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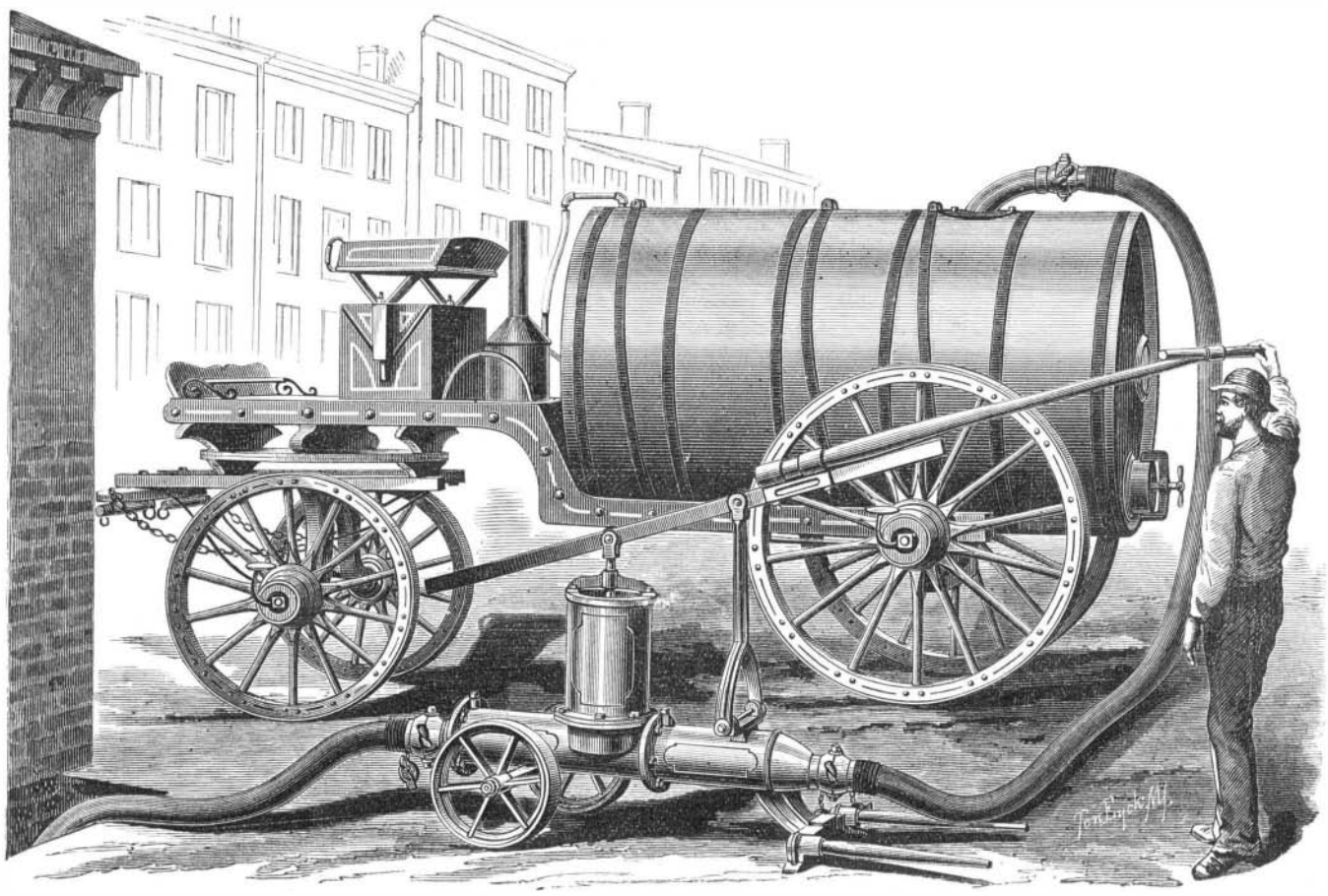
IMPROVED DEODORIZING EXCAVATING APPARATUS.

We devote our initial page this week to engravings of an improved apparatus for removing any kind of thick, semi-liquid material, or fluids heavily laden with solid obstructions, from vaults or excavations. The widest application such a machine necessarily finds is in the cleaning of cesspools, and similar receptacles for refuse, for which work it is remarkably well adapted in construction. The device, as represented in Fig. 1, consists of a pump which raises the material and forces it into the tank. The air at the same time driven into the latter, escapes through a deodorizer shown at the front part of the truck, and is there deprived of all noxious emanations by percolation through a suitable chemical solution. In this last respect the apparatus differs from others, in which the deodorization is accomplished by forcing the air through burning charcoal; and among the advantages thus claimed to be realized, besides the more complete removal of foul smells, is the obviation of sparks from the furnace, which a strong blast might throw upon and thus endanger adjacent buildings.



JOHNSON AND NETTLETON'S DEODORIZING EXCAVATOR.

The essential features of the system lie in the construction of the pump. This consists first of a barrel, mounted on trucks and provided with handles for convenience in transportation, and second, of a simple pump cylinder placed at right angles thereto and containing a piston operated by the lever shown in the hands of the figure. To each end of the barrel is connected a section of hose, by means of a simple and effective form of coupling. The pipe which leads from the vault is secured to the more elevated end of the barrel when the latter is placed for working, so that the natural tendency of the material is to flow directly into the pump. The other hose of course leads from the pump to the vat in which the refuse is carted away.

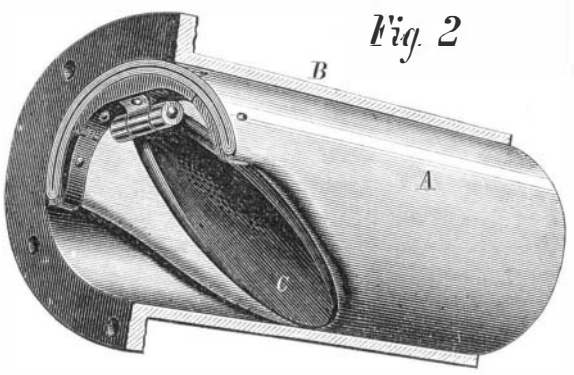
In all apparatus designed for pumping out the contents of cesspools, etc., the main difficulty encountered is to construct the valves so that they will allow of the passage of solid substances as large as the pump barrel will admit, and at the same time remain tight for fluids: and this without becoming choked so as to render necessary the repeated dismemberment of the machine in order to clear them. In tanneries, where similar material is dealt with, the old boot leg valve has long been employed; but to this the objection is urged that gravel or small solids are liable to fall between the sides of the valve and the barrel, and so ultimately to prevent the opening of the valve. To obviate this trouble the novel form of valve represented in Fig. 2 has been devised, and to this it is desired especially to direct the attention of the reader. It consists of a section of strong rubber tube, A, inserted into the barrel, B, for some distance from the end. This done, the lower edge of the tube at the end is brought up against the upper and opposite edge, and the two thicknesses of rubber are fastened together and to the inner periphery of the barrel. A metal strengthening plate is added to the valve, and to this is hinged the spoon-shaped piece, C.

From this construction it will be seen that the action of the pump must draw the material under the tube and between it and the barrel, and further that any solid capable of being pushed between these surfaces will easily pass through. The return stroke of the pump, forcing back on the valve, acts on the inside of the tube, B, pressing the same tightly against the entire periphery of the barrel. The object of the metal piece, C, is to receive the compact of hard substances and thus shield the rubber tube. The inventors inform us that, no matter how large the object which, at the end of the up stroke of the pump, may remain caught between the outside of the tube and the inside of the barrel, the rubber on the down stroke will be forced around the obstruction, and sufficient surface will pack against the barrel to render the valve perfectly tight.

One of these valves is placed at the inlet orifice and the other at the outlet, each opening in the same direction, so that the up stroke of the pump which opens the inlet closes the outlet, and *vice versa*. No material passes through the piston, and only liquid matter comes in contact with that portion; sand, gravel, stones, etc., being heavier, fall to the bottom, thus avoiding all grinding of the cylinder, while from their own gravity they move forward to the mouth of the second or outlet valve.

The inventors have exhibited to us huge stones and obstructions which it would appear must prove a stoppage to any pump, but which, they affirm, were easily drawn through.

Fig. 2



The apparatus is now on exhibition at the American Institute Fair in this city, where it may be inspected. Patented by A. W. Johnson and H. A. Nettleton, June 15, 1875. For further information address the manufacturers, Messrs. Mathewman & Johnson, New Haven, Conn.

Joints in Carpentry.

Professor Rankine sums up the principles, which should be adhered to in designing joints and fastenings in carpentry, concisely as follows: 1. To cut the joints and arrange the fastenings so as to weaken the pieces of timber they connect as little as possible. 2. To place each abutting surface in joint as nearly as possible perpendicularly to the pressure which it has to transmit. 3. To proportion the area of each surface to the pressure which it has to bear, so that the timber may be safe against injury under the heaviest load which occurs in practice; and to form and fit every pair of such surfaces accurately, in order to distribute the stress uniformly. 4. To proportion the fastenings so that they may be of equal strength with the pieces which they connect. 5. To place the fastenings in each piece of timber so that there shall be sufficient resistance to the giving way of the joint by the fastenings shearing or crushing their way through the timber.

The Sinking of the Vanguard.

One of the finest vessels in the British navy, the Vanguard, was recently sunk by her consort, the Iron Duke, through an accidental collision during a fog. The Vanguard, it seems, was leading, and, suddenly sighting a large merchantman ahead, in accordance with the usual rules of the road ported her helm. In so doing she presented her broadside to the Iron Duke, which, though rendered invisible by the fog, was closely following. Before the Vanguard could get out of the way, the Iron Duke crashed into her. Both vessels were heavily armored, and both especially built for ramming. The result was that the Iron Duke's prow cut into her consort's broadside as if it were so much paper. The strict discipline of the man-of-war averted what probably would have been, in a merchant passenger vessel, a fearful loss of life, as, in the very short time which intervened between the shock and the sinking of the ship, the entire crew of 450 men was safely removed in the boats.

The vessel cost, it is said, $2,500,000, and this loss is still further increased by all the personal property of the crew sinking with the ship. The casualty furnishes, however, an expensive but nevertheless valuable experiment as to the powers of the ram. The Vanguard is the first modern ironclad upon which the capabilities of this terrible weapon have been tested. Even the very heavy armor proved no protection to the blow delivered at the moderate speed of five knots per hour. The effect of impact, had the ironclad been driven at double or treble that speed, as she might be, can be imagined.

The Vanguard was well provided with compartments, but these, though airtight, and hence buoyant when sealed, were, at the time of the accident, not all closed. To those that were shut, the fact of the ship's remaining above water as long as she did (one hour) is due.

Dr. Leverett Bradley.

Dr. Leverett Bradley died recently in Jersey City, N. J., in the 77th year of his age.

For a number of years past Dr. Bradley has been well known as an electrician of considerable ability; but he is best known from the invention, which he patented in 1865, for winding helices with uncovered wire. In 1859 he secured a patent for an automatic telegraph apparatus, with which, on a short circuit, he succeeded in recording about 15,000 words per hour, but he was unable to practically work the apparatus on a telegraphic line of ordinary length.

In 1873, he obtained a patent for an apparatus for electric measurement, being a combination of a tangent galvanometer and rheostat, which proved very successful, and is now being much used in colleges and other institutions of learning as a means of instruction and experiment.

Professor Samuel D. Tillman, LL.D.

The death of Professor Tillman, which occurred on the 4th of September last, will be deplored not only by the members of the American Institute, with which society he has been identified for many years, but by scientific men throughout the country. Few men have attained so wide a knowledge of every branch of mechanical, scientific, and general learning; and few have worked more earnestly in behalf of the

mechanic and the inventor, and toward the furtherance of scientific progress. Professor Tillman was a native of Utica, New York, and was born in 1803; he graduated at Union College, and subsequently studied law. About twenty years ago, he came to New York and devoted himself to scientific and literary pursuits. Becoming a member of the American Institute, he was elected corresponding secretary and also chairman of the Polytechnic Club, which positions he held at the time of his death. He edited the transactions of the Institute, published annually, and also wrote several essays, principally on musical and chemical subjects, which exhibited marked ability and originality of thought.

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Contents.

(Illustrated articles are marked with an asterisk.)

THE RELATIONSHIPS OF NATIVE AMERICANS.

There has been so much wild guesswork indulged in, with regard to the origin and racial affinites of the natives of this part of the world, that any new attempt to determine who they were or where they came from is more apt to be received with derision than with over credulity. History, tradition, and archæology have been appealed to, in turn and all together, to settle the question, but it has refused to be settled. Now the younger science of comparative philology essays the task, with, let us hope, a better promise of success.

The task is an enormous one, since all the dialects of America must first be compared with each other, then collectively with all the dialects of the old world, particularly with the little known dialects of the old world of antiquity. Unfortunately the task is too generally complicated with irrelevant questions of migration, points of original dispersion, routes, etc., questions which there can be little hope of answering save for the most recent of national origins and movements It lies with geology—not history or philology—to tell where man originated, and when. In course of time, may be, traces of man's earliest migrations will be discovered; but for a long time, probably, the data for determining the order of his conquest of the earth must remain hidden under soil and sea. Certainly every attempt to account for the peopling of America by migrations along existing routes must be obviously absurd, since the evidences of man's presence here point to an age anterior to the geographical conditions by which those routes came into existence. Whether the new world was first settled from the old, the old from the new, or both from some continent now submerged, there is as yet no evidence for deciding. We doubt the possibility of determining absolutely the relationships even of those comparatively modern races whose names appear in the songs and traditions of the early history.

Still, comparative philology has done much toward making out the affinities of existing races in both worlds with those that preceded them at the dawn of the historical period; and the linguistic connection between the native races of America and those of the eastern hemisphere seem to be far closer than has been supposed of late.

Señor Lopez, who has given much time to the study of the languages of South America, goes so far as to assert, in his *Races Aryennes du Péron*, that the descendants of the Incas still speak an undeveloped Aryan tongue; and that their ancestors must have come from the same stock which furnished the great inflected languages of India and Europe, our own among them. He finds their language—the Quichua still spoken over a large part of Ecuador, Peru, Bolivia, and the Argentine Republic—full of Aryan roots, though it remains at a pre-Aryan grammatical stage, the agglutinative. His inference is that, before the grammatical forms of Aryan speech had been developed, there had been a separation of the people speaking the yet undeveloped tongue, the portion represented by the ancient Peruvians failing—as all non-Aryan races have done—to carry on their linguistic changes to the inflected stage.

The author of the latest comparative study of the dialects of America, Robert Ellis, is quite willing to grant that the Aryans were akin to the ancient Peruvians (all languages pointing more or less clearly to a single original source), but not that they were next of kin. "The American nations, considered as a whole," he says (*Peruvia Scythica*, page 3,) "and the Iberian and Turanian nations on the shores of the Pacific opposite to Peru, must, I think, stand before the Aryans in this respect." In other words the Quichua language is a highly developed representative of the American family of languages, and these as a whole are more nearly related to the Iberian and Turanian languages than to the Aryan. Indeed the Americans, the Iberians, and the Turanians are regarded by him as branches of one race—Rask's "Scythians."

Evidence of the close relationship of the Quichua language with the other dialects of America is found in their numerals. Comparing them again with the numerals of Africa, Asia, and Europe, the nearest parallels are found among the Turanians (Tungusians, Samoyeds, Turks, Chinese, Siamese, Malays, etc.), and the Iberians (Circassians, Georgians, Basques, etc.) The Aryan and Semitic parallels are more remote. "The Quichua numerals," says Mr. Ellis, "plainly connect the ancient Peruvians with he nations of the old world, their nearest kindred there appearing to be the Turanians, especially those of the yellow race."

The same is learned from a comparison of the personal pronouns of these different peoples; and similar testimony is borne by the parallels existing in American and Turanian languages between the forms of words for man, woman, head, hair, eye, nose, mouth, tongue, ear, hand, foot, bone, blood, sun, moon, star, sky, day, night, tree, stone, egg, bind, fish, ant, etc., words sure to be found in every language, however primitive, and of such common use that they are little likely to be lost or changed in course of centuries. The inference drawn from a comparison of this class of words, as found in dialects of every race and every part of the world, is that the ancestors of the Iberians, the Turanians, and the Americans were more closely united to each other, by race and speech, than either of them were to the Aryans, the Semites, or the Negroes. In other words any tribe of Indians is more directly related to the Chinese than these are to the Hindoos: more nearly related to the Basques than these are to their Spanish neighbors.

Supported as it is by much evidence drawn from the stores of archæology, architecture, national customs, etc., this testimony of comparative philology seems worthy of a good deal of credit. If future researches sustain it, our fast decaying Indians might boast—if they were able to appreciate the honor—of family ties of no mean order: with Etruria of old; with the mighty Empire of Gengis Khan in Marco Polo's day: with China and the rising empire of Japan in our own times.

AMATEUR ENGINEERING.

An effect of the widening use of steam machinery is that it tends to raise up a multitude of men who—trusting rather to that familiarity which breeds contempt than to the practical knowledge of the nature and properties of steam which every trustworthy engineer must have—are ever willing, if not eager, to step into the engineer's berth. They have seen an engine run, day in and day out. Perhaps they have helped occasionally to run one. At any rate, they have worked about an engine a good deal; and as the engineer does not impress them as a man of remarkable ability, they do not see why anybody cannot do as well as he. At least, they are confident that they can, and, in case of emergency, are willing to put their knowledge (or their lack of it) to a test.

When the emergency arises, employers are too apt to give such amateur engineers a chance to try their hand. The actual engineer is called off suddenly, is sick, or otherwise kept from his post. Somebody must take his place or every body must stop work. What shall be done?

Dick is handy. Not a regular engineer, to be sure, still a bright fellow who knows an engine well enough to keep it running if all goes right; and the particular engine, the engineer says, is in such good condition that it will almost run itself. So Dick is called in and the gap is filled. Sometimes the engineer is away longer than was anticipated; sometimes he never comes back. Dick has done well so far; he has gained some experience in caring for the engine; and if he is willing and modest in his charges—of course, he won't expect a full fledged engineer's pay at first—his sudden promotion is likely to be a permanent one. He may turn out equal to every emergency: then, again, he may not.

It is not long since a case of the kind resulted, in our harbor, in the blowing-up of a crowded ferry boat. There was a terrible list of killed and wounded; and Dick (an illiterate negro) was returned to his proper place as deck hand or fireman. It was criminal, in the first place, to let him step out of it.

But a few weeks since an English manufactory was blown up, killing several workmen. The regular engineer was absent, sick; and the substitute, who succeeded in making such a mess with things, was one of the workmen, promoted for the occasion on the strength of his pretended ability to run an engine—ability gained from observation, apparently, since his engineering education was but the slightest, and his practice as limited as it was disastrous.

With characteristic deference to the rights of property, the coroner's jury in this case modestly suggested that, in future, the proprietors of the works would do well not to trust their boilers with any one in whose capacity they had not perfect confidence!

In a leading family paper we saw, the other day, a well written story, telling "How Tom became an Engineer." Tom was of the genus loafer: specific habitat, a country railway station. The hight of his ambition was to run an engine. A commonplace lad would have gone to work in a locomotive shop, or, more modestly, would have begun by shoveling coal as fireman. Not so Tom. He was to be engineer or nothing. So he loafed about the station, watching his opportunity. His time came with a smash-up on the road, a relief train called for, and no engineer at hand. Of course Tom volunteered, was accepted, and performed his task with the *élan* of all great geniuses. Equally of course he was thereupon made master of an engine, and speedily rose to be president of as many railways as if his name had been Tom Scott.

The moral of the story is plain, and very encouraging to all boys given to loafing about railway stations. It is significant, too, of a prevalent belief that the art of managing an engine comes, like Dogberry's reading and writing—by nature. Such a belief, however covert, cannot prevail to any extent without frequent occasion for putting it into practice. With regard to the entrusting of boilers to incompetent amateurs, we have evidence for believing it far too common. The wonder is that more explosions do not occur, and the risk of serious accident from this source is likely to continue just so long as presumption and general smartness are allowed to take the place, even temporarily, of technical skill gained through patient and studious apprenticeship.

Steam is a clever giant, an obliging servant; but, like all giants, it will not stand fooling, and is obedient only when under the hand of a master.

TEASPOONFULS.

Everybody knows that cookery book recipes are rarely exact. They say what they do not mean, and do not say what they do; and in the majority of cases, leave no small amount to be interpolated or understood by the wisdom of the user. To them is to be ascribed such standards of measure as the teacupful, and the teaspoonful or tablespoonful; and occasionally the exasperating pennyworth or handful. So long as the cookery originators keep these standards to themselves—even if they must, in their multitudinous publications, inflict them on the unfortunate housewife—we shall not complain, because we are used to it; but is it not about time that some one's voice was lifted up in condemnation of the tablespoon and teaspoon being measures in physicians' prescriptions? Will some M.D. give us his idea of a teaspoonful? "A drachm," he will probably inform us. Then why not write drachm on the prescription? Because every one has teaspoons, and few have drachm measures, perhaps? See how absurd this is. We took occasion recently to ask a large silver ware dealer how many sizes of teaspoons were made. He could not answer us definitely, but he supposed more than a dozen. He showed us four teaspoons, of which one was fully twice the size of the other. One held fully a drachm and a half, the other perhaps two thirds of a drachm. These variations were in teaspoons known as teaspoons to the trade. When we consider that every thing smaller than a tablespoon, from a moderate sized dessert to the smallest coffee or berry spoon, is known to the average housewife as a teaspoon, the chances of still further variations are greatly increased. Again, the sizes of the spoons follow closely the prevailing fashions. At present, the style is large; fifteen years ago, it went to the other extreme. Consequently, a recipe in an old book which talks about teaspoonfuls is certainly unreliable now.

A manslaughter case came before a coroner's jury in England recently, on this very point. The prescription gave directions to give a child a teaspoonful of a drug of which a small quantity would not ordinarily be deadly. A big teaspoonful, probably half as much again as was contemplated by the prescriber, was administered, and the child died. The jury took these facts into consideration, and found a verdict accordingly, which absolved the person who followed the directions of the prescription from blame.

It is a very easy thing to abolish this arbitrary standard, since a simple and very excellent substitute is found in apothecaries marking the sides of their phials in drachms, etc., as they now do their glass measures. This might easily be done by projections on the glass, made during the shaping of the bottle. Then the patient can have the exact amount given to him in a teaspoon of any kind, shape, size, or pattern.