instead of allowing the water to flow by its own gravitation, to force it through the pipes under pressure, of sufficient strength to throw water at any desired hight or distance, and by placing hydrants at various points throughout the city (the more the better), with 4, 6, or 8 discharge openings, and establishing hose houses near by, an immediate and abundant supply of water could be obtained at any time, thus making a saving of millions of dollars worth of property annually. It would furthermore be a means of feeding steam boilers without the necessity of using steam pumps.

I should think that a large portion of the water now wasted might be saved, as the above arrangement would necessarily involve the passage of laws, levying a heavy fine upon any one allowing the water to run when not in actual use, and would also compel the abandonment of lead pipes, which could not stand the pressure, and which are the sole cause of much sickness in large cities on account of their poisonous action on water. It would compel the use of pipes of different metal, and thus be the means of saving many valuable lives.

I should think that this arrangement could be carried out without much expense, compared with the expense of the present fire department, and in the end allay all fears of a scarcity of water, which is now caused by the immense waste through carelessness and otherwise.

Mobile, Ala. CHARLES S. BAILEY.

[Some of our practical correspondents will be able to point out grave impracticabilities in this scheme.—EDS.

For the Scientific American.

THE CANAL OF SUEZ AND THE FUTURE OF EGYPT.

As we approach the 17th of November, the day appointed for the final opening of the Canal of Suez, the interest felt in Europe and America in this vast enterprise, increases with every new report of its advance towards completion. A few days more, and the two seas—the Sea of Corals, or Mediterranean, and the Sea of Pearls, or Red Sea—will be joined by a water route of 26 feet in depth and 328 feet in width, except at El Guisr, Serapeum, and Chalouf, where the canal only measures 196 feet.

The greater part of the expense of the works, conducted with as much patience as courage, has been borne by Egypt, while France will carry off the triumph, and England may in time derive the greatest profit.

The influence which this enterprise will have upon Egypt itself, is at the present moment a great and general question among Egyptian agriculturists as well as European traders. It is certain that the commercial aspect of Egypt will undergo a change within a short time, and the culture of the soil will be carried on in a different way from what it has been for centuries.

The large and powerful machines constructed, and many even invented for the works of the canal, will, after its completion, never return to Europe but remain in Egypt, to be used for the drainage of the Nile and the canals employed in irrigation. The "chadouf," the "sakie" or noria, and other irrigating machines often portrayed in engravings representing Egyptian scenes, will soon give way to steam engines, the price of coal having already fallen from $14 to $10 and even less according to the distance of transportation.

The great civil war of America when cotton rose to such a high price, and the speculators were so blinded by their success that they hoped it would rise still higher, caused many failures in Egypt. Even the late Pacha, Mohammed Ali, himself was carried away by the excitement. He believed that the low rate of wages for manual labor and other natural advantages, destined his empire to the cotton and other industries; he did not calculate, however, at that period upon the great worker of modern times—coal. No manual labor, even at the lowest rate, can compete with coal at a low price, such as it bears in England. Many grain mills and factories were built during the year 1864, principally in the Delta of the Nile, which were however abandoned as soon as they were constructed, and are to-day in a state of ruin.

Ismail Pacha—the "Prince of the Fellahs," as he pleases to call himself— sees clearly the many deficiencies of Egypt. He is aware that in the present state it cannot rival other commercial nations. He knows that its agriculture must undergo a change. He is not ignorant of the fact that the Egyptian wheat is much inferior to that of other countries, on account of a certain acrimony and musky flavor, and that it contains less azotic substance than other cereals. With these defects it brings only two thirds of the usual market price, and even then it is not greatly in demand. The cause for this degeneration in the quality of the Egyptian cereals is but too plain: the fellahs force the same land to produce the identical crop a hundred times successively. They do not yet understand that it refreshes the soil to change its culture, and as they have always been pressed for money, they have sold the best of their harvest, and sowed the worst.

Most of the Egyptians believe that their soil in its fertility is exempt from the law of restitution; they forget that the nurse must be nourished, else she will become weak. Those who are aware of the fact that their soil requires manuring, have taken recourse to the columbine or pigeon dung. But the culture of pigeons has proved to be a greater loss to the country than actual profit. It is estimated that the food of each of these birds amounts to about a quarter of a cent per day, which multiplied by the estimated number of pigeons in Egypt, makes up a sum of $60,000 value of wheat which they annually devour. The meat of these birds is of but little value, and the revenue of columbine produced by 20,000 pigeons is insignificant. The attempt to restore the land by the use of columbine is consequently a failure.

The Koran forbids the believers to spread the dejectures of men and beasts upon their fields, the former as being impure, the latter as being necessary for kitchen-fuel, for which purpose they have been used since time immemorial, on account of the scarcity of wood in Egypt. For this purpose they are formed into a sort of thin cakes and dried in the sun, which renders them hard and fit for burning.

A few cultivators who have studied deeper into the science of agriculture, have discovered that the phosphate of lime is wanting in the soil of Egypt. They need, however, not go far to find the remedy for this defect. The deserts are strewn with the bones of animals. This is an open mine. The bones may be gathered and ground with little trouble, and the dust gained therefrom will restore the wanted phosphate of lime. Experiments with these bones have already been tried with decided success.

Sugar-cane is extensively cultivated throughout Egypt. All the fellah's are allowed to raise, express, boil, and even refine their sugar if they choose; but the high price of machinery and implements has prevented the petty cultivators from producing sugar for the market. Only the viceroy himself is rich enough to set up sugar-works, and thus sugar manufacturing has almost become a monopoly of the sovereign. The largest of his works is at Ermentin Upper Egypt; but as the price of the tun of coal rises to $20 before it reaches that place, the home-made sugar cannot compete with foreign productions.

Out of ten sugar-canes the Egyptians carry nine to the mill and keep the tenth for planting, which they lay into the ground in its full length and every joint produces a bunch of young sprouts. This method is faulty in a double way; it is absurd to bury every year one tenth of the harvest, when it might be used to so much better advantage; and it is useless to press the upper or white end of the cane, which yields an insipid juice, containing but little sugar. Another great mistake in their planting is that they do not leave a space large enough between each separate plant, the air cannot circulate, the under leaves dry up, while the cane grows high but has no body. Irrigation is often practiced at an improper time, a month before the crop is gathered in. This is done especially by those who sell their harvest for the works of the viceroy. They bring in their cane gorged with water; this excess of moisture, which has to be removed requires a greater quantity of heat, which causes increased consumption of fuel. Yet it seems that it is difficult to hinder the fellahs from exaggerating the weight of their crop to the detriment of its quality. They are like the farmers of Flanders, who sell their beets by the pound, and therefore prefer to have them heavy, rather than rich and good.

The rate of wages paid to the fellahs for their labor is on an average about eight cents per day, and it is often paid to them in food, yet they appear satisfied with it. And yet, working hands are wanting in Egypt. For centuries, masters of the country have squandered human life. Those works of art which to-day are the admiration of travelers, the pyramids, the hypogeums, the temples, and the monuments, have cost the lives of thousands. The insecurity of property, and more than that, the severe laws of bondage have been the cause of many formidable emigrations. When the neighboring tribes will have the assurance of their liberty and that they will not be overtasked, immigration will not be slow and the working population will soon increase.

Ismail Pacha has tried to remedy all these defects ever since his accession to the throne; but what are six years of an improved government in counteracting the evils of centuries of despotism.

Until of late, the Egyptian fellah has been tortured by an insecurity of person and property. The farmer never felt secure against an arbitrary order from Government, which would send him perhaps some hundred miles away from his home to do public work, just at the time when his own fields needed attention; and no one could be sure that the tax levied upon him to-morrow would not take everything he possessed. As of old, the Egyptian of the present day, when he receives a piece of gold, makes it his first care to dig a hole in the ground and bury it as if it was an ill-gotten gain. Egypt may be paved with gold, for this custom dates back to time immemorial. The cotton crisis during the civil war of America had enriched Egypt, yet where are these riches? The apparent prosperity of the fellah has not increased, and hardly any public buildings have been constructed. It is but too probable that all the riches are holden in the ground and will be so, until Ismail Pacha has given full assurance to his subjects, that a new era has begun for Egypt, and that personal liberty will henceforth protect every commercial enterprise.

The Isthmus of Suez, once the curse of the fellahs, may ere long become a blessing to them; for assuredly there is a rich mercantile harvest in store for Egypt since the Eastern portal has been unlocked, and the traffic which, until now, was divided, will concentrate on this hitherto barren neck of land, which in time will become cultivated. Lake Timsâh, which was formerly filled with fresh water and in which crocodiles flourished, has been filled with salt water, and sea-fish and oysters can in future be raised in its deep waters, as also in the Bitter Lakes. As to the extensive Lake Menzaleh, another great project has been laid before the members of the Company by a Mr. Ritt, a young Frenchmen, who proposed to drain off this vast lagoon and prepare it for the rice culture. The idea is grand, though it can only be accomplished at great expense.

With these large sheets of inland water, rain will be a more frequent occurrence in the neighboring deserts, the lack of which has hitherto been the main obstacle to the culture of the surrounding country.

The route which the pilgrims and caravans from and to Arabia pursued was to cross the Red Sea at Kosseir, whence they traversed the desert to Keneh to gain the Nile, and thus followed the water route to Cairo and Alexandria. The tedious journey will doubtless be abandoned after the opening of the canal; already thousands of pilgrims going and coming from Mecca have chosen this new road. Keneh and its environs may, nevertheless, become a place of importance through its rich sulphur mines and granite quarries. The borders of the Red Sea abound with inestimable treasures; but they are guarded against the desires of men by an evil genius—thirst! How can a mine be explored, even if it contains gold and emeralds, in a country where it never rains, and where in consequence, not a drop of fresh water is to be found?

Should this Canal of Suez prove a decided success, then navigation will spread upon waters that have heretofore been undisturbed, and we fully agree with Edmund About, when he says that "though M. de Lesseps cannot claim the original idea of this work, which is almost as old as the world itself, yet he has invented its success." The glory of the execution will be so much greater as the obstacles appeared at first insuperable. To conquer the indifference, skepticism, avarice, and ill-will which this work has met in its progress, is a greater triumph than was ever won on a field of battle.

Facts about Varnishes.

From the Hub.

"Crawling" is caused by the gloss of the coat beneath it, which does not form proper footing, as is shown by the fact, that just so soon as this gloss is removed, there is no further trouble found. "Crawling" is therefore not a serious trouble, for it may be easily prevented by washing the under coat with water and wiping with wash-leather, as this will destroy the brilliancy of the gloss, and, in many cases, the mere dusting with a stiff duster will be found sufficient. When a previous coat "crawls," I have found that the following coat is generally more apt to do so, and in cold weather there is more liability of this trouble than in summer, for then the gloss of the under coat seems to come up to a "harder sharp." But kill the gloss of the under coat, and you kill "crawling."

Most liquids give more or less of a varnish effect—that is, they give a shining appearance to the surface upon which they are placed. Thus, when water is poured upon a deal table, it brings out the grain of the wood, and brightens the place it occupies; but water dries, and the brilliancy is only momentary, consequently water is not a varnish, so-called. A solution of strong glue gives all the desired solidity, but having no brilliancy, it cannot be called a varnish.

There are many points to which the varnish manufacturers must direct careful attention, and which the customer must understand in order to judge of the merits of an article. Varnish should be a clear limpid fluid before application, and after being applied should become solid and have a brilliancy which reflects and refracts the rays of light like the fragment of a crystal. It is as a fluid what glass is as a solid. It hightens the tone of colors and preserves them; it brings out the delicacy of outlines and of shading, and time should neither color nor dim it. It is necessary that it should adhere to glass, wood, or stone, that it may not be removed by anything short of an iron instrument or by the action of fire. It must also be strong drying, and when dry and hard should become firm and unalterable in character so that it shall neither crack nor turn white, nor be affected by light or ordinary heat, nor removed by any ordinary solvent. In other words, the qualities to be considered, in testing a varnish, are as follows:

1st. *Its Paleness*—an important feature for some classes of work, and the one which is generally first looked to.

2d. *Its Fluency.*—Upon this depends the working quality. It also has much to do with determining the real value of the article, as it governs the amount of surface which a gallon will cover.

3d. *Time of Drying.*—This is essential, because it affords a speedy protection from atmospheric changes, insects, etc., and dispenses with the inconveniences of housing newly-varnished work for a long time.

4th. *Time of Hardening.*—This feature is entirely independent of the foregoing. A varnish is *dry* when its surface is sufficiently tough to resist dust, insects, and currents of air, and after *hardening* it is solid.

5th. *Fullness.*—This is often expressed by painters as "staying where put." If a varnish continues to look bright and to stand out prominently after drying and hardening, we say it has *fullness.* Otherwise it will look thin and "saddened."

6th. *Brilliancy*—Next to durability, this is the most important qualification of a varnish.

7th. *Durability.*—This is the principal consideration, and in examining the merits of a varnish, the consumer should direct careful attention to this point. It includes the quality of elasticity, which will prevent cracking and scaling, and the quality of resisting the corrosive action of the atmosphere and of moisture. It is the most difficult feature to decide upon, for it is simply a question of time, whereas the six conditions which precede may be fully tested by a few trials.

Having defined the seven qualifications which are requisite to the perfect coach varnish, we will add in the way of caution, that while testing a varnish, the purpose for which it is required must be held constantly in mind, and especial heed should be given to those features which will best qualify it for the class of work in question.

M. REGNAULT thinks it is impossible to lay down rules for the registration of mercurial thermometers; the only exact instrument suited for experiments requiring precision is the air thermometer. This is, however, an inconvenient instrument, and therefore M. Regnault recommends that it be used only as a standard with which to compare the mercurial instruments.

Improved Awning.

The common style of awning necessitates the employment of posts and a front rail, to which the awning is quite commonly attached with cords. When a roller is employed to wind up the awning, cords and rollers must also be attached to the front rail, but these are apt to get out of order and cause delay, when, in the case of severe storms of wind, it is desirable to take in the awning quickly. The awning is also liable to get wet while on the roller and mildew, unless a protective covering of board is constructed to shelter it, the latter presenting an unsightly appearance if sufficiently extended to afford the proper shelter.

Miller & McClellan's improved awning, engravings of which are herewith presented, obviates the necessity for posts or supports at the front edge, provides a neat and effective shelter for the awning when rolled up, is perfectly easy to spread out or roll up, is simple in construction, and remarkably tasteful in appearance. It can be fully or partially extended to admit or exclude light without the aid of a step-ladder, and in a moment's time.

MILLER & McCLELLAN'S IMPROVED AWNING.

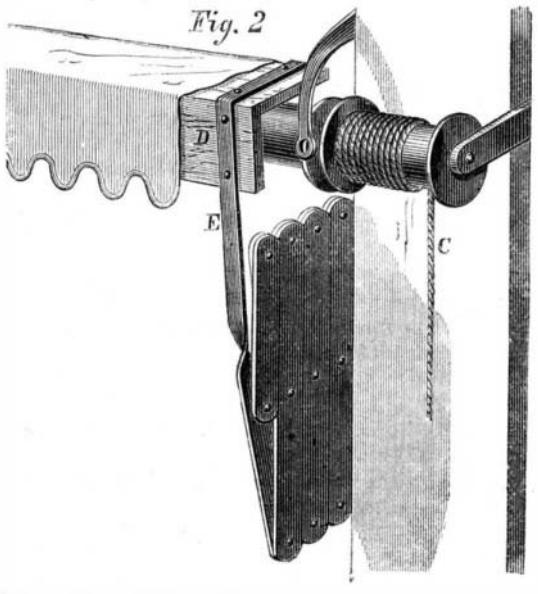
Fig. 1 is an engraving of the awning extended, a portion of one of the side flaps of the awning being removed to show a device for sustaining the roller at the middle.

The frame is formed of two lazy tongs, shown extended in Fig. 1, and folded at A, Fig. 2. A coiled spring on each side, one of which is shown at B, Fig. 1, exerts a force sufficient to keep the lazy tongs extended when no resistance is offered to its action. A cord, C, Figs. 1 and 2, is wound upon the roller when the tongs are extended. When the slack end of this cord is pulled it unwinds, at the same time turning the roller and winding up the canvas.

The front edge of the canvas is attached to two thin boards fastened together at right angles, as shown at D, Fig. 2. These boards are attached to the outer link of the lazy tongs, E, Figs. 1 and 2, as shown, thus forming a rail to which the front edge of the awning is attached. The action of the cord, C, in winding up the canvas pulls this rail inward, and, when it is completely drawn in, the outer link, E, of the lazy tongs carries it up over the roller, forming a complete shelter for the awning. When extended, the portion of the board shelter which is over the top of the roller in Fig. 2 assumes a vertical position, as shown in Fig. 1. The board shelter is covered on the outer side by canvas like the awning, which gives it an ornamental appearance, both when the awning is extended and when it is wound up.

A pair of supporting rollers at F, Fig. 1, serve to keep the main roller from sagging; and the resistance of the coiled spring, B, together with the action of these rollers, secures smoothness in winding.

The side flaps are run on cords with rings, which also wind up on the principal roller and slide the rings together from the inner side, thus folding the flaps.



We consider this form of awning as far superior to any form of canvas awning heretofore employed, combining, as it does, durability, convenience, and comeliness.

This invention was patented Nov. 12 and 26, 1867, and has been assigned to J. B. Armstrong, President National Bank at Urbana, Ohio.

Communications concerning purchase of rights or licenses should be addressed to Mr. Armstrong as above.

The Friction of Water in Tubes.

The friction or resistance which water encounters in its passage through tubes is much greater than generally supposed. The amount of resistance depends materially upon the smoothness of the walls of the pipe. This resistance is due to the particles of water, which, on coming in contact with the irregularities of the inner surface of the pipe, are thrown out of their true course, and thereby are not only delayed themselves, but impede the motion of other particles, in their onward flow. Experiments have proved that an inch tube 200 feet in length, placed on a level and connected as a discharge pipe from a tank, delivers only one fourth as much water as escapes through a simple orifice in the tank, of the same diameter as the pipe.

Air passing along tubes, is also much retarded, as miners who are obliged to employ such tubes for the ventilation of their mines, are well aware. It is on record that a person connected with a mine in Europe, without properly considering this fact, once erected a heavy bellows, for ventilating purposes, at a water-power two miles from his mine. When he set his apparatus in operation, he found it totally useless, his power was entirely taken up in the friction of the air through his two miles of pipe.

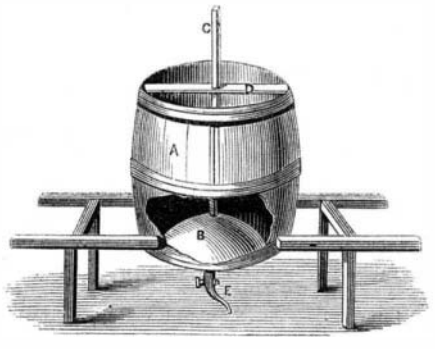
It is a singular fact that the friction of a liquid decreases in proportion as its temperature is increased. This is supposed to be due to a diminution of the cohesive properties of the particles of such liquid. It is well known that the more cohesive the liquid is, which is passed through a tube, the greater the friction and the slower the flow. This is apparent in the comparative flow of such liquids as water, oil, and sirups.

The velocity of water issuing from an orifice is as the square root of its altitude. Thus, calling the velocity of pressure under one foot, 1, the issue under 4 feet pressure will be 2; 9 feet 3; 16 feet 4; and so on. A *short* tube is found to discharge water much faster than a simple orifice in a vessel, without a tube; the difference in favor of the tube is nearly one half. This is due to certain peculiarities in the flow of liquids which can only be explained by the use of diagrams.

The simplest way of ascertaining the rate of discharge from an orifice, such as a pipe, duct, or drain, is to measure the quantity discharged in a given time. Such mode of determination may be readily employed where limited discharges only are in question.—*Mining and Scientific Press.*

A SIMPLE FILTER.

We give an engraving of a simple form of filter which may be of use to some of our readers, as we receive frequent inquiries upon the subject. A represents half a hogshead barrel; B a porous stone basin about 18 inches deep and 3 inches thick—or a double-wall box, having the space between the walls filled with clean sand and charcoal, and the walls finely perforated, may be used—through which the water has to pass, and fastened to the bottom of the barrel. C is a piece of thin lead pipe, which passes through the water to introduce air into the porous basin; D is the cross-piece to support the lead pipe; E is a tap to draw off the pure water, screwed in the bottom of the barrel. A small bunghole may be made in the side of the barrel to let off the refuse water when it requires cleaning.



When the porous stone vessel is used it may be cemented to the bottom. The wooden box, which will answer equally well, may be nailed fast.

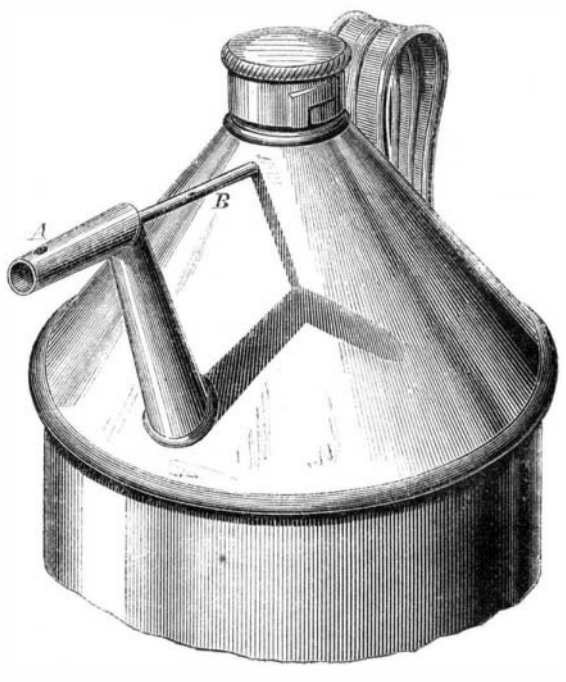
How to Choose a Steam Engine.

"Which is the most economical steam engine?" is a question often asked in these days of steam power.

What is meant by this question is, of course, which will take the least fuel? As the steam engine is quite simple in its best estate, there are but few points to consider in making the choice. It is not, however, the engine which is constructed in the most simple manner, or with the fewest parts, that is the most economical; for if this were the case, the best piston engine would be the one with a single slide valve like our locomotives. Such engines involve considerable waste of steam on account of the large passages between the valve and the piston; they involve also the necessity of exhausting through the inlet passages. These are grave objections when economy is the object sought, and it has been found far better to submit to a little complexity and have these objections removed; consequently the most economical engines are now made with four valves, viz., two inlet and two exhaust valves. The exhaust passages are made more than twice the capacity of the inlets, so that the piston is at once relieved of all counter-pressure, and receives the full value of the acting steam. Besides this, the valves are placed close to the ends of the cylinder so as to shorten the passages as much as possible. The loss of steam in some of the present locomotives amounts to some ten per cent. The boiler should be of such capacity and construction as to generate abundance of steam without a blower or extra draft, and the fire should be surrounded, except at the bottom, with generating surface. If wood is the fuel, the boiler ought to be longer than when coal is used. In either case the draft passages in and around the boiler should not extend longer than the heat maintains its generating power. The locomotive boiler may be considered one of the best type, but it must be of the best material and workmanship, else it will give much trouble. It should be surrounded with brick-work if used for stationary engines.—*Railway Times.*

H. W. STAPLE'S AUTOMATIC LAMP FILLER.

Our engraving represents an improved lamp filler called by its inventor the "Automatic Lamp Filler," which provides for the influx of air, as the oil is poured out, obviating the inconvenience caused by the lack of a vent in the old style of lamp fillers. A small tube, B, leads from the vent in the nozzle of the filler back to the breast of the can, which it penetrates. This tube is soldered to both nozzle and breast of the can, and forms not only a strong brace but permits the air to enter while pouring out the oil.



The ordinary cap, or a cork thrust on to the nozzle in the ordinary way stops at once both nozzle and vent.

This lamp filler was patented, through the Scientific American Patent Agency, Oct. 19, 1869, by H. W. Staples of Saco, Maine, for State rights or licenses to manufacture, address Howard Tilded, 63 Cornhill, Boston, Mass.

THE mechanical condition of surfaces does not wholly determine friction. Much depends upon the adhesive attraction of bodies, as to whether friction will be a maximum or minimum.