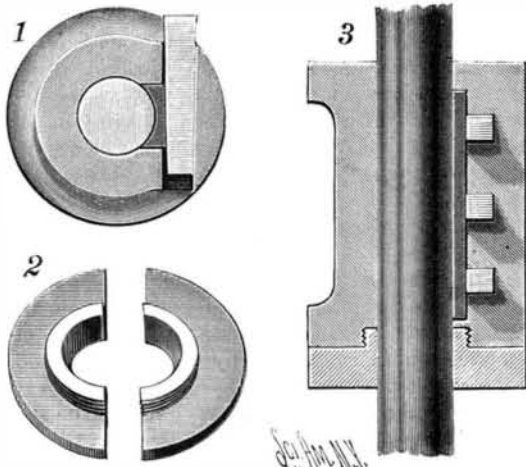


**AN IMPROVED TAPPET.**

A tappet which is simple and durable in construction, and permits of quickly removing a worn-out face and inserting a new one, is shown in the accompanying illustration, and has been patented by Mr. Walter N. Nolan, of El Oro, Tultenango, Mexico. The body of the tappet is preferably keyed to the stem, as shown in Fig. 3, and in the sectional view, Fig. 1, and on its under side is screwed a face made in ring shape and



NOLAN'S TAPPET.

formed of two or more sections. On the face is a hub, as shown in Fig. 2, with a thread adapted to screw into a corresponding thread on the under side of the tappet body. The thread on the latter is arranged in the direction of the travel of the cam, so that an accidental unscrewing of the face is impossible. When the face is worn out, it is easily unscrewed and a new face screwed on in its place. Old tappets may be thus faced up and fitted with rings, thereby saving expense, and the faces when adjusted form a smooth and level surface for the cams to operate on.

**Dry Battery.**

The mixture for filling dry cells prepared by Mr. A. V. Meserole consists of the following solid ingredients in the form of powder: Charcoal, 3 parts; mineral carbon or graphite, 1 part; peroxide of manganese, 3 parts; lime hydrate, 1 part; white arsenic (oxide), 1 part; and a mixture of glucose and dextrine or starch, 1 part; all by weight. These are intimately mixed dry and then worked into a paste of proper consistency with a fluid solution composed of equal parts of a saturated solution of chloride of ammonium and chloride of sodium in water, to which is added one tenth volume of a solution of bichloride mercury and an equal volume of hydrochloric acid. The fluid is added gradually and the mass well worked up.

**HOW HERON SOLVED IT.**

Said Ctesibius to his pupil: "Heron, will you have a glass of soda?"

"I don't care if I do," said Heron.

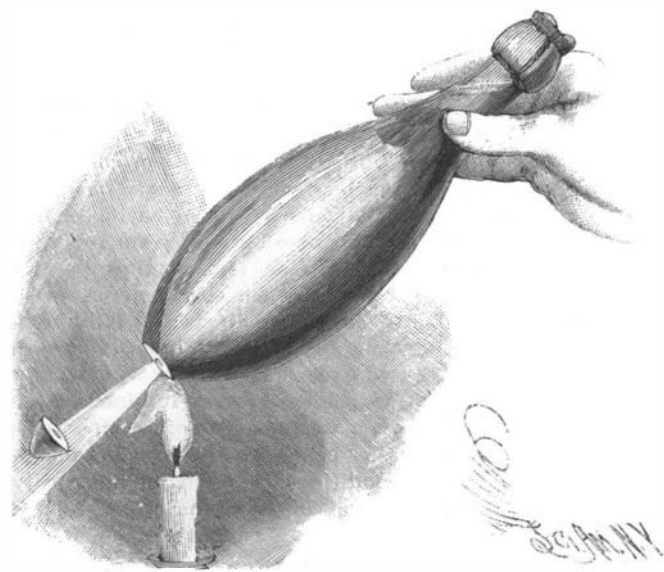
Whereupon Ctesibius produced a quaint glass bottle, having a thick conical bottom, and containing a liquid said to be soda water.

"Heron, my boy," said he, "here is your soda; drink it without removing or perforating the cork or breaking the neck of the bottle."

Heron scratched his head, and revolving the bottle in his hand, while the problem was going through a similar evolution in his brain, said: "As you well know, dear teacher, I am up in mathematics, proficient in mechanics, and not behind the age in pneumatics and hydraulics, but for this problem I have no solution."

"Heat! Unequal expansion!" said Ctesibius, impatiently.

Heron, being an apt scholar, needed no further hint.



DRAWING SODA WITHOUT REMOVING THE CORK OR BREAKING THE NECK OF THE BOTTLE.

Lighting a candle, he held it under the thick conical end of the bottle, and in less than a minute by the clepsydra, the bottom of the bottle cracked around, the pressure from within blew out the detached piece, and the soda was discharged with a fizz into the tumbler. The rest goes without saying.

**The New York Belting and Packing Company.**

This well known concern has obtained an English incorporation under the English companies acts, 1862 to 1890, as manufacturers of India rubber goods. They have been established 44 years, and their works or processes have several times been illustrated and described in the SCIENTIFIC AMERICAN. The new organization places them in a position of a stock company, open for subscriptions here and abroad. The subscription lists are in the hands of August Belmont & Co., of this city, and Lee, Higginson & Co., of Boston, Mass. A rate of profit continually increasing is shown for several years; for the five months ending May 31, 1890, the rate exceeded \$500,000 per annum. For plant and goods on hand a price of \$2,813,000 (£580,000) is asked. The capitalization includes first mortgage bonds \$1,091,250 (£225,000), ordinary stock \$970,000 (£200,000), preferred stock \$1,091,250 (£225,000), and founders' shares \$4,850 (£1,000). The preferred stock is entitled to 8 per cent preference of dividends, the ordinary stock to any further dividends up to 12 per cent, the bonds are issued at 6 per cent interest. The balance of profits after providing for a reserve fund and sinking fund go half to the ordinary and half to the founders' shares.

**Synthesis of Ammonia.**

It was demonstrated long ago, by Bunsen and Playfair, that when charcoal and potassium carbonate are heated to redness in an atmosphere of nitrogen, a certain quantity of cyanide of potassium is formed. Since that time Margueritte and Sourdeval have further shown that barium carbonate may be used instead of the potash, and that the barium cyanide produced may be again decomposed by steam into ammonia and barium carbonate. Theoretically, these reactions afford a continuous process for the conversion of atmospheric nitrogen into ammonia—a process which, if it could only be worked on a large scale commercially, would doubtless be of immense value. Unfortunately, only small proportions of the substances employed appear to enter into the reaction at ordinary pressures, hence the yield is insufficient to render the process economical. Professor Hempel has now shown by means of a simple pressure apparatus that the reaction is very much more complete, and, when potash is used, very energetic, under a pressure attaining sixty atmospheres. His apparatus consists of a solid steel cylinder closed at one end, and stopped with a screw at the other. A connection is made by a pipe from a pressure pump, and a carbon electrode also enters, and is plunged into a mixture of carbon and the alkaline oxide or carbonate. The electrode is made red hot, and nitrogen is forced in until the desired pressure is obtained. This process is not, of course, commercial, but it indicates an advance in the actual synthesis of ammonia compounds.

**The Proposed Three Americas Railway.**

The grand scheme of a continuous intercontinental railway line connecting the countries of North, Central, and South America, which has been occasionally suggested for years past, only to be received by people generally as the dream of enthusiasts and not entitled to serious consideration, has within the last year or so assumed the aspect of a practicable and desirable enterprise of great magnitude, indorsed by the government of all the nations along the proposed route and already about to undergo the inspection of engineering science in order to obtain the necessary data for further action. The international American conference in session in Washington last year, representing eighteen different American governments, passed formal resolutions in favor of the construction of a railway connecting the nations represented, and recommending that each of the governments contribute a share toward the expense of preliminary surveys of the proposed line. The report of the conference on this subject was transmitted to Congress by President Harrison. Thus officially and favorably brought to the attention of the governments and people of the chain of nations along the American continent, the grand idea of an intercontinental railway has excited great and growing interest, and information in regard to it is eagerly received. It is required to build 4,300 miles.

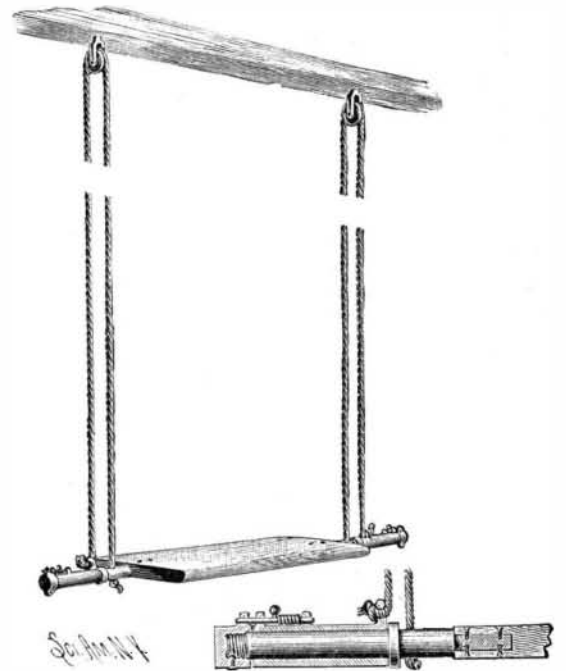
The distance from New York to Buenos Ayres by land is about 9,000 miles. More than half of this distance is already covered by railways, and lines aggregating nearly 2,000 miles more are now being surveyed and constructed; so that the undetermined and doubtful portion of the great intercontinental railway seems to be reduced to something like 2,300 miles. As to the real practicability, from both an engineering and financial standpoint, of building such a

line nothing can yet be said with positiveness, and the report of the corps of engineers which the different governments will unite in sending out must be awaited. At the best, its construction would mean a prodigious outpouring of money. One rough estimate suggests \$300,000,000, or \$75,000 per mile. How can the money be provided? Would the railway, if built, ever pay any return on the vast cost, bearing in mind the severe competition of the water routes? These are questions which may tend somewhat to check the enthusiasm which the thought of so wonderful a possible journey as one of 9,000 miles and more unbroken over American soil, through almost a score of nations, tends to inspire.—*Railway Age.*

**A SWING READILY ADJUSTABLE FOR HEIGHT.**

The illustration shows a swing which may be quickly altered as to its height to adapt the seat board to the use of adults or children. The swing has doubled ropes on each side passed over pendent pulley brackets, as shown, or ring eyes may be substituted for the brackets. To each end of the seat board is secured a short shaft, as shown in the sectional view, a sleeve being loosely held on each shaft, a short distance from the seat board, a collar on the shaft limiting the inward movement of the sleeve. One end of each rope is passed through the shaft, and secured in position by knotting the end, while the other end, the rope being passed over the pulley, is similarly secured to an ear on the sleeve. In ears projecting from the opposite end of each sleeve is a spring-pressed slide bolt adapted to engage lugs on cap nuts at the outer end of each shaft, and, in adjusting the height of the seat, these slide bolts are retracted, permitting the seat to be revolved, when the rope ends attached to the shaft are wound thereon, thus shortening the suspending ropes and raising the seat, which is lowered by reversing this operation.

Further information relative to this invention may



MILLER'S ADJUSTABLE SWING.

be obtained by addressing the patentee thereof, Mr. William K. Miller, Troy, Kansas.

**Carbonic Acid in the Air during Fogs.**

It is recorded in a local newspaper that recently, on the occasion of a particularly dense fog in Dundee and its neighborhood, a chemist attached to the University College took the opportunity of investigating the amount of carbonic acid in the atmosphere within the college grounds. The test was taken at 8 A. M., when the fog appeared to be at its thickest. At this time the proportion of carbonic acid in the air was 8 volumes in 10,000, or more than double the normal amount in the locality. It is remarked in the report of this experiment that, although the air in fog has often been analyzed before, the circumstance of the high proportion of carbonic acid present in the atmosphere under such conditions appears to be of peculiar interest, and the question is asked whether attention has been called to it. To this, says the *Journal of Gas Lighting*, the answer must be in the affirmative. If the air of a dense fog in Dundee only contains the stated maximum of carbonic acid, the people of this locality are very much better off than those condemned to breathe fogs in London or Manchester, where the maximum of the noxious gas named is at such times much higher. For the rest, an excess of carbonic acid is to be expected under the circumstances, from the stagnation of the air, which hinders the dispersion of the products of combustion and animal respiration.

A PHOTOGRAPHIC study of stellar spectra has been commenced at South Kensington under the direction of Prof. Lockyer, and one of the first results obtained was the discovery that  $\alpha$  Lyrae is a binary star of the  $\beta$  Aurigae type.