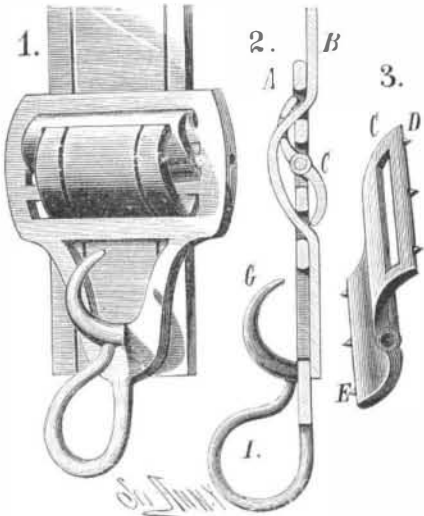


BACK BAND BUCKLE.

The main frame of the buckle is formed with two parallel transverse slots, through which the back band, B, passes from the back, and between which is a third slot in which is pivoted a clasp plate, Fig. 3, that curves in reverse directions at each side of its pivot to form the opposite clasping edges. The back band is passed through the slot in the plate, as shown in Fig. 1. It is apparent that any downward pull upon the buckle will act by the pressure of the band upon the upper half of the plate, and above its pivots to force the clasping edges firmly upon the band at the reverse sides of the frame. The edges, D E, are formed with prongs to secure a firmer hold of the buckle on the band.



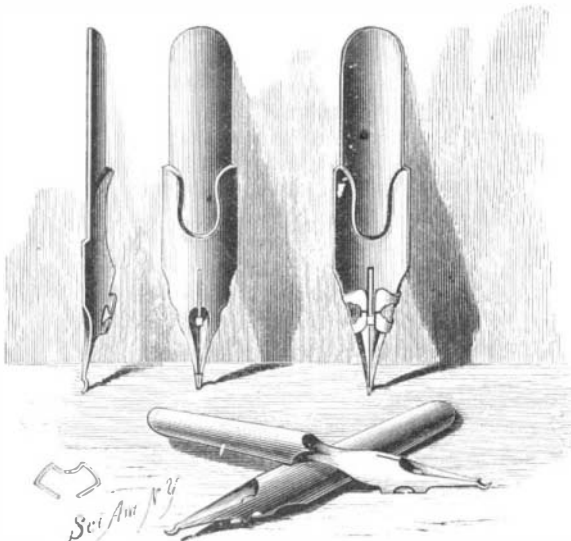
PENDER'S BACK BAND BUCKLE.

At the lower edge of the buckle frame is a downward extension, on the face of which is formed a hook, G, whose point reaches nearly to the plane of the face of the frame. By this means a space is secured between the main body of the hook and the frame in which the trace chain may be supported. In placing one of the trace links upon the hook, it may be pushed partly into the opening in the extension. A loop, I, formed on the extreme end of the extension serves to hold the rein up from the ground. The band passes over the animal's back, and carries a buckle with trace and rein hooks near each end and at each side of the animal. The double hold of the clasp plate upon opposite faces of the band affords greater security against tearing and slipping than a single toothed edge acting on one face of the band would.

This invention has been patented by Mr. P. S. Pender, and further information can be obtained from Messrs. S. S. Nash & Co., of Tarboro, N. C.

SEMICIRCULAR POINTED PENS.

The accompanying illustration shows a new manner of making metallic pens, whereby their durability is increased, they will hold a greater quantity of ink than ordinary pens, and their points are so formed as to preclude scratching, no matter in what position the pen is held. The pen is made with slight projections or flaps attached to the edges of its body, and bent inward toward the concave portion to form an open reservoir. The small transverse section at the bottom indicates the manner in which these reservoir attachments are shaped to feed the ink to the point of the pen. The point is rounded or bulged to a half ball shape, allowing the pen to touch the paper with the same roundness whether held slantingly, flatly, or sideways, and write equally well



HEWITT'S SEMICIRCULAR POINTED PENS.

in any position, while the slit parts never form cutting edges, as is the case with ordinary pens, and the point of the pen is always supplied with ink, since it acts as a minute reservoir, which is constantly supplied with ink from the larger reservoir formed by the flaps at the side. This construction is very easily and cheaply made, as it can be done by striking up the metal after the pen blank is cut out.

This invention has been patented in all the principal European countries as well as in the United States.

For further information relative thereto, apply to Mr. H. Hewitt, 100 Charlotte Street, Birmingham, England.

GEOGRAPHICAL PUZZLES AND GAMES.

The system consists in teaching geography by means of peculiarly constructed maps, in connection with small wooden blocks upon the sides of which are printed the names and concise descriptions of capitals, cities, States, Territories, countries, etc. These blocks are constructed separately from the maps, but are made of suitable form and size to fit into holes or cavities in the faces of the maps, which holes are always made, in case of territorial divisions, within their limits, and in case of cities, etc., adjacent to marks which indicate the location of the place whose name and description are printed on the sides of the block.

When in use the map is spread upon a table, and the blocks inserted one by one in the holes where they properly belong. The operation of properly placing them forms a puzzle highly interesting and at the same time very instructive. A comparatively few repetitions of the effort suffices to render a child familiar with the names, location, and characteristics of all the places represented by the blocks.

The apparatus is made in series or sets of three parts each, each part consisting of a map and its appropriate blocks. Part No. 1 of the first series consists of map No. 1 and ninety-seven blocks, each block relating to one city. The map is an outline one of the United States, with the names of the States and Territories, principal mountains, lakes, rivers, oceans, gulfs, and bays printed upon its face. The location of capitals and important commercial centers is indicated by appropriate circular marks, adjacent to which are the holes for the reception of the blocks which bear the name and description of the places. Map No. 2 of series No. 1 is wholly an outline map, having no names of any kind printed upon its surface. Names and descriptions of all States, Territories, principal cities, and towns, rivers, lakes, bays, gulfs, oceans, mountains, caves, national parks, oil, coal, gold, and silver mining districts, etc., are printed upon the little wooden blocks, which number over two hundred and fifty.

Map No. 3 of the 1st series has the same number of holes for blocks, but has all names printed on the map, while the blocks carry descriptive matter only, thus making it necessary to place the blocks with no guide to their proper places except the relation the descriptive matter bears to some name upon the map. Maps and appropriate blocks for each country in the world, and globes for the whole world, are issued on the same plan. The apparatus is constructed in special forms and sizes for use in kindergartens, in schools, and in the home circle.

Placing the little wooden blocks in their proper places in the maps forms a very interesting puzzle for a child working by itself. Two or more children may simultaneously work at it with the same map and blocks, and then they find themselves engaged in an interesting game wherein each is stimulated to excel the other in the number of blocks properly placed. When all blocks are in, and those placed by each are counted, the one having the larger number of correct locations is declared the winner of the game.

The puzzle or game plan may be pursued with equal advantage in school room and in the family circle.

Of the accompanying cuts, No. 1 represents the apparatus in use in a school room. Cut No. 2 shows the apparatus as made for use in the home circle. Cut No. 3 is a perspective view of the blocks.

Any one desiring further information may get it by addressing the author of the system and manufacturer of the apparatus, William R. Norris, at 894 Sixth Avenue, New York.

DR. CARLOS FAREMBA, of Mexico, has addressed a circular letter to all representatives of foreign governments now in Washington, advocating the celebration of the discovery of America on its 400th anniversary, October 12, 1892, and the erection of a monument on the spot where the first landing was made.

A Solvent for Gums.

This invention relates to the production from petroleum of a substitute for bisulphide of carbon which can be used for extracting oils and anthracene, for dissolving gums, resins, and analogous substances, for waterproofing, and for vulcanizing India rubber in conjunction with chloride of sulphur or other vulcanizing agents. To obtain the improved substitute, which is called "Vulcoleine," take that distillate or fraction from petroleum which passes over be-



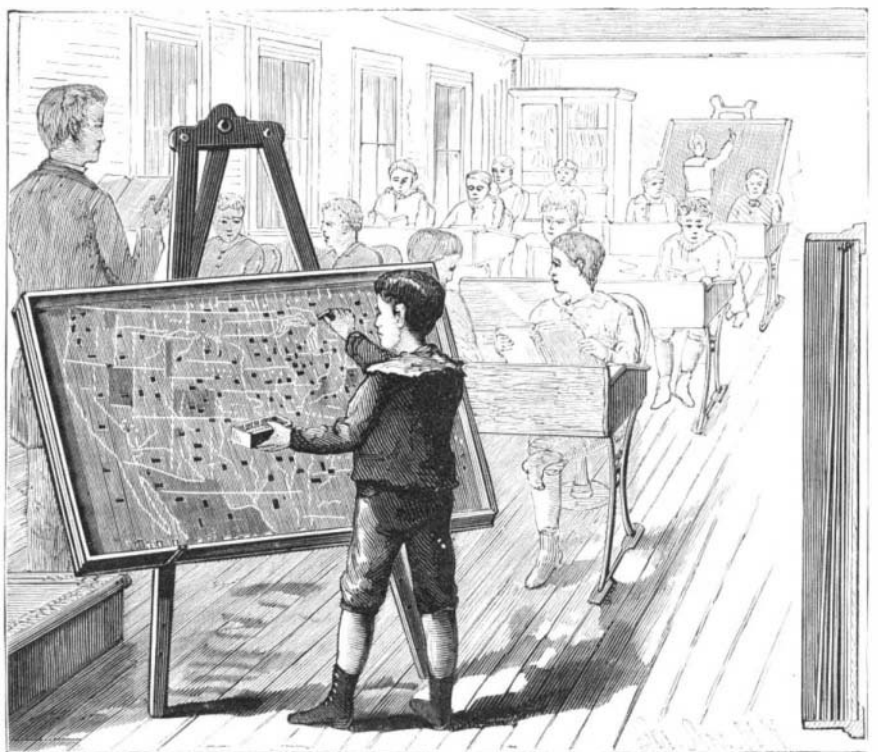
NORRIS'S GEOGRAPHICAL PUZZLE AND GAMES.—Fig. 2.

tween the temperatures of 100° and 212° Fahrenheit or thereabout (the fraction known as spirit or naphtha), and treat the same as follows: To every 100 gallons of petroleum add from two to three gallons of sulphuric acid with constant agitation, continued as long as may be necessary in a suitable vessel; it is then allowed to subside, and the liquor



Fig. 3.

decanted from the sediment is run into a still with from one to two per cent or its weight of lime or other dehydrating medium, calcium carbonate, or other alkaline carbonates, or oxides of metals capable of removing or destroying any sulpho-oils which may have been generated by the treatment



NORRIS'S GEOGRAPHICAL PUZZLE AND GAMES.—Fig. 1.

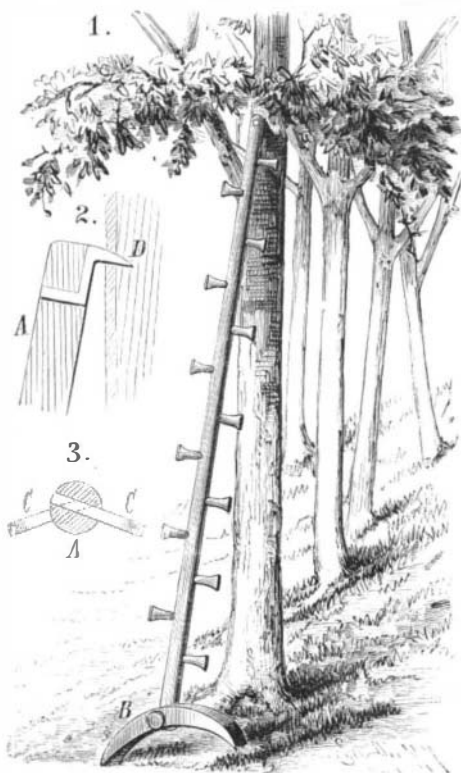
with sulphuric acid. The distillation is conducted without injecting steam or water into the contents of the still. Before distilling they sometimes submit the liquid to repeated treatment with fresh sulphuric acid until the acid ceases to be colored, or nearly so. As the distillate comes over, the receivers are exchanged as soon as the product which is coming over reaches a specific gravity from about 680 to 690, water being taken as 1,000. By these processes the portions of petroleum unsuited for a substitute for bisulphide of carbon are removed.

Solder for Aluminum.

Col. Wm. Frishmuth, of Philadelphia, Pa., says: The following receipts to solder aluminum have been tried by me and found practical. Take 10 parts silver, 10 parts copper, 20 parts aluminum, 60 parts tin, 30 parts zinc. The above solder is excellent for chains, etc., and can be used for the blowpipe operations. For a solder with the common solder iron, take either 95 parts of tin, 5 parts of bismuth; or 97 parts of tin and 3 parts of bismuth; or 98 parts of tin and 2 parts of bismuth; also 99 parts of tin and 1 part of bismuth; the fuse to use in all cases is either paraffine, stearine, vase line, balsam copaiba, benzene. Articles so soldered must be cleaned well before soldering, and the parts to be soldered must be heated to just enough to make solder adhere to the parts to be soldered. These alloys of solders, as above stated, can be changed to suit the operator.

POLE LADDER.

Pivoted to the lower end of the pole is a segmentally curved base piece, the concave edge of which faces downward; this permits of the ladder being inclined toward the object against which it rests. Projecting from the pole are outwardly inclined rings arranged alternately on opposite sides of the pole. On the upper end of the pole is a prong, D, that may be driven into the object against which the end of the ladder rests; but the main object of the prong is to aid in climbing the sides of a building, and to hook over a limb of a tree, which the pin just reaches, to support the ladder while picking the fruit. The curved base piece at all

**JAYNE'S POLE LADDER.**

times adjusts itself to the formation of the ground, giving the ladder a good, firm bearing.

This invention has been patented by Mr. John Jayne, of Forkston, Pa.

Post Mortem Diffusion of Arsenic.

Drs. Vaughan and Dawson, of the University of Michigan, have recently conducted some important experiments with the view of ascertaining if arsenious acid injected into the mouth or rectum after death would diffuse through the body. These observers not only found that such was the case, but that the diffusion was very extensive. The results of their investigations have, says the *Lancet*, a very important bearing on the question of arsenical poisoning. In the first place, it can no longer be contended that, because arsenic is found in quantity in the fluids and tissues of the body, therefore death was due to its administration; and in the second, a certain amount of immunity is given to the would-be murderer, inasmuch as there is the possibility of covering a homicidal act by using arsenic with the ostensible purpose of preserving or embalming the body. We say possibility, for such a procedure would almost to a certainty be defeated in its aim. At any rate, there would be no chance of success if the post mortem examination were conducted within a short time of death, when there would be the usual signs of inflammatory action in the alimentary canal; and again, in the face of other circumstantial evidence, the fact of the accused having resorted to such a particular mode of preserving the body would rather tend to confirm suspicion than to remove it.

That arsenic contained in soil may be dissolved in water and conveyed into the body has long been known. The researches of Drs. Vaughan and Dawson show what appears *a priori* as probable. During decomposition the relative humidity of different parts of the body, and of these with surrounding media, is constantly changing. Interstitial currents are passing through the tissues by osmotic action, and this liquid diffusion is naturally increased by the presence of crystalloid substances in solution; nor does it cease until the dialysis ends in an equilibrium of attraction which one fluid has for another, or presumably until post mortem disintegration is complete.

AN IMPROVED LOCOMOTIVE.

The accompanying illustrations represent a locomotive, recently patented by Mr. Gabriel Fretel, of Porto Real, Province de Rio Janeiro, Brazil, designed to be used on railroads having steep grades and sharp curves. The connecting rods are provided with devices for automatically lengthening or shortening them when the locomotive runs on curves, thus permitting of coupling a considerable number of driving wheels; this is accomplished by boxes mounted on the crank pins of the middle wheels of each frame, which are adapted to slide in the direction of the length of the pins. Fig. 1 is a perspective view of a locomotive embodying these principles; Fig. 2 is a plan view of the joint; and Fig. 3 is a plan view of the locomotive supporting frame and the truck frames.

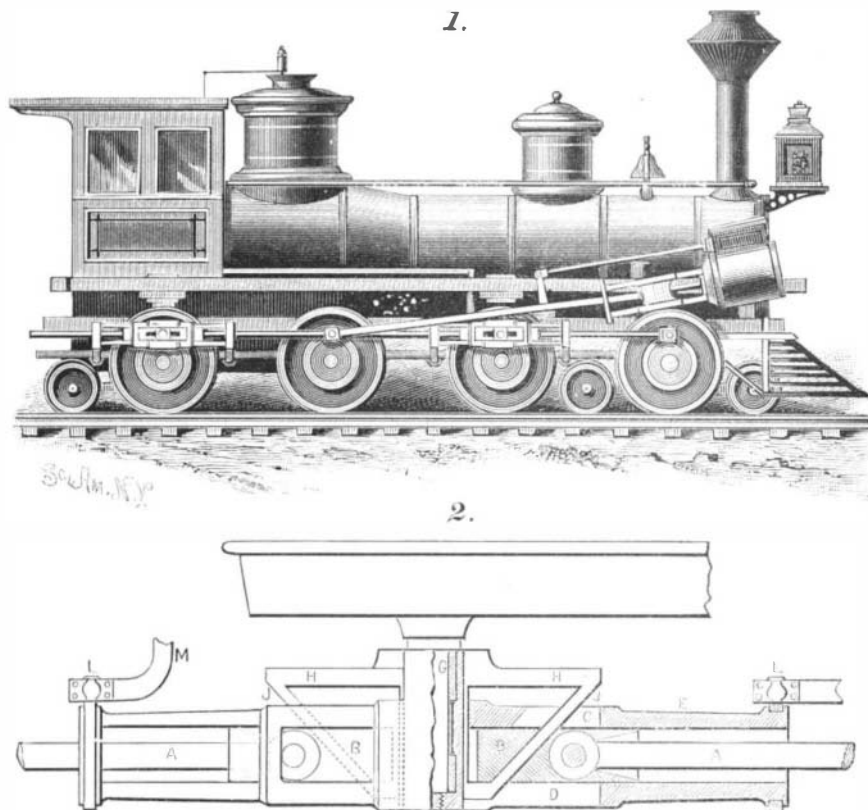
The platforms of the locomotive and tender (the latter is not shown in the engravings) are supplied with pivots, V', for supporting them on four frames, A, in the middle of which the pivots are arranged. These frames are supported by pivots on trucks formed of the platform, B, supported by springs from the axle boxes. On the bottom of the box is a frame, B², in which are journaled the shafts carrying the small guide wheels, E, the load being so distributed as to rest entirely on the axle, C, and not on the guide wheels. The axle under each pivot is provided with fixed wheels, and is so arranged that it can slide laterally in its bearings. The cylinders are united by connecting rods, L, with the crank pins, L', on those wheels that are mounted on the axles between the wheels under the pivots, V', so that motion is transmitted by rigid connecting rods. The motion is then transmitted to the other wheels by extensible connecting rods. The automatic lengthening and shortening of the connecting rods can be accomplished in various ways, one of which is shown in Figs. 2 and 3. A sleeve, G, Fig. 2, is mounted on the crank pin in such a way that the pin can revolve within the sleeve, on which are triangular frames, H, on diametrically opposite sides. The shank, J, of the frame passes through a diagonal slot in the sliding block, B, sliding longitudinally in a box, E, mounted loosely on the sleeve and which slides in the direction of the length of the sleeve. The box is formed with slots, D, through which the diagonal shank of the frame passes. The connecting bars, A, are pivoted to the sliding blocks, and the outer ends of the boxes are pivoted by ball and socket joints to the bent ends of the shafts, U, Fig. 3.

When the locomotive runs on a curve the wheels will be about in the position shown in Fig. 3; the wheels of each platform remaining on the track in the usual manner, but the middle axle slides outward toward the rail having the longer radius. Looking at the locomotive from the front, the right hand connecting rod, M, Fig. 3, extending from the front to the rear wheels, will have to be lengthened, and the left hand rod will have to be shortened. As the axle moves to the right in relation to the platform, the sleeves and their frames will move in the same direction. In the right hand wheel the inclined arms of the frames press against the sides of the slots in the sliding boxes and move them toward the ends of the frames, which, turning on the ball and socket joints, lengthens the right hand connecting rod. At the left hand end of the axle the frame, acting on opposite sides of the grooves, will draw the sliding blocks toward the middle, thereby shortening the connecting rod. We have not space to describe in detail the other methods by which these results may be accomplished. The locomotive can be built with a single platform, or with two or more platforms pivoted to each other, and the platforms can be made of greater or less length, according to the curves on the road. By coupling several driving wheels the traction is increased—a point of great importance in locomotives running on mountain rail ways.

SOUTH of Long Island, beneath the Atlantic, are the remnants of a vast marsh. In clear water roots of trees can be seen from a boat, and in stormy weather masses of decayed wood and peat are thrown upon the shore.

An Ingenious Rat Trap.

A correspondent of the *Industrial World* describes a trap of his own contrivance as follows: This trap consists of a sheet iron pipe with a sort of rim on both ends and a strong two-bushel sack tied firmly around one end. Every hole is stopped in the corn crib but one, which opens into a feed box on the other side of the partition. Then the pipe is placed in the feed box and fitted, the open end firmly over the hole, allowing the sack to hang over the edge of the box into the manger. The trap is prepared, the door of the crib is left open, and the rats permitted to have their own way for an hour or so. Then the door is shut and a noise made to

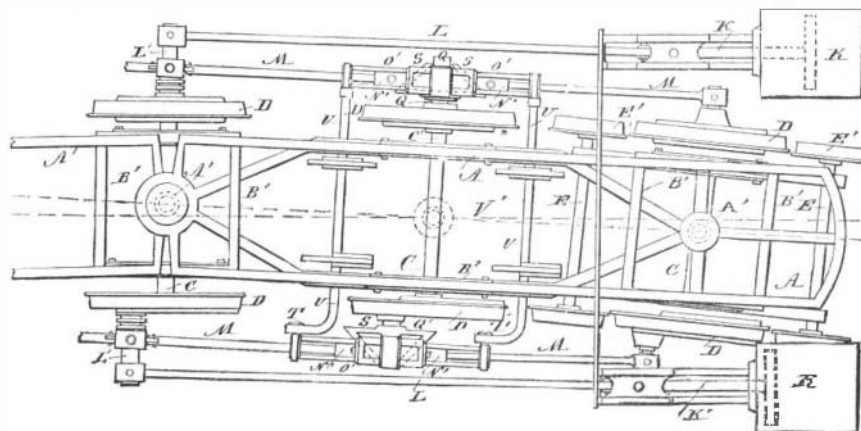
**FRETEL'S IMPROVED LOCOMOTIVE.**

frighten the rats. Having but one means of escape, they rush into the pipe and down into the sack. This correspondent caught twenty-seven rats the first time he tried his trap.

Speaking between New York and Boston.

For some time past the American Bell Telephone Company, in connection with the Southern New England Telephone Company and the Metropolitan Telephone Company, of this city, have engaged in constructing in as perfect a manner as possible an experimental telephone line between this city and Boston, a distance of 225 miles. The experiments, we learn, have been highly successful, so much so that it is said to be easier to talk from New York to Boston on this new line than on the short circuits of the local lines in this city.

The improvement consists in using a metallic wire circuit, the two wires being twisted close to each other, but separated by an insulating material. Certain improved forms of transmitters are also used. By means of the double wire all extraneous sounds due to induced currents are eliminated, and as a consequence the sound of the voice comes out clear and distinct.

**Fig. 3.—FRETEL'S IMPROVED LOCOMOTIVE.**

A few days ago Supt. Baker, of the Southern New England Company, at New Haven, Conn., stated that in a very short time the line would be thrown open to public use, and when that was done a person in New York could talk just as easily to his friend in Boston as to any one on the short lines in this city. He had talked to his wife at Stony Creek from New Haven, and they could hear each other just as distinctly as if they were both talking in New Haven.

In view of these improvements, it would seem as if it would be possible at no distant day to put New York in ready telephonic communication with all the principal cities in this country, and the wonder is that such service has not already been extended.