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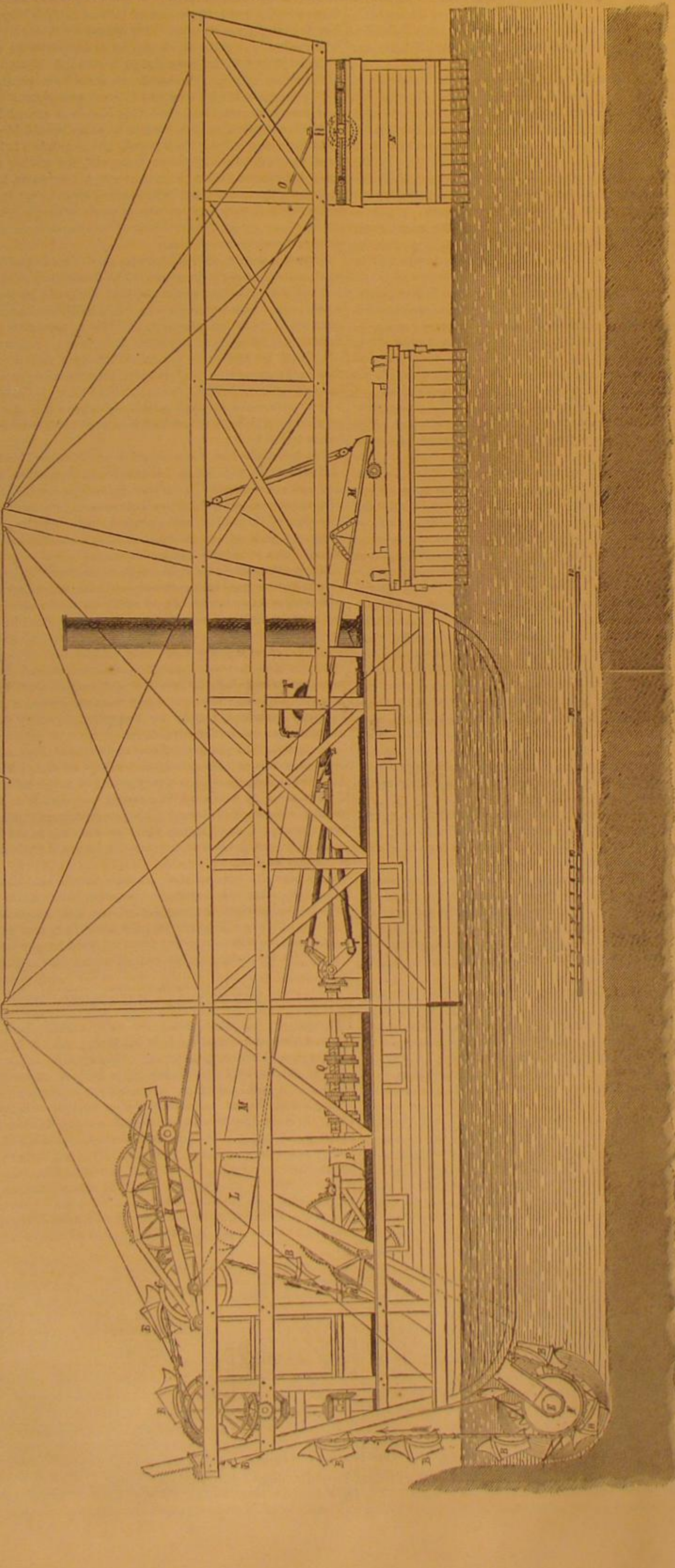


Fig. 1.

D. S. HOWARD'S IMPROVED DREDGING MACHINE.

Improved Dredging Machine.

The inventor of this machine, Mr. D. S. Howard, C. E., of Richmond, Va., after long experience in constructing dredging machines adapted to the various characters of materials to be excavated, and the different circumstances under which such machines are necessarily employed, has been led to the invention of the machine illustrated in the accompanying engravings, and which he claims is adapted to a much wider range of circumstances and situations than the machines heretofore employed.

He also informs us that the improvements in the materials and the construction of the machine render it so much more desirable, that its use has been advantageously extended beyond the immediate purposes for which it was originally constructed.

Fig. 1 is a side view of the machine which is designed to deposit in lighters over the stern or at the sides, as occasion may require. The machine is also constructed to work with any shaped bucket best adapted to the material to be excavated. Fig. 2 (see page 150) is an end view, showing the facilities for lateral deposit. In these engravings similar letters refer to the same parts.

The several parts, and their use in the general operation of the machine, are thus described by Mr. Howard:

A is the driving chain wheel, geared to the engine by wheels and shafting. The buckets, B, are attached to the chain, as shown in both figures.

C represents the center cylinders, with the spiral scrapers and hooks, for loosening and conveying the material to be excavated, from the center, each way, to the buckets.

D, in Fig. 2, represents short cylinders on the ends of the cylinder shaft, E, Fig. 1, with spiral scrapers for conveying the material to be excavated, from the outside to the buckets.

The short cylinder on the port side of the dredge, Fig. 1, is left off, to show the lower chain wheels and the lower attachments to the ways.

F is one of the lower chain wheels, attached to the cylinders and driven by the chains, in the same manner as the chains are driven by the driving chain-wheel, A, by cams fitting into alternate links of the chain.

G is one of the flange wheels seen in Fig. 1, over which the chain passes before descending to the lower chain wheels, F.

H is one of the movable frames, which suspends the flange wheels, G, on rollers running upon ascending ways, provided with powerful purchase wheels, terminating in a pinion working in a descending rack, shown in Fig. 1.

This purchase is worked by a cog wheel on the flange-wheel shaft (not shown in the drawing), working in a wallower wheel when thrown into gear, for the purpose of raising the buckets from the bottom when required, by forcing the flange wheels, G, up the inclined ways. When the machine is not in motion, the wallower wheel may be thrown out of gear, and worked by hand, with a long double crank, K, Fig. 2.

By the motion of the buckets in the direction of the arrows, the excavated material is brought up, and if it is to be deposited over the stern, it is dumped into the movable spout, L, Fig 1, which is attached to the axis of the flange wheel, G, by the extension of its sides, and moves freely within the stationary spout, M, allowing the flange wheel, G, to be drawn up, when necessary, with the movable frame, H, without changing its proper position, for receiving the contents of the buckets as they pass over the flange wheel, G.

N, Fig. 1, is the counter balance, situated about 25 feet aft of the hull, attached to it by a truss frame and hog chains, for the purpose of balancing the weight of machinery necessarily placed ahead of the hull, to enable the dredge to clear its own way. It is also used for transferring the lighters, by attaching the empty one to the outside of the counter balance, and the loaded one to the inside; then by the lever, O, which works the geared rollers between the counter balance and the truss frame, the two lighters are changed about, the empty one inside, under the spout, M, ready to be filled, and the loaded one outside, ready to be transferred to the dumping place. It is also used as a water tank for the engine, which may be filled in the morning, before the water has been disturbed by the dredging, sufficiently to afford clean water during the day.

B, Fig. 3, is a perspective view of a bucket used in this arrangement for depositing over the stern. It is provided with a loose bottom, which drops with the load about two inches, rendering the discharge perfectly certain when at work in the worst kind of material.

When the situation of the work is such as to require the deposit to be made on the bank, or into the lighters alongside, a bucket, like B, Fig. 4, is put on the chain, in place of B, Fig. 3, which dumps into the lateral spouts, situated between the driving chain wheel, A, and the flange wheel, G, by the tripping of the latch which lets fall the whole underside of the bucket, hinged to the bolt that fastens the bucket

[CONTINUED ON PAGE 150.]

ON STEAM BOILER INSPECTION.

BY MR. E. B. MARTEN.

[Read before the Institution of Engineers in Scotland, May 31, 1870.]

Steam boilers are now so common, and so often seen working with apparent safety on steamboats or railways or in manufactories that familiarity is apt to breed contempt for the danger that surrounds them if they should be faulty or used without due care.

The wreck produced by the explosion of a steam boiler is often so extensive that the casual observer is easily persuaded that there must have been some sudden accession of power at the moment of explosion, and is readily made to believe in mysterious theories involving intricate suppositions as to the influence of electricity, the spheroidal condition of water in contact with hot plates, the decomposition of water and ignition of the gases, the sudden generation of steam from water heated to a high temperature, and a host of other phenomena which are themselves true and perfectly understood, but have little or nothing to do with boiler explosions.

A very simple calculation will enable any one to realize that there is plenty of force accumulated in an ordinary boiler to account for all the mischief, if it is liberated suddenly. A boiler of an average size contains when at work sufficient accumulated "force," in the shape of steam and heated water, to work a thirty-horse engine for about ten minutes without additional firing; and if this should be liberated *in one second* by the rupture of the boiler, the power to cause explosion is equal to the united effort of 18,000 horses. A boiler forms a reservoir of power, and, like a reservoir of water, is capable of producing much useful work if allowed to flow gradually through a proper mill or engine, but capable of vast destruction should the rupture of the sides allow the contents to escape suddenly.

It has been calculated that the explosive effect of each cubic foot of water in a boiler at sixty lbs. pressure is equal to the detonation of one pound of gunpowder; so that in the case before given there would be the same effect as from the explosion of about 500 lbs. of gunpowder.

The explosions of vessels containing high pressure steam, but not exposed to any fire which would render possible any overheating or decomposition of steam, etc., cause as much havoc as the bursting of ordinary boilers when the contents are suddenly liberated by rupture of the sides.

It has long been the object of engineers who have given especial attention to this subject to obtain accurate records of every case of boiler explosion, and I have done my utmost to assist in that object, and have obtained notice of more than 1,500 explosions, causing the death of over 5,000 persons, and the injury of some 4,000 others.

The records are discouraging in many respects, as they contain the names of some of the best and most careful engineering firms as owners of exploded boilers, and also give instances of explosion of nearly every form of boiler which has been in use for any length of time; for there are plenty of exploded locomotives, Cornish, Lancashire, and other boilers, once held to be almost incapable of explosion, as well as the more old-fashioned Balloon, Haystack, Butterley, or plain cylinder boilers.

In but few of the earlier explosions are trustworthy records obtainable; but for some ten or twelve years they have been far more complete and accurate, and their careful consideration has led to the conclusion that most of the explosions could have been prevented had the actual condition of the boilers been known.

Nearly all who have given special attention to the matter being agreed that most explosions could be prevented if the conditions of the boilers were known, the problem suggests itself—how are owners to keep themselves informed of the condition of their boilers; and the simple answer is, by periodical inspection.

Inspection may be done by any one, and its value will differ according to the care and intelligence of the inspector.

It may be well to describe what is usually meant by boiler inspection. To insure due attention a written report should be made, which must be perfectly intelligible to any one who has not seen the boiler, and to prevent confusion no two boilers should be mentioned on one paper, and the report should be made complete at once, so as not to need fair copying, and illustrated with sketches. In the first place, every particular of boiler and fittings and setting should be noted that can be seen from the outside of the boiler, with sketches and sufficient dimensions to make complete detailed drawings if required.

The boiler should then be entered and internal sketch and dimensions taken sufficient to make a complete drawing. The plates should then be felt in every part with a light hammer, and the general condition noted.

The flues should be reserved for the last, because they are generally dirty, but this is often the most important part of the inspection. The fire grate and each flue should be entered and traversed, and every part of the boiler plates felt with a hammer, and also dimensions taken as before.

This is not all that is necessary to obtain complete information, for there still remain those parts of the boiler in contact with the brickwork, and the neglect of which often leads to disaster. It is easy to clear the brickwork sufficiently for examination, but a little arrangement when setting the boilers would make it far easier, and will be again alluded to.

It may be well to mention the chief impediments to carrying out this inspection. It is often impossible to make even the external examination, because boilers are so smothered up with brick and stonework. The clothing of boilers is often justly urged as leading to economy of fuel, but it should not be done in such a way as to preclude examination. The most rapid corrosion goes on if a leak should take place beneath the covering, especially if it consists partly of sand or ashes.

Internal examination is sometimes prevented by too small a man-hole, or one so awkwardly placed as to make it almost impossible to twist into the boiler; but the most usual difficulty is the want of room to move about, or to use a hammer. Sometimes also there is no means of cooling sufficiently to remain in the boiler many minutes.

Each form of boiler has its peculiar difficulties. The Cornish or one tube boiler is one of the most awkward, as there is so little space between the tube and shell at the sides and bottom, and a false step may cause the inspector to slip and become wedged. An instance of this occurred last year, where the plates of a boiler had to be cut out to extricate a man.

The Lancashire or two tube boiler obviates this difficulty, but involves another man-hole to get at the space beneath the tubes.

Most of the multitubular boilers, such as the locomotives, are too small to enter, and the impossibility of internal examination has led to many explosions.

Of course the difficulty of examination is much increased if the scale is not well cleaned off, as without this many a fault will be overlooked.

The easiest boilers to examine internally are the plain cylinders, or others without internal tubes, and this facility for examination is one of their chief recommendations.

The upright boilers, such as work from the waste gases from iron furnaces, are particularly easy to examine, as there is plenty of room to stand upright both inside and in the flues.

The flue examination is attended with some impediments, as in most boiler settings facility for entrance to the flues appears to have been the last consideration. In many cases entrance is simply impossible, as the brickwork is only a few inches from the boiler. In not a few cases the man-holes are little cast-iron frames and doors, and too small for even a lad to pass through. Even when the flues of the Cornish and Lancashire boilers are large enough to pass along, the narrow space and inclined or crawling position are awkward. The plain flash flues of the externally fired boilers are easiest to examine.

The value of the examination when all the above impediments are overcome must depend on the knowledge of the inspector as to the points to observe, and as to what mischief to be on the look out for. Of course it is presumed that the boiler when fixed was a good one; the object of inspection being to ascertain whether it has become weak or dangerous while working.

It is often found that boilers have been injudiciously altered in form. In one case the tube had been removed without due care in compensating for the loss of the support of the tube and the extra area exposed to pressure in the flat ends by suitable stays, and, of course, the end was blown out.

Great loss of strength is often caused by injudicious repair, even when there is no intended change in the form of the boiler. Plain cylinder boilers originally constructed in rings with joints crossed, are often found so much repaired with patch upon patch that the seams become nearly continuous from end to end. The strength of such boilers it is impossible to calculate, as the metal must be exposed to unequal strains from the new and more elastic plate not taking up its exact proportion.

The faults visible from the outside of the boiler are generally so apparent when the covering is removed that they can hardly escape detection. The chief danger is from corrosion from the neglect of leaking of joints.

The faults visible from the inside may more easily escape detection. In those boilers which depend upon stays for their strength, the stays need very careful examination to ascertain if there is any sign of weakness. It is not at all uncommon to finds stays of proper and good construction, but with the rivets attaching them to the boiler loose or nearly sheared off.

The effect of internal corrosion is generally easily detected, but there is a form of it called "furrowing" which may escape attention. It is found in Lancashire boilers, sometimes in the angle iron, and sometimes in the plate close to it, and as scale often fills the crevice or "furrow," it may escape notice. The same thing is found in locomotives just by the lap of seams. The furrows are supposed to be caused by the "fatigue" of the metal in certain lines of strain due to the bending backwards and forwards of the end of the boilers to accommodate itself to the varying lengths of the tubes and shell when expanded or contracted by alternate working and cooling. The same lines of strain are produced in the barrels of locomotives by their efforts to assume the truly circular shape. Not only is the metal in these lines rendered more open in texture and more liable to corrosion, but the scale is continually thrown off, exposing fresh surface. "Furrowing" should never be neglected, as it increases very rapidly when once set in.

The faults to be observed in the flues are numerous, but two or three only will be noticed. When boilers are patched the old metal is often strained and punished by the removal of the old rivets and the "drifting" to pull it up to the new plate. This not unfrequently sets up "seam rips" or cracks from hole to hole, which not only throws extra and ever increasing strain on to the rivets at each end of the "rips," but often produces a jerk which causes such enormously increased strain on each succeeding rivet that the whole seam rips round and allows the boiler to break up.

External corrosion is another most frequent fault visible from the flues. The leakage from a sprung seam will often run down the lap causing a "channel" or narrow line of corrosion. This is often found also in the seams of upright boilers on the upper side of the lap. As the channel is seldom more than one or two inches wide it is easily seen by marked contrast with the sound plate, but when corrosion is more general from dampness in the flues it is not so quickly noticed, as the edge of the upper lap also corrodes, leaving the same apparent thickness at the edge of the plates, whereas, in reality, the lower plate may be eaten more than half way through. The same thing may deceive where a new piece of plate has been inserted on to a thin plate. Very slight corrosion of the already thinned plate may be much more dangerous than would be supposed from anything seen on the outside.

The corrosion which goes on at a point of contact with brickwork is one of the most frequent causes of anxiety to those who have the inspection of boilers, as it is sometimes found when least suspected. It is caused by the damp being held against the plate, and is the more dangerous as it produces weakness in long continued lines in the directions of the greatest strain. The walls are often now constructed with removable bricks, or slight holes at each seam.

It is very frequently asserted that corrosion cannot be the cause of explosion, as the weakened place would blow out and relieve the boiler. This may be the case when it is only local, but when in continuous lines, and the giving way of one point throws the strain on the surrounding parts, it leads to a break up as described in the case of seam rips. In tubular boilers it is very necessary to measure both diameters of the tubes to detect the first signs of weakness from the departure from the true circle.

Some few words are necessary as to the testing of boilers by steam or hydraulic pressure. The former is so dangerous, and has led to so many accidents, that it should be avoided. Attempts to caulk leaking seams while under steam pressure have led to many fatal explosions. Many more fatal explosions would be caused by proving from steam pressure, were it not that makers often deceive themselves and their customers by supposing that a large boiler can be proved by connecting a small inch pipe to another boiler, the gage upon which shows the required pressure; whereas condensation goes on so rapidly that not half the pressure is ever reached in the tested boiler.

The hydraulic test is not attended with danger if all air is excluded from the boiler, but it is found in practice that it does not always detect dangerous furrows or corrosion. It is undoubtedly most useful when applied with judgment during the time of inspection, and should always be considered a necessary part of inspection, but it cannot be relied upon alone or as a substitute for inspection.

Many attempts have been made to construct boilers that should be free from all danger of explosion, by having all the parts exposed to pressure of very small diameter and avoiding the large quantity of steam and water accumulated in ordinary boilers. Such boilers are made of both cast and wrought iron, but the experience with them is short, and for ordinary work the absence of accumulations of power makes it difficult to maintain regularity. In all descriptions of such boilers, however, although absolute safety from explosion is unhesitatingly promised, facility for inspection of every part is mentioned as one of the advantages.

In conclusion, I would submit that periodical inspection is the surest means of securing the safety of steam boilers. Also, that this inspection is a very good and useful safeguard, if only done by the man in charge; but that it is a still greater safeguard if done by independent inspectors, who have the experience of seeing many boilers and are not influenced by the exigencies of the manufacturers, for whom the boiler may be used.

Such was the opinion of those who formed the Midland Boiler Inspection and Assurance Company, under whose auspices I have obtained a great deal of the information as to boiler explosions which I have been enabled to give to the public, and to whose courtesy I am indebted for permitting me to give whatever may be deemed useful in the present paper.

THE ARTISAN IN PRUSSIA.

Compulsory education being the rule in Fatherland, the German artisan has that much in his favor; yet his English brother would not care to change places; low wages and meager diet sadly counterbalancing a little extra culture. \$3·00 a week is very good pay in Prussia, as determined from a long list of the rates of weekly wages in that country in 1867. In most cases twelve hours, and in many, thirteen, go to the working day. Women form more than a fifth of the factory operatives, and earn, comparatively, good wages; but public labor brings its too frequent consequences, and the female operatives bear a very indifferent character. As for seamstresses and milliners, those who work for commercial houses are, as usual, most miserably paid; so miserably, indeed, that to live at all they are compelled to eschew morality.

The wages quoted above are said to suffice thrifty men while single, and even leave a margin for saving; but to keep a family upon them, unless the mother as least can contribute something towards the income, is out of the question; and those who know most about the matter do not set the cost of a family at a very extravagant rate. According to official calculations, a man with a wife and three or four children can provide food enough for all at an annual expense of \$60·00 if he lives in the province of Prussia; in Posen it would take more than double the amount; while in Pomeraria it may be done for a little less. Certainly the Prussian dietary standard is not a very high one, bread, vegetables, butter, and milk being all that is considered necessary; meat, except, perhaps, on holidays and Sundays, coming in the category of luxuries. The daily fare of a workman in the Rhenish provinces is set down as consisting of one pound of rye bread, two pounds of potatoes, an ounce of meat, half an ounce of salt, and one sixth of an ounce of coffee.

Nor can the Prussian be said to be much better off as concerns his lodgment; high rents, confined spaces, little comfort, and less cleanliness being the rule throughout the kingdom. In the large towns, with very rare exceptions, artisans live in lodgings; several families herd together—sometimes as many as fifteen individuals crowding into one small, low, damp room—twenty-five cents a week a head being the Berlin tariff for sleeping accommodation and convenience for washing. Three years since the returns showed there were in the capital 15,574 dwellings with an average of six to seven occupants per room. In the country and in the small towns—unless lodgings are provided by the employer—working folks generally have a house of their own: a house, such as it is. In Memel it will be a mere mud cabin with nailed up windows; in Silesia, a one-storied thatched house, with diminutive windows, and rooms just high enough to allow the proprietors to stand upright in them. The miners of the circle of Ottweiler, in the Rhine province, are perhaps the best off in this respect, being looked after by the government itself. "The three royal coal mines of Heinitz have three large sleeping houses belonging to them to accommodate 800 men. The Rheden mine has two of these for the accommodation of 400 men. The miners pay thirty-six cents a month, for which they have a bed and towels, and the use of half a press. To enable miners to settle in the neighborhood, the Miners' Union has purchased 1,350 acres of land for founding a mining colony. It sells at cost price, or leases at a moderate rent, one sixth of an acre of land to any one who will build a house upon it, and one sixth of an acre upon the same terms for a garden. Money for building purposes is also advanced at four per cent interest, to be deducted from the wages, with a present of from 100 to 120 dollars as a premium for building." These houses at Ottweiler are, as might be expected, neat and cheerful; but, with the exception of them, the description "bad, small, and densely crowded" applies generally to the habitations of the Prussian workman, in whatever part of the land he may be domiciled.

A better condition of things might be looked for where such pains are taken to render the laborer worthy of his hire. Primary education is obligatory for all children from the age of six to that of fourteen, and afterwards the journeyman or apprentice may continue educating himself at the "Fortbildungsschulen," open Sundays, and occasionally upon week days, for a somewhat higher degree of instruction. When a Prussisn lad has received the education prescribed by law, he chooses his trade, and binds himself to a master, who, for his labor, gives him board, lodging, and instruction. Apprenticeship seldom lasts more than three years, at the end of which time the young workman gets a certificate from his master, and sets out upon his travels—"wandering," as it is called, being reckoned necessary ere he can claim admittance into the ranks of journeymen. He usually makes a point of visiting the places specially famed for excellence in his branch of trade. If he be a stone-cutter, he must not miss Munich and Cologne; if a locksmith, Berlin and Vienna; if a tailor, Dresden must become his residence for a while; if no one wants his services at any town he enters, the Journeyman's Fund there supplies him with the means of taking him elsewhere. The more ambitious artisans are not satisfied with tramping through Germany, but betake themselves to foreign lands, where not a few of them are tempted to remain—and no wonder! Traveling about the world with open eyes cannot but do the travelers good, and the practice is therefore to be commanded; it is, however, doomed; the new Industrial Code of the North German Confederation has pronounced against it, by declaring wandering no longer compulsory, and that traveling handicraftsmen have no claim for assistance upon their associates in the trade. The Code only came into operation in October, 1869, so that what effect its provisions will have cannot yet be seen. By it a variety of restrictions upon the freedom of industry were swept away; all engagements between man and master are declared to be matters for mutual agreement, to be canceled by a fortnight's notice on either side; and the old prohibitions against workmen uniting, for the purpose of obtaining more favorable wages and conditions of work, more especially by means of strikes, are repealed. But, at the same time, "any one inducing, or seeking to induce, others, by physical force, threats, or outrages, or by placing them under an interdict, to take part in these coalitions," was made punishable by three months' imprisonment. Nevertheless, in Prussia, as elsewhere, labor and capital are continually wasting their resources in trying each other's strength and obstinacy.—*Chambers' Journal.*

THE APPLICATION OF PHOTOGRAPHY TO MILITARY PURPOSES.

Modern warfare may, in many respects be considered as so many applications of science. Not only is war *matériel* designed and manufactured now-a-days upon the most approved data, and according to theories worked out with mathematical accuracy, but a large section of our soldiers are educated in such a manner as fully to appreciate the value of their resources, and so to overcome difficulties which years ago would have been regarded as impossibilities. No instance demonstrates this more satisfactorily than the recent Abyssinian expedition, which, whatever may be said of it as a campaign, cannot but be regarded as one of the most wonderful feats of engineering accomplished in modern times. The nearer warfare approaches perfection, the more decisive, and therefore less cruel it necessarily becomes, as witness the brief duration of the wars of late years on the Continent; and for this reason the improvements in warfare effected by science cannot by any means be regarded as a misapplication of knowledge.

Our present remarks bear reference to the applications made of a very modest branch of science, if science, indeed, it can be called, our object being to demonstrate the many uses made by the War Department of photography. In the special application of this art-science to military matters, our Government is certainly in advance of others, if we except, perhaps, that of France. No less than three establishments have been organized in connection with the army in which photography is extensively practiced, the most important of them being the General Establishment at Woolwich; but, besides these, there are again many Royal Engineer stations, both at home and abroad, which are furnished with photographic requisites and employ the camera for divers purposes. At Chatham, the photographic establishment assumes the character of a school of instruction, at Southampton it forms an adjunct to the Ordnance Survey Office, while at Woolwich, of which department we desire more particularly to speak, the duties performed by all of the camera are as various as they are numerous. For registering patterns, recording experimental results, imparting military instruction, and for other purposes too multifarious to enumerate, photography is extensively used, the faithful accuracy of sun pictures, as likewise the facility with which they are produced, causing the art to be eagerly employed in any way where it can be made available.

As an example of the value of photography in instruction, we would cite an interesting series of pictures taken to illustrate ordnance drill. This series comprises upwards of one hundred views, and demonstrates the practical working of the various kind of guns, mortars, rockets, etc., in the service. One picture, for instance, will illustrate the command, "Prepare for action;" a gun will be shown surrounded by a group of artillerymen in the positions they have been instructed to occupy on the issue of that order, each man having his respective number attached to his cap as a distinguishing mark. The next illustration in the series is probably that of "Load," and the next again "Fire," both of which will represent the change in position of the men, as one operation succeeds another, and the various duties performed in turn by each gunner or number, for it must be remembered that in gun drill every man is told off to a particular number and intrusted with a separate and distinct duty. Thus, on the promulgation of any new system of drill, or of any modification in the method of working, it is merely necessary for the military authorities to forward pictures of this kind to the different instructors, who cannot fail at once thoroughly to understand the new exercise; and even the rawest recruit who had assigned to him a certain number at a gun, would see at a glance the exact position he is to occupy by a reference to the photographs.

Another not less striking instance of the importance of photography in this connection may be given. At the outset of the Abyssinian campaign it will be remembered that several thousands of pack-saddles were required for transporting war *matériel* into the interior. These pack-saddles were made in and sent direct from England to Annesley Bay, so that the troops coming from Bombay knew nothing of their construction, nor of the method in which they were to be packed. This ignorance in the hurry of affairs would have been of serious consequence (for a military pack-saddle of the present pattern is a somewhat complicated contrivance) had not the authorities at home been fully alive to the subject and foreseen the threatening difficulty. A mule at Woolwich was harnessed and packed, after some experience had been acquired in the matter, in the most suitable and approved manner, and the animal then carefully depicted by the aid of the camera; the dirposal of the harness and trappings, and the correct way in which the packages were to be carried, were thus clearly shown in a photograph, numerous copies of which were immediately sent out to Annesley Bay and distributed among the officers of the Quartermaster-General's department.

In recording experimental results photography again fulfills a duty which could not be discharged so rapidly and impartially by any other means. The stone iron-cased shields and armor targets built up of metal plates of different thicknesses, and then fired at by shot and shell of all descriptions, are carefully photographed after each decisive experiment, and a record of indisputable accuracy thus obtained. With a picture before us of a target, constructed to represent the side of an armor-plated vessel, which has been experimented on, we can at once form an accurate estimate of the impression made upon the iron wall by shot of different calibers, while rear and side views of the structure will show plainly the amount of damage which the backing or skin of the shield has suffered. As may be imagined these prints form important illustrations to the written reports made from time to time to the War Office authorities.

The photographing of newly adopted Government patterns, whether in the shape of guns, carriages, wagons, mantelets, tents, etc., is also an important section of the work undertaken at Woolwich, as likewise that of producing pictures relating to army equipment, such, for instance, as demonstrate the setting up of cooking apparatus, disposal of ambulances, refitting of ordnance in the field, etc. There is, moreover, the pursuit of photo-lithography to be mentioned, by means of which designs and sketches are copied and transferred to stone for printing off in the ordinary manner.

The subject of working photography in the field is a matter to which much attention has been given at the general establishment, for it will be readily conceived that the simplest and most effective methods of working, as likewise the different uses to which the camera may be put during warfare are questions of very serious study.

The photographic copies, many thousands of which are annually produced and distributed over all parts of Her Majesty's dominions, are not now printed upon silver paper in the ordinary way, but by the so-called carbon or autotype process, a method which produces prints of an absolutely permanent character. Ordinary silver prints are always liable to become faded and stained after the lapse of a few years, owing to the presence in the paper itself, or in the atmosphere with which it comes in contact, of sulphur compounds which attack the metallic silver composing the image. In the carbon pictures, however, no silver at all is present, the composition of the image being a mineral pigment in combination with an insoluble chromium.

Our description of the General Photographic Establishment at Woolwich has been very brief indeed, but enough has been said to show to what an important extent the art is employed in connection with the War Office; the department which we have described is a branch of the chemical establishment of the War Department, which was first organized in 1854, by Mr. Abel, and has gradually become intimately and indispensabiy connected with every branch of the military service.—*Nature.*

A Geological Excursion in the Moon.

[Translated for the Maine *Journal of Education* from *Cosmos*].

Under this title Stanislas Meunier recently gave a lecture filled with interesting facts, and pleasantly illustrated by numerous photographic projections by the aid of the Drummond light.

The professor remarked at the opening that it is not wholly certain that there are not on the surface of the earth specimens of lunar rocks, since there is no absolute proof that the meteorites are not ejections from the volcanoes of the moon. He moreover added that one can very profitably study at a distance the geological structure of inaccessible localities.

The moon, which appears to be wholly deprived of all atmosphere and consequently of water, presents two very different kinds of rocks, those which constitute the mountains, and those which constitute the so-called *seas*. The former, from the form which they present, and the analogy of that form with that of terrestrial volcanoes, are evidently volcanic rocks. The others, according to Lecoq, are dry sands or melted rocks.

One may, in some instances, study very closely the structure of mountains, and draw, for example, the analogy of the form of the circles in the moon with that of the circles of granite and porphyry in the earth. Schrotter and Herschel both discovered in various mountains of the moon places where a very fine stratification may be seen.

This study of the mountains of our satellite has led to a comparison with the mountains of the earth, and in some instances very striking analogies have been found, especially at the Puys d'Auvergne, the volcanoes of Teneriffe, Palma, etc.

Finally, the observations of astronomers have furnished a basis upon which Chacornac proposes a theory concerning the geogony of the moon. It comprises three grand periods: 1. The formation of the circles. 2. The extension of the muddy diluvium which constitutes the seas. 3. The formation of the comparatively small craters.

After reviewing the various observations cited to prove the actual activity of the lunar volcanoes, the lecturer adopted the opinion of Beer, Moedler, and Arago that the moon is a *dead star*. He then went on to prove that this inference may also be drawn from that singular appearance upon the surface of the moon to which has been given the name of *grooves*. There are grooves with parallel sides nearly a mile in width, and from ten to one hundred and twenty-five miles in length. About ninety have been counted, and it is very probable that they are still in the process of formation. It was a very long time before any reliable explanation of the grooves was given. We are indebted to Professor Lecoq for it (*Traité de Géologie*). It has been further developed by Saeman, who made it the subject of a special article printed in the *Bulletin de la Société géologique de France.*

According to these geologists the grooves are due to the cracking which is evident on the surface of the moon as a result of the loss of heat. There is no reason to suppose that at a former period the moon had not upon its surface both an atmosphere and water. But the latter penetrating the crust, as it does upon our globe, has been gradually absorbed in proportion as the crust has increased in thickness. All the water had disappeared long before the cooling process had reached the center. The loss of heat continuing, the rocks in solidifying contracted in a way analogous to that which basalt manifests, and the grooves are the result. Into these grooves the atmosphere settled.

Everything indicates that the earth is actually passing through the various states through which the moon has already passed. It is estimated that already one fiftieth of its primitive ocean has been absorbed, and that what remains will have been drunk up when the thickness of the crust shall be one hundred miles. Our whole earth from what is known of it, would easily absorb fifty oceans like ours, so that the water at present upon the earth, being once absorbed and which constitutes only $\frac{1}{24000}$ of its weight, would become absolutely insensible to the most precise chemical analysis.

Then the earth will crack open, as the moon has done, and its atmosphere will settle into the fissures beneath its surface. A long time before this all life will have ceased.

The prediction which the study of the moon allows us to make in regard to our globe will evidently be realized only in a far distant future, for after the experiments of Bischof nine millions of years will be needed for the earth to cool down 15°, a loss almost imperceptible, since the internal heat adds only one thirtieth of a degree to the temperature at the surface. We may go further and apply to the sun everything which has been said of the earth and the moon. Being larger, it will cool less quickly, but the time will nevertheless come, at least everything seems to indicate it, when it will have absorbed its waters and its atmosphere, and the fissures will be formed upon its surface. Our whole solar system will then be only an assemblage of dead worlds.

Improved Steam Generator and Water Heater.

This boiler is formed in sections secured together by means of flanges or ears and bolts, with packed joints, the sections being provided with fire flues, water and steam passages, furnace, and fuel magazine; the whole being designed to extend the principle of base-burning—so successfully applied to stoves—to the furnaces of steam boilers.

The number of sections is immaterial as regards the general principle of the device, this number being varied according to the required size and capacity of the boiler.

Fig. 1 is a sectional view of the boiler, which may be used for heating water by steam for domestic use when not required for motive power. It has a door in the dome above the fuel magazine through which the charge of fuel is placed in the furnace. It also has another door giving access to the fire below when necessary in starting, etc., and another still lower opening into the ash-pit. The conical dome or cap receives the smoke and incombustible gases and discharges them into the smoke stack. The boiler may be jacketed, if desired, and is usually so jacketed, but the jacket is omitted in our engraving to show the method of joining the sections.

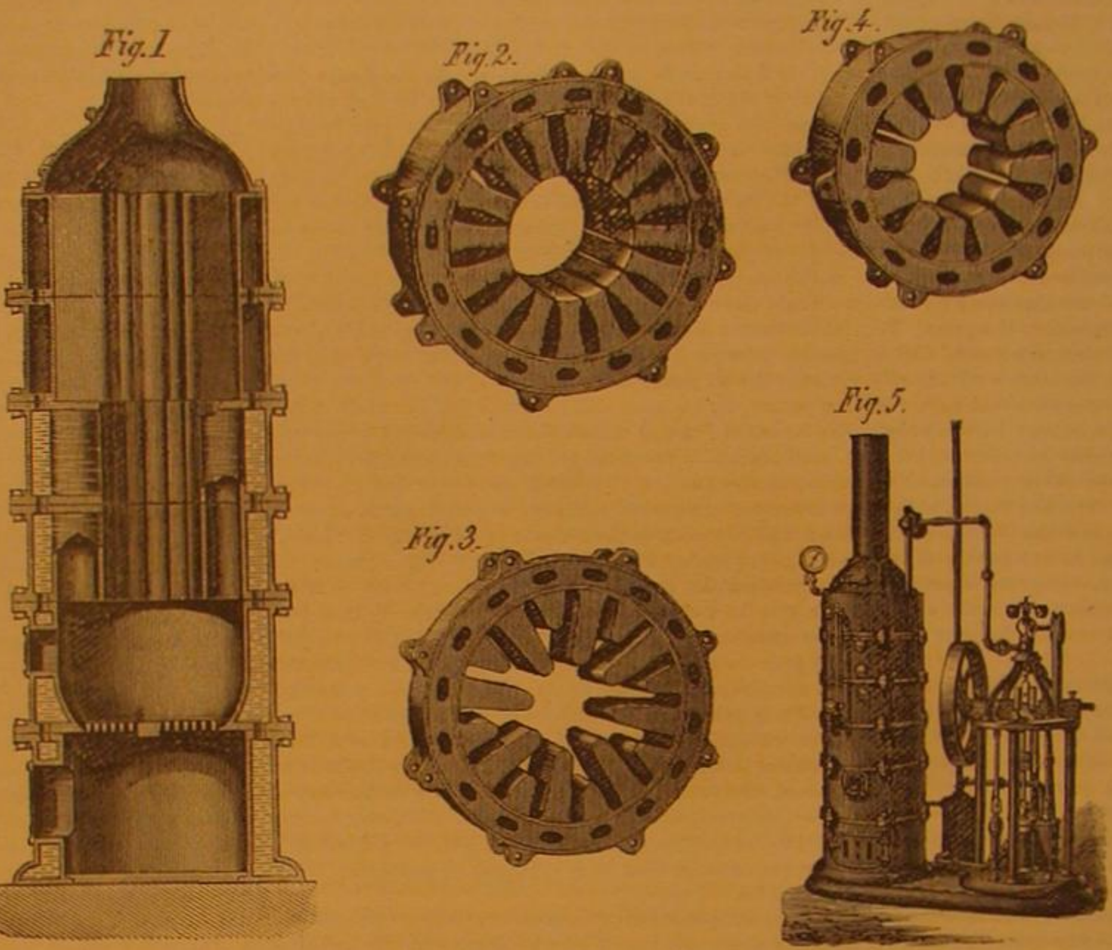
The sections, Figs. 1, 2, and 3, are cast each in a separate piece, with flues, water spaces, and communicating orifices entire. They are then faced up in a lathe and packed with simple elastic packing inserted in grooves in the faces of the sections, which are then bolted together, as shown in Fig. 1. Various forms of the sections are used, as shown in the engravings; but in none of them are the joints exposed to the fire, and the packing is consequently no more exposed than in ordinary steam joints.

Small boilers of this kind may be used advantageously for generating steam for heating purposes, and as great heating surface in proportion to the contained water is obtained by this peculiar construction, they must get up steam very quickly.

Fig. 5 shows the boiler attached to an engine designed by by the inventor of the boiler. The boiler and engine are of three-horse power, and stand on a single cast-iron bed plate twenty-six by fifty-seven inches in extent. The boiler is twenty inches in diameter and fifty-four inches high, exclusive of the bed plate and smoke dome. It has thirty square feet of fire surface, and holds about twenty gallons of water when filled to center of gage.

A water heater is constructed on the same plan as the flue section of the boiler, steam being used instead of fire for heating. This engine and boiler give, we are told, three full horse power for one day of ten hours, at an expense of only 100 lbs. of coal. We are further informed that quite a number of the boilers are in use and are giving excellent satisfaction.

This boiler was patented March 22, 1870, by Orlando Clarke, and is manufactured by Messrs. Clarke and Utter, Rockford Iron Works, Rockford, Illinois.



CLARKE'S STEAM GENERATOR AND WATER HEATER.

Improved Universal Shaft Coupling.

The object of this invention is to provide a closed joint, so constructed that it will be as flexible as the old style of universal coupling, but which, at the same time, shall cover all the working parts, so as to obviate the need of boxing, required by law in many of the States to prevent accidents.

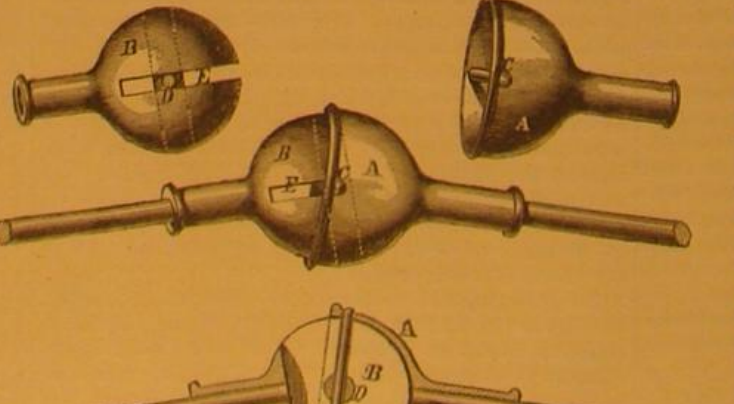
This is accomplished in a simple and ingenious manner readily understood by reference to the accompanying engraving.

A, is a hemispherical shell, taking the place of the old style crutch on its end of the shaft; a spherical shell, B, slotted at E, taking the place of the crutch on the end of the other section of shafting. The spherical shell, B, fits into A, as shown.

A bolt, C, passes across the open end of the shell, A, and through a hole in the middle of a larger bolt, D. The latter bolt reaches out to the sides, but does not penetrate the shell, B, and it cannot be withdrawn from the shell without first removing the smaller bolt, C, which passes through it, as its ends meet and engage with the inner walls of the spherical shell, B. This connects the two sections of shafting, so that they cannot come apart till the bolt C is taken out.

The slot in the shell, B, passes over the bolt, C, which plays therein, and thus a universal motion is obtained, while the parts which are likely to become entangled in clothing or belting, are entirely covered by the shells.

Patented, through the Scientific American Patent Agency, July 26, 1870, by Moses A. Keller, of Littlestown, Pa., whom address for State or shop rights.



KELLER'S IMPROVED SHAFT COUPLING.

Soft soap it is said, will soften the hardest putty.

Professor Tyndall on Electrical Phenomena and Theories.

One remarkable peculiarity in these lectures of Professor Tyndall is, the effective way in which several of the more subtile effects of electrical change and power are made manifest to a large audience by the instrumentality of beams of electric light, manipulated in various ways. Thus, for instance, the elongation of a solid bar of iron, when it is thrown into the magnetic state, by being encircled in the folds of a voltaic current, conveyed by a helix, is shown by the starting of a spot of light, some six or eight inches upon a screen, when the molecular condition of magnetism is excited by the passage of the current. A beam of light falls upon a small mirror, carried at the extremities of the arm of a lever, so resting upon the end of the iron bar, that when the lever is lifted by the magnetic elongation of the bar, the beam of light is shot off from the mirror as a long weightless index. The change in the position of the molecules of iron by the action of magnetism is also proved by throwing the beam through a vertical cell of glass, containing magnetic oxide of iron suspended in water. When the cell is exposed to the influence of the poles of a strong electro-magnetic, the light passing through the cell and contained liquid to a screen beyond, brightens, in consequence of the metallic molecules turning themselves "end on" to the incidence of the beam. The lines of magnetic force assumed, when iron fillings are sprinkled over the poles of a magnet, are portrayed by the intervention of a system of lenses, which depicts the image upon the screen. The formation of the "tree of lead" upon the negative electrode of a voltaic current, when a salt of lead is decomposed by the current, is shown in the same way; the arborescent crystals glowing and dissolving alternately on the opposite poles, immersed in the solution as the direction of the current is reversed. The very beautiful colors and patterns of Nohili's rings, formed when lead is thrown down by voltaic decomposition upon a polished plate of steel, are exhibited by a similar intervention of lenses, and the illumination from the electric beam.

An artificial telegraph cable, whose resistance to the transmission of the electric current is made identical with 14,000 miles of an actual marine cable, is formed by introducing into the path of the current gaps, consisting of feebly conducting liquids and condensers, so distributed as to represent the respective distances by telegraphic route to Gibraltar Malta, Suez, Aden, Bombay, Calcutta, Rangoon, Singapore Java, and Australia. A mirror, belonging to each gap, lies in the path of the currents, carried by a galvanometer, constrained to deflect its needle from the position of both on the instant that the passage of the current is felt. Before the current is sent through the apparatus, ten dots of light, cast from the mirrors by the instrumentality of electric illumination, lie upon the screen, in a straight vertical range. When the current is passed through the apparatus, dot after dot starts aside upon the screen, as the current fills the condenser immediately before each mirror, and then flows beyond to deflect the galvanometer immediately in advance. The deflection of the successive galvanometers, and the corresponding traverse of the beam of light upon the screen, is seen, under this arrangement, to take place at successive steps or intervals which exactly express the intervals of time which the electric current would require to reach the several stations named, in the actual progress of telegraphy The starting aside of spot after spot upon the screen when the current is sent through the apparatus, and the subsequent return of spot after spot to the position of original test in inverse order, forms a very striking illustration of the fact that the resistance of an electric cable is in some degree dependent upon its length, and that time is consumed in overcoming this resistance. The most interesting and telling of all these beam-of-light illustrations, however, is certainly the one which is employed to indicate the excitement of diamagnetic force in a tube of copper, when it is suspended between the poles of an electro-magnetic. The tube is carried by a string of silk, and rotates rapidly under the influence of a twist given to the string. The string also carries above the tube a series of small mirrors, which reflect the light of an elec tric beam, so that a continuous elliptical band of illumination is formed on the screen whilst the twisting is continued. The instant the electro-magnet is made active by the transmission of the current through its helix, the copper tube acquires diamagnetic polarity by induction, and under the influence of this polarity the rotation is arrested, and the bands of light upon the screen is changed into a small stationary spot or illumination. When the electro-magnet is unmade by the arrest of the voltaic current, the spot of light again becomes an elliptical band, under the resumption of the twisting of the silk string with its mirrors and copper tube.

Of the numerous other very pleasing and telling illustrations exhibited in these lectures, space only permits allusion to be made to a very few which have been selected from the series, as being worthy of especial mention. The sound produced by the molecular vibration in iron when its mass is transiently magnetized by the voltaic current, is made audible by suspending an iron poker upon two sounding boards, and making it the core of a helix, conveying an electric current. An assistant is converted into an extemporized electrophorus, by flapping his black coat with fur while he stands upon a glass-legged stool. Small fish of gold leaf are made to float in the air current given off from the knob of a charged Leyden jar. A thick drinking glass is shattered by the expansion of the water contained in it, when sparks formed under the intensifying power of fifty condensers joined "in cascade," and primarily charged by a voltaic battery of one thousand cells, are passed through the liquid. To demonstrate the relation of resistance to heating power, a long line of wire is arranged in alternate links of platinum and silver, and when the voltaic current of due intensity is passed through the length, each stretch of the platinum wire is seen to glow with brilliant red heat, while the stretches of silver wire between remain still invisible. A beautiful series of Geissler's vacuum tubes were brought into successive operation, in which the auroral discharge was broken into stratified leaves, in which the glow was extinguished by the approximation of the poles of an electro-magnet, in which a feeble glow was converted into bright stratified light by the influence of a magnet; and beautiful beyond all the rest, the light from the inclosed negative terminal of the voltaic battery was arranged into the well-known lines of magnetic force, when subjected to the influence of the poles of a magnet.

Successor to Professor Magnus.—This lately deceased *savant* is to be succeeded by Professor Helmholtz, from Heidelberg University, who has been elected by the Council of Berlin University a Professor of Physics.

[For the Scientific American.]

THE SCARABÆIDS.

[By Edward C. H. Day, of the School of Mines, Columbia College].

"How disgusting to the eye, how offensive to the smell, would be the whole face of Nature were the vast quantity of excrement daily falling to the earth from the various animals that inhabit it suffered to remain until gradually dissolved by the rain or decomposed by the elements." (Kirby and Spence). Few people perhaps have thought of this forbidding subject from exactly this point of view; yet we may profitably do so, for in nothing is the perfect working of the government of Nature more apparent than in her sanitary arrangements. The familiar illustrations of chemistry will at once recur to the mind of every one; but Nature knows that the operations of that power are sometimes slow, and that delay in effecting the necessary decomposition of worn-out organic matter might result in a wide-spread and undesirable destruction of living organisms. Moreover the best chemical processes are often accompanied by deleterious vapors, and such are not to be permitted in the natural economy of thickly inhabited districts; therefore Nature has her scavengers, wise beings who do not allow waste matters to lie about, uselessly tainting the pure air, but who turn it at once to some good purpose, and thus lighten the labors of the chemical department. Foremost amongst these useful members of the animal kingdom are many families of insects, and pre-eminent amongst these are the *Silphidæ* or carrion beetles, the *Staphylinidæ* or devil's coach-horses, and the *Scarabæids* or dung beetles. The first mentioned are simply destroyers of dead carcasses, whilst the last confine their labors chiefly to the removal of excrementitious matters. The readers of newspapers will be aware that we have in our cities the exact human counterparts of these occupations, but it is with the *Scarabæids* alone that we have at present to do. An occasion calls for the services of these servants of Nature's sanitary bureau; they are to be found at once on the spot; no excuses for delay are thought of, no jobbery will be winked at; they have the contract, and it will be carried out to the letter. If the weather is extraordinarily warm, extra feet and jaws will be set upon the task; the offensive substance is forthwith removed; it may be buried, it may be eaten, but it certainly is not taken from one place to be dumped in the same objectionable condition elsewhere in a populous neighborhood.

And see how these beetles at once convert it to a purpose useful to themselves and most economical to Nature; they actually make of it an edible nest for their own offspring, and thus raise from it a fresh generation of active, incorruptible scavengers, literally born and bred in the business! This may savor, at first sight, of monopoly—keeping a lucrative occupation in the family—but as the work is always well and honestly done, and this without the public being taxed for it, and as, if occasion requires, other animals may share in the perquisites, no one has any reason to complain.

But this is not the only economy accomplished by these creatures. There are cities in this the nineteenth century wasting all the sewage that should be applied to restore the fertility of the exhausted lands around them; there are farmers in this the age of Liebig and agricultural chemistry who allow the rain to wash the richest elements of their dung heaps out of the farmyard, to be wasted on the roadway or in the bed of the neighboring river; nay, worse, who suffer it to soak away into the family well, letting that which should be converted into food become a secret poison—the source of disease and death. But what a different lesson does Nature teach by her scavengers, who "not only disperse the dung, but actually bury it at the roots of the adjoining plants, and by these means contribute considerably to the fertility of our pastures, supplying the constant waste by an annual conveyance of fresh dung laid at the very root."

The *Scarabæids* have various ways of effecting this dispersion of offensive matters, and of these the most remarkable process, and the most amusing to watch, is that of the tumble bugs. See one after she has deposited an egg within a pellet of horse dung, rolling this ball along, trundling it skillfully with her hind legs, now heaving it, like Sisyphus, to the summit of an eminence, and now, Sisyphus-like, having to follow it down to the bottom, again to recommence the toilsome ascent; now digging under a stone, and with, comparatively speaking, far more than the strength of an elephant, heaving it out of her way, and then working it patiently round an obstacle that she cannot surmount; laboring on until she finally places it in a spot adapted for the security of its precious contents, and you may form some idea at once of the power of an insect's muscles, and of its indomitable industry and patience. If several tumble bugs, as is frequently the case, are at work together, you will learn that they are wise too, wise in the wisdom of unselfishness. No matter whose ball it is an individual comes across, she trundles it along. If she falls into difficulties, the others come to her aid; and if the difficulties prove insuperable, and that ball has to be deserted, she at once sets to work with another. It is as if these creatures said to one another: "What matter whether this ball is yours or mine? We have a common duty to perform; it would be folly for us to do as men do, cling each to his own and leave the rest to fate. The propagation of our race depends upon some eggs being stowed safely away; what does it matter whether they are mine or yours?" It is the story of the ants again; each for the whole community, and not for herself alone; it is the story of all Nature, and man is the only social being that disregards the moral.

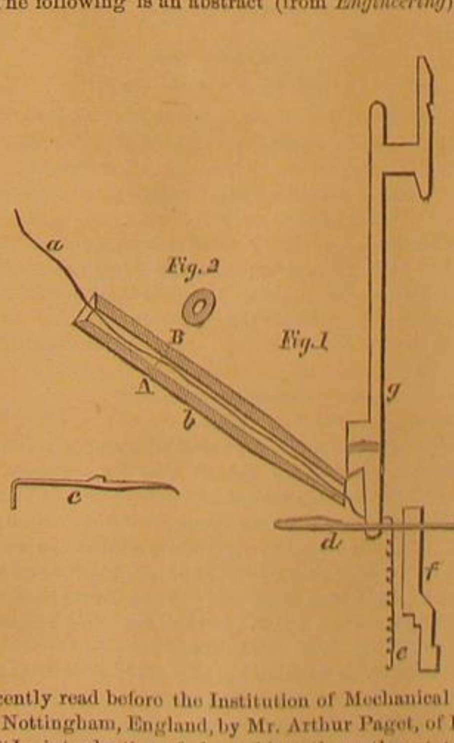
It seems almost just that this insect, lowly, and, according to a refined taste, repulsive though its mode of life may be, should have been selected by the ancient Egyptians for the highest honors, though it is hardly probable that the sacred beetle obtained its religious significance from its curious habits. Noel Humphreys says: "With the sacerdotal naturalists of Egpyt, who had carefully observed the habits and transformations of the beetle, that insect became a symbol of the principle of metempsychosis and other theological dogmas;"

NATURE'S BOARD OF HEALTH—HER SCAVENGERS.

and in Figuier's "Insect World" we find the following more extraordinary explanation: "Hor-Apollon, the learned commentator on Egyptian hieroglyphics, thinks that this people, in adopting the *Scarabæus* as a religious symbol, wished to represent at once *a unique birth, a father, the world, a man.* The *unique birth* means that the *Scarabæus* has no mother. A male wishing to procreate, said the Egyptians, takes the dung of an ox, works it up into a ball, and gives it the shape of the world, rolls it with its hind legs from east to west, and places it in the ground, where it remains twenty-eight days. The twenty-ninth day, it throws its ball, now open, into the water, and there comes forth a male *Scarabæus.* This explanation shows also why the *Scarabæus* was employed to represent at the same time, a *father*, a *man*, and the *world.*" If the priests really believed that the *Scarabæi* were all males, it does not speak much for their powers of observation; if they did not believe it, then Hor-Apollon's statement gives them credit for a wonderfully inventive imagination. We incline to the latter alternative. There are at least two species of *Ateuchus* figured on Egyptian monuments; the one here represented the *Ateuchus sacer*, common in the countries around the Mediterranean, a black insect; and the other the *A. Egyptiorum*, an insect of brilliant metallic green color, more rarely found and more exclusively African.

Knitting Machinery.

The following is an abstract (from *Engineering*) of a paper



recently read before the Institution of Mechanical Engineers, at Nottingham, England, by Mr. Arthur Paget, of Loughboro: "In introduction of the subject the author stated that the date at which the appliances for knitting had been brought within the limits of machinery as strictly so called, was very recent, and the subject of knitting and machinery for that purpose had been so much out of the pale of mechanical science that some explanation was necessary as a preliminary showing the nature of the structure of knitted web. This was done by the aid of diagrams, and it was remarked that in most knitted articles it was necessary that the web, as it was made, should be shaped during the process of making the web from the thread or yarn, and this was one great peculiarity of the hosiery manufacture, that shaped wearing apparel, comprising the numerous descriptions of underclothing, was produced direct from the yarn at one operation of the machine, and without the intervention of the tailor or milliner; and the weaver of calico cloth, or other such fabrics, would hardly realize at once the enormous amount of detail which this peculiarity entailed in the manufacture of hosiery to suit all the different shapes and qualities required, and the consequent necessity that the machines employed should be easily adapted to make articles of very great variety of shapes, thickness, and degrees of elasticity. The framework-knitter's old hand frame, though now doomed to the same fate as many other clever contrivances of former years, was even yet in this district the means of producing probably the larger part of the hosiery made. The subject of the present paper was the self-acting power frame, three specimens of which were exhibited to the meeting.

"To enable the construction of this machine to be more readily understood, the author stated that it would be desirable, first to consider the five primary parts by which the operation of knitting the thread into web is performed, and then to explain the manner in which these several parts had the proper movement imparted to them Still further, to facilitate the comprehension of the movements of the machine, there were distributed to the members present cards having fixed upon them in their proper relative positions specimens and drawings of the primary parts just referred to. From one of these cards the accompanying sketch has been prepared, *a*, in the diagram, being the thread; *b*, the thread tube; *c*, the "coverer"; *d*, the needle; *e*, the knitted web; *f*, the "knocking over bit"; and *g*, the sinker. By the aid of this diagram it may, perhaps, be possible to give a general idea of the action of the machine, which was fully and clearly described by the author in his paper, an extensive series of diagrams, showing the various parts in the positions they successively assume, being employed to illustrate the matter.

In the annexed sketch the knitted web is shown hanging on the needles, which are fixed side by side in a row of the necessary length. The thread tube has a motion to and fro across the needles, and the thread deposited by it is carried down between the needles by the sinkers, so as to form a series of loops. The sinkers are of thin steel, and they are arranged so that they can rise and fall between the needles. The line of thread having been deposited over the needles, the latter retire, and the new loop over each passes under the barb or part of the needle which is turned over. Later on, a presser bar descends and closes this turned over portion, so that its point enters into a groove formed in the top of the needle to receive it; and the retiring motion of the needle still continuing, and the sinker being raised, the old loop on the needle is by the action of the "knocking over bit" caused to pass over the closed barb of the needle, and thus over the new loop (which is inclosed within the barb) also. The sinker then descends again, and the web being then between it and the "knocking over bit," is held close to the latter as the needle advances with the barb released, the new loop being thus made to take up the position occupied by the old loop at the commencement of the circle of operations. The manner in which the primary parts above referred to have the requisite motion given to them, was fully described in the paper.

Having explained the mode of making the web, the author next described the operation of varying the width or narrowing. This is effected by withdrawing two needles at a time, at various intervals. The elasticity of the web prevented any appearance of sudden step instead of a suitable curve. The essential principle of narrowing is that the two loops to be narrowed are moved from two needles at the edge of the web, and are transferred to the two needles next to them and nearer to the centre of the width of the machine. Thus these two needles have each two loops upon them, and one of the loops of the next row is then drawn through each of these pairs of loops, and the loops which would otherwise have run down are held secure. The transferring of the loops from one pair of needles to the next pair is effected by means of the coverers, which are grooved on their under side so as to fit over the barbs of the needles. To effect the transfer of the loops two coverers at each edge of the web are advanced towards the corresponding needles so to take the loops off them. They are next drawn back and moved lateraly so as to come opposite the needles on which the loops are to be deposited, and they are then moved forward to these needles and caused to place the stitches on them.

"Having described the above mentioned operations, the author went on to state that the shaping of the articles was governed by the employment of a peculiar form of endless chain, commonly known in France as the *chaine Vaucauson*. This chain is advanced one link at the formation of each row by the machine, and at proper intervals links of peculiar shape are introduced, which, by acting on inclines, throw out of action the cams moving the needles, and bring into action those working the "coverers," the first mentioned cams being brought into action again as soon as the narrowing has been effected. A link of special form also is used to stop the machine on the completion of a piece of work. The speed of work, as compared with the older methods of knitting, was shown by the fact, as the author believed, that a skilled knitter, with the ordinary knitting pins, would knit about 60 stitches or loops per minute in knitting the leg of a stocking, and a skilled framework knitter, with his hand frame, will knit on the same work 5,400 stitches per minute, whereas a girl, will on the same work, attend to three of the self-acting machines, each making 50 courses per minute, of 13½ inches wide, and 20 stitches to the inch, thus making 40,500 stitches per minute.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Copper Poisoning.

MESSRS. EDITORS:—The following notes taken from my case book (stated in the Baltimore *Medical Bulletin*, April, 1870), may, as other similar cases, serve as a caution against the use of brass or untinned copper cooking utensils:

March 14, 1868, seven persons—five being adults—soon after eating for dinner, in a public house, stewed fruit (dried peaches) that had been cooked in a brass kettle, were attacked with the following symptoms: Pain in the epigastrium extending over the abdomen, nausea, violent vomiting in some cases, and diarrhea. In some, the gastric distress was extreme, followed by giddiness and depression. All recovered, or nearly, within thirty-six hours. All those, and those only, who partook of the fruit were attacked and had the same symptoms.

Two ladies, of the above sick number, of undoubted veracity, one of whom superintended culinary affairs, stated that the peaches after being cooled were removed from the fire and not suffered to remain in the vessel, which was previously well cleansed. This fact, which is remarkable, is mentioned to show the possibility of accident, even when care is used with a view to prevent it.

Being requested by the proprietor to subject the fruit left over to chemical examination, this was done with the following result: First, the peaches not cooked, of the same lot which had been stewed, were examined for copper, but none was detected; iron found in large proportion, this being a normal constituent of organic matter generally, especially so with peaches. The peaches of the same lot which had been used for the table (all having been cooked in the brass kettle) were next examined, when copper was found in small proportion, this accounting for the symptoms. No arsenic, no antimony, no hydrocyanic acid. For the last substance, however, an examination was unnecessary, it being so volatile, if ever present, as to have been dispelled by the heat previously employed; moreover, the symptoms were unlike the effects of prussic acid. In searching for copper, ferrocyanide of potassium and the iron test were chiefly relied upon; for antimony, Marsh's test; for arsenious acid, Reinsch's and Marsh's tests.

Snow Hill, Md. MEDICUS.

Moon Fallacies.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of Aug. 6th, on page 86, you publish an article under the caption of "A Moon Fallacy Exposed," taken from the *American Builder*. The writer quotes from M. Dechamel, a celebrated French agriculturist, which ought to be good authority; but whether the moon has any influence on the timber being cut in the different phases of that planet or not seems to be the question under discussion.

Certain facts relative to this matter have come under my observation so forcibly that I am inclined to think there is some truth in what are termed "fallacies" on this subject. Whether the moon exerts this influence or not, I do not pretend to argue; but I am quite certain if hickory timber, for instance, be cut between the full and new moon, the worms will devour it; but if cut, say three days after the new moon, up to within three or four days before the full moon, the worms will not touch it.

Let some of your country correspondents give this matter a trial. Cut a stick of hickory, say three or four days after the full of the moon, and then cut another stick of the same kind of wood, say three to four days after the new of the moon, and set these sticks up side by side for a few months, and then let us hear the result.

I venture to say, the former of these two will become worm-eaten, and the latter will show no signs of worms or wood borers. Several other facts that would be classed as "moon fallacies" have came under my observation; but let the above suffice for the present. D. A. M.

Cincinnati, Ohio.

A New Trade—Fish Oil.

MESSRS. EDITORS:—The Californian, Connecticut, and Massachusetts newspapers have been congratulating their countrymen that a "new trade" is open to them for the manufacture of the above oil, alleging as a reason "the desertion of the sardine, mackerel, etc., from the coasts of France and Spain," and "the export thereto of roes and spawn from the United States."

The true state of the case is this: Liverpool (and the neighborhood) is famous for its soap manufactories, and turns out some 50,000 boxes *weekly*. Common fish oils, when obtainable, are largely used in fabricating soft, and cheap hard soaps. Our people suggested to the French and Spaniards that instead of packing the sardine for edible purposes only, they should press them into oil with the spare roes of any other fish that could be procured, and consign to England for sale and a market. The hint was carried out so successfully that within these last twelve months, 1,000 tuns of sardine, and other fish oil have come to this market, and have sold readily at £33 and £35, equal to $160 and $168, gold, per tun of 252 gallons (nine pounds per gallon). This new application of the sardine has competed so completely with its previous use for the table, that enough fish are not to be got for "casing," and the dearth now in France and Spain is not that the production is *less*, but that the consumption is *more*. Hence the demand for American roes.

There is therefore vast scope along the almost unlimited American coast for the catch and press of any amount of fish and roes; and be the oil ever so inferior, we can take it at about the quotation given. In this, then, there was just cause for the congratulation referred to, and the soapers of this country will be glad to welcome any quantity of common fish oil that the producers of the United States can remuneratively send them.

Liverpool, England. A. M.

Balancing Cylinders.

MESSRS. EDITORS:—I see by the SCIENTIFIC AMERICAN, of August 13, that C. E. M., of N. Y., like many others, does not quite understand why his shaft, being balanced, should shake so.

Now, let us suppose we have a cylinder four or less feet long and twelve inches in diameter, built of staves on iron rings, the same as a thrashing machine cylinder or a card cylinder. We will suppose that when built it is perfectly balanced. Now let us bore a hole in the end of a stave at one end of the cylinder, and put into the hole so bored one pound of metal; then the cylinder will be so much out of balance. Now we will bore a similar hole at the other end of the cylinder, but on the opposite side. Now, if a similar piece of iron or metal of same weight be inserted it will be balanced again if laid on level, parallel steel bars, but will be out of balance while running; and this is what ails his shaft.

The only way that I have found successful is to balance while running, or rather to test while in motion. If pulleys have much force and high speed they will require to be balanced in the same way. W. O. JACOBI.

Mellenville, N. Y.

[Our correspondent would add much to the value of his communication if he will explain how, unless centrifugal force acting unequally on the opposite sides of the cylinder destroys its regular form, the cylinder will, after being balanced as described, be out of balance when running. Also, if he would give his method of balancing or testing cylinders while running. The first will be a theoretical point of interest to many who will disagree with his conclusions. The second is a matter of practical importance. If cylinders can be so balance!—which we doubt—the mechanical world would like to know it.—EDS.

New Bread.

MESSRS. EDITORS:—Your paper of the 13th of August had an article headed "New Bread," asking why it is unwholesome. The true answer to this question is, I conceive, to be found in an account, published some years ago, of some experiments made upon the soldier St. Martin, a part of whose stomach was shot away, leaving an opening by which food could be introduced, and the process of digestion watched and carefully noted. In new bread the process of fermentation is checked, but not entirely stopped, by the drying out of the moisture in baking. It appeared from the experiments on St. Martin that when new bread was introduced into his stomach the heat and moisture caused the fermentation to recommence before the process of digestion had commenced, greatly interfering with it. W.

Screw-Holes in Cast Hinges.

MESSRS. EDITORS:—Can manufacturers of cast butt hinges be induced to diminish their sales and benefit the public by diminishing the number of screw holes in their hinges?

The breaking of a cast hinge is a common occurrence—the breaking or wrenching out of a screw is rare.

Three holes in an ordinary shutter hinge, for example, will, by so decreasing the strength of the hinge, cause it to break from a strain that would be harmless if there were only two screw holes. A great saving in screws and labor would also be effected. WM. C. BUTLER.

Sassafras, Md.

Dyeing Wood.

MESSRS. EDITORS:—In No. 4, present volume of the SCIENTIFIC AMERICAN, one of your readers asks for a method of dyeing some of the lighter colored and cheaper woods to the natural color of walnut. Here is the process which Mr. J. B. Rochard, a French carpenter, used while working in Paris. Take green husks of walnuts (Brou) and put them to macerate in water for say fifteen days. At the end of that time boil them a little in the same water. Let the decoction cool, and use it by soaking a piece of rag in it and rubbing the surface of the wood with it. Two rubbings will give to the wood the color desired. When wanted to dye hard wood, like oak, rub the wood previously with salt of niter and proceed as before.

Jacksonville, Fla. F. GUICHETEAU.

Lowest Line of Perpetual Snow.

MESSRS. EDITORS:—In your number of August 6th, page 85, is a communication on this subject, indicating that there is something like a uniformity in the snow line in the same latitude, whereas the fact is quite the reverse, depending on a great diversity of circumstances.

On detached high peaks, like Teneriffe, it descends low for the latitude. On the Himalayas, it descends lower on the south side where the descent is abrupt, than on the north where the descent is less, and to an elevated extended table land.

And do we not see the same thing in America? The line of perpetual snow descends lower on Mount Hood and other peaks of the Cascade and Nevada range, with its abrupt western slope, almost to the ocean level, than on the peaks and ranges of the high table land of the Rocky Mountains.

And though the temperature on the west sides of the great continents is much milder than in the interior and on the east sides on lower lands, does that apply to the same degree at high altitudes? My impression is that it does not.

Grand Rapids, Mich. JOHN BULL.

Tin Fruit Cans.

MESSRS. EDITORS:—There are various qualities of tin purchased by fruit packers for manufacturing their cans. You probably know as well as any one of what the coating of that tin consists, whether it is all pure tin or a mixture of tin and lead. I have several times eaten peaches which had a decidedly metallic flavor, and have suspected that it was derived from the coating of the cans. I have reason to think that packers use the cheapest grade of tin for fruit, and that they use different grades for oysters and vegetables. A. B.

Balancing Pulleys and Shafting.

MESSRS. EDITORS:—If C. E. M., of N. Y., will take his pulleys from the shaft, and balance each one separately, he will have no further trouble with their shaking, if the shaft is of proper dimensions.

In my opinion, the trouble will be found in this, that the maker of the machine balanced the pulleys on the shaft. This practice is all wrong. Work balanced in this way will not run steadily. J. G. F.

Winchendon, Mass.

How the Dead Soldiers are to be Identified.

A Berlin letter says: "Mark one instance of the German practical spirit as a proof of the fashion after which these Teutons prepare to fight. In recent wars popular feeling has demanded that rank and file, captains and generals, shall be equally and impartially mentioned in the lists of the slain; but difficulties have arisen, because the enemy cannot know the dead men's names, and when the muster roll is called after battle, the missing may be only wounded or prisoners. Germany has in her solid, calm manner, arranged, in view of this difficulty, that each wife and mother shall speedily know the best or the worst about those who go to fight 'with God, for King and Fatherland.' Slips of parchment, like luggage labels have been prepared, on which the number of each German soldier is plainly written, and one of these will be fastened inside his coat when he goes into action. After the day is decided, the enemy, if he be master of the field, will be requested to collect and return these labels, of which about a million have been provided, grim tickets for an unknown journey! Think of the German wife or mother sewing it on—the battle ticket of her stake in the quarrel—the address of her particular 'material of war,' the awful traveling label whereon no loving hand may write 'with care,' seeing that its bearer goes into the Valley of the Shadow, to come forth again or not as Heaven shall decree. Sewn on with German thread, ripped off, perchance, with French knife, whole packets and parcels of these little human memoranda will surely be returned; but yet every man who buttons his coat over the label of death has looked his fate full into the face, and made himself 'ready for the burial.'"

The Fly-catching Plant.

In an article on "Flowers in Paris" in the last number of *London Society*, the writer says:

"A very curious fly-catching plant, flowered in my garden this summer, and a most curious inflorescence it is. The Corsican arum, *Arum crinitum* or *muscivorum*, called by French gardeners *gouet-chevelu* and *Attrape-mouche* (please not to confound this either with the Dragon or Italian arums, *A. dracunculus* and *Italicum*), produces a flower like the common arum of the hedges, only much larger, and with the upper part bent downwards, as if it were an accidental distortion. Both the central spadix and the spathe are thickly covered with dull purple bristles (whence its name *crinitum* and *chevelu*).

"The spathe contracts towards the base, like an hourglass, and there issues from it a faint cadaverous smell. This attracts blow-flies, blue and green. They come accordingly, not in swarms, but one by one, leisurely and taking it easy; and there are no outward and visible signs of their being caught.

"You skeptically ask yourself why the plant is named *muscivorum* or *attrape-mouche*. By-and-by, perhaps, when the spathe is shriveled, you tear it open to see whether you have any chance of obtaining seed, and the secret is revealed. At the bottom you find dead flies by scores, beguiled into a sort of vegetable Black Hole of Calcutta. Like the animals that entered the lion's den, all their footsteps pointed inwards; none came out; the bristles prevented them.

"Another year, I should like to try whether those bristles have any motion of irritability, or power of entangling and shutting in their victims."

STONE SAWING.

[From Byrne's Handbook for the Artisan.]

The softer varieties of stone admit of being cut into slabs and smaller pieces with toothed saws, which are sometimes made of a similar form to the cross-cutting saws for wood with upright teeth; but the toothed saws for soft stone are generally made somewhat wider in the middle than those for wood, so as to make the blade more rounding in the direction of its length, and, instead of being reciprocated backwards and forwards nearly in a horizontal line, as for cross-cutting wood, the toothed saws for stone are used with a swinging stroke, so as to act upon only a moderate portion of the length of the cut at the one instant of time; this is done to reduce the labor, and give the saw teeth more penetration. Some of these very soft stones are worked with chisels and gouges similar to those of the carpenter, and they may even be worked into moldings with planes like those for hard wood, but this is not generally practiced.

Slate is sawn and sometimes planed with cutting tools, very similar to those used for wood, except that they are stronger and applied by machinery, the action being partly cutting and partly forcing off the flakes of slate, as, if the tools are allowed merely to scrape over the surface, their edges become rapidly worn away. But the various sandstones, limestones, and marbles are too compact to be thus treated, and they are consequently worked almost exclusively by the chipping-chisel and various abrasive processes; the chisel being used for such parts of the material as are in excess, as in sculptured works, and the abrasive process being employed for dividing the blocks into slabs and small pieces, which are subsequently ground to the required forms with sand and water. In the case of marble, the pieces are finally polished with abrasive powders applied on rubbers of various materials.

The ordinary saw, used in dividing blocks of stone and marble into flat slabs, consists of a parallel blade of soft iron from five to ten feet long, from four to five inches wide, and from one eighth to one sixth of an inch thick, the blade is perforated near each end with a hole about three quarters of an inch in dameter, for the reception of an iron pin, by which the saw is strained in a rectangular wooden frame. The blade is inserted in the saw kerfs in the upright sides of the frame, called the *heads*, and the pins rest in two notches near the lower extremities of the heads, which serve as the handles of the saw, and are kept distended by the wooden stretcher called the *pole*, placed about a foot from the upper ends of the heads, and rested at each end against a loose block of wood called the *bolster*.

Instead of a coil of string twisted with a short lever being employed for drawing the upper ends of the frame together, as in the saws for wood, this object is effected by the use of a kind of chain made of looped iron rods, with intermediate C-shaped links, for adjusting the total length of the chain, which is furnished with iron loops that embrace the upper ends of the heads. The tenison is given by a right and left hand screw fitted to two looped nuts, attached to the iron rod by C links; the double screw has holes for a lever, by which it is twisted so as to draw the upper ends of the heads of the frame together with great force, and thereby stretch the saw in a most effectual manner.

The depth to which the saw can penetrate is limited by the distance from the edge of the blade to the under side of the pole; the nearer the pole is to the saw, the greater is the stability of the blade, and all the parts of the frame are made detached, so as to allow of their being combined and adjusted to suit the different sizes of blocks of stone. The same pair of heads are used with poles and saws of various lengths, and the pole is placed at different hights from the blade, according to the depths of the blocks of stone. When the latter are very deep, a longer pair of heads are substituted, but long heads are avoided as much as possible, as the stability of the saw frame is thereby much reduced.

The blade of the stone saw, like the metal laps used for grinding generally, does not itself cut the stone, but simply serves as a vehicle for the application of the sand, which acts as the teeth of the saw, and performs the cutting process. The coarseness of the sand that is employed depends upon the hardness of the stone to be cut; for moderately soft stone a coarse sharp sand is employed, and for the harder varieties of marble a fine sand is used; the sand or grit generally employed for cutting stone is obtained from the scrapings of roads paved with flint. The scrapings are sifted through perforated copper sieves, much the same as emery, as it is of great importance that the sand should be clean and free from small pieces of stone, or any other extraneous matters. Should a small piece of wood or a bit of coarse gravel by any accident get into the kerf beneath the saw blade, the little piece would roll over backwards and forwards, and materially impede the cutting of the block, and it then becomes necessary to remove the saw and wash away the obstacle, by pouring water down the saw kerf.

The cutting action of the sand is assisted by a small stream of water, supplied from a barrel placed a little above the block of stone. A small hole is made near the bottom of the barrel, to which is fitted a spigot and faucet, or more commonly a loose wooden peg grooved up the one side, which allows of the escape of a minute stream of water, that trickles down a sloping board placed so as to lead the water into the saw kerf. A little heap of sand is placed near the path of the water, and the workman is provided with a wooden stick with an iron hook at the end, or more commonly an old knife-blade placed at right angles to the stick near its end. This tool is called a *drip-stick*, and is used occasionally to draw forward a small quantity of sand into the running water, which thus carries down the necessary supply of sand for the cut, and the water flows away at the ends of the kerf, carrying with it the worn-out sand and the particles of stone removed in the cutting; the drip-stick is also used for tapping the wooden peg, so as to increase or diminish the flow of water according to circumstances.

The weight of the saw and frame supplies the necessary pressure for causing the penetration of the sand, so that the workman has only to guide the saw, and push it backwards and forwards for the cut, and when the pressure is so great as to render the work too laborious, a counterpoise weight is hung from a pulley placed over the saw frame, to which a cord is attached, so as to reduce the pressure to the required amount. Under this arrangement, the saw works more easily, but it does not cut so rapidly.

For marking upon the block of stone or marble the lines upon which it is to be sawn, as for cutting it into slabs of one or two inches thickness, the block is first shifted upon rollers into the position in which it is to be sawn; it is then mounted upon square pieces of wood called *skids*, with that side of the block upwards which is to constitute the edges of the desired slabs; and, as the blocks are frequently of very irregular forms, it is necessary to make one line around the top and two ends of the block to serve as the basis from which the other lines are set off, much the same as in setting out round timber.

The position of the first line having been determined, so as to allow of the greatest number of parallel slabs being cut from the block, two marks are made on the top of the stone close to the ends, with a piece of soft black slate found amongst coal, and called *black*; a line is then drawn, under the guidance of a straight edge, to connect these two marks, and the line is continued down one end, also with the straight edge. An equal distance is then set off at the bottom of the opposite end, and a line is drawn to serve as a temporary guide; two straight edges, each from two to three feet longer than the depth of the block, are applied to the two end lines, and the workman looks along the line of the two straight edges, to see if they are parallel to each other, or out of winding, in much the same manner as in the application of the winding sticks to narrow works in wood, except that, for setting out the blocks of stone, the straight edges are placed perpendicular instead of horizontal. Should the straight edges not appear parallel to each other, the one at the second end of the stone is shifted at the bottom until the two straight edges are in one plane; the permanent line at the second end of the block is then drawn in the corrected position of the straight edge, and if the work has been correctly performed, all three lines will be in the same plane. The thicknesses of the required slabs are then gaged off from this foundation line, and the lines on the top are *chased*, or cut in about one eighth of an inch deep with a narrow chisel, to form a groove in which the edge of the saw is placed for the commencement of the cut. The end lines are also chased, as the water and sand would wash out the black lines.

Before commencing the sawing, the workman examines with a plumb line whether the end lines are vertical, and if not, wedges are driven under one side of the block, to bring the end lines exactly upright; the saw is then inserted in the groove, and the sawing is proceeded with, care being taken in the first entry to keep the saw quite upright, which is greatly assisted by the hight of the saw-frame. Should the saw make the cut a little oblique to the lines, the position of the saw is slightly twisted in the saw-kerfs of the wooden heads, by blows of a hammer applied on one side of the pins which retain the blade in the frame, and which causes the saw to cut in the reverse direction. The necessity for changing the direction of the cut is, however, avoided as much as possible, as it makes the surface of the slabs irregular from the hollows thus produced. The necessity for grinding out these much increases the labor of producing a flat surface on the slabs, and the thickness of which is also lessened; this it is sometimes an important object to avoid with valuable marbles, which are occasionally cut into veneers for inlaying, which do not exceed one eighth of an inch in thickness.

The length of the traverse of the saw is generally about twenty inches, and a saw is therefore chosen that is about two feet longer than the block to be cut, as the shorter the saw that can be efficiently used the more firmly the blade is held. When two small blocks are to be cut, they are frequently placed end to end with the intended cuts in the same plane; and to prevent the sand and water, called the *feed*, from flowing out between the stones, the interval is filled up with straw rammed in firmly between the two blocks; in the case of light-colored marbles, clean shavings are used for this purpose, as the straw would stain the surfaces unless the slabs were washed immediately afterwards.

After the marble has been cut into slabs with the stone saw, if it is required to be reduced into smaller pieces, or narrow slips, such as shelves, or the sides of chimney-pieces, the slab is laid on a bench, having a flat surface of hard stone, or marble, called a *rubbing bed*. The lines indicating the margins of the required pieces are marked with the straight edge, and black lead, and the lines are chased with a narrow chisel, as for the entry of the stone saw, but the cutting is effected with smaller blades, called *grub saws*; they consist of plates of iron from one-twentieth to one tenth of an inch thick, from six inches to four feet long, and six to eight inches wide when new. These blades are not stretched in a frame, but are stiffened by having their upper edges clamped between two pieces of wood extending their whole length, and measuring about two inches wide and one inch thick, the whole being held together by means of ordinary wood screws, passing through holes in the plate, so as to form a wooden back something like those of the dovetail saws, and which serves as the handle by which the grub saw is used.

The blade should always be shorter than the length of the cut to be made, as, should the blade be longer than the cut, it would be worn hollow from the greater amount of rubbing to which the middle would be exposed; but when the grub saw is much shorter than the cut, it is liable to be worn rounding in its length. To counteract this tendency, the grub saws are sometimes filed, at every four or five inches, with angular notches about three fourths of an inch deep, and which also allow the feed, or the sand and water, to reach the bottom of the cut with greater facility, and the grub saws are consequently considered to cut rather faster for the notches.

The width of the iron blade measured to the wooden back limits the depth of the cut to which the grub saw can be applied, and, in selecting a saw for any particular piece of stone, preference is given to as narrow a blade as can be fairly applied to that thickness, as, when the blade is wide, it is rather feeble sideways, and it is besides more liable to be twisted from the perpendicular, when rubbed backwards and forwards in the cut, with one or both hands applied on the back of the saw near the middle of its length.

Washing out a Mill Race, or Foundation by Sluicing.

We learned from a friend, a returned Californian, who had seen several attempts made to wash out a race or a foundation by water, and had once tried it, but all these attempts ended in confusion and vexation, for the reason that they were all begun at the wrong end. That is, the water was shot down from a hight above into the foundation, or upper end of the race, without any proper facility being provided for carrying away the gravel and small stones; the result was always the same; the water would excavate a deep hole where it struck, but only the soft loam and clay were melted and carried away by the water, the stones and sand remaining and blocking up the channel, and it was found cheaper and better to plow and scrape the earth out. But Mr. Whipple, the Californian alluded to, has shown us the principle of *sluicing*, which experience has proved to be the cheapest and best method of making such excavations. He sluiced out a tail-race and wheel pit this winter (1869) in a hard gravel soil, in a very short time; he placed a sluice (by nailing three boards together, forming a bottom and sides, and open at top) at the lowest end or discharge of the race, and ran the water down the intended route, and through this first length of sluice into the river. He then commenced at the end of this length and loosened the earth with a pick or crowbar to the required depth and width, and the water, rushing down from the unbroken surface above, swept the earth and stones down the spout into the main stream. When thus exavated to the proper distance, another length of sluice was added, a little straw stuffed under the end, and each side blocked up with stones to direct the water into the end, and another length loosened and sent through the sluice, as before. This process was continued until the race was completed, and the foundation for the wheel-house reached; and here the benefit of Mr. Whipple's Californian experience was more conspicuous than in digging the race, because the depth of excavation here was so great that the earth would have had to be wheeled to get it out of the way, and this is always a tedious process; but he sent all the earth and moderate sized stones down the sluice and river in an incredibly short time; by shifting the chute of water upon different parts, and loosening and throwing out the larger stones, thus giving the rest a proper facility of entering the sluice, it was swept down stream by the water, requiring only a little assistance with a hoe or shovel when large or flat stones would incline to stop and obstruct the passage.

Any person who does not comprehend the assistance which such a sluice renders, to enable the water to carry away stones and gravel, may satisfy himself by trying to shovel or push such gravel and stones on top of their natural bed, and then try to shovel the same, or push them along in such a sluice; or let him try to shovel potatoes from the top of a bin, and then try shoveling them on a wooden floor.

Care should be to place each length of sluice at the full and proper depth at first, and also to give each length an equal and sufficient fall to insure the requisite rapidity of current. By Mr. Whipple's experience, two inches of fall in one length of board, or twelve feet, will carry along stones the size of potatoes, or a man's fist, while three or four inches tall to each length will roll along stones as large as a man's head. Of course, a sufficient supply of water is necessary in all such operations.—*The Practical American Millwright and Miller.*

Glass Walls.—Among the novelties in garden arrangements an English builder has lately patented a system of erecting walls of glass. These walls are formed of grooved T-iron. Stands of the required hight are fixed at four or five feet apart into a foundation of brickwork, stone, or blocks of wood, and bound together at the top by a coping which projects three inches on each side. Into the grooves rough plate glass is placed, being held in position by a packing of felt, the slabs being butt-jointed; and thus, when the coping is put on, the work is complete. Nothing can be more simple than the arrangement and construction of these walls, and they are unexceptionable in point of appearance. They are open to objections, but may be useful under some circumstances.

Mathematical and Optical.—James W. Queen & Co., the well-known mathematical and optical instrument makers, of Philadelphia, have opened a branch of their establishment in this city, at No. 5 Dey St. Their advertisement appears in our advertising columns. We can recommend this firm to such of our readers as desire to purchase articles in their line or trade.

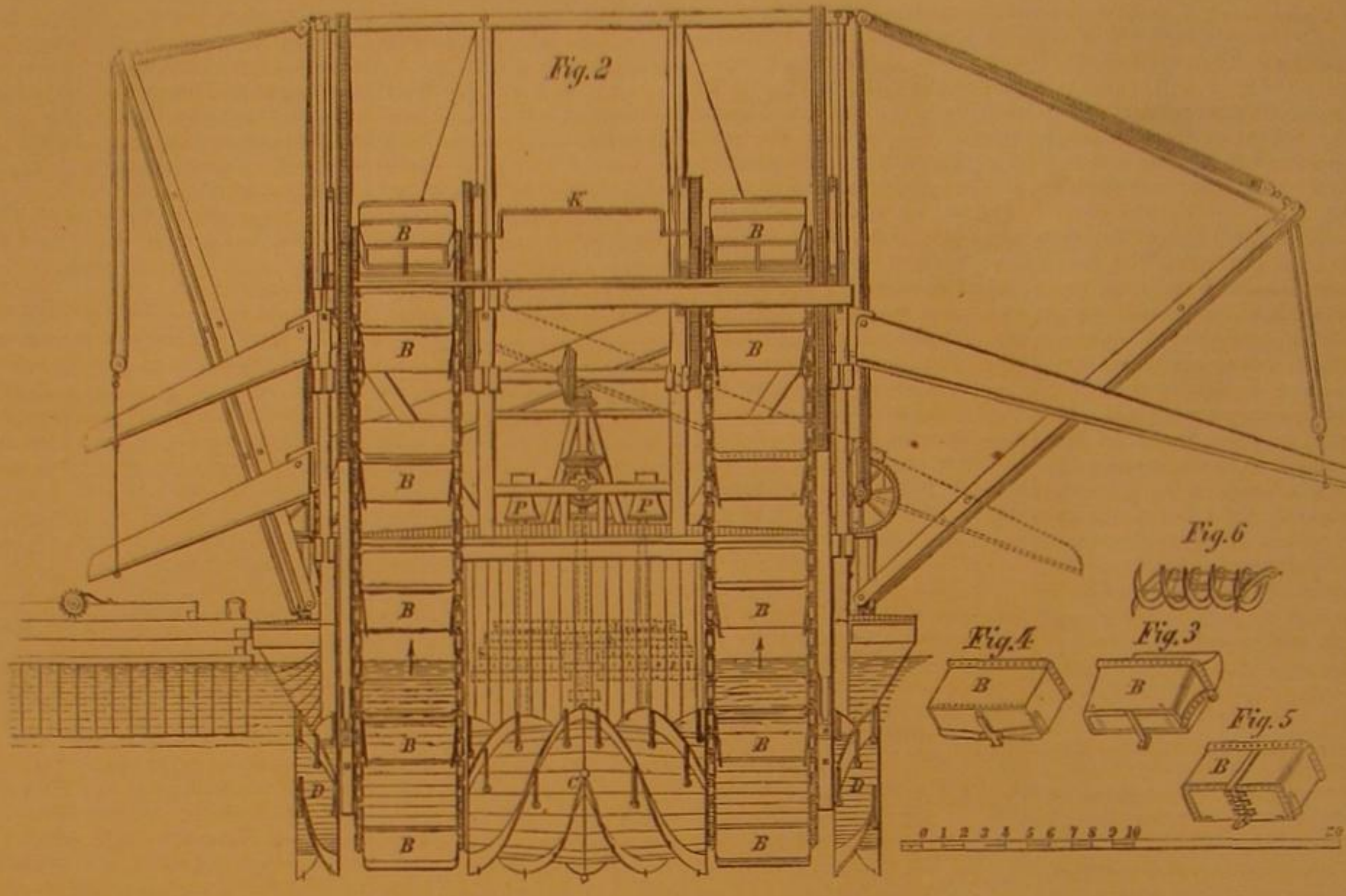
There are two hundred and forty-one and five-eighths miles of paved streets in the city of New York.

(Continued from First Page.)

to the chain. This insures the discharge of the most difficult material. The short receiving spouts under the buckets, and the one between them, are hung on pivots in the center, so that either end may be elevated, and the contents of both sets of buckets discharged on either side, or both sides, as may be desired.

Whenever the extent of the work requiring a lateral deposit is sufficient, the hull of the dredge may be built long enough, and lean enough aft, to balance the machinery forward, without the counter balance.

When the work is situated in water deep enough in front of the dredge to float the loaded lighters, the buckets like B, Fig. 5, which dump through the bottom, are brought into requisition, the latch to these may be tripped anywhere on their perpendicular way up, and discharged into a short vibrating spout, which conveys the material directly into the lighter, placed much nearer than it can be in any other arrangement—thus saving power in proportion to the hight of discharge.



HOWARD'S DREDGING MACHINE.

Fig. 6 is a gang of hooks, sometimes put upon the chains between the buckets, when working in hard, coarse material, like cobblestone, shale, or hardpan. The chain is so constructed that any shaped bucket, or any other device for loosening the material, that might be found in practice to be preferable, may be put upon it. All the articles here represented have been fully tested, and found very useful in their places. No sacrifice of power, or of economy in working, has been required in using all these appliances on the same machine; on the contrary, it is claimed that the perpendicular position of the working part of the chains, and their passing around three drums instead of two, are great improvements under all circumstances.

The perpendicular application of power secures economy of friction, in the wear of rollers, ways, etc., especially where no lubricating material can be used, nor the wearing parts secured from the destructive action of sand and water, which must always be present in dredging.

The third drum, which constitutes the flange wheels, G, is used to raise the buckets from the bottom, in the manner above mentioned, without changing the perpendicular position of the working part of the chain. It also furnishes the best possible position for the discharge of buckets like B, Fig. 3, at all times when that kind of bucket is in use. Also, that of B, Fig. 4, which dumps between the two upper drums, requiring nearly a horizontal position to discharge.

The bucket, B, Fig. 5, may be dumped anywhere on the perpendicular part of the chain, by raising or lowering the vibrating spout which trips the latch. This is the most economical of all the different buckets, where circumstances are favorable for its use, as it dumps, with perfect freedom, all kinds of material, and is discharged at a much less elevation, on account of its better relative position with respect to the lighters.

In working these machines, a pulley is anchored at a convenient distance ahead, with a feed line passing from one of the feeding capstans, P, through the pulley and back to the other capstan, either one of which, or both, may be worked by the adjustable machinery to any required motion, by a change in the series of clutches at Q, or a series of wheels below deck; while the spiral cylinders below water, with the buckets, clear the way to the full width of the dredge, and to the depth required, bringing up the material and depositing it in lighters, or on the banks, or at any distance in any direction horizontally, not exceeding one in twelve of the altitude overcome, by supporting a spout, lined with sheet iron of the length required, on a movable support, that it may coincide with the feed motion of the dredge.

The distance from the dredge at which the deposit is required, determines the length and inclination of the spouts. Something, however, depends upon the nature of the material excavated. If it contain clay, or vegetable matter sufficient to prevent the water from draining out too soon, it will run on a descent of one inch to the foot, without more water than the buckets bring up with it; but if the material be pure sand or gravel, a pump will be required to assist in the discharge, without more inclination of the spout.

These machines can be constructed with any dimensions, to suit the magnitude of the work, provided the proper proportion of the parts be preserved for strength, motion, power, and durability—considerations very important for the success of any machinery, more particularly such as is supported on a floating foundation.

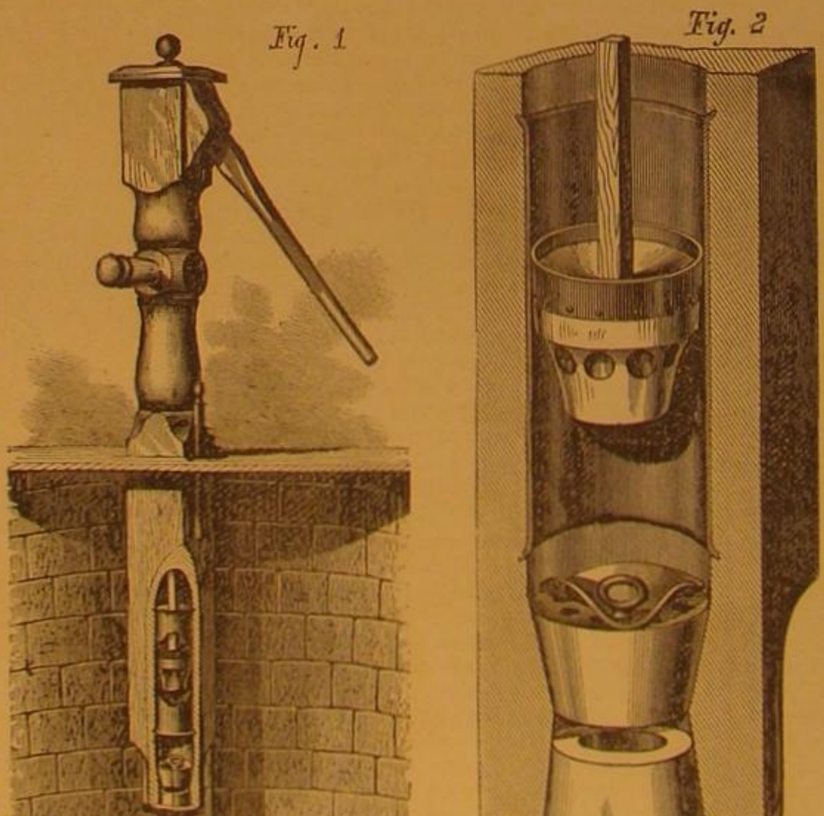
It is claimed that a machine of this kind, designed to raise 6,000 cubic yards per day, of ten hours, may be more economically worked than two designed to perform the same work, as all the help required to work the larger machine more than one of the smaller ones, would be that needed to dispose of the excavated material.

A machine capable of raising 3,000 cubic yards has been used by the Central American Transit Co., in the San Juan river and the harbor at its mouth, and is said to have worked with great satisfaction to the Company. Another, with some of the improvements described, was built in 1857, for the Corpus Christi Ship Channel Company, in Texas, with which the channel was finished to sixty-four feet in width, without the use of a lighter, except to support the long spout in which the excavated material ran off on an inclination of one inch to the foot.

Wooden Pump

The wood pump has been so long in use, and is so well known, that, at first sight, it might seem hardly worth while to attempt its improvement, more especially as it now competes with a host of metallic pumps which have secured a widespread popularity. The wood pump has, however, the advantage of metal pumps on the score of cheapness, and it is claimed that the improvements herewith illustrated enable it to compete in all other respects.

The most prominent improvement is the placing in the pump a metallic spring lining, made of galvanized iron, copper, or other suitable material. The top and bottom of this lining—which is of sufficient length to give a bearing surface for the plunger—are turned out slightly, like the mouth of a trumpet, and forced into the wood. This holds the lining firmly in place. At the same time the vertical joint is so constructed that it allows the elastic spring lining to expand and contract, to compensate for the swelling and shrinking of the wood, so that it always fits the bore of the body of the pump. The plunger has also been improved. Its shape is distinctly shown in Fig. 2 of the accompanying engravings. It is made in a solid piece, curved holes passing through it so as to leave ribs between the holes, which serve to strengthen the plunger, the curvature of the holes being such as to give natural and easy flow to the water in passing through them. The top of the plunger is concave, and is covered by a corresponding leather valve, like that shown in the lower or check valve. This valve acts from the center outward, securing, it is claimed, greater rapidity and certainty in closing, so that, we are told, a gain of one fifth over the old valve is secured by a prompt stoppage of return flow. Both valves act as described, and this construction also prevents sand from preventing the closing of the valve. The seat of the lower or check valve is made tapering, as shown, and is provided with an eye in the center whereby it may readily be withdrawn from the barrel when desired.



SMITH AND LAFFERTY'S IMPROVED WOODEN PUMP.

The spring lining is also made slightly larger at the top than at the bottom, which permits the easy withdrawal of both plunger and check valve seat. The joints which connect the pipe to the pump barrel and the couplings of the wood pipe are made tapering, which secures not only a permanent and perfect fit, but a fit the whole length of the joint, instead of, as in the old method, an imperfect and short contact.

The length of the pump barrel is such that the working parts are placed below the reach of frost in the coldest weather, the water being vented just above the lining, so that although the upper part of the barrel is freed from water, the working parts remain immersed, and no priming is required in starting. The vent stopper is a flat bar of iron pivoted in the middle to the side of the pump, and having a leather packing at the lower end to cover the vent hole, the upper end of the bar passing up through the floor of the curb, so as to be readily opened or closed, and having its motion limited by stops attached to the pump barrel. These improvements are, we are told, so cheaply applied that the cost is but slightly increased over that of the less efficient old wooden pump.

Patented June 21, 1870, by R. M. Lafferty, of Three Rivers, Mich., and manufactured by Smith & Lafferty, of the same place, and by the Toledo Pump Co., Cleveland, Ohio, to either of whom orders or letters for further information may be addressed.

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Contents:

(Illustrated articles are marked with an asterisk.)

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The Troy meeting commenced on the 17th of August, and closed on the 24th. It was a gratifying success; the proceedings were harmonious, dignified, and vigorous; many of the papers read are valuable.

The attendance was respectable, and all parts of the country were represented. But many familiar faces were not to be seen. Death has made sad havoc among the old men. Henry is in Europe; Agassiz and Peirce were kept away by sickness. There was, however, a crowd of earnest young men, of whom we name as examples the Salem naturalists, and Cope, Pickering, Hitchcock, Young, and Storer, who are ready (and who will, perhaps, some day be able) to take their places. Of course there were clap-trap, private axgrinding, and speeches for Buncombe, and yet probably no more than at former meetings.

The Association is indeed one of the most important of living agencies for the advancement of science in America. Its list of members comprises nearly all the American names which are distinguished in scientific literature. It brings together harmoniously the members of all our other learned bodies, and thus it represents the science of the whole continent. The Association is a national institution, and it asks for the sympathy of all the friends of progress.

It is to us a very gratifying fact that the Association is respected and honored by the people at large. At the present time there is no other annual peripatetic convention which is so much invited, prepared for, talked about, and hospitably entertained; and all this notwithstanding its proceedings are as unintelligible as Greek to most of its kind friends. No one can see this and believe that America is justly reproached with neglect or distaste for scientific pursuits. If America is behind other nations in scientific advancement it cannot be because our scientific laborers need the stimulus of sympathy and appreciation.

As an example of how kindly the Association is treated we may mention some interesting facts about the Troy meeting. The citizens of Troy contributed $10,000 to defray the expenses of the entertainment. Hotels, private houses, and public buildings were freely opened for the use of the Association, and the members were honored as if they were guests of the whole population. Elegant receptions were given at the houses of the Mayor and of other leading citizens. The Association in a body, at the invitation of the Troy local committee, went in a special train to enjoy the elegancies of Saratoga, and, at the invitation of the State Department of Education and in a steamer chartered by citizens of Albany, visited the Capital.

The Association is, then, a very respectable society, and it receives the hearty homage of the people. The people surely contribute fully their part in the cause of science. Should not their liberality and hospitality be a stimulus to still greater exertion on the part of the Association? Does the Association owe a duty to the public, and is that duty well attended to?

Because we respect the Association so highly, we desire to see it improved if possible, and it is for the same reason we see its defects. In some respects it is better than it was before the war; it is more in earnest, and it has more workers; and in other respects it has sadly changed. There are lately more trashy papers, and especially papers which are made big with padding from encyclopedias and old almanacs. Perhaps it is impracticable to prevent such papers being offered, but there surely may be some way of keeping them out of the printed transactions. The printing of some of these papers recently, has made the Association an object of ridicule all over the world. Why not try to prevent such a thing happening again. A little quackery, boring, or axgrinding, which lasts only during a meeting, is perhaps best to be endured, but print it in the transactions and it is a disgrace for all time.

THE ST. LOUIS BRIDGE.

The bridge now in process of erection across the Mississippi at St. Louis, is one of the wonders of the age. It is to be a tubular, cast steel, arch bridge, supported by the abutments and two piers; the latter are 515 feet apart, and 497 feet each from its nearest abutment, making three spans of about 500 feet each. Its greatest span is the same as that of the Kuilenburg bridge over the Leck, an arm of the Rhine, in Holland. Thomas Telford's suspension bridge across the Menai Straits, in the northwestern part of Wales, has a span of 570 feet. The Victoria tubular iron bridge of Montreal, exceeds this greatly in length, being 6,600 feet (1¼ miles), but it rests upon 24 piers, and its spans are only 275 feet. The Suspension Bridge at Niagara spans 821 feet, and is 245 feet above the water. The East River Bridge will span 1,600 feet, at a hight midway of 130 feet.

But the novel method of the construction of this bridge in some particulars, renders it especially worthy of note. The piers are sunk in the following manner: The masonry is commenced at the surface of the water, upon an inverted elliptical-shaped caisson, 80 feet long by 40 wide—the dimensions of the pier. This is closed at the top and open at the bottom, with its lower part larger than the upper, to facilitate its passage through the sand after it reaches the bed of the river. It would be very much like building the pier upon the bottom of an inverted wash-tub, of the same size and shape as the caisson. The caisson is filled with air, like a diving bell, and the mass of masonry which constantly accumulates upon it is borne up by the confined air, and, as the caisson descends, the pressure of the water condenses the air so that the water rises considerably within it, just as when an inverted tumbler is pressed down into a vessel of water. To prevent this and give greater buoyancy to the mass, air is forced into the caisson through a vertical passage in the masonry by a powerful steam pump. The caisson with its superstructure of masonry must be sunk to the rock bed of the river, because the deposit of sand above it—which at one pier is 79 feet deep—in times of flood and freshet, is scoured away to a great depth, if not to the rock itself. When the caisson reaches the river bed, the sand within it must be removed. This is done by a current of water that is forced down, by a tube, through the masonry, into the caisson and then up again to the surface; and as it takes its upward course the sand is shoveled into it through a contrivance for the purpose, and carried to the surface in the form of muddy water by the ascending current and poured out into the river. Here it causes a bank of sand to accumulate which sometimes rises to the surface of the water.

Workmen are needed in this caisson of condensed air, below the bed of the river, to shovel the sand and do other necessary work. These pass down by means of a circular stairway in another vertical passage—there being five in all—through the center of the pier, and are admitted into the caisson through an air-lock or chamber, with an air-tight door on the upper and lower sides. Into this chamber, after the men have passed the upper door, the condensed air is gradually admitted till it is as dense in the lock as in the caisson below. They experience here very peculiar sensations, among which are, a burdensome pressure upon the whole system and especially upon the drum of the ear, and a great increase of heat in the system, because condensed air has a smaller capacity for heat than in its ordinary state. In passing out, of course, the order of proceeding and of sensation is reversed. The workmen in the caisson are exposed to considerable danger from the unusual atmospheric pressure, which sometimes amounts to two or three atmospheres. Several have died from the injuries here received. When the caisson has reached the bed rock, the rock which "dips" towards the Illinois shore, is leveled off with concrete; then the caisson and the passages in the pier are filled with concrete, and the *solid pier* rests upon a foundation of limestone rock. Two piers have been sunk in this manner and are now above the surface of the water; the last will be similarly sunk this fall.

The manner of testing the steel which will form the arches of the superstructure is also very interesting. This is done by means of a massive machine which acts by hydrostatic power. By its use the power of the steel to resist both compression and tension is accurately determined. It is a well known principle of hydrostatics, that a given pressure upon one square inch of liquid surface causes equal pressure upon *every* inch of that surface. This instrument is so constructed that the surface where the power is exerted is to the surface of the piston where the power is applied as 1 to 100; hence the exertion of one pound of power produces a compressing or tensile force of 100 pounds. Any change in the length of the steel to be tested, even to the 20,000th of an inch, it is said can be detected. This change is indicated by a mirror, which revolves as the piston moves, and which reflects light from a graduated arc, 25 feet distant, to a telescope situated in the arc. Through this the observer looks and records the continued changes of the steel by the varied pressure to which it is subjected. Every piece is tested until its limit of elasticity is reached, that is, until it has become so compressed that it will not spring back when the pressure is removed. It may be subjected to a force of 100 tuns.

A WANT IN LOCOMOTIVE ENGINEERING.

We this week saw in an English paper a controversy in regard to the speed of a train in rounding a curve, it being charged that a "driver," as our British cousins style a man who runs a locomotive, was in the habit of taking a particular train around a curve above the standard speed of forty miles an hour, for which the curves are calculated, thus endangering the safety of passengers.

This question of speed always comes up when accidents occur, and as yet no adequate means have been adopted whereby the precise speed of a locomotive engine at any given point of its running can be so recorded as to settle such questions beyond dispute.

Such an instrument would be a boon to engineers who run locomotives, and who are, in our opinion, much more often unjustly than justly blamed for undue and improper speed on the occasion of accidents.

The problem is not a difficult one to solve. We once, as a matter of personal amusement, designed an instrument on the principle of the ball governor which would do it perfectly. The balls, instead of being hung on pivoted arms, slid out on horizontal arms against scale-springs of definite power, as they revolved by motion derived from one of the truck wheels. In doing this they raised a tracing point along the side of a vertical cylinder revolving by clock-work, making a mark of given hight for a given speed, rising with increased speed, and falling as the velocity of the locomotive decreased. Vertical lines on the surface of the cylinder represented hours and five minute divisions, and the position of the pointer between these lines might easily be computed for any less time than five minutes.

The general principle of this device is simply the conversion of rotary motion into pressure, and taking a diagram of the pressure at different points of motion, as is done with the steam indicator.

Doubtless inventors might greatly simplify this device, or it may be, adopting a different principle, succeed in devising something much better.

In these days of accurate measurement in everything pertaining to the use of steam it seems a little singular that a matter of such importance, in a scientific as well as a legal point of view, should have been so long overlooked.

In legal actions arising from accidents on railways the corporations are always placed at a disadvantage before juries, the latter always being inclined to sympathize with individuals rather than with the companies, who, it is thought, can better afford to pay, than the individual can afford to fail to recover the damages he claims.

The witnesses, also, are, many of them, totally incompetent to judge of the question of speed, and are mostly liable to overrate it. The adoption of such an instrument as we have described, or some other calculated to effect the same object, would obviate all disagreements of this character, and thus prove valuable to the corporations, as well as to those who hold the responsible posts of engineers.

THE SOUTHERN DEMAND FOR MACHINERY.

We find in the columns of the Kaufman (Texas) *Star*, an article calling attention to the changed condition of the South, and the pressing need of employing machinery to make up the existing deficiency in labor. That the minds of the most enterprising of the people are fully aroused to this need is evident from the many communications we receive in relation to it, and also from the fact that a very respectable beginning in manufacturing has been already made in some of the States.

The article alluded to gives some facts relative to the section of the State—Kaufman County—in which the journal above named is published.

These facts, as significant of the great want of machinery in various parts of the South, and that immense development which may be expected from its introduction, will be of interest to our mechanical readers, especially those engaged in the manufacture of wood-working machines.

This section is, like many other Southern sections, well stocked with valuable timber. The Bois d'arc fork of the Trinity River passes through the county, and the bottom lands constitute one vast forest of bois d'arc trees, two miles wide, and fifty miles long. These trees here attain to a diameter of from two to three feet.

The journal referred to states that this timber is the most durable in the world. It says: "We will venture the assertion that no living man ever saw the symptom of decay in this remarkable timber. The running gear of a wagon that has been in constant use over twenty years, is before us as we write this article, and yet the wood works are, to all appearance, as sound as when turned out of the shop. There is an oil in the wood which fills up the pores and prevents either air or water from affecting it. No one can tell how long it will last, even when exposed to the weather. A reward might be offered in vain, for a decayed particle of this timber. It is not affected by the rays of the sun, and hence it never shrinks. A carriage wheel made of bois d'arc will run until the tire is worn out, without having to set it. But the greatest evidence of the superior quality of this wood, for wagons and carriages, may be estimated from the fact that a rough home-made bois d'arc wagon is worth about double the best Northern-made wagon."

To make by hand twenty-four spokes of this timber has been considered a fair day's work. Four wagon hubs were also considered a day's work.

There are no doubt plenty of machines that will turn out these spokes at an average rate of one thousand per day, and which can be afforded for less than the cost of one man's labor for a single year. We are certain that machines are made which will turn out also from three to four hundred hubs of this timber per day. Indeed, the Kaufman *Star* informs us that a Northern firm offer to furnish spoke machines capable of making from twelve hundred to fifteen hundred spokes per day, for $250 each, and machines at the same price that shall make from four hundred to four hundred and fifty hubs per day, each requiring only one attendant, and the two doing more work than one hundred men could do without machinery.

It is easy to see how the introduction of such machinery into the region described would enable these hubs and spokes to be made for shipment to all parts of the country at a remunerative price, or even to be exported.

But Texas is not alone in the possession of timber treasures. Virginia, Georgia, North and South Carolina, and many other parts of the Southern States also can boast of very large tracts of valuable timber land, the most of which could be made to yield immense returns by the introduction of such machinery as has been for years employed in the timbered sections of the North. The cost of transportation after the raw material has been made into forms of increased value, is not materially more than for the shipment of the crude lumber, while it pays far better.

The manufacture of tubs, pails, chairs, sashes and blinds, and the great variety of wares which have made New England famous as a wood-working section, might, without doubt, be most advantageously carried on in the South, and our information of some few factories of this kind, which are now running in Southern localities is such as to greatly encourage the establishment of others.

PARAFFINE INDUSTRY.

In the Paris Exhibition of 1855 was shown a block of paraffine, with a few candles. Few visitors understood what it was, and no one could have anticipated the great extent to which the trade in this article would subsequently be pushed. The manufacture of paraffine candles has become an important industry, and there are single establishments in Germany capable of turning out 240,000 candles daily. In England and France the industry has reached vast proportions, and in this country it has no mean significance. Wagner estimates the production of paraffine in Prussia alone for the year 1870 at 11,000,000 pounds. The brown coal of Germany and the bog-head of Scotland and the Rangoon petroleum are particularly well adapted to the production of paraffine, while Bohemian and Austrian and other continental coals yield a very small quantity. The uses of paraffine are many. As its melting point is low it is proposed to employ it for the preservation of meat. Meat several times immersed in a bath of melted paraffine will keep for a long time, and when wanted it is only necessary to melt off the adhering wax-like coating to prepare it for cooking. For stoppers to acid bottles, to coat paper for photographic and other uses, as a lubricator, for candles, as burning oil, to coat pills, in the refinery of alcohol and spirits, paraffine now finds ready use. It has also been employed for the adulteration of chocolate and candies; for the preservation of railroad timber; to saturate filter paper for certain purposes; to coat the sides of vessels in which hydrofluoric acid was to be kept; to preserve fruit from decay; for oil baths of constant temperature; to prevent the oxidation of the protoxides; to render fabrics waterproof; as a substitute for wax in the manufacture of matches; as a disinfecting agent; as a varnish for leather, and for many other useful purposes. There are very few bodies that can attack or in any way decompose paraffine, and hence its great value in many chemical processes. Its use is likely to be further extended the more we become familiar with its properties, and it appears destined to assume an important position among our chemical industries.

CRAIK'S PRACTICAL AMERICAN MILLWRIGHT AND MILLER.

In our column of "New Books and Publications" will be found the notice of a book under the above title which deserves more than the ordinary notice; not that it has no deficiencies, or that it is characterized by scientific style and method, but that it embodies the results of a long and varied experience in the construction of various kinds of mills, an experience all the more valuable, as the author gives evidence in his pages that he is one of the comparatively rare individuals who can observe with discrimination, and draw accurate inferences. Perhaps no department of engineering demands greater fertility of resources than mill construction. Hardly any two mills are alike in circumstances of position, available power, and character of soil, upon which their foundations must be placed. Dams, also, require endless variety of detail according to the peculiarities of the beds of streams upon which they are erected. Varying heads of water, also, introduce further complications. In all of these particulars, and in many others, not specified, no amount of theoretical information can supply the lack of experimental knowledge; and next to such knowledge, personally acquired in practice, ranks that tersely and plainly communicated by such a man as the author of this work. The aim has not been to produce a scientific treatise. The work is rather an embodiment of practical results and tests of the various kinds of mill machinery under a wide range of circumstances, some of them "offering considerable difficulties and calling for great diversity of practice." The six chapters on water wheels are alone worth the price of the book. They however comprise only a comparatively small portion of the work, which is a large octavo, filled with practical information upon nearly every topic connected with the subject of mill building and running. The subjects of wind mills, their construction and adaptation to our Western prairie country, is of great interest, and is treated at length. The style of the work is such as any mechanic may understand, all algebraic formula being avoided, and the rules being simplified to the utmost.

Mr. Craik makes a statement in his discussion of the transmission of motive power, which is not correct. He says, "probably the greatest distance power was ever carried was by a combination of jointed rods used to connect a series of pumps with the water wheels which drove them, at the celebrated waterworks of Marli, near Paris, in France. Eighty-two of these pumps were placed more than three hundred feet above the power which drove them, and *half a mile away*." In Prof. Barnard's report upon the Paris Universal Exposition, on page 132, is an account of the successful transmission of power by Hirn's telodynamic cable, to a distance of nearly three and one eighth miles, at the mines of Falun, in Sweden. A short extract upon this subject, from the report alluded to, was published in our last issue.

But such an error as this is of little importance when compared to the great practical value of the work. In another part of the paper will be found an extract which is a fair sample of the plain, comprehensive character of the book, which we can confidently recommend to all who are interested in mill building and milling.

THE MILLENNIUM, OR SOMETHING LIKE IT.

We have, in another column, noticed the fact that the American Association for the Advancement of Science is forced occasionally to listen to papers containing nothing but twaddle, and that this twaddle, printed, redounds not to the honor of the Association at home or abroad.

Such, however, was not the character of the paper read by the well known scientist, thinker, and inventor of the "panatechner," Clinton Roosevelt, of this city. His paper discussed the question, "Ought a true science of national wealth to be excluded from the curriculum of the American Association for the Advancement of Science?"

If we may judge from the character of many of the papers read, the question as to whether anything should be excluded seems superfluous. But a superfluous question is often a splendid thing to string words upon, especially if in the stringing, the elegancies and accuracies of congruity, pertinence, terseness, perspicuity, and logic, are not considered essential.

To discuss the momentous question propounded by Mr. Roosevelt, was by no means a difficult task to one so rich in ideas, and so fertile and felicitous in diction. We were not present at the reading of his paper, but the report of it, published in the *Times*, gives evidence of its brilliant and exhaustive character. The assembled *savans* no doubt gave full expression to their delight when Mr. Roosevelt finished his paper. Being a polite set of men, they would not be likely to interrupt him by applause during the reading, however much the fullness of emotion might struggle for utterance.

Mr. Roosevelt was willing to allow, according to the motion of Professor Agassiz, made at the last annual meeting of the Association, at Salem., Mass., that the system of political economy, as taught in our colleges and universities, embracing only production, distribution, exchange, and consumption of articles having exchangeable values, is insufficient to embrace a true science of national wealth. In his view the science of national wealth consists of three orders and nine genera, without counting the species, varieties, etc.

Surely the *savans* cannot refuse to seize upon a subject involving three orders, nine genera, and an indefinite number of species. Such a field as this to enter in upon and take possession of! A veritable scientific Canaan, flowing with philosophic milk and speculative honey, and bearing choice fruits of endless discussion and debate! Surely, they each and all exclaimed in their hearts (being too polite to speak in meeting), "*Here's* richness! Here's *Richness!*"

According to Mr. Roosevelt, "the reason why all systems of government by reason alone, have failed hitherto to make peace on earth and good will to all, is that the will of man is not governed or to be governed by the greatest motives, but by the same general law that governs in physics; thus accepting the science of government as the science of motive powers. Motive powers are of two kinds, metaphysical and physical. And whereas, in physics motive powers operate directly as the substance, and inversely as the squares of the distances in space, in metaphysics motives govern the will of man in times. Thus men who verily believe in eternal rewards and punishments still give way to the present temptations, and fear little practically, until death or the instrument of punishment comes near. Thus, as in the State of Wisconsin, the La Crosse and Milwaukee Railroad Company bribed all at once the Legislature, the Judiciary, and the Executive, and left the people as so many sheep without a shepherd; so has it always been."

As a specimen of much in little, we commend this passage as a model for very young students of English composition. Much words and little sense is a style that pays well in modern literature, as most contributors to our magazine literature are now paid by the column.

"The same things, which, if left alone, are destructive to life and happiness, if removed, become beneficial in their proper places; as the offal of cities left to find its own level in the lowest places, sends forth malaria, disease, and death, if transported to the surrounding country and covered in the soil produces flowers, fruits, and cereals for the support of life and happiness; that there is a law of Providence under the higher law of absolute necessity in the nature of things; that what a man or nation will not labor or fight to gain and guard when gained, shal' not be enjoyed."

This passage is copied verbatim from the *Times'* report. It doubtless means something, and if it were not too late, we would suggest that the Association should appoint a committee to ascertain the meaning, correct the grammar, and report at their next meeting whether it should be admitted into the curriculum of the Association, or not.

At the same time, Mr. Roosevelt's orders, genera, and species might also be distributed among the members—a priceless boon, since, according to that gifted thinker, they comprise "all that man can reasonably desire on earth, as useful or delightful to him"—a millennium, or something like it.

Mr. Roosevelt is especially hard on the free-traders, putting them into the same category with "free-lovers" and "freebooters." We don't see how they are going to stand this violent attack, which, following Mr. Greeley's *Tribune* essays on political economy, is, like charging, after a battle, upon the dead and wounded—to say the least—ungallant of Mr. R. He might, indeed he might, have let the free-traders alone, and confined his remarks to the physical and metaphysical motors which run railways and legislatures. How *easy* it would have been to have pilloried Prince Erie on his metaphysical motors, Fisk's Opera House, Camp Jay Gould, and an unlimited grab from the pockets of the Erie stockholders, not to mention Fisk himself, the most metaphysical motor on this continent.

But we reluctantly leave Mr. Roosevelt's paper, from the reading of which we have become better, wiser, and more able to grapple with the hard problems of social science. When in due time the transactions of the American Association for the Advancement of Science shall appear, it will be demonstrated to the world that he who advanced it most, during the year 1870, was Clinton Roosevelt, Scientist, Thinker, and Inventor of the Panatechner.

THE ANALYSIS OF MILK.

Dr. Chandler, of Columbia College, has recently been paying attention to the analysis of milk in connection with an examination of the milk vended in this city. The results of his examination having been published, the method adopted for the analysis of milk in so far as its adulteration by water is concerned, has met with criticism from the pen of Dr. A. E. Davies, in the *Chemical News*. As the short article of Dr. Davies not only gives the method employed by Dr. Chandler to ascertain the amount of adulteration by water, and the reasons why it is considered defective, but adds a method considered much more exact, we copy the whole of it. The method is one that can be easily and generally applied, and will be found of use in the numerous cheese factories established during the past few years in this country.

Dr. Davies says:

"As to water being the only substance which is employed for adulterating milk, I perfectly agree with Dr. Chandler. Carbonate of soda and nitrate of potash are occasionally added, but only rarely, and in very small quantity. I have never met with chalk, sheep's brains, mucilage, sugar, etc., in any sample which I have analyzed.

"Since water, then, appears to be practically the only substance fraudulently added to milk, it is a matter of the greatest importance that we should be able to detect the presence of added water, and to estimate, at least approximately, its amount. This (at least the presence of added water) Dr. Chandler considers may be done by taking the specific gravity of the milk and estimating the water it contains by evaporating a weighed sample to dryness. 'Pure milk,' he says, 'varies in specific gravity from 1·023 to 1·032, water being represented by 1·000.' And, again, 'It is found that good milk generally has a specific gravity of from 1·029 to 1·032. In testing milk, the lower number is selected as a fair gravity for pure milk; and whenever the gravity falls much below this the milk may be considered as containing an excess of water, and consequently poor in quality or adulterated.'

"Now, according to my experiments, the specific gravity cannot be at all relied on as a test either of freedom from adulteration or of natural richness. I give a single example. A sample of milk of known genuineness recently analyzed by me gave the following results: Casein, 4·26; fat 6·26; sugar, 5·13; salts, 0·60; water, 83·75; cream (by the lactometer). 17 per cent; specific gravity, 1·0246. It was, therefore, a very excellent sample, and rich in all the solid constituents of milk, especially butter, but had it been judged by its specific gravity, it would have been put down as of very inferior quality. Besides, even supposing the specific gravity to be a reliable test of quality, it gives us no indication as to whether the milk is naturally poor or has been rendered so by the addition of water, and the test, in my opinion, is therefore worthless.

"As to the estimation of the amount of water by evaporation, Dr. Chandler says: 'A perfectly reliable method, though more laborious, is to actually determine the percentage of water in the milk, by evaporating a weighed quantity and carefully drying the residue at 212° Fah. If a milk loses more than 88 per cent of water, leaving less than 12 per cent of solids, it may safely be pronounced to be adulterated.'

"From this view, I totally dissent; the presence of 88 per cent of water is an indication of inferior quality, but is certainly no indication whatever that water has been purposely added. In milk of known purity, examined by Dr. Voelcker, as much as 90·70 per cent of water was found; and this alone shows the untrustworthiness of Dr. Chandler's test—at least, as far as it refers to added water.

"It appears to me, that what is wanted is, not a test which will simply tell us whether or not the milk contains more than the normal quantity of water, without giving any indication whether the water has or has not been added to the milk. If this were all, the estimation of the water, by evaporation, would accomplish it; but, what really is required, is a test which will show if the milk has been purposely diluted with water, and, if so, what quantity of water has been added. Such a test, I believe, we have in the specific gravity of the serum, or liquid portion of the milk, from which the casein and fat have been removed by coagulating and straining. The gravity of this liquid I have found to be remarkably constant, ranging, in that obtained from genuine milk, from 1·026 to 1·028; and, by carefully ascertaining the specific gravity of the serum of genuine milk diluted with various quantities of water, we may obtain a standard of comparison which will enable us to say, within a few per cents, what quantity of water has been added to any sample of milk that may come under our notice."

DIVISIBILITY OF MATTER AND SIZE OF CHEMICAL ATOMS.

Atoms as indivisible material elements of unchangeable form, size, and weight, are a convenient hypothesis conceivable in so far as the properties above enunciated are concerned. But any attempt to conceive of them as they really are is futile. Even if we could by improvements in optical instruments render them visible and demonstrate their existence by actual sight there would still be inconceivable things about these seen atoms, differing, as they would, from all other things that we can see, and from each other, not only in size and weight, but in qualities, of which we can have no conception, but which are inferred to exist from the chemical comportment of the elements to each other.

A correspondent has asked in what solution is the extremest division of matter apparent, and the nearest approximation to the size or bulk of the atom made. The first part of this query may be answered; the second is unanswerable, because the size of neither the atomic or molecular intersticial spaces are yet determined, so that if we could determine that a definite number of atoms were mingled with a given number of atoms of another kind we should still lack data for any estimate of their relative size. Assuming them to be spheres with their sides in absolute contact, such a calculation might be made, but all we know of the various states which matter assumes teaches that they do not touch each other.

To answer even the first part of the query would, however, require much research. We shall content ourselves with giving some remarkable instances of extreme divisibility. One three-hundred-and-sixty millionth of a grain of gold may be seen by the use of a microscope magnifying 500 diameters. A grain of copper dissolved in nitric acid will, upon addition of ammonia, give a blue tint to 392 cubic inches of water; one three-hundred-and-ninety-two millionth of which may be seen by the aid of a microscope. The ammonia contained in a small drop of water may be detected though only one part in two hundred thousand by the use of chloride of mercury.

Thompson, the celebrated physicist, has lately been performing a very interesting calculation with a view to determine approximately the size of atoms, the calculation being based upon the phenomenon of capillary attraction, the work performed in overcoming the contractile force of soap bubbles, the kinetic theory of gases (first suggested by Bernouilli, and since worked out by Herapath, Joule, Clausius, and Maxwell), together with the laws of optical dynamics. As the result of these calculations, he concludes that the diameter of gaseous molecules, or atoms of elmentary gases, are not less than 0·0000000007942 of an inch. How much larger than this they may be, he does not tell us in numbers, but he does say that, if a drop of water should be magnified to the size of the earth, and each molecule magnified in the same proportion, the molecules would even then be smaller than cricket balls.

ENTERPRISING JOURNALISM.

The Atlantic Cable dispatch containing a full account of the great battle of Gravelotte sent to the New York *Tribune* and published in that paper on the 24th ult., is probably the longest and most costly dispatch ever sent over the trans-continental wires. It cost the *Tribune* $2,260 in gold. As a specimen of enterprising journalism this is absolutely unprecedented, but it may be surpassed ere the war closes. The slow moving dailies of London and other foreign cities will stand wide-mouthed with astonishment at the absolute disregard of expense shown by their American cotemporaries in obtaining news. We doubt whether any of them ever paid as much for news in an entire week as the *Tribune* paid for this single dispatch.

$20,000 BONUS FOR A NEW PRESS.

The circulation of the New York *Sun* has become so enormous that the publisher, Mr. I. W. England, finds it almost impossible to print the edition. Five presses are now employed for that purpose, but the utmost capacity of either is only equal to printing 17,000 copies per hour.

Mr. England wants a press that can strike off 40,000 copies per hour, printed on both sides, and he authorizes us to offer a bonus of $20,000 for such a press—one that will do its work well. This question of more rapid printing is one that must engage the earnest attention of our inventors, and it seems that the tendency of the *Sun* is in that direction.

THE School of Mines, of Columbia College, will re-open on Monday, Oct. 3. The announcement of Dean Chandler appears in our advertising columns.

SCIENTIFIC INTELLIGENCE.

FLUORIDE OF SODIUM.

This valuable reagent can be made on a large scale by fusing 100 parts fluor spar, 140 parts of carbonate of lime, 200 parts of sulphate of soda, and an excess of carbon. The fluor spar is completely decomposed, all of the sulphur remains with the lime as sulphide of calcium, and the flux yields a colorless, pure solution.

The difficulty of obtaining a sufficient amount of material has prevented an extensive use of the fluoride of sodium, but now that it can be easily made it ought to attract more attention. It could be advantageously used for the resolution of many silicates, as it forms insoluble double salts with some of the sesquioxides, and in this way the soluble protoxides could be removed. Take, for example, the beryl, by treating it with fluoride of sodium, the aluminum would combine with the soda to form the insoluble double fluoride of aluminum and sodium (cryolite) while the glucina would be separated in an insoluble state.

Feldspar, treated in a similar way, would, no doubt, leave the potash in an available state, while the aluminum would form insoluble cryolite with the sodium. Fluoride of sodium would prove a valuable flux and reagent in the laboratory.

PLATINIZING GLASS.

R. Bottger recommends the following process: Pour rose mary oil upon the dry chloride of platinum in a porcelain dish, and knead it well until all parts are moistened; then rub this up with five times its weight of lavender oil, and leave the liquid a short time to clarify. The objects to be platinized are to be thinly coated with the above preparation and afterwards heated for a few minutes in a muffle or over a Bunsen burner.

This recipe is much simpler than the one given by us some time ago, and can be easily tried by any one. In order to recover the platinum from defective or broken glass, moisten with hydrochloric acid, and touch the spot with a zinc rod, when the platinum will fall off in thin leaves.

WRITING INK.

According to R. Bottger, a very good copying ink can be prepared as follows: Pulverize 30 grammes of extract of Campeachy wood and 8 grammes of crystallized carbonate of soda, and pour on 250 cubic centimeters of distilled water, and boil until the liquid has assumed a deep red color, and the extract is fully dissolved. Then remove the vessel from the fire, and add, with constant stirring, 30 grammes of glycercin of specific gravity of 1·25, and also 1 gramme of the yellow chromate of potash, previously dissolved in a little water, and 8 grammes of finely-pulverized gum-arabic, also previously moistened with water, and the ink will then be ready for use. This preparation will keep indefinitely in well-stoppered bottles, and there is nothing in it to attack the pens. Manuscripts can be copied by it without the aid of the press, by simply moistening the paper and using an iron knife or the thumb nail. The carbonate of soda prevents the gelatinizing of the ink, and the glycerin is a substitute for the sugar formerly employed.

TO DETECT THE AGE OF HANDWRITING.

Attempts have been made to invent a method for approximately determining the age of any writing. Iron inks suffer a change in process of time, and become yellow, the organic constituents disappear, and the iron becomes more prominent. By moistening the writing with weak hydrochloric acid (1 acid, 12 water) if the ink is old only a faint copy can be obtained, and the newer the writing the plainer will be the copy.

In experiments made by Carre, handwriting 30 years old gave scarcely any impression—an authentic document from the year 1787 yielded mere traces. Soaking the paper in weak hydrochloric acid gives opposite results, as handwriting a few months or a few years old is at once removed by the acid, while old ink has suffered such a chemical change that the acid no longer acts upon it. After the experiment it is well to neutralize the acid by suspending the paper over a capsule containing sal ammoniac. The test appears to be only applicable to writing several years old, and is confined to iron inks.

TO RENDER PAPER WATER-TIGHT.

The ammonia oxide of copper is a solvent for silk, paper, and cellulose. If its action be limited to a few moments it converts the surfaces into a gelatinous mass, and Scoffern proposes to employ this property to render the paper water-tight. If in the mill the endless sheet of paper is made to pass at a proper velocity through the ammonia copper solution, and is afterwards dried and pressed, the surfaces will be converted into a species of parchment, and will be water-tight. The rate of speed for the rollers must be a matter of experiment.

LIQUID GLUE.

Experience has shown that glue undergoes a chemical change when dried in the air, and its adhesive properties are decidedly deteriorated. To avoid this, says Prof. Wagner, in his report for 1869, some of the manufacturers have introduced a pure liquid glue in close packages, which is said to be superior to the dry article. It is prepared by digesting bones in a peculiarly constructed apparatus, and is sold according to a fixed specific gravity, so that the purchaser does not pay for the water, which in dry glue sometimes amounts to 12 per cent. The price is also less than for dry glue.

CEMENT FOR IRON AND STONE.

Glycerin and litharge stirred, to a paste, hardens rapidly, and makes a durable cement for iron upon iron, for two stone surfaces, and especially for fastening iron in stone. The cement is insoluble, and is not attacked by strong acids.

HIGHT AND WEIGHT.

[Condensed from Nature.]

One of the earliest efforts made to obtain anything like a fixed relation between hight and weight was that of Dr. Boyd, who weighed a certain number of inmates in Marylebone Workhouse. He took the hight and weight of 108 persons laboring under consumption, and found they measured 5 feet 7 inches, and weighed 90 pounds. He then measured and weighed 141 paupers who were not consumptive, and found that their average hight was 5 feet 3 inches, and that they weighed 134 pounds.

This subject attracted the attention of the late Dr. John Hutchinson, and he determined to take the hight and weight of all classes of persons in the community. In this way he collected the hight and weight of upwards of 5,000 persons. This list, however, included persons who exhibited themselves as giants and dwarfs, and other exceptional cases. He therefore reduced his instances to 2,650 persons, all of whom were men in the vigor and prime of life, and included sailors, firemen, policemen, soldiers, cricketers, draymen, gentlemen, paupers, and pugilists. This group of cases was intended to make one class as a set off against another, so as to get a fair average.

The following is the result of Dr. Hutchinson's observations:

Hight.		Weight.	Hight.		Weight.
Ft.	In.	lbs.	Ft.	In.	lbs.
5	1	129	5	7	148
5	2	126	5	8	155
5	3	133	5	9	162
5	4	139	5	10	169
5	5	142	5	11	174
5	6	145	6	0	178

Of course the result of these investigations of Dr. Hutchinson can only be considered as approximative, and he himself thought that a larger number of observations would lead to a more perfect law. The fact is, his observations are quite sufficient to establish all that we need, and to show that among a certain set of healthy men his estimate of weight and hight may be regarded as an approach to a healthy standard. It is only where considerable departures from the estimates given by Dr. Hutchinson take place that any particular case demands attention.

If the table is examined, it will be seen that the increase in weight for every inch of hight is a little more than five pounds. In fact, allowing for any error in observation, we may say that Dr. Hutchinson's table is reducible to the law that for every inch of stature beyond 5 feet 1 inch, or sixty-one inches, a healthy man increases five pounds for every inch in hight. If this deduction be accepted, we may very much simplify Dr. Hutchinson's table, and say that, as a rule, a man's weight increases at the rate of five pounds for every inch of hight, and this rule holds good for all practical purposes.

Although this law is approximately good for a certain number of cases, even above and below this table; it is practically found, and especially in the case of children and growing persons, that there is a wide difference of weight at hights below 5 feet.

Attention may also be drawn here to the fact that there will constantly occur in the community instances of persons where either the muscular or bony systems are excessively developed, and who consequently weigh more or less than their hight.

Dr. Chambers gives the hight and weight of certain celebrated prize-fighters, the result of Mr. Brent observations, which makes it very obvious that in certain cases the great weight depends on muscular and osseous development.

	Hight.		Weight.
			lbs.
Perrins	6	2	228
Caunt	6	2	213
Spring	5	11	185
Jackson	5	11	206
Bendigo	5	9	168
Johnson	5	8	187
Slack	5	8	192
Mendoza	5	7	172

The conclusion we come to with regard to these weighings and measurings is that all ordinary departures from the average hight and weight of the body deduced from Dr. Hutchinson's tables are due either to an increase or decrease of the fatty matter or of the adipose tissue in the body. Thus, taking the composition of a human body weighing 154 pounds, and measuring 5 feet 8 inches, it will be found that it contains 12 pounds of fat. It is then mainly due to the diminution or increase of this substance that human beings weigh more or less than the standard weights given in the above table. It will be therefore here worth while to inquire what is the use of fat in the system, and what indications are afforded by the hight and weight of the human body for caution in diet and regimen.

The exact way in which fat is produced in the tissue of plants and animals is not known, but there is evidence to show that it is found very generally in the tissues of plants and especially in the seeds. Oil when used for commercial purposes is mostly obtained from the seeds of plants, as seen in castor oil, rape oil, linseed oil, cocoa-nut oil, palm oil, and a hundred others. As it is found in the seeds of plants, so it is found in the eggs of animals. The embryo of all animals is developed in contact with oil, of which we have a familiar instance in the yelk of the egg of birds. It appears also that the muscular and other tissues grow under the fostering influence of the adipose tissue.

Besides this primary influence on the growth of the body, fat subserves many other purposes. In the first place it seems to be a reserve of material for producing muscular force when needed. Animals grow fat in summer, but as the supply of this material becomes scanty in winter they lose their fat and get thin. Man himself gets fat in summer and grows thin in winter from the demand on this store for heating purposes. Hybernating animals go to their winter sleep sleek and fat, but wake up in the spring lean and meager, from the loss of fat in maintaining the animal heat necessary for life. Fat is thus seen to be an essential of animal life. Where there is too little deposited for the purposes of life, then serious disease has already commenced or may set in; while on the other hand a redundancy of this deposit may seriously interfere with the functions necessary to life.

It is from this point of view that the value practically of a knowledge of the hight and weight of individuals becomes apparent. When the weight of a person is much below his hight, then it may be suspected that some disease has set in, which may go on to the destruction of life. One of the earliest symptoms of consumption, the most fatal disease of the civilized inhabitants of Europe, is a tendency to loss of weight. Long before any symptoms are present of tuberculous deposits in the lungs, this loss of weight is observable in persons afflicted with consumption. And at this stage a large amount of evidence renders it probable that the fatal advance of this disease may be prevented.

Within the last thirty years a practice has been resorted to with great success of administering to persons losing weight and threatened with consumption, cod-liver oil, pancreatic emulsion, and fatty substances, as articles of food, for the purpose of preventing or arresting the tendency to loss of fat, which obviously results in the production of fatal disease. In fact, it may be stated generally, not without exceptions, that wherever the weight is much below the hight, there the commencement of dangerous disease may be suspected, and precautions taken to prevent the loss of fat. That this treatment has been successful in really preventing disease, and loss of life as the consequence, is the conviction of a host of intelligent practitioners of medicine. At the same time, it should be remembered that it is not only necessary in these cases to administer cod-liver oil or pancreatic emulsion as medicines, but that the consumptive should have recourse to a fatty diet, and should eat butter, cream, cream-cheese, fat and fatty articles of diet.

Obituary.—Samuel V. Merrick.

It is with great regret that we are called upon to record the death of Mr. Samuel V. Merrick of Philadelphia, Pa., the Founder and President of the Franklin Institute, and for many years an esteemed client of this office. A man of inflexible integrity, liberal culture, and great business capacity, he has for a long time been one of the most honored of the citizens of Philadelphia. His connection with the Franklin Institute has made his name familiar to the scientific world.

A meeting of the Board of Managers of the Institute was held to notice his death, and a series of highly complimentary resolutions were passed in relation to the character and acts of the deceased.

We also notice the recent death of T. A. Wasson, the well known car builder, at Springfield, Mass.

Province of Quebec Fair.

The Province of Quebec Fair of 1870, will be held at Montreal, Sept. 13, 14, 15, 16. $15,000 prizes.

American exhibitors are admitted on the same footing as Canadians. An entrance fee of one dollar covers all entries and entitles the exhibitor to four tickets to the grounds. Custom duties to be refunded. It is expected that American manufacturers, stock breeders, etc., will be fully represented. Entries for implements, etc., on or before the 3d September. For further particulars apply to the Secretary, Council of Agriculture, Montreal.

Ridicule.

Sometimes our correspondents make the mistake, in their replies to published letters, of attempting to heap ridicule upon the opinions expressed by other correspondents who happen not to agree with their theories. We are obliged to decline all such letters. Abuse is one thing, fair criticism is quite another, and the latter only is acceptable to us.

WATERING STREETS WITH SALINE SOLUTIONS.—It is stated that, of the two deliquescent salts which have been applied for this purpose—viz., the chlorides of magnesium and calcium—the last-named suits best, the quantity being adjusted at one half a pound per square yard. In 1860 and 1863, the Place Bellacour, at Lyons, France, was (experimentally, and during great heat) watered with a mixture of chloride of calcium and commercial hydrochloric acid, properly diluted in water, the effect being highly appreciated by the inhabitants also on account of the perceptible purification of the air.

How perfectly almanac makers hit it, was verified in the weather word in one of the almanacs against the second Sabbath in August. "Scorching," was its prophecy. It was about the only Sabbath that was not scorching, and was the only one to which it applied that epithet. Thick clothes were its uniform. The almanac guessers should employ better mediums.

CANADIANS can now apply for patents in the United States upon the same terms as citizens. Full information can be obtained by applying to the publishers of the SCIENTIFIC AMERICAN.

IN the year 1811 Kirchoff, a celebrated German chemist, discovered that it was possible to convert starch, by means of sulphuric acid, into sugar.

NEW BOOKS AND PUBLICATIONS.

ON MICROSCOPICAL MANIPULATION. Being the Subject-Matter of a Course of Lectures Delivered before the Quekett Microscopical Club, January–April, 1869. By W. T. Suffolk, F.R.M.S. Illustrated with forty-nine Engravings and seven Lithographs. Philadelphia: J. B. Lippincott & Co.

The microscope and the spectroscope are now leading the way to the interpentralia of Nature's profound mysteries. Not that when all that human mind and human hands can do has been done there will remain nothing mysterious, we look for no such consummation; but to these instruments science is indebted for keys by which it has been enabled to enter whole realms of facts utterly inaccessible without them. But these keys are of but little value unless used in the proper manner. Fortunately for those unskilled, the manipulations necessary to success in microscopy, can be so described in books that an intelligent person may practice the most of them after a few attempts. But that this desirable result shall be attained it is necessary that the book upon which he relies for guidance be prepared, not only by one who understands the use of the microscope in its most approved forms, but is able to convey his knowledge and experience in plain unmistakable language. The book under present consideration is written by a man who ranks high among the many accomplished English microscopists. This is a sufficient guarantee that his knowledge and experience are ample for the task he has undertaken. The pages of the book bear the evidence of his ability as an instructor. The book contains seven chapters, with an appendix and notes, containing full information upon the construction of the instrument, its various parts, their uses, and adjustments; the mechanical processes of glass cutting, drilling, bending, and working of tubes; how to select the various tools and implements, and to keep them in perfect order; how to mount objects dry, in balsam, and in fluid; illuminating apparatus, comprising all the most approved devices for this purpose; polarized light, and its uses in microscopic examination; drawing and micrometry, etc.; six lessons upon the examination of various representative substances, with notes upon various collateral subjects connected with the art of microscopy. The work is handsomely printed and bound, and is really the most practical and complete manual for beginners in this delightful field of science we have ever met with.

THE PRACTICAL AMERICAN MILLWRIGHT AND MILLER. Comprising the Elementary Principles of Mechanics, Mechanism, and Motive Power, Hydraulics and Hydraulic Motors, Mill-Dams, Saw Mills, Grist Mills, the Oat-Meal Mill, the Barley Mill, Wool Carding and Cloth Fulling and Dressing, Windmills, Steam Power, etc. By David Craik, Millwright. Illustrated by numerous Wood Engravings and Folding Plates. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut street. 1870. Price, by mail, free of postage, $5·00.

See notice in editorial columns.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal.

All reference to back numbers should be by volume and page.

M. G., of N. Y., asks whether there would be any power gained by placing a turbine wheel higher in the draft-box—or tube which conveys water to the wheel—than the hight to which atmospheric pressure will sustain a column of water in a tube from which the air is exhausted, at the locality in which the wheel is placed, say, as an outside figure, thirty-three and one third feet above the tail water. We answer, that as all the water below the wheel can do, is by its weight and motion in falling to overcome the pressure of the atmosphere against the flow of the water through the wheel (the same as the condensation of steam in the steam engine removes the pressure of the atmosphere from the advancing piston), it is evident that when the wheel is placed at a hight sufficient to secure this action below the wheel, nothing can be gained by placing it higher. On the contrary, loss must result, from the diminished head above the wheel. In fact there can be no gain in placing the wheel above the level of the tail water, although it may for convenience be raised, without loss, within certain practical limits, varying somewhat with circumstances, but always less than the theoretical hight above specified.

T. S. K., of Ill., and several others, write in regard to the balancing of shafts and pulley systems, all agreeing that pulleys should be balanced separately, if they are to be run together, and also that the heaviest sides should be placed opposite each other on the shaft, so that centrifugal force shall act equally on opposite sides. This would not of course work where the number of pulleys is odd, and each required balancing; nor would it answer in all cases where the number of pulleys is even, as some may need more counterpoising than others. Most agree that the shaft should be large enough so as not to spring by the tension of the belt. One correspondent, however, erroneously thinks this of little consequence. For ourselves, we still adhere to the opinion that where pulleys have wide faces, and thin rims, they should have more than one spider, and the spokes ought also to alternate, so as to prevent springing of the rim. We also would make the arms of the spider straight and radial, instead of bent, or tangential to the hub, as is often done, as we believe a pulley unevenly weighted at the rim, and running at high speed, will maintain its shape better with straight, radial arms.

W. H. S., of Va.—Thin rubber, of the kind you describe, and used for tying over the tops of jars, as well as for other purposes, may be obtained at all the dealers in rubber goods. It is, however, not wholly impervious to water when long immersed, and gases will also pass through it. It will not do to seal fruit jars in this way, unless the fruit be preserved in sugar, "*pound for pound*," according to the old rule, in which case a loose cover will be as serviceable as the rubber.

J. D. B., of Pa.—It is impossible, without knowing the exact consistence of the varnish you have invented, to advise you what material added to it will make it dry more rapidly. If the vehicle is alcohol, it ought to dry quickly without such addition; if siccative oils are used, acetate of lead or litharge will make it dry quicker.

H. B. D., of O.—Wheels for ordinary canceling presses are made of composition, and cannot be used for perforating. Perforating stamps should be made of steel, and hardened, and it is better to make the figures separate, and set them in, so that in case of falling or breaking, they can be taken out and replaced.

H. W. G., of Mich.—To clean brass or silver, and polish the same, use aqua-ammonia and rotten stone, followed by rouge, applied with soft leather.

D. S., of Md.—The steam plows in use in this country are very few, and, so far as we know, have been imported from England. We do not think they can be obtained in this country.

F. H., of N. Y.—What is called "lodestone" is simply a species of magnetic iron ore.

G. L., of Kan.—We cannot give you the address of an emery and crocus cloth manufactory.

S. S. H., of Ala.—English flint glass expands 1 part in 1,248 in length, and 1 part in 316 in bulk, in heating from 32° Fah. to 212°. Brass expands under the same treatment 1 part in 526 in length, and 1 part in 179 in bulk. Iron, 1 in 846 in length, and 1 in 282 in bulk. These substances will expand nearly in the same proportions for higher temperatures below the point of fusion. Brass melts at 1,650° Fah. Iron at from 1,900° Fah. to 2,910°. Glass requires a very high temperature to fuse it to anything like fluidity. It, however, becomes soft and plastic at a red heat. It varies much in this respect, according to composition, that containing soda being more fusible than those containing potash.

J. F. G., of Mass.—In computing the power and resistance that will produce equilibrium in hydraulic presses or accumulators, it is the *areas of pistons only* that is taken into account, the areas of the supply pipe sections have no bearing upon the subject, other than that if too small they will increase the friction.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4·00 a year. Advertisements 17c. a line

For Sale—One half the interest in McGee's Patent Self-boring Faucet. Address T. Nugent, Morristown, N. J.

The best selected assortment of Patent Rights in the United States for sale by E. E. Roberts & Co., 15 Wall st., New York. See advertisement headed Patentees.

Wanted—A good Steam Engine of from 80 to 100-H. P. Address, with particulars, Box 1969, New York.

Every Reader of the Scientific American, who will send his address to S. R. Wells, 389 Broadway, New York, with 15c., will receive a specimen of The Phrenological Journal, a first-class Family Magazine published at $3 a year, 30 cents a number.

John Dane, Jr., Newark, N. J., builds the best Hand Lathes, slide rests, presses, all kinds, Jeweler's rolls, models, dies, all kinds of light machinery and work, to order. Send for circular.

Six new and perfect Automatic Gas Generators, Wood's Patent at a low price. Or will sell the air pumps alone. Address David Street, 273 Franklin st., Cleveland, Ohio.

Owners of Worthington Pumps can hear of something to their advantage by addressing Jno. Clark, Water Works, Harrisburg, Pa.

Crampton's Imperial Laundry Soap, washes in hard or salt water, removes paint, tar, and grease spots, and, containing a large percentage of vegetable oil, is as agreeable as Castile soap for washing hands. "Grocers keep it." Office 84 Front st., New York.

Enterprising men wanting a genuine Patent Monopoly, please address, immediately, C. H. Hudson, 174 Washington st., New York.

Wanted—Salesman in the mechanical branch of business. Only experienced need apply at S. Firuski & Co.'s, 20 Cedar st., New York.

See advertisement on New Work on "Soluble Glass," published by Dr. L. Feuchtwanger, 55 Cedar st., N.Y. Price $3·12, mailed free.

Dickinson's Patent Shaped Carbon Points and adjustable holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24th, and Nov. 20, 1869. 64 Nassau st., New York.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

"507 Mechanical Movements."—Over 18,000 copies of this book have been sold. This is by far the largest illustrated table of movements ever published. An invaluable aid to mechanics, inventors, etc. Price $1. By mail, $1·12. Address Theo. Tusch, 37 Park Row, New York.

Best Boiler-tube cleaner—A. H. & M. Morse, Franklin, Mass.

A Good Machinist, with about $3,000, can have an interest and entire charge of a paying manufacturing business Address Machinist. Box 507, Baltimore, Md.

Tools and Machines for special uses built to order. Chas. N. Trump, Port Chester, N. Y.

For Sale or to Lease—A never-failing water-power at Ellenville, N. Y., ½ mile from depot of the Ellenville Branch N. Y. and O. Midland R. R., and only 80 miles from New York city, by rail. For full particulars address Blackwell, Shultis, Gross & Co., Kingston, N. Y.

Gatling Guns that fire 400 times per minute are now made at Colt's Armory, Hartford, Conn. Send for pamphlets.

Pictures for the Library.—Prang's latest publications: "Wild Flowers," "Water Lilies," "Chas. Dickens," Sold in all Art Stores.

Japanese Paper Ware—Spitoons, wash basins, pails, milk pans, etc. Perfectly water-proof, and will not break or rust. Send for circulars. Jennings Brothers, 352 Pearl st., New York.

"Your $50 Foot Lathes are worth $75." Good news for all. At your door. Catalogues Free. N. H. Baldwin, Laconia, N. H.

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Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

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I have used one of Wheeler & Wilson's Sewing Machines(No. 2,762) nearly fourteen years, making cloaks for the last eleven years, and doing all other kinds of sewing down to book muslin. It is now in perfect order,has never had any repairs, and I have not broken a needle since I can remember. I appreciate my machine more and more every day, and would not exchange it for any machine that I know. M. BUDLONG.
Utica, N. Y.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

HORSE HAY RAKE.—James M.Colson, Morrill, Me.—This invention has for its object to furnish an improved horse hay rake which shall be simple in construction, easily operated, strong, durable, not liable to get out of order, and effective in operation.

GRASS-SEED SEPARATOR.—D. B. Dixon, Unionville, Mo.—This invention has for its object to furnish an improved device for separating and preserving the seed of timothy or Hungarian grass, when being fed to horses or other stock.

RAILROAD CAR WHEELS AND AXLES.—Frederick Sturneyk, Saint Paul, Minn.—This invention has for its object to improve the construction of railroad wheels and axles so as to almost entirely overcome the friction between the wheels and the rails when the cars are passing around a curve in the track.

PLOWS.—Robert Dickie and Hugh K. Johnston, Bunker Hill, Ill.—This invention relates to improvements in plows, and consists in attaching the beam to the plow in a novel manner, for adjusting it horizontally, for varying the breadth of the furrow, and vertically, for varying the depth.

FERRULE FOR PAINT BRUSHES.—Wm. B. Burtnett, New York city.—This invention relates to improvements in the metal ferrules used for confining the but ends of the bristles and the handles together, and it consists in an improved ferrule, made of sheet metal, by stamping up in dies.

COMBINED SHAFTS AND POLE.—John G. Burchfield and S. W. Brock, Niantic, Ill.—This invention relates to improvements in buggies and other light wagons, and consists in an arrangement of shafts so that they may be used as a pole, also,by slightly shifting them, thereby saving the expense of a separate pole and the labor of detaching one and attaching the other.

MEDICAL COMPOUND.—Lewis L. Gebhart, M.D., New Providence, Ind.—This invention has for its object to furnish what has been long sought for, viz: an agent that would not only be beneficial in its local action, when applied to the surface of the body, but, at the same time would be taken up by the general circulation, both of the blood vessels and the nerves.

PAINT BRUSHES.—Wm. B. Burtnett, New York city.—This invention relates to improvements in attaching the bristles and handles together, and consists in securing a handle having a disk on the end, of the size of the upper end of the ferrule,which is larger than the end receiving the bristles, by means of a screw or pin, passing through a conical plug, driven in at the center of the bristles in the same way the handles are in the common construction of brushes, the said disks being also glued or cemented to the ferrules and the ends of the bristles.

TUBING CLAMP.—Wm. H. Downing, Pioneer, Pa.—This invention relates to improvements in tubing clamps or clutches, used for attaching the hoisting chains to oil-well tubing, for hoisting it out of the wells, and consists in the application to a circular hub on the top of a bifurcated block, adapted to receive the tube below the enlarged coupling joint, and for attachment to the hoisting chain of a ring, with an opening, arranged to be set to coincide with the bifurcation, for the reception of the tube, and for turning of the ends to confine the tube therein.

COMBINATION SCRUB BRUSH.—E. K. Wood, De Witt, Iowa.—This invention relates to a new and useful improvement in a scrub brush, with which is combined a water can and rubber dryer or wiper, to the head of which, the brush, water can, and dryer are attached.

SEED PLANTER.—Levi Smith, Chester Center, Mass.—This invention relates to important improvements in machines for planting seeds, more especially designed for planting corn, but applicable to other kind of seeds.

HAND CORN PLANTER.—Hugh Dyer, Fort Scott, Kansas.—This invention has for its object to furnish an improved hand corn planter, simple in construction, and effective, reliable, and uniform in its operation.

MACHINE FOR MAKING TILES, AND ALSO MOLDS FOR THE SAME.—Joseph Christen, New Orleans, La.—This invention relates to a new and useful improvement in a machine for forming tiles for roofs and floors, and for ornamental work for building and other purposes, from clay, cement, or plaster of Paris.

SCALES.—George W. Dickinson, Charleston, Ill.—This invention has for its object to furnish a simple, convenient, accurate, and reliable scale, for weighing light or heavy articles.

ROTARY PUMP.—George W. Heald and L. D. Sisco, Baldwinsville, N. Y.—This invention relates to a new and useful improvement in rotary pumps, whereby they are made more useful and more durable than they have hitherto been, and consists mainly in connecting a lifting or suction pump thereto, for priming or filling the same.

COTTON PICKERS.—D. M. McRae, Webberville, Texas.—This invention relates to improvements in machinery for picking cotton from the plants, and consists in a set of saws mounted on a truck, and geared with the driving wheels, to run in the tops of the plants (the lateral parts of which are brought within the range of the saws by gatherers in front) and detach the cotton, and convey it to a brushing roller above, which detaches the cotton from the saws, and delivers it into a receptacle behind.

INDELIBLE WRITING FLUID.—Charles Hebel, Louisville, Ky.—This invention relates to a new and useful improvement in an indelible writing fluid, or ink, designed more especially for use in banks, and for filling up notes, checks, bonds, etc.

SHEET METAL CANS.—Franz Albaum, Greenpoint, N. Y.—This invention relates to a new manner of securing the tops and bottoms in sheet metal cans, with the object of supporting the same firmly, and permitting their rapid application.

COOKING STOVE.—John M. Goodfellow, Troy, N. Y.—This invention consists in providing, in the upper part of the fire-box of a cooking stove, a bridge extending lengthwise of the box, which bridge forms the front side of an air chamber lying horizontally over the oven, and is perforated with a number of holes made for the purpose of letting out jets of heated air from the said chamber directly upon the smoke and gases rising from the fire-box, so that the same may be more thoroughly consumed; the fire-box being also provided with perforated doors so as to let in air in jets for a similar purpose. The invention also consists in the attachment to the stove of a hot water-tank combined with heating chambers; also in providing flue strips for conducting air into the central parts of air chamber over the oven.

COMBINED GANG PLOW AND CULTIVATOR.—Sterling C. Thornton, Macomb, Texas.—This invention consists of sundry improvements in a machine that may serve the purpose either of a gang plow, or, the position of two of the plows having been changed, of a cultivator, said improvements tending to reduce resistance and strain, experienced by the draft animals in drawing the plows through the earth, to their minimum, and to increase the general efficiency of the apparatus.

TIME LOCK.—Lewis A. Haines, Wakefield, Md.—This invention consists in the combination of a lock with a clockwork in such a manner that the lock-bolt may be withdrawn from the keeper at any hour to which the clockwork may be set and not a moment sooner, the lock mechanism being also constructed with peculiar safeguards against burglary.

METALLIC SEAL.—Alexander B. Small, New Orleans, La.—This invention is an improvement on "Mears and Houlton's "Seal for Railroad Freight Cars, etc," patented July 14, 1867, and consisting of a soft metal disk, and a wire that is first passed through staples attached to the door and door-frame of the car, after which, either the ends of the wire are bent, and then inserted in holes extending partly through the soft metal disk, or the branches of the wire are passed entirely through the disk, after which, in either case, the disk is struck with a proper die and compressed upon the wires with force enough to hold them firmly.

BUCKET FOR THE PROPELLING WHEELS OF VESSELS.—A. C. Loud, San Francisco, Cal.—There are certain well-known obstacles which prevent the perfect working of the paddle-wheels and screws, as commonly constructed, of steam vessels. One of these is the lifting of water by the buckets or blades as they emerge, the fluid thus lifted not only retarding the wheel, but also hanging as a dead weight on the vessel and making friction as it is dragged over the surface of the body of water in which the vessel is sailing. Moreover, the striking of the ordinary paddles against the water produces jars, which extend over, and injure the ship, besides annoying the passengers. These obstacles it is the object of this invention to overcome. To this end the inventions consists in buckets or blades constructed of parallel bars, with spaces between them, or of perforated plates, or of bars formed into lattice-work, or in any other manner in which a bucket or blade may be produced which shall present a series of openings through which water may pass, alternating with a series of surfaces against which water may react.

GAGE FOR CUTTING BIAS PIECES.—Samuel T. Taylor, New York city.—This invention consists in the combination of a straight wand with sliding cross-pieces placed at right angles to the wand, in sockets at the ends of the same, and with a cord which connects those extremities of the cross-pieces that are on the same side of the wand, by which arrangement the cord may be set at any desired angle with the wand, on moving the cross-pieces to the requisite extent.

HAY RAKER AND LOADER.—Gilbert G. Park, Xenia, Nebraska.—This invention has for its object to provide an apparatus for raking and loading hay in such manner that the hay will not be disturbed while on the said apparatus by wind or other obstacles.

GIN FOR LINTING COTTON.—George W. Payne, Memphis, Tenn.—This invention relates to a new arrangement of machinery for removing the short lint from cotton seed that has already been ginned, and also for ginning cotton seed as it comes from the field.

COUPLING FOR HEATING CARS BY STEAM.—Samuel A. Appold, Baltimore, Md.—This invention has for its object to connect the steam heating system of pipes of one car with the steam heating system of pipes of another car, by a universally-jointed and expansible coupling placed beneath the bumpers, and so constructed that it may accommodate itself to the curves and irregularities of railways, and to the inequalities in speed which produce variations in the intervals between the cars of a moving train.

BOAT-DETACHING TACKLE BLOCK.—N. M. Ray, Surrey, Maine.—This invention relates to a new and useful improvement in the mode of detaching boats from vessels, and consists in a tackle block provided with a pivot hook and tripping device, by means of which the ends of a boat may be simultaneously detached from the davits by people on board the vessel.

SHOW CASE.—J. A. Holmes, Shopiere, Wis.—This invention relates to improvements in show cases, and consists in the application to them, whether made round, octagonal, or of other form, and revolving or not, of reflecting mirrors arranged in angles of ninety degrees or less for repeating the reflections of the articles to be exhibited which are placed between the reflecting mirrors.

ADJUSTABLE RAILROAD CAR SEATS.—J. I. Pease, Stockbridge, Mass.—This invention has for its object to furnish an improved seat for railroad cars which shall be so constructed that its back and head and foot rests may be swung or inclined into such a position that the passenger may recline or sleep comfortably upon it.

HARNESS MOTION FOR LOOMS.—A. R. Field, Central Falls, R. I.—This invention relates to improvements in harness motion for looms, and consists in a novel arrangement of differential gears for turning two sets of tappet shafts on their own axes while being carried around the shafts of drums on which they are mounted, between which drums the looms are mounted.

HAY AND COTTON PRESS.—Grey Utley, Charlotte, N. C.—This invention has for its object to improve the construction of the improved hay and cotton press patented by the same inventor May 12, 1868, and numbered 77,852, so as to make it more convenient and satisfactory in use, and more effective in operation.

COMBINED HARROW AND ROLLER.—J. M. Blankenbeker, Powers' Station, Ind.—This invention has for its object to furnish an improved harrow which shall be so constructed that the ground may be harrowed and rolled or harrowed, rolled, and cultivated, as may be desired, and which shall, at the same time, be simple in construction, and easily adjusted and operated.

REED ORGAN PIPES.—C. W. Small, Worcester, Mass.—This invention relates to improvements in the construction and arrangement of the pipes used in melodeons, organs, and the like instruments for the purpose of softening the sound and increasing the volume, and it consists of a pipe made of wood or other suitable material, having the reed placed at one side, near one end, and terminating at the other end in a hollow spherical enlargement, with a mouth in one side to emit the sound.

TRACTION ENGINE.—M. P. Hall, Hinsdale, N. Y.—This invention has for its object to furnish a simple and convenient engine to take the place of animal power for various farm purposes, for towing canal boats, and other uses, where the continuous, untiring exertion of power is required, and which will apply the power in the most natural and direct manner.

CHUCKS FOR CUTTING SCREWS ON GAS PIPES OR TUBES.—W. T. Cole, New York city.—This invention relates to a new and useful improvement in chucks for holding gas pipe and other tubing while screw threads are being cut thereon, and for other purposes, the mechanism being such that the pipe or article is released as soon as the thread is cut without stopping the machine or lathe, and also such that the driving power is used for fastening the pipe.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,092.—PRODUCTION OF IRON AND STEEL.—J. E. Sherman, Bucksport, Me. July 25, 1870.

2,094.—WASHING MACHINE.—H. Greaves, Newark, N. J. July 25, 1870.

2,100.—VEGETABLE PARCHMENT OR PARCHMENT PAPER.—C. Campbell, Buffalo, N. Y. July 26, 1870.

2,102.—MANUFACTURE OF RAILWAY WHEELS ALSO IN THE MOLDS AND THE CONVERTING FURNACES TO BE USED IN THE MANUFACTURE OF RAILWAY WHEELS.—J. B. Tarr, Fairhaven, N. Y. July 26, 1870.

2,112.—HEATING WATER FOR STEAM BOILERS.—C. E. Hutson, Commerce, Mo. July 27, 1870.

2,115.—INKING APPARATUS FOR PRINTING PRESSES.—I. L. G. Rice, Cambridge, Mass. July 28, 1870.

2,124.—DEVICE FOR GUIDING COVERED WIRE TO BE SECURED UPON A FABRIC OR SUBSTANCE IN A SEWING MACHINE.—W. T. Cook, New York city. July 29, 1870.

2,153.—LUBRICATING PACKING FOR RAILWAY CARRIAGE JOURNALS.—W. H. Jewell, New York city. Aug. 2, 1870.

2,159.—PRESERVING WOOD FROM DECAY.—A. B. Tripler, New Orleans, La. August 2, 1870.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING August 23, 1870.

Reported Officially for the Scientific American

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106,531.—KNITTING MACHINE.—W. H. Abel, Bennington Vt., assignor to himself and J. E. Crane, Lowell, Mass.
106,532.—COAL SIFTER.—Sanford Adams, Boston, Mass.
106,533.—SHEET METAL CAN.—Franz Albaum, Greenpoint, N. Y.
106,534.—MACHINE FOR RULING SLATES.—Franklin Ames, North Bridgwater, Mass.
106,535.—HARVESTER.—V. S. Barber (assignor to Nixon & Co.), Alliance, Ohio.
106,536.—MACHINE FOR SAND-PAPERING MOLDINGS.—Joseph Barker (assignor to himself and Philip Myers), Chicago, Ill.
106,537.—MOTIVE POWER.—Charles Batcheller, Polk county, Iowa.
106,538.—PRUNING SHEARS.—George Bergner, Washington. Mo.
106,539.—COMBINED HARROW AND ROLLER.—J. M. Blankenbeker, Powers' Station, Ind.
106,540.—METHOD OF PUTTING FACE-DRESS ON MILLSTONES.—J. S. Braley, J. A. Schmitt, and P. L. Schmitt, Utica, Mo.
106,541.—SCYTHE.—H. C. Brown, Barkhamsted, Conn.
106,542.—COMBINATION OF SHAFTS AND POLE.—J. G. Burchfield and S. W. Brock, Niantic, Ill., assignors to S. W. Brock.
106,543.—LET-OFF MECHANISM FOR LOOMS.—M. C. Burleigh, Somersworth, N. H.
106,544.—PAINT BRUSH.—W. B. Burtnett, New York city.
106,545.—FERRULE FOR PAINT BRUSHES.—W. B. Burtnett, New York city.
106,546.—SEEDING MACHINE.—Alphonso Button, Dunkirk, N. Y.
106,547.—DEVICE FOR PROPELLING CANAL-BOATS.—J. B. Calnan, New Haven, Conn., assignor to himself and V. P. Parkhurst, Templeton, Mass.
106,548.—WHEEL PLOW.—H. C. Carr, Bordentown, N. J.
106,549.—HITCH HOOK.—G. W. Chandler (assignor to himself and Calvin Searle), Mason, N. H.
106,550.—TILE MACHINE.—Joseph Christen, New Orleans La.
106,551.—CHUCK FOR HOLDING PIPES AND TUBES WHILE BEING SCREW-THREADED.—W. T. Cole, New York city.
106,552.—DISH STAND.—W. F. Collier, Worcester, Mass.
106,553.—ROASTING FURNACES FOR ORES.—John Collom Empire City, Colorado Territory. Antedated August 15, 1870.
106,554.—HORSE HAY RAKE.—J. M. Colson, Morrill, Maine.
106,555.—AUTOMATIC BUGGY BRAKE.—L. T. Conant, New Lisbon, Ohio.
106,556.—PLOW.—W. G. Coombs, New Gloucester, Maine.
106,557.—BOTTLE STOPPER.—J. T. Cree, Worcester, Mass.
106,558.—VENTILATING WINDOW FOR RAILROAD CARS.—Samuel Darling, Providence, R. I.
106,559.—PLOW.—Robert Dickie and H. K. Johnston, Bunker Hill, Ill.
106,560.—WEIGHING SCALES.—G. W. Dickinson, Charleston, Ill.
106,561.—MACHINE FOR MANUFACTURING WATCH CASES.—T. B. Dill, Boston, Mass.
106,562.—GRASS-SEED SEPARATOR FOR MANGERS.—D. B. Dixon, Unionville, Mo.
106,563.—TUBING CLAMP.—W. H. Downing, Pioneer, Pa.
106,564.—EARTH CLOSET.—J. A. Drake (assignor to himself and M. E. B. Clark), New Orleans, La.
106,565.—EARTH CLOSET.—J. A. Drake (assignor to himself and M. E. B. Clark), New Orleans, La.
106,566.—EARTH CLOSET.—J. A. Drake (assignor to himself and M. E. B. Clark), New Orleans, La.
106,567.—SPINDLE BOLSTER.—W. F. Draper, Hopedale, Mass.
106,568.—HAND CORN PLANTER.—Hugh Dyer, Fort Scott, Kansas.
106,569.—MANUFACTURE OF INFLAMMABLE GASES FOR FUEL, ETC.—William Elmer, New York city. Antedated August 12, 1870.
106,570.—TRUSS.—T. M. Fell, Glastonbury, Conn.
106,571.—HARNESS-OPERATING MECHANISM FOR LOOMS.—A. R. Field, Central Falls, R. I.
106,572.—COFFEE-POT.—William Funk and G. W. Port, Warrensburg, Mo.
106,573.—MEDICAL COMPOUND.—L. L. Gebhart, Providence Ind.
106,574.—VAPOR BURNER.—Ernest Gillert, St. Louis, Mo.
106,575.—CHURN DASHER.—W. H. H. Gorham and B. H Williams, Greenwich, Ohio.
106,576.—WASHING MACHINE.—Allen Gregg (assignor to himself and Perry Gregg), Springborough, Ohio.
106,577.—TRACTION ENGINE.—M. P. Hall, Hinsdale, N. Y.
106,578.—HEAD BLOCK FOR SAW MILLS.—J. W. Handshy, Tanesville, Ohio.
106,579.—WHEEL CULTIVATOR.—E. D. Hatch, Oconomowoc Wis.
106,580.—GUARD FOR ROOFS.—S. R. Hathorn, Worcester Mass.
106,581.—ROTARY PUMP.—G. W. Heald and L. D. Sisco Baldwinsville, N. Y.
106,582.—INK OR WRITING FLUID.—Charles Hebel, Louisville, Ky.
106,583.—POTATO DIGGER.—Leonard Henderson, Manson, N. C.
106,584.—DRESSING AND TANNING SKINS.—H. A. Hibbard, Augusta, Mich. Antedated August 11, 1870.
106,585.—COATING METAL ARTICLES WITH INDIA-RUBBER.—Constantine Hingher, New Brunswick, N. J.
106,586.—SHOW CASE.—J. A. Holmes, Shopiere, Wis.
106,587.—ATOMIZING TUBE.—T. J. Holmes, Malden, Mass.
106,588.—LIQUID MEASURE AND FUNNEL.—Joseph Huff, Ironton, Mo.
106,589.—MACHINE FOR REPAIRING BOILER FLUES.—John Hughes, Bloomington, Ill.
106,590.—FURNITURE FASTENING.—L. A. Johnson, Candor N. Y.
106,591.—LAST.—Nathaniel Jones, Syracuse, N. Y.
106,592.—SCREW CUTTING MACHINE.—Edward Kaylor, Pittsburgh, Pa.
106,593.—EARTH CLOSET.—Christian Kieffer and J. R. D Seeds, Wilmington, Del.
106,594.—GRAIN DRILL.—S. L. King and Wm. Ogden, Owego N. Y
106,595.—STAY FOR CARRIAGE.—George G. Larkin, Portland, Me.
106,596.—PEN HOLDER.—Robert B. Lawrence, Wheeling, W Va.
106,597.—SIEVE.—R. J. Mann, Dallas City, Ill.

106,598.—Low-water and High-pressure Alarm.—G. B. Massey (assignor to Massey Low-Water Detector Company), New York city.
105,599.—Churn.—Riley T. McCormick, Greencastle Junction, Ind.
106,600.—Motive Power for Driving Street Cars.—P. E. McDonnell, Lyons, Ill.
106,601.—Cotton Picker.—Daniel M. McRae, Webberville, Texas.
106,602.—Seeding Machine.—Daniel E. McSherry, Dayton, Ohio.
106,603.—Machine for Bending Volute Springs.—Reuben Miller, Pittsburgh, Pa.
106,604.—Horse Hay Rake.—Joseph Mills, Milan, Ind.
106,605.—Fruit Basket.—Richard Mitchell, Smyrna, Del.
106,606.—Apparatus for the Manufacture of Nitro-Glycerin.—George M. Mowbray, North Adams, Mass.
106,607.—Apparatus for the Manufa ture of Nitro-Glycerin, Nitro-Benzole, etc.—Geo. M. Mowbray, North Adams, Mass.
106 608.—Cabin Table.—Henry J. Nichols, Searsport, Me.
106,609.—Base-Burning Stove.—Benjamin Nott, Albany, N. Y.
106,610.—Automatic Passenger Register for Vehicles.—Charles Ottinger, Philadelphia, Pa.
106,611.—Hay Loader.—Gilbert G. Park, Xenia, Nebraska.
106,612.—Piano.—S. W. Parker, Somerville, Mass.
106,613.—Gin for Linting Cotton.—G. W. Payne, Memphis, Tenn.
106,614.—Lubricator for Loose Wheels.—S. E. Peart, McKeesport, Pa.
106,615.—Railway Car Seat.—J. I. Pease, Stockbridge, Mass.
106,616.—Production of Colors for Dyes, Inks, etc., from Aniline.—Robert Pinkney, London, England.
106,617.—Materi l for Paste for Book Binders and others.—Isaac L. Plumer, Chelsea, assignor to J. S. Chase, Harwich, Mass.
106,618.—Wagon and Buggy Brace.—Nicholas Ramseyer, Farmersville, Ill.
106,619.—Boat-Detaching Apparatus.—N. M. Ray, Surrey, Me.
106,620.—Paddle Wheel.—James Rees, Pittsburgh, Pa.
106,621.—Spindle Bolster.—I. P. Richards, Whitinsville, assignor to George Draper & Son, Hopedale, Mass.
106 622.—Grain Thrasher, etc.—Henry Ries, Norwalk, Ohio.
106,623.—Wash Boiler.—Henry R. Robbins, Baltimore, Md.
106,624.—Process of forming Smooth Tops on Glass Jars.—Frederick Rohrbacher and Ferdinand Hormann (assignors to S. B. Rowley), Philadelphia, Pa.
106,625.—Preserving Wood.—A. J. Sheldon, Buffalo, N. Y. Antedated August 12, 1870.
106,626.—Manufacture of Fertilizers.—Thomas Sim, (assignor to himself and J. L. Hutchinson) Baltimore, Md.
106,627.—Machine for Decorticating and Drying Grain.—Evan Skelly, Plaquemine, La.
106,628.—Reed Organ Pipe.—Chas. W. Small, Worcester, Mass.
106,629.—Vapor Chandelier.—C. E. Smith and H. J. Rice, Columbus, Ohio.
106,630.—Vapor-Burning Street Lamp.—C. E. Smith and H. J. Rice, Columbus, Ohio.
106,631.—Seed Planter.—Levi Smith, Chester Center, Mass.
106,632.—Preserving Meat.—Lewis H. Spear, Peekskill, N. Y.
106,633.—Folding Chair.—Alexander W. Stewart, Boston, Mass.
106,634.—Window Frame.—Adam W. Stine, Crestline, Ohio.
106,635.—Railway-Car Axle.—Frederick Sturneyk, St. Paul, Minn.
106,636.—Stack for Puddling, Boiling, and other Furnaces.—William Swindell, Allegheny City, Pa.
106,637.—Curtain Fixture.—Albert E. Tripp, Springfield, Ohio.
106,638.—Hay and Cotton Press.—Grey Utley, Charlotte, N. C.
106,639.—Lifting Jack.—A. M. Waters, Cuyahoga Falls, assignor to himself and Henry E. Mariner, Akron, Ohio.
106,640.—Fence.—Isaiah M. West, Wilmington, Ohio.
106,641.—Logotype.—Wm. H. Wilkinson, Southwick, Mass. Antedated August 12, 1870.
106,642.—Hoisting Machine.—W. C. Williamson (assignor to Williamson Brothers), Philadelphia, Pa.
106,643.—Combination of Ochers for Paint.—D. S. Wood, Tiskilwa, Ill.
106,644.—Combined Scrubbing Brush, etc.—E. K. Wood, De Witt, assignor to N. J. Eaton, Montana, Iowa.
106,645.—Adjustable Fruit Ladder.—Samuel Wright, Hillsborough, Mo.
106,646.—Table.—G. E Young, Providence, R. I., assignor to C. A. Young, and S. W. Young. Antedated August 19, 870.
106,647.—Method of Preventing Decay in the Timbers of Bridges, Buildings, etc.—Augustus Allen, Cass county, Mich.
106,648.—Steam Coupling for Railroad Cars.—S. A. Appold, Baltimore, Md.
106,649.—Manufacture of Shears.—W. B. Barnard and A. J. Barnard Waterville, Conn.
106,650.—Stove Leg.—D. L. Bates, Dayton, Ohio.
106,651.—Wooden Pavement.—G. A. Beidler, Philadelphia, Pa.
106,652.—Jacket for Heating Pipes.—Michael Ber, New York city.
106,653.—Ditching Machine.—Ulric Blickensderfer, Springfield, Pa.
106,654.—Bread Toaster.—Alanson Brown, Rochester, N. Y.
106,655.—Saw-Mill Dog.—John S. Brown, Seabrook, N. H.
106 656.—Grain Fork.—William W. Bryan, Schaghticoke, N. Y.
106,657.—Heel Burnisher.—Moses Burnham, 2d, Wenham, Mass.
106 658.—Apparatus for Gaging or Regulating the Flow of Water or other Fluids.—Edme Augustin Chameroy, Paris, France.
106,6 9.—Extension Step Ladder.—H. D. Chance, Llewellyn, Pa.
106,660.—Baling Press.—M. D. Cheek, Memphis, Tenn.
106,661.—Piano.—C. F. Chew, Geoge St., Chalk Farm road, England.
106,662.—Steam Generator.—Jonathan M. Clark, New York city.
106,663.—Fruit Box.—Chas. Colby and H. C. Ward, Benton Harbor, Mich.
106,664.—Mucilage Holder.—Chas. C. Converse, Brooklyn, N. Y.
106,665.—Hand Stamp.—W. F. Corne, New York city.
106,666.—Bed Bottom.—A. W. Cramer, Honesdale, Pa.
106,667.—Bronzing Machine.—Samuel Crump, Brooklyn, N. Y.
106,668.—Nut Lock.—David Cumming, Jr., Brooklyn, N. Y. Antedated Aug. 11, 1870.
106,669.—Slide Vale for Steam Engine.—Francis Curtis, Newburyport, Mass.
106,670.—Portable Gate Fence.—John W. Curtis, Bath, N. Y.
106,671.—Machine for Cutting Hoops.—W. H. Davis (assignor to himself and Joseph Harlan), Lexington, Ind.
106,672.—Stop-motion for Braiding Machines.—E. W. Dean, Norwich, Conn.
106,673.—Pum-rod Connection for Deep Wells.—H. De Zavala, New York city. Antedated Aug. 11, 1870.
106,674.—Revolving Road Scraper.—E. M. Doty, J. L. Little, and P. A. Schmidler (assignors to E. M. Doty), Springfield, Ohio. Antedated Aug. 13, 1870.
106,675.—Spinning Machine.—William Duffner, Petersburg, Ind.
106,676.—Machine for Varnishing and Dressing Loom Harness.—E. J. Ellis, Lewiston, Me.
106,677.—Harrow.—G. M. Ellis, Huntertown, Ind.
106,678.—Hub for Carriage Wheels.—J. M. Emmerich, New Haven, Conn.
106,6 9.—Carpet Duster.—Thomas Ferry, Wilmington, Del.
106 680.—Hair Brush.—S. M. Firey, Clear Spring, Md.
106,681.—Umbrella.—Samuel Fox, Stockbridge Works, Deepcar, near Sheffield, England. Patented in England, September 21, 1868.
106,682.—Ballot Box.—Gilbert Adolphe Frebault, Paris, France.
106,683.—Steam Pump.—Alexander Friedmann, Vienna, Austria.
106,684.—Combined Mop Head and Wringer.—Wm. Gage, Buffalo, N. Y.
106,685.—Wood-molding Machine.—A. S. Gear, New Haven, Conn.
106,686.—Apparatus for Cooling Beer.—Wm. Gee, New York city.
106,687.—Thill Coupling.—W. S. Geer, Marshall, Mich.
106,688.—Cooking Stove.—J. M. Goodfellow, Troy, N. Y.
106,689.—Vapor Burner.—Benjamin D. Greene, Sturgis, Mich.
106,690.—Construction of Ditches.—Tobias K. Grube, Napoleon, Ohio.
106,691.—Time Lock.—L. A. Haines, Wakefield, Md.
106,692.—Parlor Organ.—E. Hamlin, Winchester, Mass., assignor to Mason & Hamlin Organ Co.
106,693.—Corn Plow.—Henry Harrier, Indianapolis, Ind.
106,694.—Machine for Cutting Blind Slats.—J. W. Helder (assignor to himself and Luther Trescott), Shannon, Ill.
106,695.—Churn.—F. M. Hindman and Nicholas Hiatt, Sidney, Iowa.
106,696.—Blotting Pad.—G. C. Hinman, Boston, assignor to L. L. Tower, Somerville, Mass.
106 697.—Flour Bolt.—J. H. Jones, Yellow Springs, Iowa. Antedated Aug. 12, 1870.
106,698.—Bale Tie.—W. A. Jordan, New Orleans, La., assignor to E. P. Jones.
106,699.—Manufacture of Gas for Illumination, etc.—Joshua Kidd, New York city. Patented in England January 5, 1864.
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106,704.—Bucket for Paddle Wheels.—A. C. Loud (assignor to himself and W. J. Miller), San Francisco, Cal.
106,705.—Pruning Shears.—Enoch J. Marsters, Shaw's Flat, Cal.
106,706.—Fruit Corer.—Enoch J. Marsters, Shaw's Flat, Cal.
106,707.—Straw Cutter.—Albert P. Massey, Cleveland, Ohio.
106,708.—Hot-air Furnace.—John McCoy, Burlington, N. J., assignor to himself and Carbon Stove Co.
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106,724.—Machine for Varnishing and Labeling Fruit Cans and other Cylindrical Packages.—A. C. Platt, Sandusky, Ohio.
106,725.—Skate.—A. C. Platt, Sandusky, Ohio.
106,726.—Bed Bottom.—George Richardson, Milwaukee, Wis.
106,727.—Pumping Engine.—Louis C. Rodier, Springfield, Mass.
106,728.—Cultivator.—John Root, Hartland, N. Y.
106,729.—Circular Saw Mill.—T. H. Russell, Northfield, Vt. Antedated August 17, 1870.
106,730.—Binding Attachment for Sewing Machines.—J. W. Sawyer, Boston, Mass., assignor to F. Draper & Co., Cambridge, Mass.
106,731.—Fifth-wheel for Carriages.—Henry Sayler, Saint Paris, Ohio.
106,732.—Breeching Attachment for Horses.—Wm. F. Schatz, Columbus, Ohio.
106,733.—Cultivator.—N. S. Shields, Rockford, Ill.
106,734.—Metallic Seal.—Alex. B. Small, New Orleans, La.
106,735.—Pocket Sun Dial.—D. L. Smith, Waterbury, Conn.
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106,737.—Means for Adjusting Car Wheels to Different Gages.—W. B. Snow, New York city.
106,738.—Suspension Ring.—D. M. Somers, Brooklyn, N.Y., assignor to Levi L. Tower, Somerville, Mass.
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106,740.—Stock or Blank for Bracelets.—I. B. Staples, Attleborough, Mass.
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106,743.—Combined Gang Plow and Cultivator.—S. C. Thornton, Macomb, Texas.
106,744.—Head-block of Saw Mills.—Wm. B. Trunick, (assignor to N. B. Connel), Louisville, Ky.
106,745.—Culinary Apparatus.—John Van, Cincinnati, Ohio.
106,746.—Hot Air Furnace.—John Van, Cincinnati, Ohio.
106,747.—Calk for Boot and Shoe.—J. L. Wager and A. L. Scudder, Sanford, N. Y.
106,748.—Skate.—E. P. Waggoner, Syracuse, N. Y.
106,749.—Walls for Buildings.—James Weathers (assignor to himself and V. P. Harris), Greensburg, Ind.
106,750.—Coal Stove.—J. R. Webber, Morris, Ill.
106,751.—Seed Planter and Fertilizer.—D. P. Webster, Boston, Mass.
106,752.—Shuttle for Sewing Machine.—W. W. Wells, Webster, Iowa.
106,753.—Vapor Burner.—Joseph White (assignor to himself and J. B. Wickersham), Philadelphia, Pa.
106,754.—Bit Stocks.—Charles P. Whitman, Charlemont, Mass.
106,755.—Shaft Coupling.—S. H. Whitmore (assignor to C. C. Burroughs and James Milliken), Decatur, Ill.
106,756.—Shaft Coupling.—Seth H. Whitemore (assignor to C. C. Burroughs and J. Milliken), Decatur, Ill.
106,757.—Weather Strip.—Henry W. Wicker, Norwich, Conn.
106,758.—Combined Fork and Band Cutter.—M. Wenger, Upper Leacock Post Office, Pa.
106,759.—Device for Removing Lime from Hard Water.—Kasson Frazer, Syracuse, N. Y.

REISSUES.

4,103.—Spring Mattress.—E. L. Bushnell, Poughkeepsie, N. Y.—Patent No. 95,394, dated Oct. 19, 1869.
4,104.—Buggy Top.—A. M. Cory, New Providence, N. J.—Patent No. 97,479, dated December 7, 1869; antedated November 30, 1869.
4,105.—Cherry Stoner.—George Geer, T. G. Hadley, and William Hamilton, Galesburg, Ill., assignees of George Geer.—Patent No. 63,715, dated April 9, 1867.
4,106.—Stone Pavement.—Charles Guidet, New York city.—Patent No. 85,814, dated Jan. 12, 1869.
4,107.—Apparatus for Crutching Soap.—Geo. M. Leslie, Northumberland, Pa., assignor to himself and Jesse Oakley, New York city.—Patent No. 44,142, dated Sept. 6, 1864.
4,108.—Brick Machine.—The United States Brick Machine Co., Chicago, Ill., assignees of B. M. Gard and E. R. Gard.—Patent No. 100,136, dated Feb. 21, 1870.

DESIGNS.

4,298.—Lamp Stand.—J. S. Atterbury and T. B. Atterbury, Pittsburgh, Pa.
4,299.—Clock Front.—John H. Bellamy, Charlestown, Mass.
4,300 and 4,301.—"Persian Cloak."—T. Dolan, Philadelphia, Pa. Two Patents.
4,302.—Joining Wood.—C. B. Knapp, Waterloo, Wis.
4,303.—Hair Pin.—G. W. Manson (assignor to C. M. Vandervoort and W. F. Fishrer), New York city.
4,304.—Ash Pail.—John Merry, New York city.

EXTENSIONS.

Pegging Jacks.—Alfred Bailey, of Amesbury, Mass.—Letters Patent No. 15,406, dated July 29, 1856.
Rotary Knitting Machine.—S. W. Park, of Albany, N.Y., and E. S. Ells, of Fremont, N. Y.—Letters Patent No. 15,482, dated Aug. 5, 1856.
Sewing Machine.—Extended by an Act of Congress.—John Bachelder, of Boston, Mass.—Letters Patent No. 6,439, dated May 8, 1849; reissue No. 617, dated November 2, 1858.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

Machine for Paring Apples, Potatoes, etc.—Elizabeth V. Pratt, North Beverly, Mass., has petitioned for the extension of the above patent. Day of hearing Oct. 26, 1870.

Burglar-Proof Safes.—William H. Butler and Sarah A. Holmes, New York city, have petitioned for an extension of the above patent. Day of hearing Nov. 2, 1870.

Platform Scales.—Francis M. Strong and Thomas Ross, Vergennes, Vt., have petitioned for an extension of the above patent. Day of hearing Nov. 9, 1870.

Currycomb.—Elliott P. Gleason, New York city, and Alvah Crosman North Providence, R. I., have petitioned for an extension of the above patent. Day of hearing Nov. 9, 1870.

Harvesting Machine.—William N. Whiteley, Springfield, Ohio, has applied for an extension of the above patent. Day of hearing Nov. 9, 1870.

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Subscribed and sworn to before me this 26th Aug. 1870. NATHANIEL GILL, Notary Public, 17 Nassau St., New York city.

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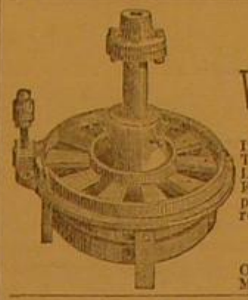

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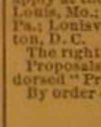

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