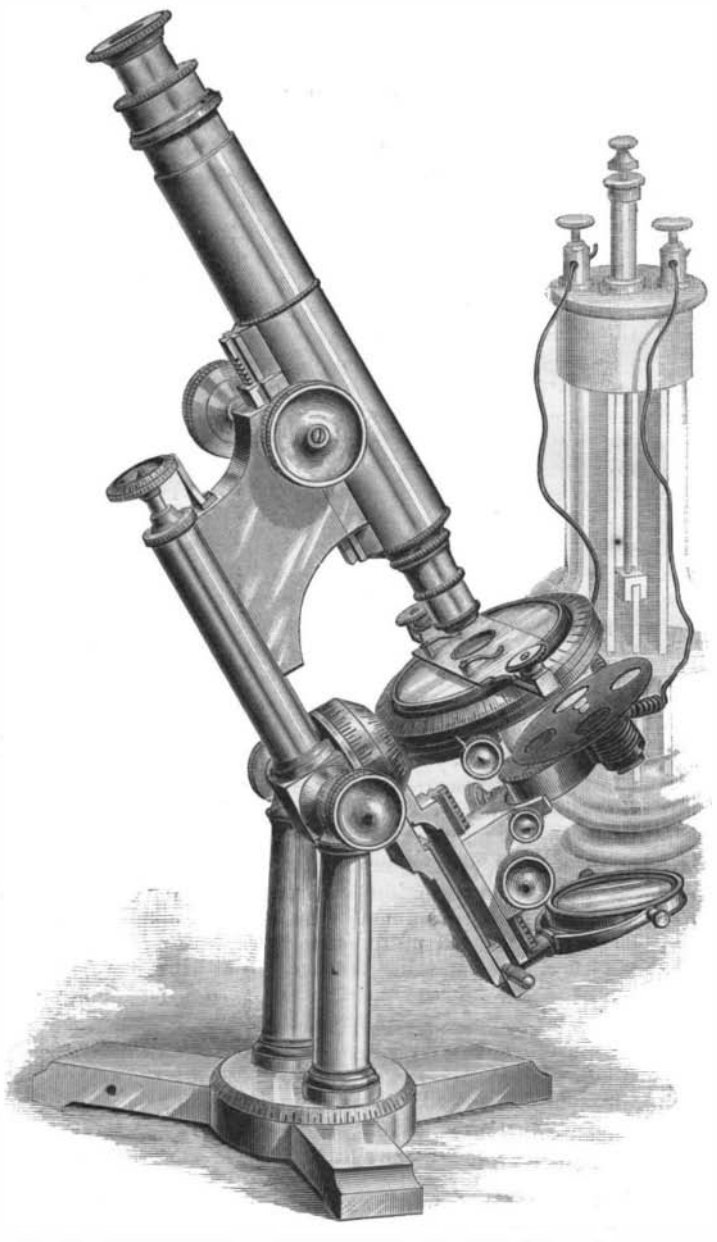


Fig. 2.—MICROSCOPIC EXAMINATION OF CILIATED ORGANISMS BY INTERMITTENT LIGHT.

The combined effect of interrupted illumination and persistence of vision may be practically utilized for examining objects under motion which could not otherwise be satisfactorily studied. To apply intermittent light to the microscopical examination of ciliated organisms, the writer has devised the electrically rotated apertured disk shown in Fig. 1, which is arranged to interrupt the beam of light employed in illuminating the object to be examined.

The instrument consists of an electric motor of the simplest kind mounted on a plate having a collar fitted to the substage of the microscope, as shown in Fig. 2. The shaft, which carries a simple bar armature before the poles of the magnet, also carries upon its upper extremity a disk having two or four apertures, which coincide with the apertures of the stage and substage two or four times during the revolutions of the disk.

The shaft carries a commutator, and the course of the current from the battery through the instrument is through the spring touching the commutator, through the shaft and frame of the instrument to the magnet, thence out and back to the battery. There are two methods by which the speed of rotation of the apertured disk may be varied; one is by plunging the elements of the battery more or less, and the other is by applying the finger to the shaft of the motor as a brake, the motor in the latter case being started at its maximum speed, and then slowed down to the required degree by the friction of the finger. Experiment shows that the period of darkness should be to the period of illumination about as three to one for the best effects. Closing two diametrically opposite holes in the disk represented in the cut secures about the correct proportion.

Various rotifers examined by intermittent light showed the cilia perfectly stationary. The ciliary filaments of some of the infusoria, Vorticella and the Stentor, for example, when viewed by intermittent light, appeared to stand still, and their length seemed much greater than when examined by continuous light. The interrupted light brings out not only the cilia around the oral aperture, but shows to good advantage the cilia disposed along the margin of the body. What interrupted light may reveal in the examination of flagellate or ciliated plants the writer is unable to say, as no objects of this character have been available. It is presumable, however, that something interesting will result from the examination of Volvox and other motile plants, by means of this kind of illumination. Although it is necessary to interrupt the beam of light regularly, for continuous observation, the effect of intermittent light may be exhibited to some extent by an apertured disk like that above described, twirled by the thumb and finger or revolved like a top by means of a string; or by using a larger apertured disk fitted to a rotator, and placed between the source of light and the mirror of the microscope.

The Flood Rock Explosion.

Professor W. A. Rogers, of the Harvard Observatory, has reported to the American Academy of Arts and Sciences, in Boston, the results of his observations on the transmission of shock from the Flood Rock explosion.

The air line distance between the observatory in Cambridge and Flood Rock is 190 miles, and the observations were timed as follows: Disturbance first seen, 11:17:14; instant of maximum disturbance, 11:18:03; disturbance ceased, 11:20. The figures are all in seventy-fifth meridian or "Eastern" time. The method used to develop the existence of vibration was the placing of a saucer of mercury on the solid cellar floor. In this mercury was a speck or flaw. Upon this point was brought to bear a microscope of 750 magnifying power, the spider line being in exact coincidence with the flaw.

The first vibration perceived was about a thousandth of an inch, and recurred at intervals for nearly two minutes, the greatest swaying of the mercury being over a space of one five-hundredth of an inch.

In this connection it is interesting to note that General Abbot reported that the shock from 50,000 pounds of dynamite, exploded in 1876 at Hallet's Point, was transmitted through the drift formation of Long Island, at the rate of 5,300 feet per second for 13½ miles. Assuming the figures of the Cambridge report as correct, and that the mine at Flood Rock was exploded at 11:14, seventy-fifth meridian time, it took the wave just 194 seconds to travel 190 miles, or at the rate of 5,120 feet per second. This is very near the rate of transmission observed by General Abbot, when the greatly increased distance is taken into account.—*Engineering News.*

THE Genesta arrived at Portsmouth, England, on the 28th of October, having made the trip across the Atlantic from New York in 20 days and 10 hours.