SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLI.—No. 21. [NEW SERIES.] NEW YORK, NOVEMBER 22, 1879. [$3.20 per Annum. [POSTAGE PREPAID.]

FRIEDMANN'S EJECTOR.

We give herewith an engraving which will afford an idea of some of the uses to which the ejector is applied. It is not only very simple, but one of the most effective machines within recognized limits, for raising water and conveying liquids rapidly and economically by steam, that has yet been invented, and in many instances the only one that can properly do the work.

It is applicable in a great variety of forms for raising water and other fluids from tanks, wells, ponds, mines, quarries, holds of vessels, docks, gas works, wheel pits, and it is also well adapted for conveying liquids, of various degrees of consistency, from tank to tank or floor to floor in breweries, chemical works, distilleries, sugar refineries, and other similar establishments.

In outward appearance the ejector is a cylinder of irregular form, varying in length from 6 inches to 3 feet, according to size and capacity, and in circumference proportionately to its length. There are three apertures in each machine, one for steam, one for suction, and one for discharge, that which admits steam being much smaller than either of the other two.

The sectional engraving at the top conveys a clear idea of the internal construction of these ejectors and reveals at once to the mechanical eye the secret of their power. It will be perceived that they are provided with a series of intermediate nozzles or cones, firmly fitted to the body of the ejector, by which the water from the suction pipe is admitted to the receiving chamber in successive streams.

The great utility of this arrangement (which is the vital principle of the ejector) lies just here. In the ejector the steam jet acts at first only on that portion of the incoming water which is admitted through the first nozzle or cone, so that only a comparatively small jet of steam is required to move it. This stream, propelled by the force of the steam, gives an impetus to the water entering through the second cone, and that in turn becomes a motor to the next, and so on until the last is reached. The water or liquid, accelerated in its passage through these successive nozzles or cones, as well by the force already described as by the vacuum always formed under such conditions, is carried with great velocity through the diverging pipe into the discharge pipe, with all the force and rapidity necessary to convey it to its required destination.

As a means of ejecting water in sinking shafts and cross-cutting drifts these ejectors are valuable, as they can be adjusted to the work, as it progresses, by simply lengthening the piping, the slow process of keeping the water free by means of buckets or bailing out being thus dispensed with.

The lower right hand view in the engraving gives a general idea of the operation of the ejector in shallow mines or coal pits, where the depth is not more than 100 feet.

The upper right hand view shows the ejector placed on the bank of a lake, river, or pond, 10 to 15 feet above the level of the water, for raising water for irrigation and other purposes. The large central view shows the ejector as applied to the filling of locomotive tanks from a river, pond, or ditch; and the view immediately below it shows the application of the ejector as a bilge pump. In view of their complete adaptability to this kind of work, and their ability to keep ships clear of water in case of accident from shot or shell, or leakage of any kind, the French, Austrian, Russian, Italian, Belgian, and other navies have provided their men-of-war with them.

We are informed that the British navy have also adopted

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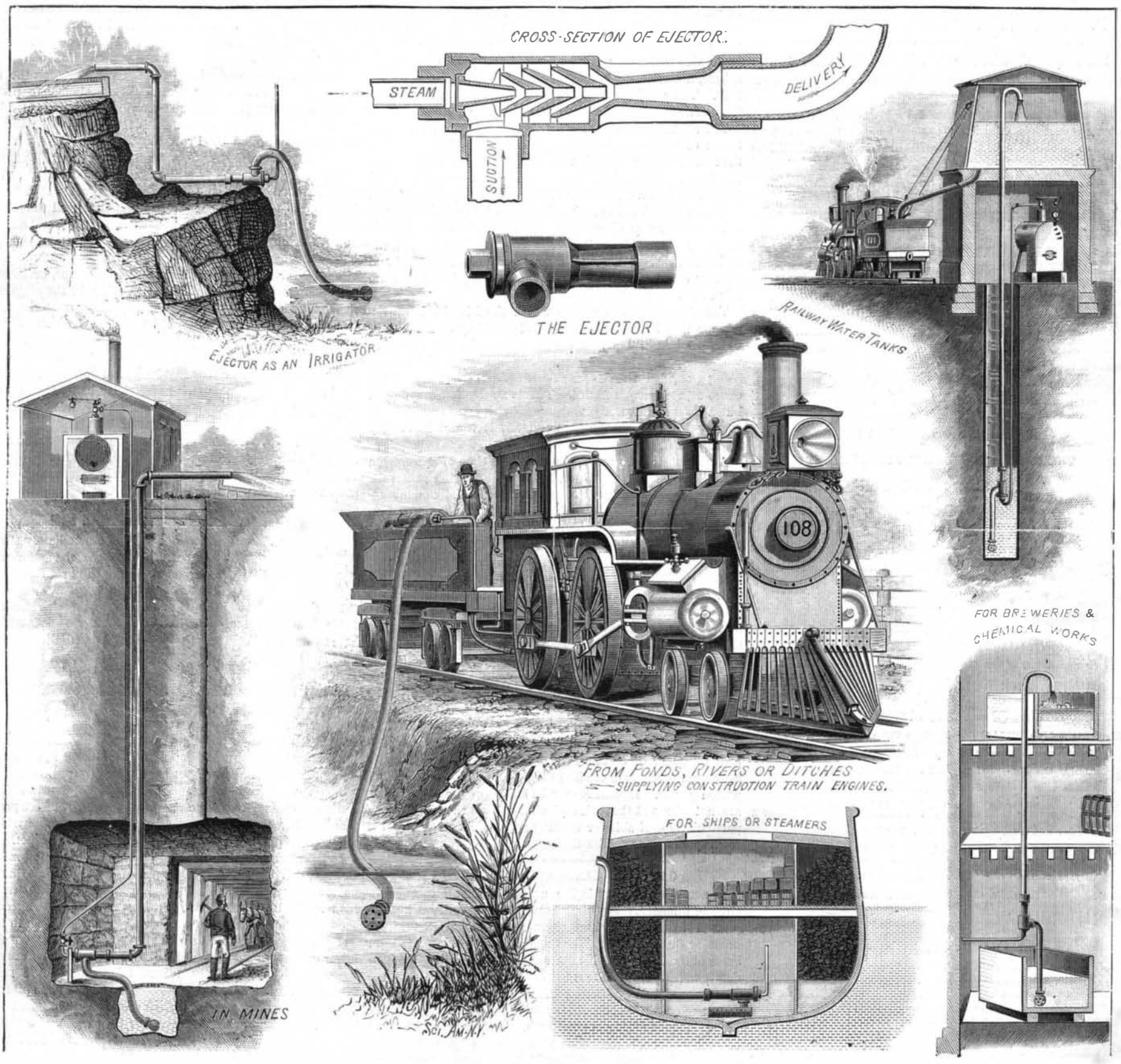


FRIEDMANN'S PATENT EJECTOR.

Mr. Otis E. Davidson, of Clarksville, Tenn., has recently patented an improved paper bag machine, which is capable of rapidly and economically making satchel-bottomed bags having a single lengthwise seam or lap. The invention consists in novel mechanism for feeding and pasting, and also creasing the continuous web of paper, and for cutting off blanks therefrom, and folding, pasting, and pressing the latter, and discharging them from the machine as completed bags. A complete detailed description of the construction and operation of this machine would require engravings.

An improved centrifugal honey extractor has been patented by Mr. George W. Williams, of San Diego, Cal. The invention consists in the combination of a revolving extractor fitted with swinging comb holders and a cylindrical vessel. The shaft carries radial arms and hinged foraminous comb holders.

Messrs. Louis Rakow and Charles H. Kunke, of Gilbert's, Ill., have patented an improved machine for holding the hubs and spokes of wheels whilethe spokes are being driven. The invention consists in a combination of devices which cannot be clearly described without engravings.

Mr. Samuel P. McClean, of Range, O., has patented an improved metallic burial safe, which is intended to effectually prevent what is known as "body-snatching." The invention consists in a strong metallic case having a cover provided with locking devices of such a character that when once locked they are permanently locked, and can never be opened except by cutting through the heavy iron of the case. Devices are also provided which prevent the digging of the earth down to the case; and the case is secured so that it cannot be removed bodily for the purpose of gaining entrance to it through the bottom.

Mr. Richard Elliot, of Plainfield, N. J., has patented an earth auger provided with guards in the spiral groove, made fan-shaped to allow the earth to work up past them when the auger is working into the ground, and prevent its relapse as the auger is pulled out.

Mr. Henry P. Schneck, of Huntingburg, Ind., has patented an improved hay carrier which consists of a frame having wheels and sliding on an elevated rod or track, and provided with a bottom sliding plate moved by the contraction of a spring, and also having a sliding bar and clutch, the whole being arranged so that it may be moved and operated in opposite directions.

An improved truck for loading locomotive tenders has been patented by Mr. Mark A. Dees, of Scranton, Miss. The object of this invention is to construct apparatus for loading wood or coal upon locomotive tenders in the required quantity at once in place of tossing the fuel by hand, as usually practiced, thereby saving time, and, in the case of wood, packing it more closelyon the tender. The invention consists in a truck adapted for being moved on a track by means of a rack and pinion, whereby one end may be projected over the tender, and fitted at its end with a tilting platform for receiving the fuel and discharging it.

Mr. Carroll J. Atkins, of Louisiana, Mo., has invented an improved elevator for putting ice from water into a house. The horizontal part of the elevator is to set into the water deep enough to allow the ice to be floated into it, while the inclined part extends up to the house to the height, or above it, at which the ice is to be packed. The ice is drawn up the incline by means of a windlass and chains or ropes.

THE CARE OF TOOLS.

We believe—although we are not certain that it is capable of demonstration—that more tools are ruined by want of care than broken or worn out by proper use. It is surprising how ready even the thoughtful workman is to leave to neglect the tool which has just subserved his purpose. Carelessness in the use of tools is a source of enormous annual expense to manufacturers and others, an expense which, if aggregated, would probably surprise even the most observant. On the farm the plow is left in the furrow, the hoe between the rows of corn, the shovel in the pit, the scythe on the tree, and the ax in the log—left to rust and to the liability of accidents. The wood-worker, called away suddenly from the job he is doing, leaves his plane on the board he has been smoothing, to be knocked off by the first passer-by, or allows the auger bit or the saw to remain in the half-pierced timber, to be broken by the first swinging board in the hands of the apprentice. The blacksmith leaves his tongs at the vise when he needs them at the anvil, and the machinist drops tap, drill, reamer, or hammer, where last used.

Order is the "first law" in the shop as in heaven, and care, no less than cleanliness, is "next to godliness." Next to the advantage of having a place for every thing is the wisdom of keeping every thing in workable condition. In the machine shop the use of impure oils in drilling, tapping, etc., is an expensive economy. Oil containing mineral or earthy matter is only a grindstone in solution. It cuts and abrades the edges of the tool, while in use, precisely as does the grindstone or buff wheel. Gummy oils are scarcely less injurious. They add to the friction of the tap or drill, and demand increased strength to resist torsion. A "gummed-up" tap or file is almost useless until thoroughly cleaned. The application of warm soapsuds, benzine, or turpentine, will not always remove this gum. In such a case they can be readily cleaned by covering them with oil, turpentine, or any inflammable substance, and exposing them for a moment to a flame until the liquid takes fire; then card or wipe them and they will be found to be in excellent order. Finishing files not unfrequently become clogged, and when the card is useless to remove the "gurry," this process will be found efficient.

Sometimes, also, in filing wrought iron the tough particles of the iron are torn off by the teeth of the file and lodge, producing scratches on the work, and thus impairing the efficiency of the tool. A simple device, which we used for years, that easily and quickly dislodges these clinging particles, is a piece of soft iron wire flattened under the hammer at one end to a chisel point, or disintegrated like a broom and used thus: The point of the file resting on the bench, the handle held by the left hand; then strike across the face of the file, in the direction of the "first cut" teeth, with the flattened end. It certainly and thoroughly dislodges the snags, and the file is ready for work. The wire instrument may have a ring turned at the handle end, or be affixed to a wooden handle. No. 8 wire is large enough.

Turning tools, after being tempered and ground, are frequently left wet from the stone until wanted for use. In this state the keen edge is acted upon by rust, and a regrinding becomes necessary. If not put at once to the oil stone they should be wiped with oily waste. These little matters are more important than they seem at first sight. A saw or chisel which has been used in unseasoned wood, should be carefully wiped and oiled, otherwise it contracts rust, and wears away fast. A new file should not be put upon the scale of cast iron or of unannealed steel, and a file kept for brass or bronze should not be used on a harder metal. Back saws for cutting iron and other metals are often ruined in inexperienced hands. If drawn forward and back too rapidly they heat and lose their temper, when they become almost useless.

A hundred other instances might be adduced to show the depreciation of tools by neglect and the necessity of paying attention to these "little things." The real economist, however, needs but a hint, while the constitutionally careless are slow to see their errors.

The Microscope in the Witness Box.

As the New York *Tribune* says, the scientific aspects of the evidence against the Rev. Mr. Hayden, of Madison, Conn., for the murder of Mary Stannard, are truly remarkable; indeed the microscopic exhibition of arsenic and the comparison of arsenical crystals show that the law has a powerful auxiliary in chemistry. After the arrest of Mr. Hayden, and the disinterment of the remains of the dead girl for examination, it was claimed that all of the arsenic which Hayden had bought was still in a box in the barn. There a box was found containing a full ounce. It was shown that the arsenic found in Mary Stannard's stomach could not have been taken from this box. At this point recourse by the prosecution was had to Prof. Dana, who visited England, studied the manufacture of arsenic, and then, by the use of his microscope on the crystals, demonstrated that the arsenic from the girl's stomach was an entirely different lot from that hidden in the barn, and that it was identical with the arsenic sold by Tyler, at the time when Hayden is known to have bought his ounce. The conclusion sought to be established is that a part of the arsenic bought by Hayden was used to poison the girl, and that the rest was flung way, and that the barn arsenic was bought elsewhere afterward merely as a blind. The crystals of the stomach arsenic are three or four times as large as those of the barn arsenic, but none of them are large enough to be visible without the microscope. Hereafter criminals will do well to recognize in science one of the agents of possible detection.

Profitable Reading.

In these days all men and women read something, but the trouble is that by reading in a single vein, which so strongly appeals to their individual tastes and personal idiosyncrasies that it is not study at all, they lose their power to study anything else. The rule for successful and profitable reading would, in the light of these facts, seem to be to read only what one does not like to read. That reading which costs no effort, and necessarily dissipates the power of study, is that which we know to be important in itself, and in its bearings upon broad knowledge and culture should most engage our time and attention. The trouble is, not that we do not read enough, but we read so much of that which simply pleases us as to destroy our power to read that which will edify and enlarge us.—*Dr. J. G. Holland.*

Probable Uses of the Telegraph.

The following curious item, headed as above, was published in the SCIENTIFIC AMERICAN, October 26, 1867, when telegraphy may be said to have been in its early infancy:

Why should not every house have its telegraph wire? When gas was first applied to purposes of illumination it was used only in the public buildings and streets, and even now on the continent of Europe it has been introduced but sparingly into private dwellings. Why may not the telegraph wire be extended and diffused—if we may say so—as the gas pipe has been? Suppose a network of such wires laid from a central point in the city to the library or sitting room of every dwelling, and an arrangement made for collecting news similar to that controlled by the associated press. Through the wires, then, this news might be instantly communicated to each family, without the work of time rendered necessary to put it into type, print it, and distribute it by means of carriers. A fire, a murder, a riot, the result of an election, would be simultaneously known in every part of the city. Of course, this would do away with newspapers, but what of that? All things have their day, and why should such ephemeral things as newspapers be an exception to the rule?

THE EJECTOR.

[*Continued from first page.*]

them after a thorough test, and after a severe competition with those of English make. Ocean and coasting steamers provided with one or more of these ejectors in each watertight compartment would have a means of keeping clear of water until the necessary repairs could be made.

It is not sufficient to say that a steamer is provided with pumps, as it is a notable fact that pumps are almost always in a state of disarrangement, whereas there is nothing in the ejector that can get out of order or be misplaced.

The upper right hand view shows the application of the ejector to the fitting of railway water tanks, and the view below it shows its application to work in breweries and chemical works.

The ejectors are made in different ways for different purposes, and persons contemplating adopting these useful instruments should address Messrs. Nathan & Dreyfus, 108 Liberty street, New York city, for further information.

Water and Fire Proof Paper.

A water and fire proof paper lately patented is made by putting a mixture of ordinary pulp and asbestos reduced to pulp in the proportion of about two-thirds of the former to one-third of the latter into a strong solution of common salt and alum. This mixture is put through the engine and then run off through a Fourdrinier. The paper thus made is run through a bath of gum shellac dissolved in alcohol or other suitable volatile solvent of that gum, and subsequently through ordinary calender rolls, after which the paper is ready to be cut into such sized sheets as may be required for use. The effect of the strong solution of salt and alum upon the paper is to greatly strengthen it and to increase its fire-resisting qualities. The shellac bath to which it is treated is said to cause the paper to become thoroughly permeated with the gum, so the paper becomes water-proof to such an extent that long boiling in water does not disintegrate it, and the presence of the gum in and upon the surface of the paper seems to present no obstacle to the proper and usual absorption of ink, either printing or writing. Thus, by the combination of the asbestos, salt, and alum in the paper, it is rendered so far fire-proof that a direct exposure to an intense fire does not burn up the substance of the paper to an extent that interferes with safely handling it, and when exposed to great heat in books, or between metallic plates, a number of sheets together, it is much less injured by the fire.

The addition of the gum shellac to the paper makes it, for all practical purposes, water-proof, so that if account-books, valuable documents, bank bills, and other monetary papers for which this paper is used be subjected to the action of fire and water, either one or both, in a burning building, they will not be injured to such an extent as to destroy their value.

A Large Electro-Magnet.

Mr. Charles Reitz, of Indianapolis, Ind., sends us a description of a large electro-magnet made by him for Professor Zahm, of the University of Notre Dame. The length of the cores is 30 inches, diameter 4 inches. Heads, of rubber, ½ inch thick, 9 inches in diameter. The yoke is 3¾ inches thick, 6½ inches wide, and 18 inches long, with 3 inch slots to admit of moving the cores. The bolts which connect the cores with the yoke are 1¼ inches in diameter. The cores are wound with eight layers of No. 6 cotton covered copper wire, the wire being wound double, and the alternate layers being provided with terminals, which are connected with a plug switch on the baseboard, so that the electric current may be sent through the coils in various ways. The magnet is provided with two sets of pole extensions for diamagnetic experiments, one set being conical, the other flat. The armature is 15 inches long, 3 inches thick, and 4 inches wide.

Different effects may be produced in this magnet by connecting the coils with the battery in different ways. The changes that may be made in this way are almost without number. It is estimated that the magnet, with proper battery power, will lift three tons. The weight of the magnet and its attachments is 800 pounds.

The Maryland Ship Canal.

The route chosen for the proposed ship canal between Chesapeake and Delaware bays begins at Queenstown, Maryland, and runs across the peninsula to Lewes, Delaware, discharging into Delaware Bay, five miles above the Delaware breakwater; distance, 51 miles. It is proposed that the canal shall be 200 feet wide and 25 feet deep, with tide locks only. The entire line will have to be dug; estimated cost, $31,000,000. The saving in distance between Baltimore and any Northern port will be 225 miles.

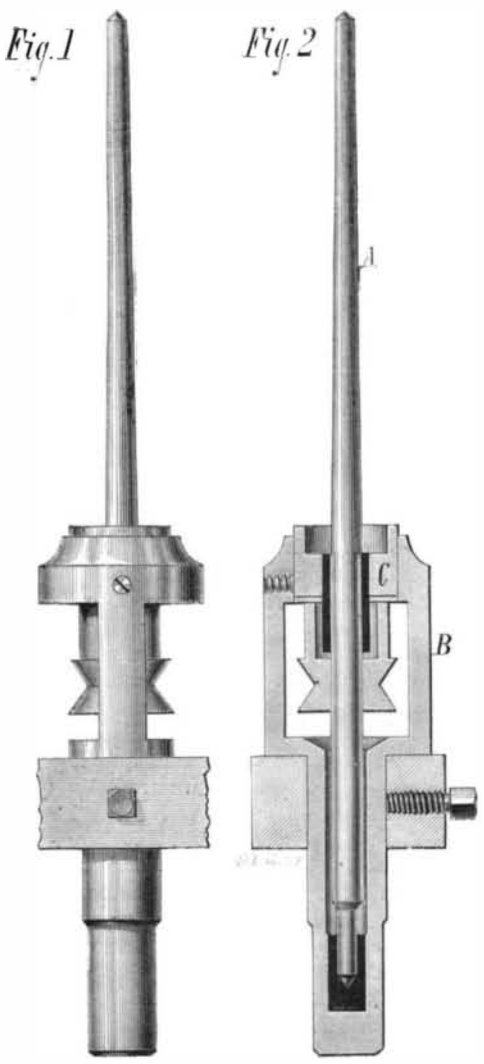
Value of Knowledge.

It is affirmed that "a little knowledge is a dangerous thing." The saying may be true, but it is not necessarily true. I cannot help thinking that it is a great advantage to you to gain as much knowledge as you can, of as many subjects as you can, and not to be deterred by any fear that your knowledge, being superficial, may lead you into error. Of course, the danger is that a person, who knows only a little of a subject, may fancy himself well qualified to give an opinion on points that are really out of his depth; but as long as a person feels and knows that his knowledge of a subject extends only so far, and does not venture beyond

his depth, that person has everything to gain and nothing to lose by getting some knowledge of it, even though the knowledge may be limited.—*Hon. W. E. Gladstone, M. P.*

AN IMPROVED SPINDLE.

We give herewith a side elevation and sectional view of an improved spindle and bolster patented by Messrs. Joseph Duffy & Henry Whorwell, of Paterson, N. J. The object sought by the inventors is to provide a bolster which will



DUFFY & WHORWELL'S IMPROVED SPINDLE.

properly support the spindle, and yet permit of readily removing the spindle and its whorl when occasion requires, and to facilitate the lubrication of the spindle bearings.

The spindle, A, revolves in its bolster, B, which is secured in a socket in the supporting rail by means of a set screw. The tubular lower portion of the bolster, together with the bridge piece that supports the upper bearing of the spindle, are formed of a single piece, and the sleeve, C, in which the spindle revolves is of the same diameter as the whorls, so that when the sleeve is loosened the spindle, together with its whorl, may be removed from the bolster. An annular oil cup is formed in the upper end of the sleeve, C, and an annular collar formed on the upper side of the whorl incloses the lower end of the sleeve, C, and returns to the bearing the oil that runs through the sleeve.

We understand that three frames, containing in all 900 spindles of this improved kind, have been built by the Danforth Locomotive and Machine Works, and are now in operation in the Watson Works at Paterson.

This spindle can be readily adapted to frames now running inferior spindles. The inventors claim that this spindle is clean, economical, free running, and substantial.

Further information may be obtained by addressing Messrs. Duffy & Whorwell, at the Danforth Locomotive and Machine Works, Paterson, N. J.

THE OTTER.

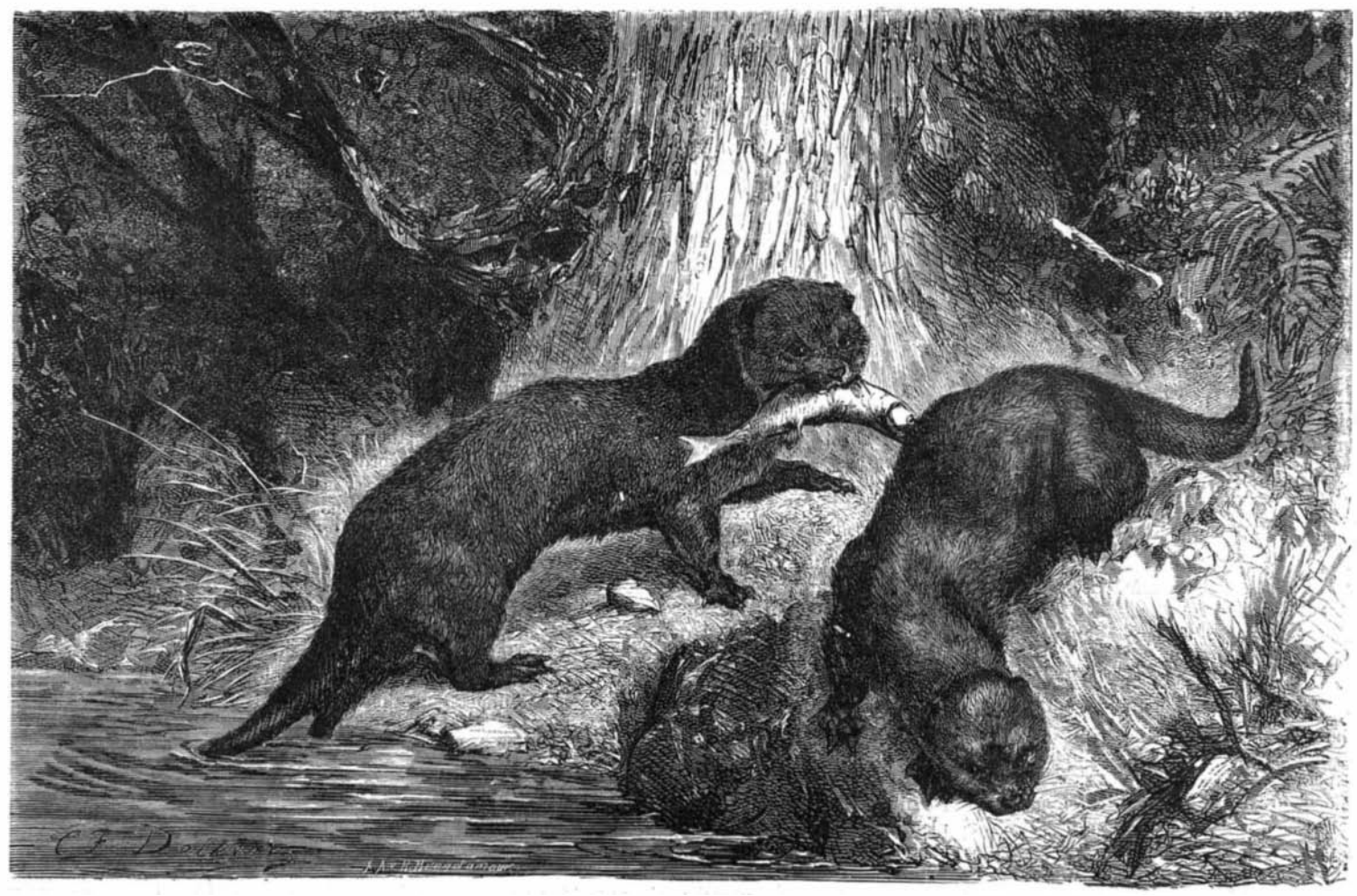
Although by no means a large animal, the otter has attained a universal reputation as a terrible and persevering foe to fish. Being possessed of a very discriminating palate, and invariably choosing the finest fish that can be found in the locality, the otter is the object of the profoundest hate to the proprietors of streams and by all human fishermen. It is so dainty an animal that it will frequently kill several fish, devouring only those portions which best please its palate, and leaving the remainder on the banks to become the prey of rats, birds, or other fish-loving creatures

For the pursuit of its finny prey the otter is admirably adapted by nature. The body is lithe and serpentine; the feet are furnished with a broad web that connects the toes, and is of infinite service in propelling the animal through the water; the tail is long, broad, and flat, proving a powerful and effectual rudder by which its movements are directed; and the short, powerful legs are so loosely jointed that the animal can turn them in almost any direction. The hair which covers the body and limbs is of two kinds, the one a close, fine, and soft fur, which lies next the skin and serves to protect the animal from the extremes of heat and cold, and the other composed of long, shining, and coarser hairs, which permit the animal to glide easily through the water The teeth are sharp and strong, and of great service in preventing the slippery prey from escaping.

The color of the otter varies slightly according to the light in which it is viewed, but is generally of a rich brown tint, intermixed with whitish-gray. This color is lighter along the back and the outside of the legs than on the other parts of the body, which are of a paler grayish hue. Its habitation is made in the bank of the river which it frequents, and is rather inartificial in its character, as the creature is fonder of occupying some natural crevice or deserted excavation than of digging a burrow for itself. The nest of the otter is composed of dry rushes, flags, or other aquatic plants, and is purposely placed as near the water as possible, so that in case of a sudden alarm the mother otter may plunge into the stream together with her young family, aud find a refuge among the vegetation that skirts the river banks. The number of the young is from three to five, and they make their appearance about March or April.

On account of the powerfully-scented secretion with which the otter is furnished by nature, it is readily followed by dogs, who are always eager after the sport, although they may not be very willing to engage in single fight with so redoubtable an opponent. An otter has been known to turn savagely upon a dog that was urged to attack it, to drag it into the water, and to drown it. The best dogs for the purpose are said to be the otter hounds. Even human foes are resisted with equal violence.

The fur of the otter is so warm and handsome that it is in great request for commercial purposes. The entire length of the animal is rather under three feet and a half, of which the tail occupies about fourteen or fifteen inches. On the average, it weighs about twenty-three pounds; but there are examples which have far surpassed that weight. Mr. Bell records an instance of a gigantic otter that was captured in the river Lea, between Hertford and Ware, which weighed forty pounds.



THE OTTER.—*Lutra Vulgaris.*

NEW BARREL LIFTER.

It is difficult to conceive of a more ungainly and inconvenient object to handle than a common barrel. It is very well calculated for rolling about on a level surface, but when it is desired to lift it from one level to another, as from the ground into a wagon, for example, or carrying it up and down steps or stairs and through narrow passages, it is quite a difficult matter

BROWN'S BARREL LIFTER.

The engraving shows a device, the invention of Mr. William Brown, of 65 Java street, Greenpoint, L. I., which is intended to facilitate the handling of barrels. It is a very simple and efficient contrivance, and is adapted to barrels of different sizes. It consists of two pairs of triangular castings, A, each pair being connected by a handle, B, and a curved iron or steel bar, C, at the top, and the iron hoop which surrounds the barrel passes through mortises in the lower arms of the castings and is held in place by set screws. The hoop may be adjusted to barrels of different sizes by loosening the set screws and sliding the ends of the hoop one way or the otherthrough the castings.

The manner of applying the lifter will be clearly understood by referring to Fig. 1 in the engraving. An upward strain upon the handles puts a lateral strain upon the hoop, and brings the curved bars, C, against the side of the barrel with sufficient force to admit of lifting it by the handles. A patent is pending for this invention in the United States Patent Office. Further information may be obtained by addressing the inventor as above.