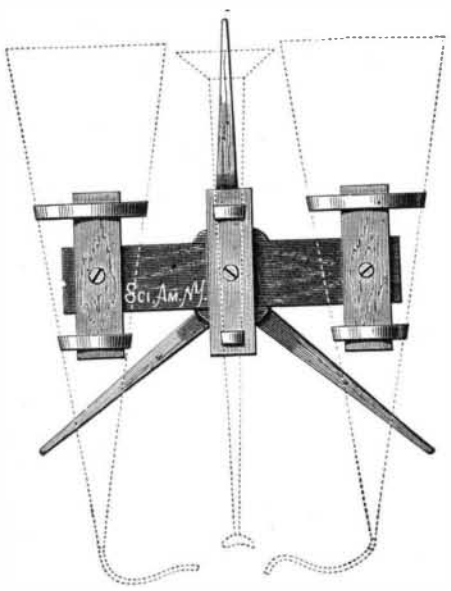
[*Continued from first page.*]

ployed on land to direct vocal sounds so that they may be heard above other sounds. It is tolerably certain that the speaking trumpet is of modern origin, and that it is the invention of Samuel Moreland, 1670.

Kircher, in his *Ars Magna et Umbra* and in his *Phonurgia*, mentions a kind of gigantic speaking trumpet, described



PLAN OF MEGAPHONE.

as the horn of Alexander. According to Kircher, this horn enabled Alexander the Great to call his soldiers from a distance of ten miles. The diameter of the ring must have been 8 feet, and Kircher conjectures that it was mounted on three poles.

Late in the last century Professor Huth, a German, made a model of the horn, and found that it served as a powerful speaking trumpet, but we are considerably in doubt as to the distance through which sounds can be projected through such an instrument.

The ear trumpet, which is the counterpart of the speaking trumpet, has been made in various forms during the last two centuries, but no form yet devised has any advantage over a plain conical tube with a bell-shaped or flaring mouth.

Common forms of ear trumpets are shown at 1, 2. The one at 3 is telescopic; 4 is provided with a diaphragm (shown in dotted lines), which renders the sound less confused, though it does not increase its strength; 5 is a shell having a mouth piece and ear tube; and 6 is a stethoscope. So much for the antecedents of the megaphone.

Professor Edison, in his researches on sound, has made many curious experiments, one of the most interesting of which is that of conversing through a distance of 1½ to 2 miles with no other apparatus than a few paper funnels. These funnels constitute the megaphone, an instrument wonderful both for its simplicity and effectiveness. In the plan view the details of construction are clearly shown, and our large engraving represents the instrument as it stands on the balcony of Professor Edison's laboratory. A mile and a half distant, at the spot indicated by the two birds, there is another instrument exactly like the one in the foreground.

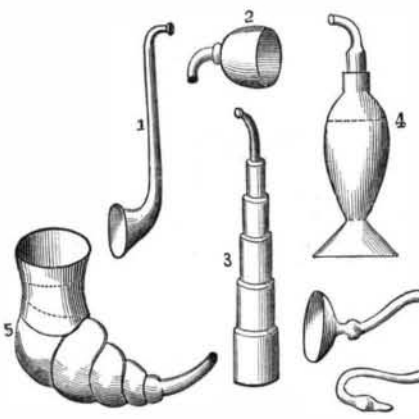
The two larger funnels are 6 feet 8 inches long, and 27½ inches in diameter at the larger end. These funnels are each provided with a flexible ear tube, the end of which is placed in the ear. The speaking trumpet in the middle does not differ materially from the ordinary ones. It is a little longer and has a larger bell mouth. With this instrument conversation can be readily carried on through a distance of 1½ to 2 miles. We have conversed and heard singing through the distance named, although both the singing and talking were in the ordinary tone of voice. A low whisper, uttered without using the speaking trumpet, is distinctly audible at a thousand feet, and walking through grass and weeds may be heard at a much greater distance

American Horse Cars.

A *World* reporter has obtained from the veteran street car builder, Mr. John Stephenson, of this city, a column of interesting facts concerning the origin and progress of street railroads and horse cars throughout the world. The first street car line, the Fourth Avenue, was opened in 1832, and the following year Mr. Stephenson took out his first patent for improvement in car building. No other roads were opened in New York until 1852, when the Second, Third, Sixth, and Eighth Avenue lines were inaugurated. In 1856-7, Boston and Philadelphia adopted street cars, and some years after the leading Canadian cities followed. In 1869 the first street car line outside of America was started by George Francis Train, at Birkenhead, England. The same year a road was built at Buenos Ayres, South America. About the time of the Vienna Exhibition, tramway lines were built at Brussels and Berlin. Very recently they have been adopted in Paris, in Russia, in South America, and almost everywhere in the large cities of the English colonies.

Mr. Stephenson's business is cosmopolitan in scope. He said: "Besides orders for various cities in the Union, we have orders in the shop now from London, Paris, Chorillos, Peru; Hamilton, London, and Toronto, Canada; Port Adelaide and Gawlertown, Australia; Kingston, Jamaica; Lima, Peru; City of Mexico; St. Petersburg, Russia; Wolverhampton, Swansea, Hull, and Liverpool, England; Jalapa, Mexico; Bahia, Brazil; Amsterdam, Holland; Wellington, New Zealand; Berlin, Germany; Rio Janeiro; Christiania, Norway; Hamburg, and many other places. We have an order for twenty-five cars for the North Metropolitan Tramway of London, the largest street railway corporation outside of the United States. There were nineteen competitors for the order."

In answer to the question, "How is it that you can compete with the foreign manufacturer in his own town?" Mr. Stephenson replied: "Shortly after the Hull road had been stocked by us, a Birmingham manufacturer accosted Alderman Bannister, of that city, and asked him why he sent the order for the cars to America. The Alderman replied that the town had patronized American industry because it was found that a better car could be procured for £35 less than the Birmingham man could furnish one for. Our cars weigh less by one half than those made in Germany, and the cars we furnished Glasgow are operated with a stable one third less than their own require. The nature of American woods has much to do with our success. The selection and preparation of material are no light job; the process of preparation requires three or four years. Our object is to obtain strength with lightness. The American irons are tougher than the English, and we can get the required strength with less weight than they can. We use white oak, white ash, poplar, basswood, hickory, beech, maple, and pine—woods all easily procurable by us, while the English are obliged to use principally teak imported from the West Indies. Teak is used largely in ship building, and is always in the English market. The English manufacturer does not seem to possess that quality of discriminating between the different kinds of woods, which long experience has given our firm. The selection of wood is a practical



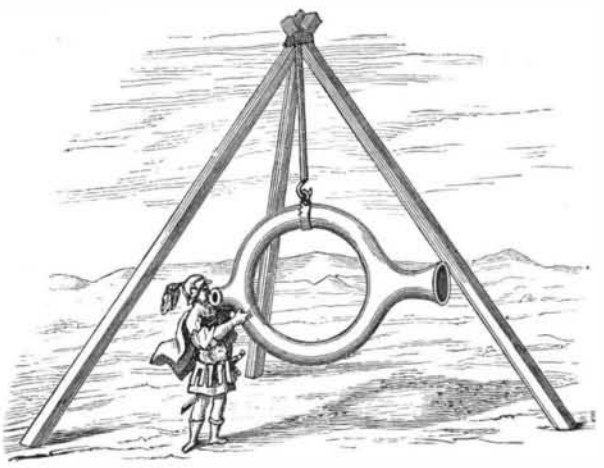
EAR TRUMPETS.

science. Their ideas are heavier than ours, and because their woods are inferior they have been obliged to re-enforce with iron at the expense of lightness. Our raw material is abundant with us and is inexpensive. Then our labor-saving machinery is such that no small establishment can compete with us. We meet with considerable opposition abroad, and the press is used to raise a cry against any corporation sending money away from home, especially in the present hard times." The cost of a modern car, ready for use, was given as from $1,000 to $1,200.

SPEAKING TRUMPET IN THE MERCHANT SERVICE.

Proofs of Prosperity.

With nations, as with individuals, increased income with diminished expenditures is the surest evidence of prosperity. Judged by this standard the United States have been more than ordinarily prosperous the past year. The following comparison of the exports and imports of the country for the year ending July 31, 1878, with those for the previous



THE HORN OF ALEXANDER.

year, are conclusive on this point. The figures are those of the Bureau of Statistics:

MERCHANDISE.

	1877.	1878.
Exports—Domestic	$589,670,224	$680,683,798
Foreign	12,804,996	14,200,402
Total	$602,475,220	$694,884,200
Imports	451,323,126	437,051,533
Excess of exports over imports	$151,152,094	$257,832,667

GOLD AND SILVER (COIN AND BULLION).

	1877.	1878.
Exports—Domestic	$43,134,738	$27,054,985
Foreign	13,027,499	6,678,240
Total	$56,162,237	$33,733,225
Imports	40,774,414	29,821,313
Excess of exports over imports	$15,387,823	$3,911,912

TOTAL MERCHANDISE AND SPECIE.

	1877.	1878.
Exports—Domestic	$632,804,962	$707,738,783
Foreign	25,832,495	20,878,642
Total	$658,637,457	$728,617,425
Imports	492,087,540	466,872,846
Excess of exports over imports	$166,539,917	$261,744,579

Thus, in comparison with last year, the foreign trade of the country shows a gain for 1878 of nearly one hundred million dollars.

FURTHER EVIDENCE OF ATLANTIS.

In "Glimpses of Atlantis" (SCIENTIFIC AMERICAN, July 28, 1877), we reviewed at considerable length the evidence furnished by American geology and paleontology, and the deep sea explorations of recent years, touching the continent that formerly lay where the Atlantic now rolls. Another glimpse of that vanished land is furnished by the eocene deposits of England. In discussing the character and evident origin of those deposits (*Pop. Sci. Rev.*, July, 1878), the English geologist, M. J. Starkie Gardner, shows that throughout the whole eocene period a great river flowed from the westward, its estuary covering at first the southeastern and then the southern part of what is now England. The magnitude of this river, together with the multitude and variety of the flora and fauna brought down by it, and the former total severance of the North Sea from the Bay of Biscay, Mr. Gardner believes, reduce from theory to fact, and in the most positive manner, the assumption that a great extension of land then existed to the west of Cornwall. The extraordinary mingling of American, Asiatic, Australian, and African genera in all European floras of the tertiary periods shows no less conclusively that some communication existed between these several lands in former times.

After showing how this commingling would be made possible by the elevation of the "Dolphin" and "Challenger" ridges, as described in this paper a year ago, Mr. Gardner asserts that, without entering upon the discussion of probabilities, the fact remains that a great tract of land formerly existed where the sea is now, and that Cornwall, the Scilly and Channel Isles, Ireland, and Brittany are the remains of its elevated land. It must at least have been as large as France, Switzerland, and Germany, although unconnected with southern Europe. There is in addition, he adds, an ever increasing mass of botanical and zoölogical evidence showing that the Atlantic Isles formerly must have been portions of a great continent; and Wollaston, from a study of the insects of the Azores, Madeira, etc., quite recently has been able emphatically to reiterate this fact.

The final submergence of the land did not take place until miocene times, and was coincident with the elevation of the Alps.

Foreign Bodies in the Nose and Ears.

Dr. Mason, in a lecture on the Surgery of the Face, published in the *Lancet*, says that foreign bodies, such as cherry stones, locust beans, brass rings, slate pencils, screws, buttons, pieces of wood, peas, etc., are not unfrequently met with in the aural and nasal cavities of children, and even of adults. Such substances have been known to remain in one or other of these cavities for nearly a lifetime, causing little or no inconvenience. Thus a case is related of a lady from whose nostril a foreign body was dislodged during the act of sneezing. It was found to be a button which had belonged to her little brother when they were both infants. Another case is recorded in which a piece of slate pencil was removed from a woman's ear, and which had been put there when she was at school forty years before. And a third instance, in which a cherry stone had been in an ear for sixty years. A case is recorded of a gentleman, aged forty-one, from whose ear a piece of cedar wood was removed by syringing. The patient remembered distinctly the fact of its introduction when he was a boy at school, at least thirty years previous. No attempt had been made to extract it, and its presence had not troubled him until now. It occasionally happens, however, that a good deal of inflammatory action is set up by the foreign body, as in the case of a girl who was under the author's care in the hospital, to which she had been admitted on account of a small stone in her ear. She subsequently had paralysis of the facial nerve. A case is reported of a child who not only had facial palsy, but died of meningitis, caused by the presence of a locust bean in the ear. Living larvæ have been found in the meatus of the ear. Dr. Routh publishes such a case. The patient was a gentleman who three years before was tormented by a fly near his ear. Convulsions followed the presence of the larvæ, but the patient recovered, although he remained deaf. Dr. Blake, of Boston, has seen four such cases. A case is reported which shows the curious course taken by a pin that had been introduced into the external meatus. It passed through the middle ear, probably along the Eustachian tube, and was extracted by the patient from her throat by hooking it with her finger. There are various instruments employed for removing foreign bodies from the ear, each good in its way—a loop of wire, or a needle with the point just slightly turned up, forceps, or an instrument like that devised by the author's colleague, Dr. Hone. This consists of two pieces of silk covered silver wire, wound together in a single strand, about three inches in length. The whole is insulated and stiffened with shellac, the ends being left loose for connection with a battery and galvanometer; the object of the electrical part being to detect the presence of metallic bodies.

In dealing with foreign objects situated in the external auditory meatus, syringing the passage will often suffice to effect their removal; but in many cases forceps and other instruments must be used, yet they should be employed with the greatest caution. As a rule, if left alone, the substance becomes loose, and falls out on the pillow as the patient lies in bed. In extracting foreign bodies from the ear, M. Debout has recommended that the mouth of the patient should at the same time be kept open. It is sufficient to introduce the end of the finger into the external auditory canal, and to make the lower jaw move, in order to become convinced of the enlargement that the canal undergoes each time the condyle of the jaw is made to move. Dr. Voltilini, in some practical remarks on the subject, says that in the removal of these bodies we should never employ force; not that foreign bodies should always be left in the ear, but that matters should not be made worse by violent manipulations. More recently Dr. Dolby has laid down the very practical law that no attempt should be made to remove a foreign body from the ear unless the auditory canal be thoroughly illuminated. Where this rule is broken, the tympanic membrane will most probably be ruptured, and the life of the patient be thus placed in imminent peril.

Niello.

The composition of the Russian tula, or niello silver, has been hitherto kept secret. According to the *Berliner Tagblatt*, the firm of F. Zacher & Co., in Berlin, have discovered the method of manufacture, and have made it in large quantities. It consists of nine parts silver, one part copper, one part lead, and one part bismuth, which are melted together and saturated with sulphur. This mixture produces the gorgeous blue which has often been erroneously spoken of as steel blue.

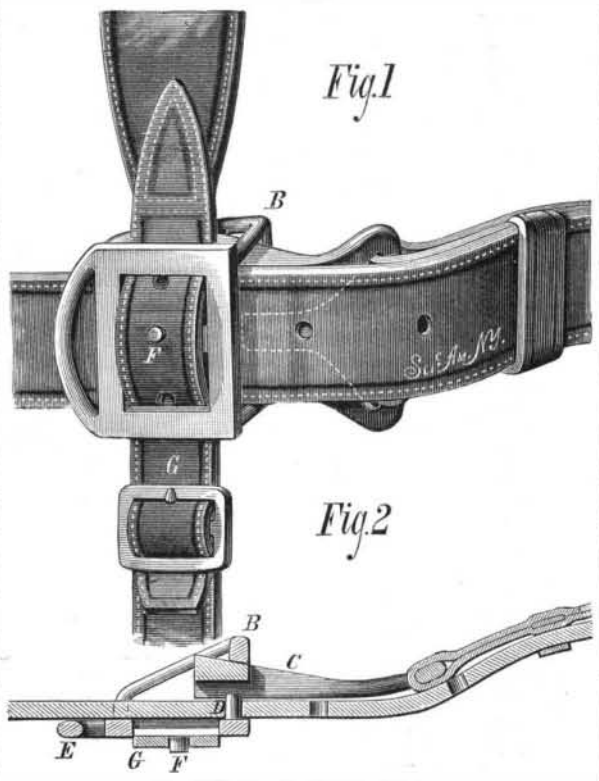
NEW TRACE AND PAD BUCKLE.

Our engraving represents an improved buckle for connecting the traces, hame-tugs, pads, and belly-band of a harness.

The main frame of the buckle is provided with a flange, B, which is slotted to receive the trace and the wedge-shaped block, C. The buckle frame has a rigid tongue, D, which enters a hole in the trace and prevents it from moving out of place before it is fully clamped by the wedge, C. The wedge is grooved longitudinally upon its outer side for the passage of the tongue. Upon the smaller end of the wedge, C, there is a loop to which is attached the end of the hame tug.

The buckle frame has a loop, E, for receiving the side straps of the harness; it also has a central bar from which a rigid tongue, F, projects for receiving the pad strap, G. To the lower end of the pad strap is attached the belly-band.

By this construction, the trace when under tension will be firmly clamped between the wedge block and the buckle frame, so that the entire strength of the material may be utilized in sustaining the draught



BATES' TRACE FASTENING.

For further information, address the inventor, Mr. George E. Bales, Seattle, King Co., Washington Territory.

QUICK SPEED HAND DRILL.

Our engravings represent a new and useful tool for light drilling in wood or metal, invented by Mr. C. L. Belamy, of Arlington, N. J. Its chief parts are a fly-wheel carrying the drill, and a pulley spring and clutch mechanism, all of which revolve loosely on a spindle held stationary by a handle (Fig. 1). The action is as follows: By drawing with one hand a string wound around the drum, the latter and the clutch, together with the fly-wheel and drill, are set in motion at a certain speed. At the same time the spring attached to the drum is tightened. As soon as the tension of the hand holding the string is relaxed, the movement of the pulley is reversed, taking up the slack at the same time. The fly-wheel and the drill do not, however, take part in the reversal of the motion, owing to the action of the clutch. A continuous revolving movement in one direction is thus insured for the drill, the speed varying from 500 to 1000 revolutions per minute. The necessary feed may at all times be felt, and be accordingly controlled by the hand grasping the handle. The drill may be used in any position, and drills of any kind can be inserted.

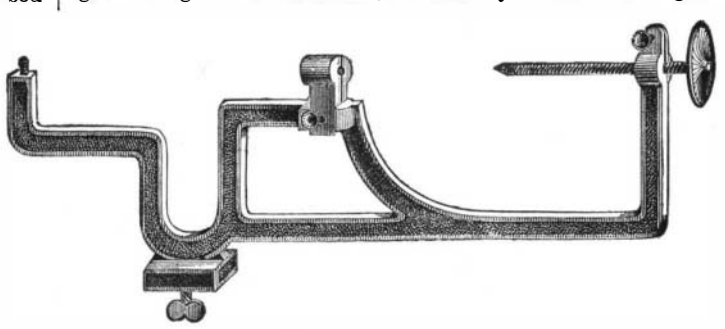


FIG. 2.—BRACKET FOR HOLDING THE HAND DRILL.

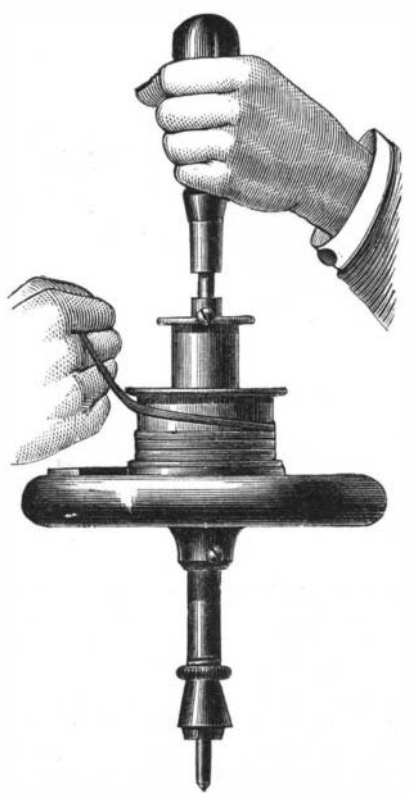


FIG. 1.—QUICK SPEED HAND DRILL

By the use of a simple attachment which is not shown in the cut, the instrument can be so arranged that it may be operated with one hand. Another attachment, shown in Fig. 2, is provided by which the drill can be worked by hand or foot; this consists of a bracket for holding the drill, converting it into a tool similar to a small lathe. The bracket is held by inserting the bottom in the jaws of an ordinary vise. In this case the drill can be used for polishing. The tool is a very neat and effective one, and seems capable of doing a pretty wide range of work.

For further particulars, address James D. Foot, 22 Platt Street, New York.

The "Germ Theory" in its Chemical Aspect.

Some of our principal daily papers, whose mission is, or at least should be, to diffuse useful and correct information among the masses, have succeeded in ferreting out a remarkable French chemist, who, having renounced for a time both his profession and the outer world, has betaken himself to the gloom of an old brewery cellar in Hoboken in order to devote himself to the cultivation of mushrooms. Now in the mere growing of mushrooms for the market there is nothing to call forth particular remark—it is a very laudable and a very honorable business, whether engaged in by a gardener or by an "exiled Frenchman and chemist and a friend of Gambetta;" but when we find the newspaper reporter giving credence to the marvelous fictions of this so-called chemist, and then giving them prominence in a lengthy article, we begin to lose our respect for the "professional" qualifications of both individuals. Of this exiled chemist we are told that, "having seen mushrooms grow in France by supplying the ground with the germs, he set to work to discover their chemical composition and to manufacture them artificially." We are further informed that the experiment is a success and that 150 pounds have been raised in a day, and that no poisonous kinds can possibly get among M. Mezzarelli's plants because nothing enters his "carefully manured soil but the germs which he makes in his little laboratory." This wonderful discovery in agricultural chemistry having duly gone the rounds of the press, we shall be fully prepared to read an account of the brilliant feats of some other exiled foreign scientist in the artificial production of the "germs" or seeds of our entire catalogue of field and garden plants, and the consequent ruin of all our large seed houses. Such a statement would be no less absurd than the former. It is hardly necessary to say that mushrooms and allied plants produce and are developed from small bodies which, although not seeds, are analogous to seeds, and that the manufacture of these is just as far beyond the reach of human talent as that of any other living organism.

The cultivation of these much esteemed delicacies is a remarkably easy matter, requiring neither the intervention of the foreign scientist nor the use of chemically prepared materials to make it a success; and the only wonder is that so simple and so inexpensive a process should not long ago have developed into a prominent industry in this country. To prove that it would be profitable it is only necessary to refer to the immense number of cans of "Champignons" annually imported from France into the United States, and which are held at a price out of all proportion to the costs of production and preparation for the market.

Official Paper.

Professor Reuleaux recently gave a discourse before a commercial meeting at Leipsic, upon the character of the paper employed in the public offices, which he regarded as a striking evidence that the giving of contracts to the lowest bidder exerts an injurious influence. The paper which is now delivered consists almost entirely of wood, and in the course of ten or fifteen years we may reasonably anticipate that the official records, which are of the greatest importance to our families, will be destroyed through the natural processes of decay. Such a serious evil would seem almost incredible if it was not sustained by weighty evidence. But as long as our officials hold to their present course, and so long as they buy only what is cheapest, and what, as a necessary consequence, is also bad, we have no right to anticipate any improvement.—*Pap. Zeit.*

How Grapes Ripen.

According to *Comptes Rendus*, St. Pierre and Magnien have arrived at the following conclusions in regard to the changes which grapes undergo while ripening. During the process they evolve carbonic acid in darkness as well as in light, when exposed to the air or placed in an indifferent gas. The amount of oxygen evolved in air is always in excess of the oxygen taken up; this has been remarked in the case of observations extending over a long space of time. Grapes can absorb or give off water according as they are placed in a moist or dry medium. As the change goes on the acids decrease in amount, while the quantity of sugar increases. The acids and the glucose are carried to the grapes by the sap. Here the acids are slowly consumed, while the sugar increases in point of concentration, and at a still later stage the sugar itself is consumed.