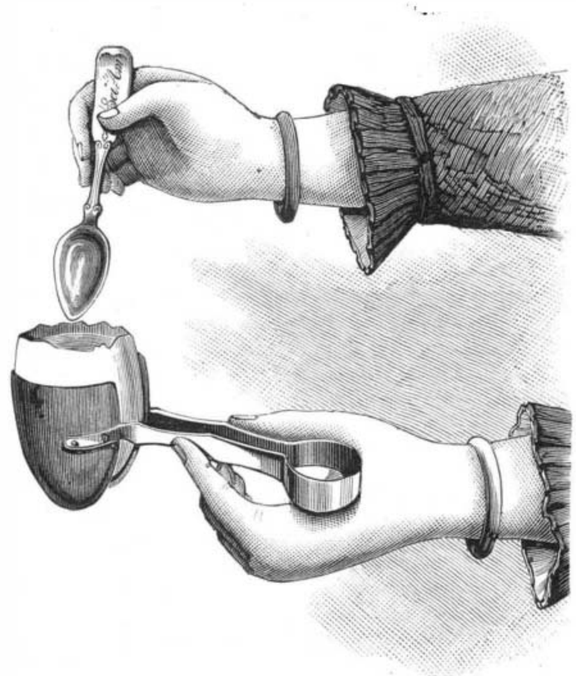
will come when none other but the machine-made goods may be had. The manufacturers, some of whom are named, are said to be now exporting largely, and thus in foreign markets they are cultivating the American liking and preference for these goods. This is not to be wondered at, because the quality, the appearance, the fit, are all they ought to be to win and keep customers.—*British Trade Journal.*

## NEW EGG TONGS.

The annexed engraving represents a neat and inexpensive egg tongs recently patented by Mr. R. P. H. Koska, of East Saginaw, Mich. It is one of those devices that is likely to come into general use, as it is as simple as anything well



KOSKA'S EGG TONGS.

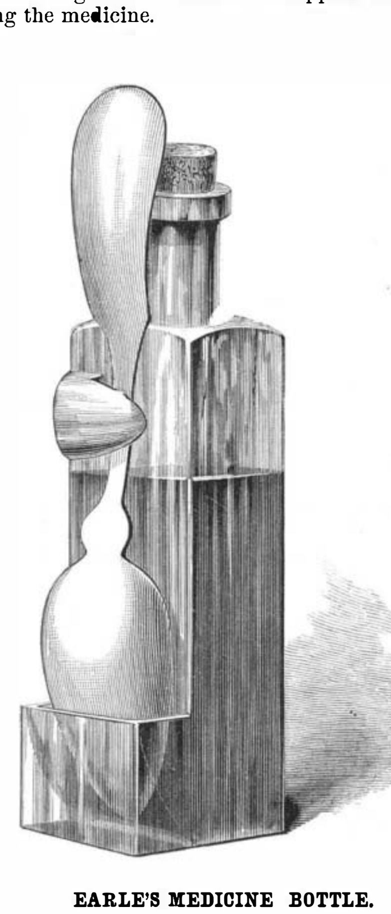
could be for the purpose; it forms a handsome article of table furniture, and will be of great utility, as eggs are now generally eaten soft boiled. This device does away with the egg cup and with inconvenience in handling and breaking the egg, and it affords a simple means of holding the shell while its contents are eaten with an egg spoon, the egg shell forming the cup.

The construction of the device will be readily understood from the engraving. The concave receptacles at the end of the spring handle are of such shape and size as to inclose something more than half of an egg. Each cup carries a small spur, which pierces the shell and assists in holding it.

Further information concerning this invention may be obtained from Mr. R. P. H. Koska, Bancroft House, East Saginaw, Mich.

## IMPROVED MEDICINE BOTTLE.

The accompanying engraving shows an improved medicine bottle designed to receive and support the spoon used in taking the medicine.



EARLE'S MEDICINE BOTTLE.

The bottle has upon one side a socket or cup of suitable size and shape to receive the greater portion of the spoon bowl, and near the top of the bottle there is a clip for holding the spoon handle. This device is the invention of Mr. J. H. Earle, of Fall River, Mass.

## Engineers.—Their Value.

Under this heading the *Boston Journal of Commerce* comments on the engineer who solves problems—not the man, adds the editor, who opens the throttle valve of a locomotive that goes racing over the track from one city to another, or of him who sets in motion one of the Corliss monsters that drives its thousands of spindles and looms or other machinery—but the civil engineer, who lays out the work that employs the others, deals either in one or the other of two separate and distinct realms—absolute fact or supposition. In the first he is often made to doubt his own sagacity and capability, for he must often change his course of action by reason of deductions drawn from experiment in which all his ideas of strength, elasticity, or economy have strangely departed. If he deals in the second he becomes, as too many have done, egotistical, and by very lack of knowledge or through force of circumstances, is constantly taking up untenable positions, making expensive, unsatisfactory and unsuccessful experiments—in other words, father of failures. Too much of this has been and is done. In many cases the parties are sooner or later involved in an outlay of thousands of dollars, and then comes the legitimate outgrowth of an attempt at the impossible—disagreement, disappointment, law suits, bitter feeling, loss of time, money, production, loss to every one involved; and yet it is a matter of every-day occurrence, and one which would have been avoided by the employment of a competent engineer for a day or two at the cost of fifty or a hundred dollars. Men who know nothing of proportion, strength, elasticity, pressure, torsion, volume, or density, get out an idea and patent it, or advise it and get it introduced, and then users get the effect by adoption.

Engineers are not always consistent, we had almost said not honest. They deal sometimes in vagaries or in elements of uncertainty without careful consideration or consultation of authorities who have preceded them, and give opinions or make out tables or results from preconceived ideas of matters to which they never give an hour's consideration in an honest, careful way. In this way they have in a measure detracted from their usefulness and the respect due them. Such a one, however, is always found out sooner or later, and finds his level. A man to do his work in a successful way should be careful in all his statements, and if he does not know a thing for a *sure thing*, say so, and not assume one thing or the other, for it is in engineering as with law—common sense is a pretty sure guide, and will lead you right a thousand times where it leads you wrong once.

In dealing with earth, iron, water, steel, steam, or any of the natural elements or created forces, we must remember that we are only capable, at least, of an approximation; that we must reason and investigate—and if we live to the extreme allotment of life, we are still learners. The profession has in the last decade done much to attract the attention and merit the admiration of men who never think deeply, clearly, or upon forces or matter other than to see results that are the outcome of close reasoning. There is too much of the superficial, too little of the real; to progress we must look closely at all elements, simple or compound; and when we have learned our own insignificance, we have commenced building upon a "bed rock" that does not "heave or settle."

## The Delaware Ship Canal.

The surveys of routes for the proposed Chesapeake and Delaware Ship Canal were completed in December last. Six routes have now been estimated for, as shown in the following table:

| No. | Name. | Length in miles. | Length of canal proper. | Cost in millions of dollars. | Relative time of transit in hours. | Saving in distance in miles. |
|---|---|---|---|---|---|---|
| 1 | Choptauk ...... | 149·81 | 37·67 | 16½ | 19⅓ | 175 |
| 1 | Choptauk (inland | 138 91 | 30·00 | 18¼ | 18 | 186 |
| 2 | Wye........... | 128 42 | 42·99 | 26⅓ | 17¾ | 196½ |
| 3 | Queenstown..... | 107 29 | 53·78 | 37¼ | 17 | 217½ |
| 4 | Centreville ...... | 106 38 | 50·95 | 41½ | 16⅓ | 219 |
| 5 | Southeast Creek.. | 115·78 | 38 35 | 25 | 15¾ | 209¼ |
| 6 | Sassafras ......... | 129·25 | 16·20 | 8 | 15 1/10 | 195¾ |

The lengths given are respectively from Baltimore to a common point at sea, twelve miles outside of the Delaware breakwater. The distance from Baltimore by the route now used to the same point is 325 miles, or 33¼ hours, allowing a speed of 10 miles in open water and 8 miles in dredged canals.

Mr. N. H. Hutton, under whom these surveys were made, reports that the Sassafras route is the shortest in time and the cheapest; but it has very expensive approaches to maintain and very serious conditions to be overcome if it is to be used during the winter. The Centreville and Queenstown routes are the most direct, rate second as to time, but cost largely in excess of other routes; have expensive approaches to maintain on the Chesapeake side, and are, as the Sassafras route, liable to obstruction by ice during the winter. The Choptauk route rates slightly below the Sassafras as to time of transit, and rates third in this respect, while it is second on the list in point of cost, its greatest advantages being in the matters of freedom from obstruction by ice and economy of maintenance of approaches.

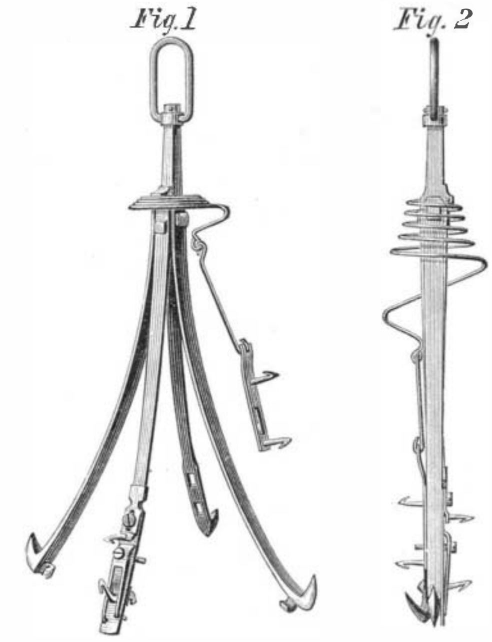
More recently Major W. P. Craighill, of the Engineer Corps, has made a new survey of the Sassafras route and estimates its cost at half a million dollars more than Mr. Hutton's estimate. Major Craighill's estimate is for a canal 100 feet wide on the bottom, 26 feet below low water, side slopes one and one-half to one, with a berme on one side 12 feet wide and 30 feet above the bottom.

The other estimates are for a canal 100 feet wide at the bottom, 26 feet below low water. The width is to be 178 feet at low water; the locks to have chambers 600 feet long and 60 feet wide; tide locks only to be built, and these will probably be generally open and only exceptionally used.

## IMPROVED ANIMAL TRAP.

The annexed engraving represents a novel animal trap, recently patented by Mr. William J. Taber, of Lookout Station, Wyoming Ter. It is especially intended for catching bears, wolves, and other large animals, and it consists of four curved spring bars provided with hooks, and having a catch and trigger which hold them together when the trap is set, as shown in Fig. 2.

Fig. 1 Fig. 2



TABER'S ANIMAL TRAP.

Fig. 1 represents the trap after it is sprung. In setting the trap the outer ends of the spring bars are pressed together and held in place by the catch or trigger. The latter is engaged by a bait plate connected with the spiral spring at the top of the trap. The bait is attached to this plate, and when the animal seizes it, the trigger is disengaged and the curved bars spring outward, thrusting the hooks into the sides of the animal's mouth.

The inventor states that the barbs or points cut the mouth of the animal so that it soon bleeds to death.

## IMPROVEMENT IN JUGS.

A stone jug is almost the last thing we would expect to see improved, and yet our engraving shows an improvement in this article which possesses the merit of being both simple and efficient. It consists of a passage or vent formed lengthwise in the handle, commencing inside the jug and terminating near the mouth of the jug. In filling the jug air is permitted to escape through this vent, thus allowing the liquid to enter the jug with greater rapidity than it

IMPROVED JUG.

otherwise would, and in pouring the contents from the jug, air enters the vent and fills the space as the liquid escapes.

This invention was recently patented by Mr. Samuel A. Conrad, of Terre Haute, Ind.

THIS has been a bad winter for fur dealers, sleigh makers, ice monopolists, and coal retailers in New York and vicinity.

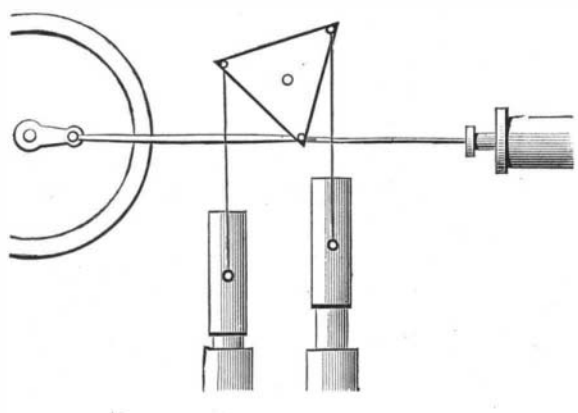
## Correspondence.

### Novel Pumping Engines.

*To the Editor of the Scientific American:*

The recently completed new water works of Pittsburg, Pa., include a series of pumping engines of novel design, and whose construction has cost that city $500,000, with an additional $200,000 in litigation. Their general plan and operations are so widely at variance with preconceived ideas as to what constitutes economical and effective pumping machinery, that engineers throughout the country generally denounce the Pittsburg engines as mechanical monstrosities. Their construction was begun several years ago, and as yet, owing to a succession of mishaps, they have not been taken off of the contractors' hands.

The inventor, Mr. Jos. Lowry—Mechanical Engineer to the city of Pittsburg—calls his invention the "graduating plunger" pumping engine. The Lowry engine resembles the Cornish pumper in having a walking beam which operates the pumps. In all other respects this engine differs from the Cornish. Each steam cylinder operates two equally



heavy plungers, and the momentum of a heavy flywheel aids in reaching the results attained. It is a horizontal engine, operating its flywheel on a level with its cylinder, but between cylinder and main shaft of the flywheel, about midway, are placed the novel features in the Lowry engine. These features in chief comprise a triangular, equal-sided walking beam, swinging on trunnions resting upon pillow blocks supported upon the bed plate, and 10 feet above the center line of the cylinder. This beam has a motion in a plane parallel to the vertical plane passing the center line named. This motion is taken directly from a pitman connecting the crosshead with the lower corner of the beam. To the upper two corners of the triangle are attached the pitmans leading downward to the pump plunger, which latter, with the pump barrels, air chambers, valve chamber, etc., are located directly beneath the walking beam and bed plate of the engine. To actuate the flywheel another pitman leads from the lower corner of the beam to the crank of the wheel shaft.

Regarding these features the inventor has this to say: "The great novelty in this engine consists in the manner of connecting the plungers and the steam piston, both piston and plungers being connected to a triangular walking beam and at an equal length of lever from the beam shaft or center, but at such angles that the following result is attained. When steam is admitted, and is at its maximum pressure, the steam piston is operating on the short lever of the beam, and the plunger is suspended on the longest arc of the same; and as the steam grows weaker by expansion the beam leverage increases, permitting a proportionate increase of speed by the piston. Meanwhile the corner of the beam connected with the pump plunger is shortened as to leverage. The result shows that, although the connecting points of both cylinder and plunger pitman are equidistant from the fulcrum, or center of the beam shaft, the steam piston travels 14 feet while the pump plungers travel 11 feet. But the great peculiarity of the engine is the continual varying of the relative speeds of steam piston and plungers. At the beginning of the stroke, when the steam is at its greatest pressure, the lowest plunger is lifted one-fifth faster than the travel of the steam piston actuating such plunger. At the end of the stroke, when the steam is weakened by expansion (cutting off at one-sixth the stroke), the steam piston is given leverage in proportion to this decreased force, permitting the piston to travel three times faster than the plunger. Again, on the descending stroke, the plungers first move slowly, traveling but one-third the rate of the piston, until, at the end of the stroke, it is traveling one-fifth faster."

This plan will be more clearly comprehended by inspecting the subjoined diagram, showing the principle only of the engine. The triangle, etc., are depicted in the position assumed at the beginning of the stroke, and when the crank of the main shaft is on the center nearest the cylinder. The valve chambers occupy the space just beneath the pumps and plungers, and the air chamber is located between the same.

As to labor performed, dimensions, etc., the following are the salient points: The water is taken from the Allegheny River and forced to the height of 356 feet into a reservoir 2,800 feet distant. To accomplish this requires the loading of each plunger to 220,000 pounds dead weight. The engines are four in number, coupled in pairs, each pair operating four such plungers as are described above. One pair is provided with compound cylinders, using the exhaust steam expansively. Their stroke is 14 feet, while that of the plungers is 11 feet 3 inches. Diameter of small cylinder, 64 inches; large, 106⅜ inches. Diameter pump barrels, 40 inches. The engines have been found to give best results when running at a speed of 8 revolutions per minute, though they have been worked all the way from 1 to 9½ revolutions in that time. Diameter flywheel, 32 feet; weight of each, 160,000 pounds. Estimated weight of the 4 engines and pumps, 5,600,000 pounds. In operation these great engines behave handsomely, working without apparent jar or strain. As to their actual duty no thorough test has as yet been made. The inventor states, however, that "in a partial test under many disadvantages, uncovered boilers and steam pipes, etc., the engine raised 4,682,000 gallons of water 356 feet high with the consumption of 300 bushels of coal, equal to a duty of 62,000,000 pounds raised 1 foot per 100 pounds coal used." G. F. M.

### Long Distance Telephoning.

*To the Editor of the Scientific American:*

Noticing an article in your issue of January 17, 1880, entitled "Long Distance Telephoning," I would like to say that nearly six months ago, in connection with the Western Union Managers of Marion, Fort Wayne, Ind., and Defiance, Ohio, I talked with as much ease and clearness as ordinary conversation is now carried on in this city and suburbs by the instruments mentioned in your article, the distance being 166 miles; after which Toledo, Ohio, was put in the circuit, making in all over 200 miles. The lines used were those of the Western Union Telegraph Company's, and as such subject to same conditions as are likely to be met with in nearly any part of the country. The instruments were the Edison carbon transmitter and the Phelps pony crown telephone as receiver, the same as now provided by the Gold and Stock Telegraph Company, of this city, no special adjustment or preparation being made. The future of long distance telephoning is *now waiting* at our doors.

LONG-LINES.

New York, January 16, 1880.

### Railroading Reduced to a Science.

We are indebted for the following facts, says the *Railroad Journal*, to an official whose connections with the New York Central and Hudson River Railroad are such as to give him an intimate knowledge of the practical management of that property. From these it will be seen that railroading is fast being reduced to a practical science by Mr. Vanderbilt, as well as by Col. Scott, who was the first railroad president in this country, we believe, to employ scientific experts in the practical management of railroads. The series of experiments by which the results below enumerated were obtained and said facts demonstrated, were commenced under Commodore Vanderbilt, when he laid the two extra tracks, making the first four track road in the world the basis of these experiments.

Under the old two track system the New York Central with its heavy traffic had the maximum switching expenses, which is well understood among railroad men to be the greatest pertaining to the maintenance of a double track road. With four tracks this expense is reduced to the minimum, as well as that for maintaining the track and road bed. This is upon the recognized principle in railroading, that the most economically maintained and operated road is a single track road running only one train from one end of the road to the other and back without switching or switches. Every additional train running in opposite directions requires an additional switch, with additional expense for attendance and maintenance. Hence, the New York Central, with its 20 passenger and 30 freight trains daily, is run much cheaper on what is practically four single track roads, than formerly on its double tracks. There is now no switching or delay by switching and passing of trains from one end of the four tracks to the other, except to local freight trains which gather up and distribute all local freight between the larger stations without hinderance to the through trains which are run with the same engine from Buffalo to Albany or New York as the case may be, without stopping, except for fuel and water. Under the present system, adopted in 1875 or 1876, an engine is kept fired and running until it needs repairs, and not cooled off as formerly while the engineer slept. Now three sets of engineers and firemen are assigned to one engine for each 24 hours, or eight hours each. A locomotive is sent to the shops only once for repairs, it being found cheaper to sell and build new, than repair the second time. In this way the rolling stock of the road is idle (except for want of business) only when under repairs, and is never delayed by waiting for other trains to meet and pass, with the men who run them. It has been demonstrated also, that upon this road even, with its straight tracks, 15 miles per hour for a freight train is the most profitable speed, as above that the increase in wear and tear is greater than the saving in time.

As to the cost of attending and maintaining its tracks, the expense with four as compared with two tracks is as 1 to 8; that is, one man to 8 miles of track now against one man to 1 mile of track formerly. Thus, with more than double the capacity it is able to maintain and attend four tracks for one quarter the former cost of two tracks. This expense was formerly $750,000 per year, or $250,000 more than the present interest on the cost of the two extra tracks. The results upon the traffic of the New York Central for the first nine months after the opening of these extra tracks were that it hauled 75,000 more loaded freight cars and 750,000 tons more of freight than for the same time the preceding year, notwithstanding it included the period of the fierce railroad war of 1876 when there was a scarcity of freight for the trunk lines. It was also then asserted by the officers of the company that the road earned its 8 per cent dividends which were daily ascertained and set aside, to the dividend fund, notwithstanding what were then called "ruinously low rates of freight." From the foregoing it will be seen what a few years of scientific and practical experiment produced in economy of railroad management and also what may yet be done in the same direction.

### The Avoidance of Fire Risk in Factories.

The art of constructing houses so as not to burn was described as follows by Mr. Edward Atkinson, in a recent address in Boston:

"The modern factory has no place in it, if we know it, where a rat can build a nest and not be found, or where fire cannot be reached by water. The factory properly consists of a brick wall, with the floor timbers 8 feet apart. These are about 6 inches by 12, and on them is laid 3 inch plank, and sometimes two thicknesses of tarred felt, and then the top floor. The whole construction is open; the spaces between the beams are wide, not narrow; water can be sent in great streams crosswise or lengthwise. The roof is built in the same way, nearly flat, so that whatever happens, there is a standing place upon it for the firemen. There is not a great mass of gables and cornices and concealed spots which modern architecture so many times requires, and which public opinion imposes upon architects, who know better. In the factory we don't allow any furrings or plaster on the walls. There is another thing which we never permit in the factory, but which, like iron shutters, is, I believe, required by the building law of Boston, that the timbers should be connected with the walls, so that when the beam burns off or is torn off, it brings the wall down. We have the beams laid on an iron plate, with their top corners arched off and the bricks immediately above them laid dry, so that if anything happens to those beams they roll out of their places and do not tear the wall down. But the great secret is cleanliness and order and the means of putting out small fires. When the secret is discovered how to make the interest of the assured and the interest of the underwriter identical, and to give the assured an interest in the success of the insurance company, as it is in the mutual company, then discipline may be enforced."

The practical economy of this sort of construction was shown by the following facts:

"Forty-five years ago the Hon. Zachariah Allen, of Rhode Island, having a cotton factory with some of the appliances that are now known to be effective, went to an underwriter of that day and asked that in consideration of those appliances the rate of insurance upon his factory should be reduced. The answer which he received was, 'Oh, we can't send our men around to look into all these little improvements that may amount to something and may not. The rate on cotton factories is 2 per cent, you may take it or leave it.' That induced Mr. Allen to found the system of the mutual insurance of factories, with a system of inspectors who did go around to look into these little appliances and see whether they made any difference in the risk or not. The result of that is a combination of companies, now insuring $200,000,000 a year, each insuring the other. The company of which I am president insured last year $43,000,000; it was a disastrous year in other lines; a year of excessive losses; we have lost less than $14,000. The mutual alliance of companies which Mr. Allen founded 40 years ago returned to their members this year on the 1st of January, on the risks then expiring, an average of 90 per cent of their premiums, and their average premiums on the mills which they insured, instead of being 2 per cent, is nine-tenths of 1 per cent; the sending around of a few young men to see whether these appliances were good for anything or not has reduced the cost of the insurance of those extra-hazardous properties to 9-100 of 1 per cent the past year. Compare that with the other method of insurance which is called stock insurance. Eighty-three New York companies, tabulated by the Superintendent of Insurance of New York, disclose the following facts: That their expenses had been 50 per cent of their premiums, and their losses 70 per cent."

### THE ANTIQUITY OF THE SPOON.

The use of our common table utensil, the spoon, is widespread, and its invention, as it appears, dates from remote antiquity. The form which we use at the present day—a small oval bowl provided with a shank and flattened handle —is not that which has been universally adopted. If we examine into the manners and customs of some of the people less civilized than we—the Kabyles for example—we shall find that they use a round wooden spoon. The Romans also used a round spoon, which was made of copper. We might be led, from the latter fact, to infer that the primitive form of this utensil was round, and that the oval shape was a comparatively modern invention. But such is not the case; for M. Chantre, in making some excavations on the borders of Lake Paladru, the waters of which had been partially drawn off, found, in good state of preservation, wooden spoons which in shape were nearly like those in use at the present day; the only difference being in the form of the handle, which was no wider than the shank. The lacustrine station where these were found dates back to the ninth century, and we therefore have evidence that oval spoons were already in use during the Carlovingian epoch. The Neolithic peoples used oval spoons made of baked clay;