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Dressing Millstones by the Use of the Diamond.

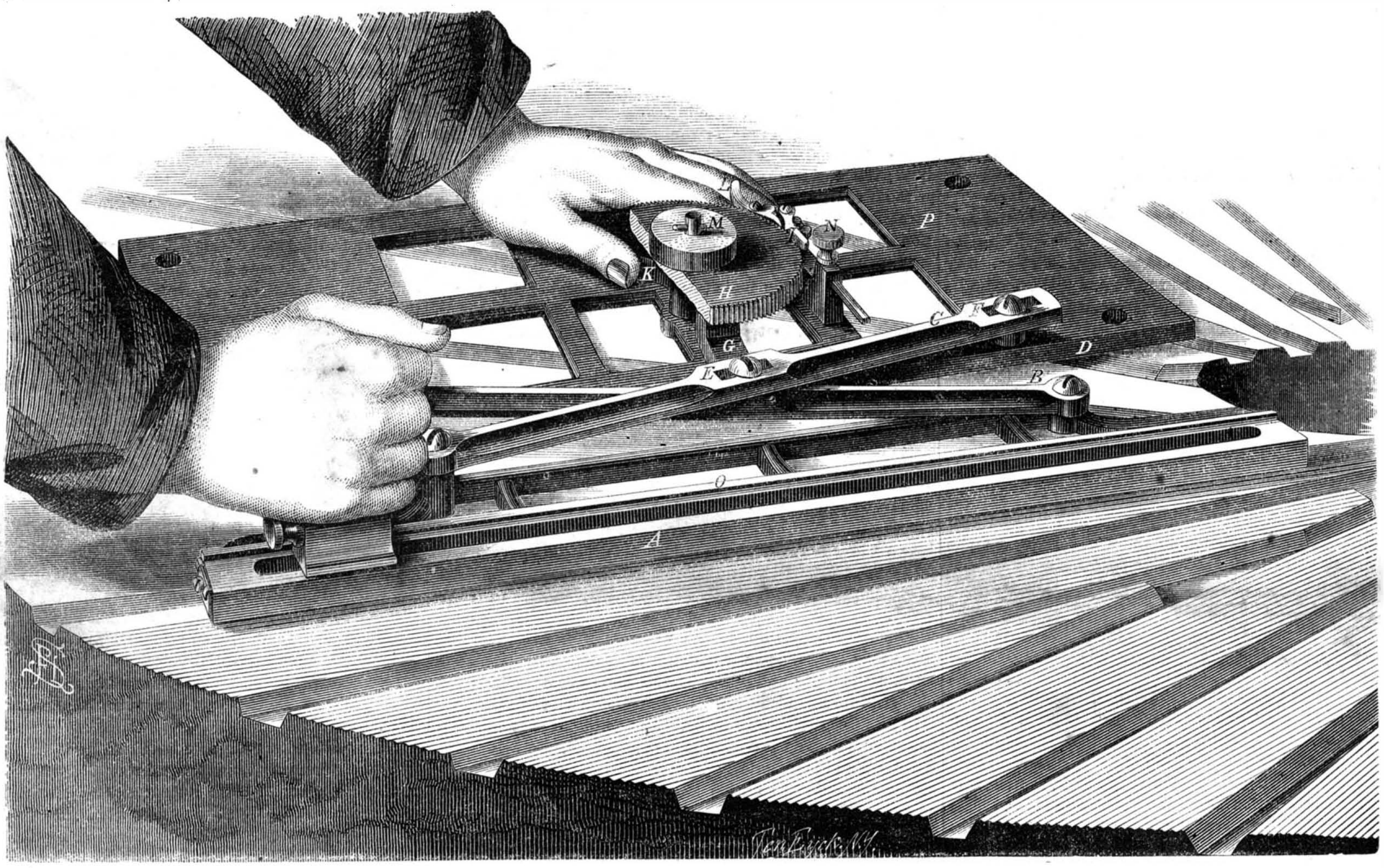
In an article, entitled "Diamonds and their Uses in the Mechanic Arts," published on page 49, current volume, we promised our readers an illustration and description of a very effective machine for dressing millstones by the use of the diamond, invented by Mr. John Dickinson, of New York city, and patented by him in America and Europe, for which a medal was awarded at the International World's Fair, held at London in 1862.

Millers who may be unacquainted with the nature of diamonds or their durability, it is reasonable to suppose, will be somewhat skeptical and incredulous as to the practicability of using them successfully as an economical application in dressing the lands of millstones. But if they would take the trouble to investigate their history and the purposes for which they are, and have been employed, besides that of ornaments, they will learn that they were used before the Christian era, and up to the present age, for making lines of any depth or form, and for carving faces and figures in relief upon the hardest class of stones, such as the onyx, and others which are almost as hard as the diamond itself. Again, diamonds are now being used successfully for drilling, sawing, planing, turning, shaping, carving, and dressing stones or other hard substances.

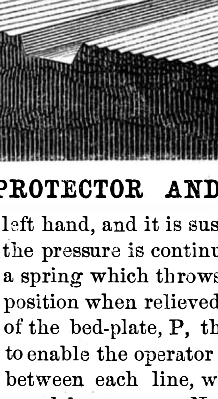
Diamonds set in an ordinary stem or ferule, were tried many years ago in Europe (and recently in this country) for producing lines upon millstones, and the millers were perfectly satisfied that the finest and most effective dress was attained by merely gliding the diamond lightly over the stone. The use of diamonds for this purpose was abandoned, however, from the difficulty in keeping them in their setting, and the liability of their being broken by over pressure. It was universally conceded, that if the diamond could be set sufficiently firm in an instrument, so constructed as to regulate the pressure and protect it, it would eventually in a great measure supersede the pick.

After many experiments and trials, Mr. Dickinson has succeeded in constructing the important improvements, illustrated in our engravings, the success of which is attested by those using the machine for over six years. The main difficulty he found was in educating millers to the proper handling of the diamond, and overcoming prejudices against any innovation upon the old mode of dressing with a pick. From their habit of seeing so much stone displaced, it had become an idea or conviction with them that such displacement was actually necessary or unavoidable, and it has taken some time to convince them of the contrary.

The large engraving exhibits Mr. Dickinson's patent graduated guide. A double rule, A, is connected to a straight edge, D, by two transverse arms, B and C; the arm, C, having slots, E and F, cut in the center and the right-hand end to accommodate the motion in drawing the arms in a direct line with each other toward the straight edge, D, which is done by the revolution of a small roller in a spiral cut in the wheel, H. This roller is screwed on a projection, G, attached to the middle of the lower arm, B. The wheel, H, has also cut on its edge graduated teeth in which a pawl, I, is made to catch, propelling the wheel around when actuated by the thumb-piece, K, with the pressure of the thumb of the left hand, and it is sustained in its position by a pawl, L, as the pressure is continuously repeated. The box, M, contains a spring which throws the double rule, A, back to its former position when relieved from the pawl, L. On a raised ledging of the bed-plate, P, there is a graduated scale with figures, to enable the operator to set his distances as he may require between each line, which is done by a short sliding bar, secured by a screw, N. O is a raised ledging on the inner rule which guides and steadies the protector in its motion. The spiral movement described is attached to the bed-plate, P (the latter being planed level), and is adjustable upon the face of the stone as may be required.



JOHN DICKINSON'S PATENT PROTECTOR AND GUIDE FOR DRESSING MILLSTONES WITH THE DIAMOND



In using this guide, the operation is very simple, and requires but little practice, the guide being so constructed as to produce the distances between each crack mathematically correct. It can also be set by the scale so as to obtain any number of cracks to the inch from eight to forty-eight.

When using this instrument the palm of the left hand is pressed firmly upon the bed-plate, P, on which the movement is fixed, and, after having marked with the diamond as often as required, the thumb-piece, K, is pushed by the thumb of the left hand as far as it will go, then immediately relieved.

This pressure is repeated until the back of the double rule touches the straight edge, D, when the forefinger of the left hand presses the pawl, L, and the spring in the box, M, then instantly extends the double rule to its first position.

The small diagram shows the construction of the "protector." A represents the stock or protector in which is inserted a steel bar, B, containing the diamond, C. A is a shifting guard upon which the protector is made to slide between the double rule or tramway. This guard is adjustable and secured in its position by a thumb screw, D. E is a rod which is pressed upon the bar, B, containing the diamond, C, by a spring, F, which pressure is increased or diminished by a screw, H, at the top of the handle, G, in accordance with the nature of the burrs and depth of dress required.

This protector is drawn through the double rule or tramway, the same as a pencil in ruling a slate. The operation is so simple that a boy could operate with it blind-folded.

Any person of ordinary skill can dress a pair of burrs by following the directions. The lines produced upon the lands of a burr are fine, perfect in shape and regular on each edge, totally different from the cracks made by a pick, which are naturally coarse and irregular. In the usual mode the pick produces a stellated fracture, thereby weakening or disintegrating the stone as far as the fracture extends. Thus the edges of the crack, weakened by the blow from the pick, soon crumble away wearing the face of the stone as the particles thus detached are thrown out.

The line cut by the diamond upon a glassy surface which has never been disintegrated by a blow from a pick is clear and distinct, having its edges sharp and fine, with no disposition to crumble, being perfect to the edge of the crack, thereby insuring a sharp corner or cutting edge perfectly straight and equal. Stones dressed after this mode, either hard or soft, open or close, will, it is claimed, run longer and perform a greater amount of work, and also will become more perfect as the bruises occasioned by the pick are removed. It is not intended for dressing out the furrows.

There is no crushing contact of the stones with the wheat, the sharp edges of the cracks actually cutting, or shaving up the grain, although brought very close together. Stones running clear of each other produce a clear whistling sound, differing from that obtained by any other mode of dress. On the starting of the stones they commence to do their work effectively, producing no middlings, and the flour comes from them with its nutritive properties unimpaired. There is no perceptible moisture generated in the operation of grinding, and much less power is required to produce a superior article of flour.

It is further claimed that after putting the furrows in proper order, the lands of the burrs can be kept so by the labor of from one to two hours every four days; and that burrs have been run satisfactorily with this dress over six days and nights without taking them up, and have performed half as much more work with less power and in the same time.

It is claimed to be much easier to keep the burrs in face on this system. The use of the pick is entirely dispensed with, except in dressing the furrows and high glossy spots on the face, which must be taken off with a sharp pick.

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Mr. Dickinson claims that by this method of dressing stones not less than three pounds more flour per bushel is obtained than is possible with the old dress, and of better quality, devoid of grit. The saving in labor, time of the mill, cost of picks, and quantity and quality of flour in the aggregate must be a very large item, sufficient in itself to constitute a difference between a successful and unsuccessful business. Without dispensing with the services of the operative millers, it will lighten their labors, and enable them to keep their burrs in good condition.

These claims are attested by numerous testimonials, from practical millers in various sections of the country. We have personally witnessed the operation of this invention, and have formed a most favorable opinion of its merits. The sales of this machine have been somewhat retarded by the reluctance of millers to impart their knowledge of its value to others, and their prejudices against any innovation upon established customs; but latterly the demand has so much increased that, together with the demand for carbon points, cutters, and tools for working stone and for other mechanical purposes, Mr. Dickinson has found it necessary to enlarge the facilities of his establishment, and proposes, we believe, to organize a stock company to develop the uses and extend the manufacture of the carbon points and cutters. Some of these tools will form the subject of a descriptive article in a future number.

Mr. Dickinson expresses confidence that when the diamond millstone dressing machines are more universally known, they will be generally adopted throughout the world. Many of them have already been in use six years, and have not cost over ten dollars for diamonds or repairs.

The prices of the machines vary in accordance with the size of the diamond set in the protector. Some mills having larger, harder, and more burrs than others, require larger diamonds.

Those desiring any further information relative to the uses of diamonds, will find Mr. J. Dickinson able and willing to impart it, at his office, 64 Nassau street, New York city. Any person addressing him by letter in regard to tools, should be particular to state the precise purpose for which they want them.

AMMONIACAL GAS-ENGINES.

[By. F. A. P. Barnard, L.L.D., Commissioner to the late French Exposition.]

If hot-air engines and inflammable gas engines fail as yet to furnish power comparable to that which steam affords, without a very disproportionate increase of bulk, and for high powers fail to furnish it at all, the same objection will not hold in regard to the new motors now beginning to make their appearance, in which the motive power is derived from ammoniacal gas. The gas, which is an incidental and abundant product in certain manufactures, especially that of coal gas, and which makes its appearance in the destructive distillation of all animal substances, is found in commerce chiefly in the form of the aqueous solution. It is the most soluble in water of all known gases, being absorbed, at the temperature of freezing, to the extent of more than a thousand volumes of gas to one of water; and at the temperature of 50° Fah., of more than eight hundred to one. What is most remarkable in regard to this property is, that, at low temperatures, the solution is sensibly instantaneous. This may be strikingly illustrated by transferring a bell-glass filled with the gas to a vessel containing water, and managing the transfer so that the water may not come into contact with the gas until after the mouth of the bell is fully submerged. The water will enter the bell with a violent rush, precisely as into a vacuum, and if the gas be quite free from mixture with any other gas insoluble in water, the bell will inevitably be broken. The presence of a bubble of air may break the force of the shock and save the bell.

This gas cannot, of course, be collected over water. In the experiment just described, the bell is filled by means of a pneumatic trough containing mercury. It is transferred by passing beneath it a shallow vessel, which takes up not only the bell-glass but also a sufficient quantity of mercury to keep the gas imprisoned until the arrangements for the experiment are completed.

The extreme solubility of ammoniacal gas is, therefore, a property of which advantage may be taken for creating a vacuum, exactly as the same object is accomplished by the condensation of steam. As, on the other hand, the pressure which it is capable of exerting at given temperatures is much higher than that which steam affords at the same temperatures; and as, conversely, this gas requires a temperature considerably lower to produce a given pressure than is required by steam, it seems to possess a combination of properties favorable to the production of an economical motive power.

Ammonia, like several other of the gases called permanent, may be liquefied by cold and pressure. At a temperature of—38°·5 C., it becomes liquid at the pressure of the atmosphere. At the boiling point of water it requires more than sixty-one atmospheres of pressure to reduce it to liquefaction. The same effect is produced at the freezing point of water by a pressure of five atmospheres, at 21° C. (70° Fah.) by a pressure of nine, and at 38° C. (100° Fah.) by a pressure of fourteen.

If a refrigerator could be created having a constant temperature of 0° C., or lower, liquid ammonia would furnish a motive power of great energy, without the use of any artificial heat. The heat necessary to its evaporation might be supplied by placing the vessel containing it in a water bath, fed, at least during summer, from any natural stream. Such a condenser could not be economically maintained. A condenser at 21° C., however, and an artificial temperature in the boiler of 38° C., would furnish a differential pressure of five atmospheres, with a maximum pressure of fourteen. By carrying the heat as high as 50° C. (122° Fah.), a differential pressure of eleven atmospheres could be obtained, with an absolute pressure of twenty.

These pressures are too high to be desirable or safe. Moreover, condensation is more easily effected by solution than by simple refrigeration, and hence, in the ammoniacal gas engines thus far constructed, the motive power has been derived, not from the liquefied gas, but from the aqueous solution. The gas is expelled from the solution by elevation of temperature. At 50° C. (122° Fah.) the pressure of the liberated gas is equal to that of the atmosphere. At 80° C. (176° Fah.) it amounts to five atmospheres, and at 100° C. (212° Fah.) to seven and a half. At lower temperatures the gas is redissolved, and the pressure correspondingly reduced.

In the ammoniacal engine, therefore, the expulsion and resolution of the gas take the place of vaporization and condensation of vapor in the steam engine. The manner of operation of the two descriptions of machine is indeed so entirely similar, that but for the necessity of providing against the loss of the ammonia, they might be used interchangeably. The ammonia engine can always be worked as a steam engine, and the steam engine can be driven by ammonia, provided the ammonia be permitted to escape after use. The advantage of the one over the other results from the lower temperature required in the case of ammonia to produce a given pressure, or from the higher pressure obtainable at a given temperature. These circumstances are favorable to the economical action of the machine in two ways. In the first place, they considerably diminish the great waste of heat which always takes place in the furnace of every engine driven by heat; the waste—that is, which occurs through the chimney without contributing in any manner to the operation of the machine. This waste will be necessarily greater in proportion as the fire is more strongly urged; and it will be necessary to urge the fire in proportion as the temperature is higher at which the boiler, or vessel containing the elastic medium which furnishes the power, has to be maintained. In the second place, that great loss of power to which the steam engine is subject, in consequence of the high temperature at which the steam is discharged into the air, or into a condenser, is very materially diminished in the engine driven by ammoniacal gas.

For instance, steam formed at the temperature of 150° C. (302° Fah.) has a pressure of nearly five atmospheres (4·8). If worked expansively, its pressure will fall to one atmo sphere, and its temperature to 100° C. (212° Fah.) after an increase of volume as one to four. If, now, it is discharged into a condenser, there is an abrupt fall of temperature of 50°, 60°, or 70°, without any corresponding advantage. If it is discharged into the air, this heat is just as much thrown away. In point of fact, when steam of five atmospheres is discharged into the air at the pressure of one, considerably more than half the power which it is theoretically capable of exerting is lost; and when, at the same pressure, it is discharged into a condenser, more than one quarter of the power is in like manner thrown away. And as the expansion given to steam is usually less than is here supposed, the loss habitually suffered is materially greater.

The ammoniacal solution affords a pressure of five atmospheres at 80° C. (176° Fah.), and in dilating to four times its bulk, if it were a perfectly dry gas, its temperature would fall below 0° C. But as some vapor of water necessarily accompanies it, this is condensed as the temperature falls and its latent heat is liberated. The water formed by condensation dissolves also a portion of the gas, and this solution produces additional heat. In this manner an extreme depression of temperature is prevented, but it is practicable, at the same time, to maintain a lower temperature in the condenser than exists in that of the steam engine. It must be observed, however, that owing to the very low boiling point of the solution it is not generally practicable to reduce the pressure in the condenser below half an atmosphere.

The advantages here attributed to ammoniacal gas belong also, more or less, to the vapors of many liquids more volatile than water; as, for instance, ether and chloroform. Engines have therefore been constructed in which these vapors have been employed to produce motion by being used alone, or in combination with steam. The economy of using the heat of exhaust steam in vaporizing the more volatile liquid is obvious. But all these vapors are highly inflammable, and in mixture with atmospheric air they are explosive. The dangers attendant on their use are therefore very great. Ammonia is neither inflammable nor explosive, and if, by the rupture of a tube or other accident, the solution should be lost, the engine will still operate with water alone.

The action of ammonia upon brass is injurious; but it preserves iron from corrosion indefinitely. It contributes, therefore, materially to the durability of boilers. A steam engine may be converted into an ammonia engine by replacing with iron or steel the parts constructed of brass, and by modifying to some extent the apparatus of condensation.

CAPTAIN ERICSSON ON THE ROTATION OF THE EARTH.

Among the papers read at the meeting of the United States National Academy of Science, held at Northampton last month, was one by Captain Ericsson, which the author stated was an extract from an "Essay on Solar Heat" upon which he is engaged.

It appears that certain investigations relating to solar heat, undertaken chiefly with a view of ascertaining accurately how far the dynamic energy of the radiant heat of the sun can be made subservient in producing motive power, led him to consider, among other important practical manifestations of solar energy, the abrasion of the earth's surface caused by the flow of rain water, in its course to the sea. In other words, the effect produced on the rotation of the earth by the mere change of position of the enormous masses of matter detached by the flow of rain water, irrespective of any expenditure of force called for on account of friction in transit.

It is evident, he says, that the effects resulting from the change of position of the matter abraded, are twofold as regards the earth's axial rotation. In the first place, the matter is brought nearer to the earth's center, which approach tends to increase the rotary velocity of the earth, since the weight transferred moves in a less circle at the base than at the top of the hight from which it extends, consequently calling for the extinction of a certain amount of *vis viva*. The increase of rotary velocity imparted to the earth from this cause is, however, almost inappreciable. Secondly, the abraded matter, besides its change of position relative to the earth's *center*, will, in its course towards the sea, either approach the equator or recede from it. In the former case the change will cause a retardation, while in the latter it will augment the earth's rotary motion round the axis.

In order to arrive at some practical idea of the amount of retardation due to this cause, Captain Ericsson has chosen the Mississippi as his example. He has made choice of this river for the following reasons: It has been thoroughly surveyed, and it comprises in its field every variety of soil and climate, its source being among snows and lakes, frozen during a great portion of the year, while its outlet is near the tropics. How completely the Mississippi basin represents the average of the river systems of both hemispheres will be understood from this fact, that although the rain gages at its northern extremity show only thirteen inches for twelve months, those of the southern extremity reach sixty-six inches with every possible gradation of rain-fall in the intermediate space. In addition to this important circumstance, the basin covers 21° of latitude and 35° of longitude, or 1,460 miles by 1,730 miles. It has been shown by the official reports prepared by Humphreys and Abbott in 1861 that the average quantity of earthy matter carried into the Gulf of Mexico, partly suspended in the water and partly pushed along the bottom of the river by the current, amounts for each twelve months to 903,100,000,000 of pounds. This enormous weight of matter is contributed by numerous large branches, and upwards of one thousand small tributaries. The mean distance along the streams by which the sediment is carried, in its course to the sea exceeds 1,500 miles; but the true mean which determines the amount of force acting to check the earth's rotation is far less. Now the center of the Mississippi basin rotates in a circle of 15,784,782 feet radius, and its velocity round the axis of the globe is 1147·90 feet per second. The mouth of the river, on the other hand, rotates in a circle of 18,246,102 feet radius, with a circumferential velocity of 1,326·89 feet per second. It will be seen, therefore, on comparing these velocities, that an increased circumferential velocity of very nearly 179 feet per second must be imparted to the sedimentary matter during its course from the center of the basin to the mouth of the river.

The question here presents itself, where is the motive energy to come from to impart the increased velocity acquired during the transit? The author states that the earth must supply the needed force. In other words, an amount of the earth's *vis viva* corresponding to the force required to generate the augmented speed will be extinguished. It has been stated above that the annual discharge of earthy matter at the mouth of the Mississippi is 903,100 millions of pounds. It has also been shown that there is an increase of velocity of 179 feet per second, a rate acquired by a fall through 500·6 feet. If, then, we multiply 903,100 millions by 500·6, we prove that the amount of energy to be given up by the earth in order to impart the stated increase of rotary velocity to the abraded matter exceeds four hundred and fifty-two trillions of foot pounds annually. But the formation of 30,000 square miles of delta, over which the Mississippi now runs, has required ages, during which the earth has been unceasingly deprived of *vis viva*.

The next point to be considered is whether there exists sufficient compensatory force to make good the immense amount of dynamic energy expended. The mean rate of discharge into the Gulf of Mexico exceeds 38,600,000 pounds per second; and, as has been already shown, there is an increase of circumferential velocity so considerable that a fall through 500·6 feet is necessary to generate the same. Therefore, the amount of *vis viva* of which the earth is deprived every second by the waters of the Mississippi and its tributaries, will be 19,323,000,000 foot-pounds, or 35,133,000-horse power. What provision do we discover for making good this stupendous drag on the earth's rotation? The water precipitated on the Mississippi basin come chiefly from the Gulf of Mexico, raised by the heat of the sun. The gulf being situated *south* of the outlet of the river, the aqueous particles possess, at the commencement of the ascent, a greater circumferential velocity than the basin, and hence tend to impart motion to the atmosphere during their northerly course. On purely dynamic considerations, that motion and the motion of the aqueous particles ought to restore to the earth the loss of *vis viva* sustained, provided solar influence be not present. But solar influence is present; the atmospheric currents do not move altogether in accordance with static laws, but are controlled and perturbed by the heat of the sun—an *outside* force competent to disturb and destroy terrestrial equilibrium. Hence it is found that in place of an easterly motion of the atmosphere tending to restore, by its friction against the surface of the basin, the loss under consideration, the sun is frequently expending a vast amount of mechanical energy productive of

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currents which, by friction in a contrary direction, augment the loss. Captain Ericsson observes that it would be futile to attempt a demonstration to prove that, owing to solar influence, the friction and other resistance called forth by the currents of air and vapor is inadequate to restore the loss of *vis viva* sustained by the earth in consequence of the increase of rotary velocity which it must impart to the water of rivers running towards the equator. Nor would it be less futile to attempt a demonstration showing that the friction and resistance produced by such currents passing over the Mississippi basin from west to east is sufficient to restore the expended force of 35,000,000 of horse-power exerted in an opposite direction.

As an example of rivers running in an opposite direction, the author makes choice of the Lena, which falls into the Arctic Ocean. In this case he shows that the force exerted in the direction of the earth's rotation very nearly balances the the retardation caused by the Mississippi. But the waters of the Lena, unlike the southern river, do not directly enter into a heated caldron, to be at once converted into vapor. The previously chilled masses of the Lena flow into the great polar refrigerator, and from thence are transferred to the evaporator in the equatorial regions. This transfer cannot be effected without a considerable retreat from the earth's axis —so considerable, indeed, that before the required evaporation takes place the waters are further from that axis than their source at the foot of the Gablonoi Mountains. There the imparted *vis viva* is more than neutralized. The author then proceeded to consider that portion of the subject which relates to the recovery of *vis viva* resulting from the lowering of the earth's surface by the abrasion caused by rain, and showed that the approach of the abraded matter towards the center of the earth scarcely recovers 1-41,000,000th part of the energy parted with during the change of position in the direction of the equator. Captain Ericsson also urged as a cause of retardation the erection of towns and other edifices on the earth. He considers that the change of position of the enormous masses of stone and earth in the form of bricks, together with the coal and other minerals from below the surface of the earth to some hight above it, cannot but be the cause of considerable retardation.

He observed, in conclusion, that "no reasonable doubt can be entertained that the earth sustains a loss of *vis viva* of 39,894,658 foot-pounds every second. Multiply this sum by 86,400 seconds, we learn that every succeeding day marks a diminution of the earth's *vis viva* of 3,446,898,451,200 foot-pounds, in consequence of the change of position of the abraded matter carried towards the equator."

POTASH FROM A NEW SOURCE.---THE STASSFURT MINES.

The alkaline salt potash is so important in agriculture and the arts, that we think a full explanation of the method of obtaining it in large quantities from a new source will be interesting to the readers of the *Journal*. Potash, as is well known, was formerly the cheapest of the alkalies, but it is now the dearest; and in every possible case its place has been filled by one of the other alkalies, usually soda. The principal, and, for a long time, the only source of potash, has been the ashes of plants; but within a short time, potash salts have been discovered in vast amounts at the salt mines of Stassfurt, Prussia. Their value was not at first recognized, but did not long escape the notice of the very eminent chemist, Henrich Rose, who pointed out their importance. At the present time they are extensively worked. They are found overlying the salt beds in layers of various thicknesses, and are associated with salts of lime and magnesia. The principal forms in which they occur are known as mineral species under the names of polyhalite, sylvite, carnallite and kainite; accompanying them are found rock-salt, anhydrite, kieserite, tachydrite, and boracite. Polyhalite is a hydrated sulphate of potash, lime, and magnesia; sylvite is chloride of potassium; carnallite, a double chloride of magnesium and potassium; and kainite, a compound of hydrated chloride of potassium and sulphate of magnesia. Of the associated minerals, it need hardly be said that anhydrite is the anhydrous form of sulphate of lime; kieserite is a hydrated sulphate of magnesia; tachydrite, a double chloride of calcium and magnesium; and boracite, a borate of magnesia

Carnallite is the material worked for the extraction of potash. It is found mixed with rock-salt, kieserite, and small quantities of the other species mentioned above. As the mineral comes from the mine, it contains about one-sixth its weight of the potassium salt (the chloride) the rest being rock-salt and the chloride of magnesium, which is combined with the potassium salt as carnallite. In the process used to get the chloride of potassium in a reasonable degree of purity, advantage is taken of the different degrees of solubility of the various substances with which it is associated. The chlorides of potassium and magnesium are much more soluble than the chloride of sodium; so by treating the salt mass with an insufficient quantity of hot water, the two first-named salts are dissolved, while the most of the common salt is left behind undissolved. Chloride of magnesium is very soluble in cold water, and common salt is equally soluble in hot and cold water, so that both these remain in solution, while the potassium salt crystallizes out in a state of tolerable purity, about 80 or 90 per cent of chloride.

This product is good enough for commercial purposes and is used for making other salts. By further concentration of the mother liquor, the original salt, carnallite, deposits, and can be again worked over, while chloride of magnesium only is left in the solution. From the chloride of potassium the sulphate can be prepared by treatment with sulphuric acid; and from the sulphate the carbonated and caustic alkali, by Leblanc's process. This method, however, requires the use of a material (the acid), which is obtainable at the mines only at a considerable expense. It was therefore desirable to employ, if possible, the natural sulphate of magnesia, which is very plentiful at Stassfurt. After a great deal of experimenting, this was finally accomplished in a very ingenious manner by the formation of a double sulphate of potash and magnesia. This is done by simply adding sulphate of magnesia to the solution of chloride of potassium, a double decomposition taking place, with the production of sulphate of potash and chloride of magnesium. But the sulphate of magnesia, as mined, is mixed with common salt, from which it must first be freed.

The mixture of rock-salt and sulphate of magnesia is placed in water. The magnesia sulphate is but slightly soluble in the brine which is soon formed and collects at the bottom of the vessel, from which it is removed and used to form the double salt above mentioned. By careful treatment of the double salt, a part of the sulphate of magnesia may be got rid of, and from the residue carbonate of potash produced by Leblanc's process. Another mode of treating this double salt is by a solution of chloride of potassium, and then, by a series of crystallizations, are obtained pure sulphate of potash, the double sulphate again, and a double chloride of potassium and magnesium (carnallite.) The sulphate of potash is of course fit for the market, but the other salts are again worked over in the ways previously described.

As already stated, the deposits at Stassfurt are of enormous extent, and from them potash and its salts are now produced in such great quantities that their cost has been very materially lessened, so that even in agriculture they can be advantageously used. The processes employed for their extraction seem simple, and indeed are not very complex, yet are of a very interesting character, must be carried on with care and judgment, and require skill in manipulation. Separations of the kind we have been describing, are only possible on a large scale. One of the most important points connected with them is the manner in which the various mother liquors are brought into use. For instance, if the raw mass of rock-salt, chloride of potassium, and magnesia salts, instead of being treated with pure water, is acted upon by a mother liquor, already saturated with the two former, it is evident that almost all of the magnesia compounds will be dissolved, leaving the alkaline chlorides behind. Again, in the process given above, by which pure sulphate of potash is obtained, it will be noticed that at the same time other salts are formed, only to be worked over again. The final mother liquors contain very little besides magnesia salts, and are utilized to some extent as a source of magnesia.—*Boston Journal of Chemistry.*

Separating Animal from Vegetable Fiber.

In mixed fabrics or fabrics composed partly of animal and partly of vegetable fibers, the separation of animal fibers, such as, for example, wool, hair, or silk, from the vegetable fibers, such as cotton, flax, or jute, is a process necessary for certain purposes. The plan hitherto adopted for the purpose of separating these fibers has been to treat the material to be operated upon with acids. This is, however, objectionable, as the animal fiber is by their action rotted, and thereby loses its milling and felting properties. In a recent patent, Mr. James Stuart, of 40 Ropemakers' Fields, Limehouse, dispenses with these acids, and substitutes neutral substances. In this way rags, carpet cuttings, old carpet, and other waste material of mixed fibers may be utilized to a greater extent than has hitherto been found practicable, and, as the separated animal fiber retains in most cases its color, it can oftentimes be worked up again into articles for use without the necessity of its being re-dyed.

His invention consists in subjecting rags, carpet cuttings, old carpet, or other material of animal and vegetable fiber intermixed to the action of chlorides of the metals or sulphates of the oxides of the metals, preferring, however, to use as the active agent the chloride of aluminum. In thus treating the material, certain chemical reactions take place whereby the vegetable fiber is decomposed and the animal fiber is recovered uninjured either in substance or in color. It is then in a fit state to be re-manufactured without re-carding, spinning, dyeing, or other operations that have hitherto been necessitated.

In practice, Mr. Stuart first makes a solution of ingredients in the following proportions: In 100 gallons of hot water dissolve 100 lbs. of the suphate of alumina of commerce; then add 50 lbs. of chloride of sodium: when this last-named ingredient is added, a reaction takes place: sulphate of soda is formed, and also chloride of aluminum. With the solution thus made the material to be treated is saturated. It is then drained so as to allow the excess of the solution to pass therefrom; or the material may be slightly wrung or pressed for the same purpose. The material is next dried and afterwards exposed to a steady temperature of 200° Fah. During the time of this exposure, the chloride of aluminum decomposes, and the resulting volatile products, as they pass off, act upon the vegetable fiber, rotting them, but leaving the animal fiber uninjured. The material treated is then scribbled, and the vegetable matter separates in the form of dust. This treatment refers more particularly to rags of light mixed fabrics.

When treating heavier or denser material, such as carpet cuttings or old carpet, the solution of chloride of aluminum is of greater strength. In 100 gallons of water dissolve 150 lbs. in weight of sulphate of alumina and 75 lbs. of chloride of sodium, and then proceed in the manner before described.

In some cases, it is found more convenient to treat the material by boiling than by heating in drying rooms. Mr. Stuart then proceeds in the following manner: He makes a solution of sulphate of alumina by dissolving 100 lbs. of that substance in 100 gallons of water, and with this solution he saturates the material. It is then drained, and afterwards placed in a boiling saturated solution of common salt. In this solution the material is kept boiling until the vegetable fiber is decomposed or rotted; the material is then well washed and dried, and scribbled or carded.—*Mechanics' Magazine.*

The Danford Steam Generator.

The Joliet, Ill., *Republican*, in speaking of the above generator, says:

Had it been in use at the Indianapolis State Fair, the columns of the press all over the country would have been filled with pleasanter matter for perusal than the heart-rending tales of that sad disaster.

Our investigations of it were of such a satisfactory character that we have already purchased a generator and engine, and are this week placing it in our establishment to run our presses, and we do not hesitate to recommend it to every one who uses steam power as being absolutely safe.

The novelty of the Danford Steam Generator consists in its being a hollow wrought iron cylinder of 5-8th inch thickness, the side and heads welded together. This is placed in a jacket or furnace lined with fire brick; the back wall of the furnace is so constructed as to throw the heat and smoke around the cylinder or generator, which is made by a simple process to revolve, creating a draft, helping to consume the gases and smoke, and what is more important, equalizes the heat on the generator, making the iron to last much longer. We have been shown iron subject to this test for twelve months, after which it was softer and better than the day it was put in. The fire to heat the generator and make the steam is placed in the furnace, immediately under it, playing on the bottom of the circle as it revolves. By putting a three-fourth inch water pipe through the generator from end to end, plugging up the end from the engine and perforating it with 30 or 40 small holes the size of a pin head, you have the machine ready for use. To make steam by this invention is so simple, and still so effective, that it wins you as a friend at once. To make a fire in the furnace and heat the empty generator is but the work of a very few moments, after which you work a temporary handle attached to the pump, and by a few strokes you raise the pressure to 100 pounds, after which you are ready to operate with your engine, which makes the necessary steam to run it and keep up the reserve at every revolution by throwing a sufficient amount of water through the holes in the water pipe in the condition of spray, which is instantly flashed into steam, thereby keeping a regular pressure on the generator.

The generator or cylinder never contains any water to be suddenly expanded into a large body of steam, and is, therefore, to our judgment and others' experience, absolutely non-explosive, and as the steam made is superheated, almost any desired pressure can be obtained and used with safety. To our knowledge steam by this machine has been made and used up to 300 pounds pressure to the square inch without fear or danger.

We are glad to learn from Mr. George P. Jones, Secretary of the Company at Chicago, Ill., that this improvement, patented in this country and in Europe through the Scientific American Patent Agency, "is now a practical success."

Something New in Working Plaster of Paris.

We find the following in the *Druggists' Circular*:

"It is a well-known fact that powdered gypsum, when freed by calcination of its water of crystallization, regains to a great extent its original hardness when incorporated with water enough to form a stiff paste. In order to attain this end, there is at least thirty-three per cent of water required, wherefrom twenty-two per cent is withheld as water of crystallization. The rest evaporates, and thus brings about the porosity of the hardened gypsum. In working up a small quantity of gypsum, one has only a few minutes' time for using the paste for molding or puttying, as it soon becomes hard. With larger quantities, in which case the making of the paste requires a longer time, the mass hardens, sometimes, during the operation of dressing. According to Mr. Puscher, of Nuremburg, this inconvenience may be got rid of by mixing with the dry powdered gypsum from two to four per cent of finely pulverized althea-root, (marsh mallow) and kneading the intimate mixture to a paste with forty per cent of water. In consequence of the great amount of pectin which is contained in the althea-root, and which in fact amounts to about fifty per cent, a mass similar to fat clay is obtained. This mixture begins to harden only after a lapse of one hour's time. Moreover, when dry it may be filed, cut, twined, bored, and thus become of use in the making of domino-stones, dies, brooches, snuff-boxes, and a variety of other things of a similar character. Eight per cent of althea-root, when mixed with pulverized gypsum, retards the hardening for a still longer time, but increases the tenacity of the mass. The latter may be rolled out on window-glass into thin sheets, which never crack in drying, may be easily detached from the glass, and take on a polish readily upon rubbing them. This material, if incorporated with mineral or other paints, and properly kneaded, gives very fine imitations of marble. They bear coloring also when dry, and can then be made water-proof by polishing and varnishing. The artisan, in the practice of his trade, will probably find it to his advantage to make use of this prepared gypsum in place of that usually employed by him; the manufacturer of frames need have no fear that his wares will crack if he uses a mixture of the above-indicated composition; moreover, the chemist and chemical manufacturer will find that the same does excellent service in luting vessels of every kind. The exact proportion of water to be made use of cannot be given exactly, as it varies within a few per cent, according to the fineness and purity of the gypsum employed. The above-mentioned althea-root need not be of the very best quality, the ordinary kind serving the purpose perhaps quite as well."

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Improved Wagon Tongue.

The object of this invention is to furnish a spring support for wagon tongues. It is without doubt much superior to the old method; avoiding all bumping, and adding to the comfort of horses, driver, and passengers.

A, in the accompanying engraving of this invention, is a piece bolted or screwed to the under side of the tongue, to which is pivoted the rod, B, extending back beneath the tongue to a cylindrical rubber spring, D. A collar, C, with nut running upon the rod, B, serves to adjust the support to hold the tongue at the proper hight. The rod, B, passes through the center of the rubber spring and through an eye in the center of the oscillating cross head, E. This oscillating cross-head permits all the necessary oscillation of the tongue and the support without allowing the tongue to hammer upon the neck-yoke, or hold-back supports, thus relieving the necks of the horses. The oscillating cross-head is pivoted to curved supporting bars, F.

These are all the parts of the device which seems simple and serviceable.

Patented through the Scientific American Patent Agency, Sept. 21, 1869, by George Alexander, of Romney, Ind., who may be addressed for exclusive rights to manufacture in the United States.

Suspension Bridges in China.

The construction of suspension bridges has been thought a signal achievement by the Western nations, but in China they are of great antiquity, and many still exist. They are made of iron chains, and their mode of construction resembles, in the main, that used in the Western countries. They are, however, generally confined to the mountainous regions, and span rivers whose navigation is interrupted. There is one over a river in the Yunnan province that is said to have been first built by one famous Chu-koh-hand more than two thousand years ago; and there is a second and much larger one in the Kwelchow province, spanning the river Pei. This latter was built during the Ming dynasty. It consists of many chains stretched across the river and fastened firmly in the stone on either bank; from natural elevations above, other chains depend, and are made fast to the span, and there are also chains fastened to it from below, the object being to make the bridge as firm as possible. A plank floor is laid on this bed of chains; it is repaired at regular intervals of from three to five years at the imperial expense. The span of this bridge is said to be several hundred feet.

"Ventilate your Sewers! Do not Trap!"

These words form the close of a very valuable address on the influence of sewer vapor on health, delivered by Dr. Carpenter, of Croydon, before the Social Science Association, and we think the substance of it deserves the widest circulation.

It is within the memory of this generation that typhoid fever has been distinguished from other fevers, and has been traced to sewage. The earliest efforts of sanitarians were directed to the abolition of those collections of impurity in cesspools which formerly poisoned the earth, air, and water for our forefathers; and with the introduction of water-closets and of tubular drainage, it was hoped that typhoid fever, at least, might be exterminated. Nevertheless, it did recur again and again, as at Croydon; because, says Dr. Carpenter:

"In the early sanitary works which were carried out under the supervision and with the approval of the General Board of Health, and under the authority of the Public Health Act of 1848, the consequences of sewer gas not being foreseen were not guarded against; no provisions were made to prevent its ascent into the house, or for exit into the open air before it could reach the inside of the dwelling. The rapid spread of luxurious habits among the people, the introduction of low fireplaces and register stoves, and the method adopted to exclude drafts by having exceedingly close-fitting windows and doors, prevented the easy exit, and its baneful influence became manifest, often without the real cause being at that time at all suspected. It often happens that the easiest way for air to enter the house is by the sewer."

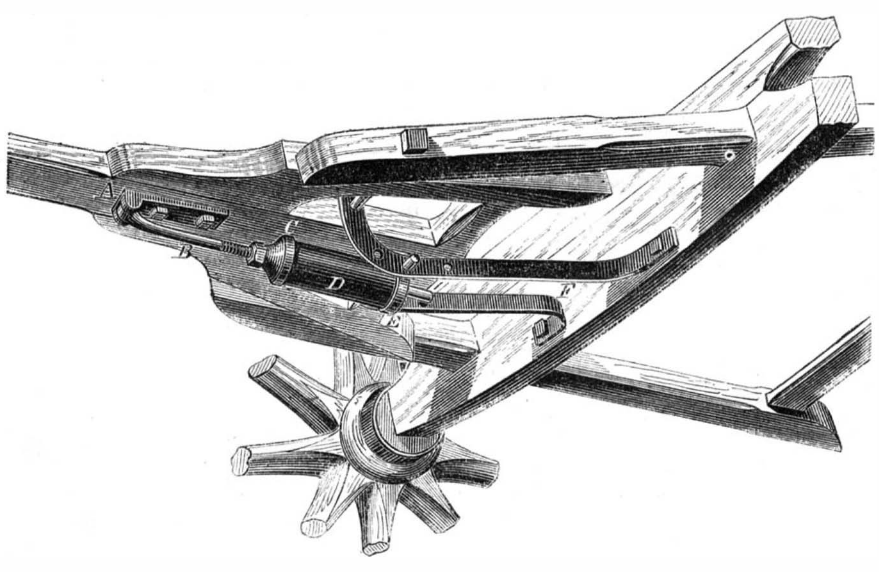
Then, with this state of things, "fever would recur; fever always the same in type, 'the enteric or typhoid' form, with rose-colored spots, often with abdominal complications, and always in those houses nearest to the top of the sewer (perhaps I should say generally), and farthest from the outfall."

Nor is fever the only consequence of the entry of sewer gas into dwelling houses. "Many other disorders of the system," says Dr. Carpenter, "have been directly traced to its influence—thus diarrhea; dyspepsia in all its forms; palpitation of the heart; various forms of asthma (indeed, it may help to explain some of the vagaries of this curious disease); convulsions, especially in teething infants; headaches, both persistent and intermittent. The evils which sometimes attend or follow upon the puerperal state, as milk fever, abscesses in the breast, and phlegmasia dolens or white leg, are frequently caused by it. I believe that these latter cases have been so associated, from observing their frequent occurrence in new houses before the plan now adopted in our district was carried out."

How, then, is this enemy so subtile and deadly to be dealt with? Most sanitarians have but one reply—put efficient traps and shut out the gas.

Trapping alone, Dr. Carpenter concludes, is delusive; for not only may the trap become dry, but the water that seals it absorbs gas from the sewer, and gives it off into the house, and, if there be any pressure, the trap is forced. Neither is it of any use to say that sewers ought to be self-cleansing, that they ought to form no deposit and give off no gas. What ought to be, and what actually is in this wicked world are two very different things.

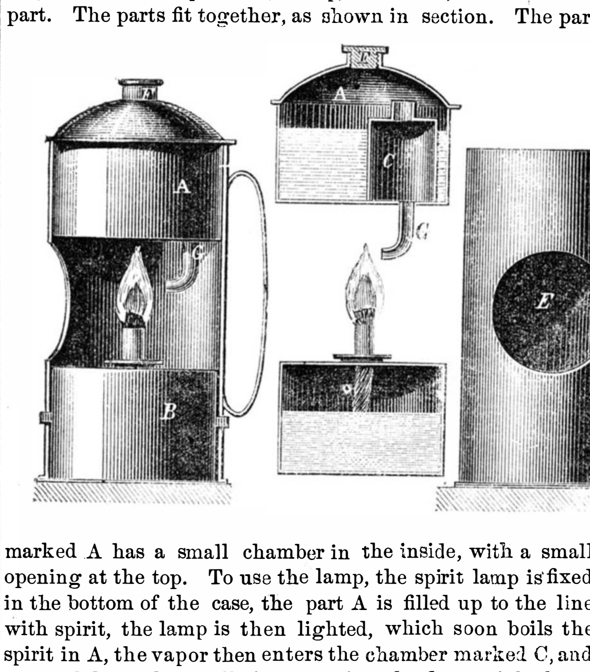
The real plan is to ventilate every sewer abundantly; to have a rapid and constant circulation of air through it; so that the sewer gas may be diluted and decomposed as soon as formed. In order to effect this, in the first place every house drain ought to be ventilated by carrying up the soil pipe to the highest available point, so that it be far enough removed from windows and chimneys. Other ventilating shafts, straight and perpendicular, ought to be put to every pipe requiring a trap, so as to protect the trap from the effects of pressure. Then, instead of closing the apertures into the street sewers, they ought to be as many and as open as possible. Stagnation in sewers, whether of solid, or liquid, or gas, must be avoided, and, considering that the sewers have a higher temperature than the air above, there is sure to be a rapid circulation through them if openings enough be provided; and public safety may be consulted by placing charcoal ventilators in the line of the up currents.—*New York Medical Journal.*



ALEXANDER'S IMPROVED WAGON TONGUE.

A USEFUL BRAZING LAMP.

A good form of brazing lamp which any tinman can construct, is shown in the accompanying engraving. It is made of copper, with the exception of the screws. The outside case is a cylinder, D, about four and a half inches high, and two and a half inches diameter, with a hole, E, as shown in the sketch; it is without ends, so that the receiver, marked A, may slide in the top, and the lamp, marked B, fit in the lower part. The parts fit together, as shown in section. The part marked A has a small chamber in the inside, with a small opening at the top. To use the lamp, the spirit lamp is fixed in the bottom of the case, the part A is filled up to the line with spirit, the lamp is then lighted, which soon boils the spirit in A, the vapor then enters the chamber marked C, and is forced down the small pipe, G, against the flame of the lamp with such force that it sends a strong fierce flame through the hole to the outside of the lamp. The outside hole of the blowpipe is to be made very small—so small that the point of a fine needle will only just enter.



Origin and Improvement of Steel Pens.

Few of the millions who use a steel pen give its origin a thought, yet there is no invention which is so universally used. During the first twenty years of this century, a Mr. James Perry was the proprietor and conductor of a popular school near London. To save himself from the drudgery of making and mending pens for scrawling urchins, he invented, in the year 1820, in imitation of the ancient *stylus*, a pen made of steel; and after many unsuccessful attempts, so far succeeded as to substitute it for the quill in the school room.

Mr. Perry, although a schoolmaster, was a keen business man. He followed up this success vigorously, and it ended in the production of the celebrated Perryan pen, known and used to this day. Mr. Perry, even in those early days, knew the value of advertising. He gave his invention a wide circulation, and in 1824, only four years after the first introduction of steel pens in Perry's school room, Robert Griffin (who is still alive) says: "During this year I wrote with pens made of steel, manufactured under the direction of Mr. James Perry—a pen that lasted about eight or nine weeks, writing about eight hours a day." In 1825 Mr. Perry employed fifty operators in London to manufacture steel pens; but although he was the inventor of the steel pen, he was not able to make them popular. That was left for a very remarkable man, namely, the still living philanthropist, Josiah Mason.

Mr. Mason, who endowed an orphan asylum a few months ago in Endenton, near Birmingham, England, with £250,000, was in his younger days a carpet weaver in Kiddermin ster. He, however, left that occupation and went to Birmingham, where he sold shoe-laces, pins, needles, etc., in the market place. One day he saw the Perryan pen exposed in a shop window at the moderate price of sixpence each; he bought three of them, determined to see whether he could not imitate them, and soon produced a pen lighter and better than the original. Far from taking a mean advantage in selling them to customers (Perry being then, 1830, the only maker), Mr Mason sent three dozens of his pens, mounted upon cards, to Perry, in London, offering to make them at fifteen shillings a gross. Mr. Perry, who seems to have been a liberal and shrewd business man, soon saw that a genius had got hold of the invention who could make great progress in the production. He at once accepted Mr. Mason's offer, made him small advances of money, and only stipulated that Mason should furnish him the sole supply.

Mason then began to give his whole mind to the subject. His first effort was to get the steel rolled to the proper thinness, in which alone at that time the difficulty lay. Then the machinist was called in to aid by a regular cut form what had before been shaped by hand. When Mr. Perry saw that Mason could turn out more pens in Birmingham in a day than he himself could do, with all his hands in London in a week, he thought it time to propose a partnership to Mason, which was accepted, and since Mr. Perry's death the Perryan pen is manufactured and owned by Mr. Mason, in Birmingham.

Hay Fever caused by Vibriones.

Helmholz says in *Virchow's Archives*, that since 1847, he has been attacked every year, at some time between May 20th and the end of June, with a catarrh of the upper air passages. These attacks increase rapidly in severity; violent sneezing comes on, with secretion of a thin, very irritating fluid; in a few hours there is a painful inflammation of the nose, both externally and internally; then fever, violent headache, and great prostration. This train of symptoms is sure to follow if he is exposed to the sun and heat, and is equally certain to disappear in a short time if he withdraws himself from such exposure. At the approach of cold weather these catarrhs cease. He has otherwise very little tendency to catarrhs or colds.

For five years past, at the season indicated, and only then, he has regularly succeeded in finding vibrios in his nasal secretions. They are only discernible with the immersion lense of a very good Hartnak's. The single joints, commonly isolated, are characterized by containing four granules in a row; each two granules being more closely connected, pairwise, and the combined length equaling 0·004mm. The joints are also found united in rows, or in series of branches. As they are seen only in the secretion which is expelled by a violent sneeze and not in that which trickles gradually forth, he concludes that they are probably situated in the adjoining cavities and recesses of the nose.

On reading Binz's account of the poisonous effect of quinine upon infusoria, he determined to try it in his own case. He took a saturated neutral solution of quiniæ sulph. in water =1 : 740. This excites a moderate sensation of burning in the nasal mucous membrane. Lying upon his back, he dropped 4 centim. of the solution, by a pencil, into each nostril; moving his head meanwhile in all directions, to bring the fluid thoroughly into contact with the parts, until he felt it reach the œsophagus. Relief was immediate. He was able, for some hours, freely to expose himself to the heat of the sun. Three applications a day sufficed to keep him free from the catarrh, under circumstances the most unfavorable. The vibriones, also, were no longer to be found.

The experiment was made in 1867; and was repeated at the first recurrence of the attack in May, 1868, preventing the further development of the attack for that year.

Graphic Sketch of Col. Drake, the Oil Pioneer.

About a mile below Titusville, Pa., the first oil well derrick that was ever built, in this or any other country, is still to be seen. In the light that petroleum has thrown upon the world since, it is sad to reflect that the man who first bored for oil, and, by his pluck and perseverance, not only flooded a community with sudden riches, but increased the wealth of the world, died as a common pauper.

Colonel E. L. Drake first made his appearance here in 1857. Previous to that time he had been a conductor on a railroad in Connecticut. He came to Oil Creek to obtain for another person an acknowledgment of a deed from one Squire Trowbridge, living in Cherrytree Township, Venango County. Calling casually at the office of Brewer & Watson, in Titusville, he there found a bottle of crude oil, and his curiosity

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being excited concerning it, he learned from Dr. Brewer all facts of interest connected with its production, namely, that it flowed from natural springs on the Watson flats; had been known to the Seneca Indians before the settlement of this region, and had been introduced by them as liniment or medicine to white persons, and sold to the druggists, and latterly had been gathered by Brewer & Watson, and used for lighting the sawmills of the firm and for lubricating purposes.

Drake visited the flats to examine the oil springs, and while there conceived the idea of boring to the sources of the oil. Returning to the East, he presented his view to a number of friends, and the result was that in the following year he came back to the oil region as the agent of an existing oil company at New Haven, who had purchased an oil tract, and Drake had full authority to bore, but very little means for the undertaking.

Drake may have got his idea from having heard that parties, sinking artesian wells for salt down on the Allegheny, were sometimes annoyed by meeting with a flow of oil. At all events, his first step was to visit the salt works near Pittsburgh, and engage experienced hands to go up and sink a well for him. A bargain was made; but it was not kept, the honest drillers for salt concluding, after Drake's departure, that the man must be a fool who thought of drilling for oil. A second trip to Pittsburgh, in a buggy (there was no railroad from Oil Creek then), resulted in another contract, which was broken for similar reasons. Drake then made a third trip; and finding it idle to talk of oil to men who were accustomed to regard it only as a nuisance troubling their salt water veins, he proposed to one of them to go with him and bore for salt. Salt seemed reasonable, and the man accepted his offer; and finally, in June, 1859, ground was broken for the first artesian oil well.

The drillers wished to make a large cribbed opening to the rock, which seems to have been their usual method of starting a well. But Drake said he would drive down an iron tube instead. This plan, which his friends claim was original with him (if so, it is a pity he didn't secure a patent for it, which would have been worth a fortune to him) was adopted, and it has been in use ever since, not only in sinking oil wells but in artesian boring for other purposes. The pipe was driven thirty-two feet, to the first stratum of rock. The workmen then drilled thirty-seven feet and six inches farther, entering what is known as the first sand rock, and making a total depth of sixty-nine and a half feet. They were at this point, when, one day—August 28, 1859—as the tools were lifted out of the bore, a foaming, dingy fluid, resembling somewhat, in appearance, boiling maple sugar, rushed up, and stood within a few inches of the top of the pipe. It was oil. In the meanwhile Drake had great difficulties to overcome, and greater were before him. There was still no railroad in that part of the country, and all his machinery and apparatus had to come in wagons from Erie, a distance of forty miles. He had to send to Erie for everything—once for a pair of common shovels, the store at Titusville being unable to furnish them. He had soon spent the money advanced to him by the company, and it refused to advance him more. He had exhausted his credit, too, and could not get trusted for the value of an oak plank or a center bit. He was thought insane, and people called him "Crazy Drake." His workmen were unpaid and discontented, and his enterprise must have failed when on the very verge of success, had not two gentlemen of Titusville, worthy of mention here—Messrs. R. D. Fletcher and Peter Wilson—having faith in the man and his work, come to his assistance. They indorsed his paper and loaned him money—and with this timely aid he struck oil.

Yet even now, with his well in operation, pumping twenty-five barrels a day, he seemed to be getting deeper and deeper into difficulty. He found, as he afterward said, that he had an elephant on his hands. There had been a demand for oil, at a good price, in small quantities, but there was no demand for it in large quantities. Imitators followed him, other wells were sunk, and the market was flooded. Teamsters charged $10 for hauling a barrel to Erie, where it could not fetch $10. The oil could not be generally used as an illuminating agent without being refined, and the coal oil refiners refused to touch a rival production, whose success in the market would be likely to injure their interests. Drake's health, if not his spirits, gave way under these complications, and he returned to the East about the time when petroleum —first refined by James McKeown and Samuel Kier, of Pittsburgh—was coming into general use. The great oil excitement came too late for poor Drake to profit by it. He died recently in a Connecticut poor house.

MALLEABILITY AND DUCTILITY OF METALS.

LECTURE BY JOHN ANDERSON, C. E., AT THE SOCIETY OF ARTS, LONDON.

In order readily to understand the two remarkable properties of malleability and ductility, which are now turned to such good account in almost every branch of the mechanical arts, it will be convenient to think of the malleable or ductile metals, such as lead, tin, copper, wrought iron, and steel, as substances that can be moved about like dough, that can be spread out as with a roller, that can be elongated by drawing out with the hands, that can be squirted through a hole by presssure like macaroni, or even that the dough can be pushed or gathered back again into its original mass of dough—that is, if proper means are employed to perform the operation gently, and this may be done without breaking the continuity of the particles of which the mass is composed. Such a statement may well seem fabulous, but it will be my province now to enumerate many things in connection with metal much more wonderful than what I have said regarding the dough, and even more strange than the change in dough when overtaken by the biscuit state from the baking process.

It is difficult to understand the possibility of the malleable and ductile properties without fully realizing that their particles are fluid, in a certain sense, and that this is due to the molecular arrangement, not so fluid, as water, tar, or bitumen, but still a fluid which will flow in obedience to sufficient pressure, and just as those fluids require time when acted upon by gravity, so the metals require greater time and more force than gravity, the rate of flow being determined by the nature of the metal, the softer metals requiring less pressure and flowing faster than the harder; and in the case of steel the flow is extremely slow, but with pressure, time, and patience, it also may be overcome and made to flow gently into any shape or form while in the solid condition.

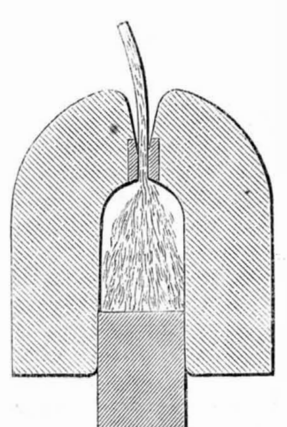
For a number of years the flowing property of the softer solid metals, such as lead and tin, has been taken advantage of very extensively, in the squirting of pipes and otherwise; and for thousands of years the malleable and ductile metals have been under treatment by man, and a vast number of facts have thus been accumulated; but it is due to M. Tresca, of Paris, to say, that he has done more, perhaps, than any other man in regard to the investigation of the natural laws by which the flow of solids is governed under varying circumstances, and the most interesting point of all is the great similarity that exists between the flow of solid metal and that of the flow of water—that in the flow of solids from an orifice there are the same converging currents, eddies, and that the quantity of metal issuing is dependent on the same conditions as water when issuing from orifices of different arrangement, and only differs in degree.

From time immemorial man has been familiar with gold as a flowing metal, both as malleable and ductile. It is in consequence of these properties that gold may be beaten into leaves so thin that it takes two hundred and ninety thousand to make one inch in thickness, or it can be drawn into a wire so fine that an ounce weight would extend a distance of fifty miles. The flowing action which takes place in coining a sovereign or other coin is very apparent. This process is not the mere stamping which it is generally considered to be, but the particles of the gold have really to flow in the same manner as a liquid, from one part of the die to another, in order to fill up the deeper recesses of the die from from the shallow part of the space, and so form the perfect coin from the rush of gold penetrating everywhere. As, however, gold is not one of the most common metals of applied mechanics, its presence in the workshop is less seldom met with than some of the others which have been already enumerated.

The metals lead and tin are both malleable and ductile, but their malleability, or spreading-out property, is much greater than their ductility, or drawing property; and both being soft, and having the flowing property in a pre-eminent degree, they can thus be squirted or rolled to any extent, or into any form of pipe or sheet, so that the want of ductility is scarcely felt.

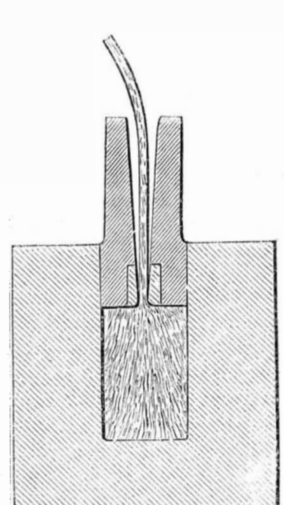
The diagram (Fig. 1) will explain the nature of apparatus which is employed to squirt these metals when in the solid state. It is a powerful syringe filled with solid metal, with pressure on the piston varying according to the dimensions; in some the force required is two thousand tuns. In the earlier machines the arrangement was exactly the same as in an ordinary syringe, as shown in Fig. 1, but it was found that the fluid pressure of the metal within the syringe created. such an inordinate amount of friction upon the inner surface as to rapidly wear out the several parts; but by a slight modification, more in accordance with sound principles, the defect has been obviated.

FIG. 1.



In the arrangement shown in Fig. 2, the piston contains the orifice, and in pressing against the upper surface of the metal, causes it to remain in a state of rest within the containing vessel; but as fluid pressure is equal in every direction, the solid finds the orifice as a point of less resistance, hence it flows outward in a continuous stream, thereby avoiding the friction of the solid lead within the cylinder. It will thus be observed that a rod of lead or tin can be squirted of any form or dimensions, depending on the die or orifice. In the Royal Arsenal may be seen lead thus squirted into continuous rod, and then wound upon reels like yarn, to be again unwound and made into bullets by self-acting compressing machinery; but the whole of the several processes are entirely due to the flowing property. Man's mechanism is very subordinate, and may be varied to any extent as circumstances may require.

FIG. 2.



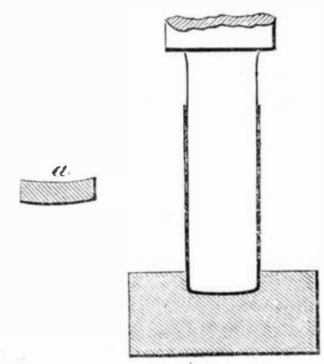
Pipes are made with the same facility as rods, by the mere insertion of a steel pin, the size of the required bore, placed in the bottom of the cylinder, and exactly in the center of the orifice, thus forming an annular space through which the metal flows outward as a continuous pipe; or, by making this pipe of sufficiently large diameter, and then cutting it open by a stationary knife as it leaves the machine the pipe becomes a sheet of lead, which, by means of suitable rollers, may be wound on a reel as a long web of sheet lead, or the sheet lead may be rolled out by rollers. In both ways the same mechanical work has to be done; the respective friction is a disputed point.

A very singular result was obtained by an attempt to squirt brass pipes, which are extensively used as steam boiler tubes and for gasfitting purposes. This brass consisted of 60 parts of copper and 40 parts of zinc, and of various other proportions, but, singular to relate, the pipes so squirted were zinc rather than brass; the most of the copper remained in the vessel and refused to flow. We are not to infer from this that the copper would not flow, but rather that the union between the zinc and the copper was less than the pressure necessary to make the copper flow; the mixture may have been more mechanical than chemical, or the temperature may have been such as to have had the zinc too near its melting point. Whatever is the explanation, the subject is well worth further experiment. In any such operation, the nearer the lead or other metal is to the liquid state, the easier it is accomplished; but it must be solid.

Lead or tin may be rolled out to any extent, either singly or both combined, or with a thin coating of tin or other metal upon one or both sides of the lead, so as to have a leaden substance, but yet covered with a tin surface, perhaps not thicker, if so thick, as the leaf called tinfoil, thus combining economy, with scarcely any disadvantage, for many purposes.

A beautiful illustration of the flowing property of tin is shown in the manufacture of the German capsule, in which the paint for artists is made up for sale and use. A button of tin, as in Fig. 3, is laid in the recess of a die in a fly press; a corresponding punch or die, a little smaller, is then brought down upon it with a smart blow, thus leaving, from the difference of dimensions, an annular space between them, when the metal at once squirts upward like water, but at a velocity much faster than the eye can follow, thus converting it into a perfect capsule. The form of the punch and die depends upon the article to be made, but in all provision has to be made for the admission of the atmosphere on the removal from the dies.

FIG. 3.



From these remarks it will be seen that, by understanding a few of the natural properties of these metals, how completely they are under man's control, and, by knowing the simple laws, he can modify the apparatus in thousands of different ways, in order to produce whatever may be required.

Correspondence.

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

Speculative Moonology.

MESSRS. EDITORS:—The idea that the full moon is hot seems to me so unscientific, that, though advanced or advocated by all the Herschels and backed by the Rosse reflector to boot, I take the liberty of offering a reason or two which may go to prove it untenable.

The convexity of the moon's surface is so much greater than that of the earth, that the moon must be effected by the sun's heat less than the earth is by a proportion considerably less than the ratio of size or diameter between the earth and moon would seem to indicate—nearly all the heat being deflected or reflected into space and dissipated. (And this convexity is possibly the cause of so little heat being reflected directly earthward.) The sun's rays can have but a small spot—small, as compared with the earth in this respect—on which they can at any time be said to fall vertically; a much less distance being required there than on the earth to reduce them to rays falling through all degrees of obliquity down to horizontal. So the vertical and nearly vertical rays may move around the moon quite slowly, and yet heat but at most a tropical belt, while there would be temperate and frigid zones as on the earth. But it would be doubtful whether that belt could by any possibility reach a temperature of 492° as claimed by modern astronomers.

All this, supposing the moon has all the conditions and requirements which the earth possesses for rendering sensible the solar heat; but the first and principal one of these is an atmosphere and astronomers tell us the moon has none at all; and without the atmospheric lens to contract the sun's rays together and squeeze out the heat, how, and from whence is free caloric to be obtained? On the earth it is known that at a certain hight, where (and because) the air has but little density, snow never melts, even under the tropics; whence we may infer that at greater elevations and with air still more rarefied, ice and snow would remain unmelted even if exposed to the rays of an equatorial sun for a century—and with no atmosphere at all it would be still colder than with a little.

It is stated that the addition of a small per centum of a denser gas (carbonic acid) to our atmosphere or increased

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density due to a few miles more in hight or depth of the air-ocean would—unless corrected by increased evaporation—cause the earth to grow hotter and hotter, so as to finally preclude the possibility of human existence; or it would enable the earth to retain its heat indefinitely long, though the sun should go into the comet business, speed away, and leave us out here in the cold of the planetary spaces.

All depending on atmosphere: now if the moon has no atmosphere, I don't quite see how it can form an exception to what we are bound to consider universal laws, operating always in the same manner—conditions being the same—whether on the earth, moon, sun, or stars. So, unless the moon is formed of materials new to science, or unless it has an equivalent to our atmosphere in some form (a fact which we may not be able either to prove or disprove on account of there not being moisture enough to form clouds, fogs or mists), I must continue to think the moon does not reach a temperature of 492°—or any other number of positive degrees,—"during its long lunar day of 300 hours."

Another thing: give the moon an atmosphere like ours, and as deep, (a larger portion than she is entitled to) yet, attraction is so much weaker there than on the earth that the air would expand into space, and I opine the density of that atmosphere would be less at the moon's surface than ours is at the tops of our highest mountains. Consequently, clouds could not float in it, nor birds fly in it, nor ordinary vegetable or animal life have any existence there. All water, if the moon had any, would be congealed, and there would be but little motion or chemical action. Intense cold would always prevail, and snow or ice would never melt under a perpetually vertical sun—if such a thing could be had for the occasion.

Wilmington, Del. W. L. DAVIS.

To Plow Manufacturers.

MESSRS. EDITORS:—By inserting this article in your valuable paper, it may subserve the interest of the Northern mechanic and Southern farmers.

What the South mostly needs is manufacturers, and at present the greatest needed, is a plow and agricultural implement factory. The necessity for improved plows, harrows, etc., are being felt, and the use of such would greatly increase were they manufactured among us, but so long as imported from the North, the cost of transportation and commissions put them out of our reach. As one instance, I will mention a case in point. I saw on a gentleman's farm two turning plows (iron beams) made at Hudson, N. Y., which cost at the shop $8 a piece. He told me that the freight on those plows from that shop to Rome, Ga., was $28, making each plow cost $32, and such is a fair representation of the cost of all the plows received, and seven tenths of them are worthless articles imposed upon us. Here is another instance. I showed a farmer from New Jersey a plow manufactured at Louisville, Ky., a one-horse turning plow—cost, delivered at at Rome, $10. He said such a plow would not bring ten cents in their State to use on their farms. The cases recited above show how we are imposed on, and our only remedy is in having factories at the South.

We have iron, coal, wood, and water power in abundance near Rome, Ga., and a more eligible point cannot be found anywhere South to put up such an establishment, the climate, water, society, etc., all that could be desired. If there are any plow manufacturers North desirous of establishing a factory South, they would do well to come and see for themselves, and if they would call on me at my farm, two miles of Cave Spring and fourteen west of Rome, it would afford me great pleasure to give them all the information they may need as to the advantages of setting up such a factory in this part of the country. JNO. H. DENT.

Cottage Home, Ga.

Aero-Steam Generators.

MESSRS. EDITORS:—In No. 13, current volume, of the SCIENTIFIC AMERICAN, you published a description of Mr. Warsop's aero-steam generator, and an account of his experiments. Mr. Warsop is in error in his way of accounting for his gain of power. He attributes it to the expansion of the air which he forces into his boiler. This is not the case, as air becomes heated by compression, to a higher degree than the steam itself, whenever it is forced into a boiler, carrying a pressure of sixty pounds or more to the inch. This heating is done by mechanical force taken directly from the engine. So there will be but little heat taken from the fuel by the air; and, consequently, very little expansion results from this source. The specific heat of steam is greater than that of air, and gases expand equally under the same degree of heat; so in forming an equilibrium of heat between the air and steam, the air being heated to the greatest degree, there will be more contraction of the air than expansion of the steam, volume for volume. That he gains all he claims, I have no doubt at all, but he is not aware of the true source of gain. Were it not for this heating of air by compression, air-engines would be a success; as it is, they can never be of any great value for converting heat into motion; neither can air ever be employed as a medium for transmitting power to long distances, as all this heat resulting from compression will be lost by radiation. The true source of gain in Mr. Warsop's apparatus is this: All water contains a large quantity of air in a state of solution; this air occupies the inter-molecular spaces of the water, and forms an elastic cushion, which forces the molecules of water apart, thus decreasing their cohesion. Air will prevent water from absorbing any other gas, which it will do when it contains no air. Air also has the power to expel other gases in a remarkable degree; consequently, it will prevent water from absorbing its own vapor, and will expel it as fast as formed. Water contained in steam boilers contains scarcely any air; because it is incompressible, while air is very elastic; water always absorbs the same volume of air without regard to pressure, but when it is forced into a steam boiler under a pressure of 100 pounds to the inch, the air contained in the water is compressed into about one fifth its original volume, thus leaving a vacuum of four fifths, besides air is expelled by heat. When water does not contain its complement of air, its cohesion is vastly increased by the absorption of its own vapor, which fills its inter-molecular spaces to such a degree that it restores the attraction of cohesion between the molecules of steam and the molecules of water to a great extent; cohesion not being annihilated by heat but only overcome. When air is absorbed by water there is no attraction of cohesion between the molecules of water and the atoms of air, but a positive repulsion, which widens the distance between the molecules of water, thus decreasing their attraction, thereby facilitating the molecular motion of heat. Also in Mr. Warsop's apparatus we have nearly a perfect circulation of the water; which is attained in no other boiler. After a study of the subject for a number of years, I am satisfied that the above are facts. In 1866, I obtained a patent, through the Scientific American Patent Agency, for a steam generator similar in principle in every respect to Mr. Warsop's apparatus. D. B. TANGER.

Bellefontaine, Ohio.

The Fossil Man of Onondaga.

MESSRS. EDITORS:—As an old subscriber (I have the SCIENTIFIC AMERICAN from its first No. to the last one), and as an admirer of the great truthfulness, candor, and intelligence which have always characterized your opinions and expressions, I beg leave to call your attention to an article on page 310, current volume, upon "The Fossil Man of Onondaga." The writer, "G. B.," who dates his communication "Syracuse, N. Y.," not only makes a general attack upon all connected with the Onondaga Stone Giant, but seeks to palm off both upon you and upon your readers, the infamous and ridiculous Geraud hoax—which was concocted by a physician, in this city, purely "as a hoax and as a test of the credulity of New York editors," and, as the author now says, without the least faith that any one would believe it — as an explanation of this most marvelous wonder of the age. The only theory which gained the least credence in this vicinity, is embodied in what is known as "the Tully story." This story relates, that about one year ago, a "four-horse team" passed through Tully, which is some six or seven miles south of Cardiff, drawing a large box, which was evidently heavy, and that the team was in some way connected with one Geo. Hull, of Binghamton, whose conduct was observed to be mysterious, and who was a cousin of the man Newell, on whose farm the Giant was found. I cannot undertake, in detail, to refute this, at first, apparently *possible* theory to account for the discovery of this Giant Statue, or "Stone Giant." In addition to the affidavits I herewith send you, and which cover this entire ground, I will simply say, that any theory involving the idea that a stone statue, weighing 2990 pounds, was brought in an ordinary wagon, from nobody knows where, and deposited some three or four feet below the surface, and partially under a large limb of a tree, by two men, is so entirely ridiculous, that no sensible man, who is in the least acquainted with the surroundings, can possibly give it a second thought, and any belief, either in this, or the crazy Canadian or Geraud story, requires a stretch of credulity far greater than that necessary to regard it a very ancient statue, or even a petrified Giant. Its removal required about fifteen selected men, with the most nicely adjusted machinery and appliances, and the whole, wagon, box, and sand into which it was embedded for safety of transportation, weighed 7965 pounds, or almost four tuns.

It would, after stating the above facts, be not only a waste of words, but an insult to your good sense, to spend more time in this communication, to disprove either of the silly theories above alluded to, to account for this strange image. I hardly need state, as it is already a matter of such public notoriety, that the State authorities have undertaken the investigation, sending here the Regents of the University, together with the State Geologist, Prof. James Hall. While these gentlemen have not (so far as we know) been enabled to come to any definite conclusion as to its origin or exact antiquity, they have settled several questions which are of great importance, as connected with this subject. The composition of the Giant is declared to be sulphate of lime or gypsum. On the supposition that it is hewn from a rock, where did it come from? Could it have been made here, or hereabouts? Prof. Hall, after a most careful examination of all of the gypsum quarries or beds in this county (and there are none near elsewhere), has decided that no gypsum, either in kind or quality, exists in this region, from which this stone Giant could, by any possibility have been taken. If, then, his Giantship be a carving, or the production of the artist's chisel, he is a foreigner. This is further shown by the fact, that from first to last, there is not the least shadow of evidence tending to show that the work was done anywhere near where he was found. The figure is wholly unique in design, and in the surface left in every part of the body and limbs where they are not corroded by water. The figure is that of a male, entirely nude, with every part fully shown, but without any attempt at representing hair or whiskers. It is made, neither to stand up or lie down, having neither pedestal or tablet accompanying it. It is carved(?) as perfectly upon the back as upon the front side, and was found lying upon a clay bed, which underlies the surface of the whole valley, which is alluvial and vegetable mold, to a depth varying from one to five feet throughout the valley. It was found lying upon its back, almost exactly horizontal, and in the direction corresponding to that of the stream, as it is supposed to have run at some former period. On its removal there was no trace of anything whatever to indicate its origin.

The statue(?) is most imposing and impressive. It has now been seen by not less than twelve thousand persons, including many of the most scientific men of the nation, and, so far as I am informed, or have had the means of knowing, not a single individual has ever examined it who was not impressed with the feeling and belief that it is the most extraordinary and gigantic wonder ever presented to the eye of man. Be it what it may, it presents a most perfect human form, of colossal size, defying the present state of science, whether geology or archæology. Its origin, we have to confess, is as deep a mystery as when first brought to light. Any theory, traced but a few steps, involves a belief in hitherto unproven facts or assumptions having, mainly imaginary foundations. Had it ever been well established that the human body was capable of becoming petrified so as to preserve the entirety of every part, it would be far easier to suppose this a veritable petrifaction of one of the Giants that lived "in those days," than to suppose it a statue. But the negative of this having been assumed, and all subsequent reasoning and facts, made to square to the assumption, that the petrification of the human body was impossible, the statue theory is, of course, the only thing left, and the conclusion is, that it is a statue, because it cannot be a petrifaction.

Whether this is, or is not, good logic, in the present state of knowledge upon this subject, I am not now disposed to offer an opinion, but will merely add, in this connection, that we have, really, no fewer obstacles to overcome, in concluding it a statue. There is not a chisel mark upon the entire image, nor of any other implement employed by human hand. The style of model, its perfection, its peculiarly smooth surface, all defy the artist. Be it statue or petrifaction, it has every indication of having occupied its late bed for a great number of ages, and was not, as your correspondent asserts, gotten up to impose upon "a gullible public." It is now "lying in state" in this city, where, for some time, all who are disposed to examine its form will have ample opportunity to do so; and I would add, in all due deference to your all-wise correspondent, that men of sense and wealth have thought it a reality of sufficient magnitude to make it an object to pay a large sum of money to possess it.

A. WESTCOTT, A.M., M.D.

Syracuse, N. Y.

The Stone Giant.

MESSRS. EDITORS:—Upon reading the several communications in your paper, I judge there are two disputed questions in relation to the stone giant, recently exhumed at Cardiff.

1st. As to its being a fossil.

2d. As to its antiquity.

On page 43, vol. I., of Clark's "History of Onondaga," published 1849, is recorded the fact that there existed among the Onondaga Indians a tradition that among the things that heretofore had been troublesome to their nation were the "Quis Quis, or big hog, the big bear, the horned water serpent, and the *stone giant*." The author seems to have thought the tradition not well founded, as can be seen by reading the work (which I have not at hand or I would quote further). They have found the stone giant, and no doubt the hog, bear, and serpent are there.

Perhaps if the Onondagians could read their own history there would be less of a pow wow over their recent discovery. C. ALVORD.

Washington, D. C.

Cultivation of the Poppy in Texas.

MESSRS. EDITORS:—In a former number of your paper, I noticed an article on the culture of the poppy, written by my brother, James Byars.

He mentions seeing the white poppy growing wild and in great abundance about West Liberty. This is the Argemone Mexicana, or prickly poppy. The whole plant abounds in a milky, viscid juice, which becomes yellow on exposure to the air. This juice, which is acrid, has been used internally in obstinate cutaneous eruptions, and as a local application to warts, etc. The flowers are said by De Candolle to have been employed as a soporific. The seeds, which are small, round, black, and rough, in doses of two drachms to a pint of watery infusion, act as an emetic. In smaller doses they are purgative. An oil may be obtained from them by expression, which is equal, if not superior to castor oil in mildness and certainty of action.

The oil might be made here in any quantity from the abundant wild growth of the plant. There is no doubt, I think, of the adaptability of the soil and climate here for the culture of the white poppy (Papaver somniferum), and if you can send the seed or inform me where to procure it, I will give it a trial. WM. M. BYARS, M. D.

Columbus, Texas.

Supply of Water in Large Cities.

MESSRS. EDITORS:—I would like, through the medium of your very able and valuable journal, to make some suggestions relative to the supply of water in large cities in cases of fire, and others of importance to those using steam boilers, etc. It is well known that immense amounts of money are lost annually by fire which might be saved provided there was some means by which water could be obtained at a few minutes' notice instead of being compelled (as is the case in many instances) to await the arrival of fire apparatus. The latter alternative has to my certain knowledge resulted several times in severe losses, which, had the case been otherwise, would have only been a trifling loss.

I would suggest placing at the supplying reservoir large pumping engines, supplied with safety-pressure valves, and

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

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

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

Mobile, Ala. CHARLES S. BAILEY.

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

For the Scientific American.

THE CANAL OF SUEZ AND THE FUTURE OF EGYPT.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Facts about Varnishes.

From the Hub.

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

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

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

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

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

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

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

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

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

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

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

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

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Improved Awning.

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

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

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

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

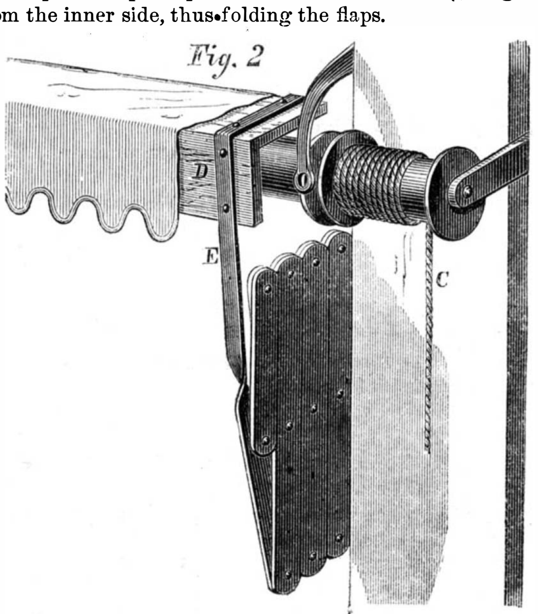
The front edge of the canvas is attached to two thin boards fastened together at right angles, as shown at D, Fig. 2. These boards are attached to the outer link of the lazy tongs, E, Figs. 1 and 2, as shown, thus forming a rail to which the front edge of the awning is attached. The action of the cord,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

MILLER & McCLELLAN'S IMPROVED AWNING.

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

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

Fig. 2



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

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

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

The Friction of Water in Tubes.

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

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

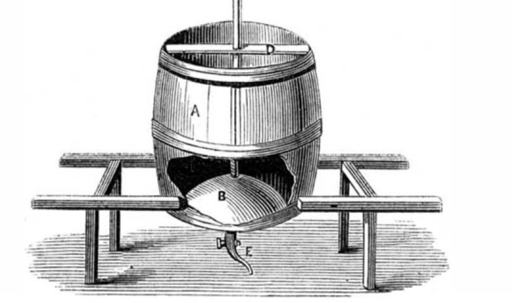
It is a singular fact that the friction of a liquid decreases in proportion as its temperature is increased. This is supposed to be due to a diminution of the cohesive properties of the particles of such liquid. It is well known that the more cohesive the liquid is, which is passed through a tube, the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

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

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

A SIMPLE FILTER.

We give an engraving of a simple form of filter which may be of use to some of our readers, as we receive frequent inquiries upon the subject. A represents half a hogshead barrel; B a porous stone basin about 18 inches deep and 3 inches thick—or a double-wall box, having the space between the walls filled with clean sand and charcoal, and the



walls finely perforated, may be used—through which the water has to pass, and fastened to the bottom of the barrel. C is a piece of thin lead pipe, which passes through the water to introduce air into the porous basin; D is the cross-piece to support the lead pipe; E is a tap to draw off the pure water, screwed in the bottom of the barrel. A small bunghole may be made in the side of the barrel to let off the refuse water when it requires cleaning.

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

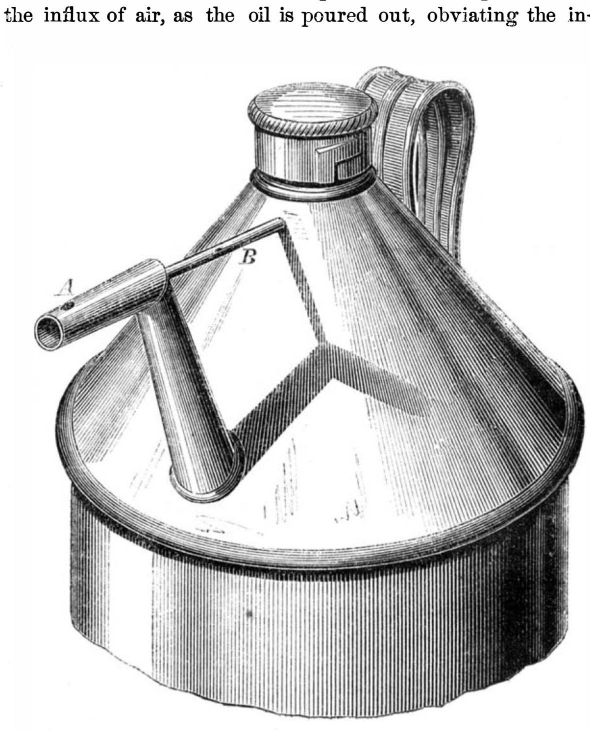
How to Choose a Steam Engine.

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

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

H. W. STAPLE'S AUTOMATIC LAMP FILLER.

Our engraving represents an improved lamp filler called by its inventor the "Automatic Lamp Filler," which provides for the influx of air, as the oil is poured out, obviating the in-



convenience caused by the lack of a vent in the old style of lamp fillers. A small tube, B, leads from the vent in the nozzle of the filler back to the breast of the can, which it penetrates. This tube is soldered to both nozzle and breast of the can, and forms not only a strong brace but permits the air to enter while pouring out the oil.

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

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

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

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OUR WORK AND ITS RESULTS.

The SCIENTIFIC AMERICAN has now been in existence upwards of twenty-four years. From a small beginning it has grown to a large and prosperous enterprise, and its weekly issues reach every latitude and longitude where the English language is read. Its aim has been from the first to stimulate inventive talent, to educate the masses and familiarize them with the great landmarks of science, to give the earliest information in regard to discoveries important in their industrial applications, or likely to become so, to discuss general topics relating to health and the welfare both of individuals and society, and to aid in the development of the great industrial resources of this country, which, when the first number of this journal was published, had but scarcely emerged from an embryonic condition into permanent prosperity and enlargement.

The extent to which these resources could be developed were but dimly recognized by the statesmen of that day. The vast network of railroads which was to cover this continent had only been commenced. The first electric-telegraph line, as now employed, had just been erected, and its brilliant history had yet to be written. The art of daguerreotyping, from which was to spring such immense results, had but just been introduced into the country, and in all departments of the arts and manufactures there remained a wide field for improvement and invention.

We may, without assumption, claim to have done much towards the rapid onward march of improvement since that period. The records of the United States Patent Office will show that of all the patents issued a very large share has been taken out through our agency, and the history of these inventions would doubtless show that many of them originated either in some want made known, or information imparted through our columns.

Since the commencement of the SCIENTIFIC AMERICAN, many branches of industry have been created, and old ones have been revolutionized. The severe labor of the farm has been superseded by the work of most admirable and efficient machinery, the value of which to the world it is impossible to estimate. The sewing machine, that marvel of mechanical skill, has added its help to modern progress, and the metallurgic arts have extended beyond what the boldest prophet would at that time have ventured to predict. The printing-press, that great disseminator of light and knowledge, has also had its capacities more than doubled, and electrotyping has become general.

The records of our office show that in all these great improvements our readers and clients have played an important part, and that the inference is just that the SCIENTIFIC AMERICAN has done more to advance the industrial interests of the United States than any other journal ever published in the country.

Begun at a time when scientific information was very sparsely diffused among the masses, it has grown with the distribution of such knowledge, until it now circulates more widely than any similar journal published in the world. It has made this vigorous and healthy growth against much competition, and has succeeded because it has steadily striven to deserve success.

We are fast approaching the close of the seventh decade of the eighteenth century. This period is crowded with the most remarkable events of American history. It has witnessed the connexion of the two hemispheres by telegraphic cables, and of the two great oceans by the Pacific Railway. The origin of these great works was American, and they have, to a large extent, been carried to successful and unprecedentedly rapid completion by American enterprise. The next ten years will witness the birth and maturity of other giant enterprises and will be crowded with important discoveries. With all future progress we shall, as we have in the past, endeavor to keep pace, and our readers may depend that no effort will be spared to make and keep the SCIENTIFIC AMERICAN the leading paper of its class. The more extended our circulation the better shall we be able to perform this task, and if our friends and patrons second our efforts, as they have hitherto done, and our subscription list shall continue to increase in the same ratio for the coming ten years as it has done since 1860, we shall enter the year 1880 with one hundred thousand subscribers.

MECHANICAL ACCURACY.

The attainment of even an approximation to mechanical accuracy is a matter of great difficulty; perfect accuracy is unattainable. This is, however, trite and well understood by mechanics in general; the reasons are not so well understood.

Why is it not possible to make two things precisely alike? In vain the painter essays to reproduce a picture, or the sculptor to remodel a statue. In vain the counterfeiter strives to engrave a bank-note plate which will exactly resemble the one he attempts to imitate. He may, in some rare instances, succeed so well as to deceive all inferior eyes, but he himself can perceive defects, and these defects cause him many fears and anxieties that others will discern them. Go to any heap of newly-struck coins, you can find no two which exactly resemble each other. The joiner lays out his work with the utmost care, and works to line as nearly as possible only to find that when the parts come together a shaving must be taken off here or a joint is open there; some imperfection mars his work let him do the best he can.

Now there must be some fundamental reason for this. What is it?

We find upon close analysis two physiological causes at work to prevent regularity and uniformity in anything we do. One is imperfect sensation, the other imperfect command of muscles. It is only by cultivating in the highest degree the senses, and disciplining the muscles to become as much as possible subordinate to the will, that the artisan becomes skillful. These things accomplished, the physical education of a workman is completed; all other things requisite may be acquired without manual practice, but practice alone can perfect sensation and give power to the will over muscular motion.

It may be said that much of the imperfection of workmanship arises from imperfections in implements: but it is easy to trace these imperfections to defective sensation and execution. It has only been by a gradual division and reduction of imperfections, that we have obtained more perfect tools than savages use. From the stone used to crack nuts to the steel hammer of the present day a great many slow steps have been taken. How wide the difference between the auger and drill of modern times and the stone drill of the ancient races of North America; yet this difference has been attained by slow progression. Even yet our most delicately constructed instruments are not quite perfect.

The two senses most to be charged with imperfect workmanship are sight and touch, but sight betrays us far more than all the others put together.

In astronomical observation the habitual error in recording the instant of an astronomical event is ascertained as nearly as possible, and the formula expressing it is called the *personal equation*. This is allowed for in reducing all observations, and will generally be found pretty nearly constant. It amounts in some cases to one half a second.

The British mint allows twelve grains to the troy pound for variation in weight in coining; and this may be taken perhaps as the measure of the nearest approach to mechanical accuracy in coining. It is fifteen seventy-seconds of one per cent.

But there are other causes which lead to imperfection in workmanship not yet named. The variable textures of the materials used and the different thermometric and hygrometric conditions both of materials and tools, all tend to defeat accuracy. There are scarcely any two days in the year when a boxwood rule is precisely of the same length, and the variations in metallic rules are even greater than in those of wood. In very accurate drawing the draftsman finds it necessary to make a scale on the same paper as that upon which the drawing is made, that the hygrometric expansion and contraction of the paper may not mislead the workman. Surveyors find errors creeping into their measurements from the expansion of their chains; and we might go on to show that no material or implement can be made entirely free from one or the other of these adverse influences; while many are subject to both.

By clearly recognizing these facts, and with a full knowledge of the nature of materials and how they are affected by heat and moisture, the mechanic may attain very much greater accuracy than would otherwise be possible, no matter how skilled may be his eye and hand; and it has been by attending to these nice points in combination with skill in other particulars that the *chef-d'œuvres* of handiwork have been achieved.

DEATH OF INVENTORS.

We regret to announce the death of Mr. Paul A. Sabbaton, which took place at Albany on the evening of Nov. 1st. Mr. Sabbaton was a distinguished gas engineer and inventor, and resided formerly in New York. He was an esteemed client, and at one time a frequent contributor to the SCIENTIFIC AMERICAN. He had reached the advanced age of eighty-one years. We also regret to announce the death of Mr. Otis Tufts, of Boston, an inventor of considerable note. He was the builder of the iron steamer, *R. B. Forbes*, and one of the improvers of the steam engine. He invented a power and a hand printing press, the latter of which is still in use; and he was the inventor of an excellent elevator for hotels, stores, etc., which has been extensively used both in America and Europe.

WHAT WILL YOU DO WITH YOUR EVENINGS THIS WINTER?

Winter is fast approaching. Already it has sent out its skirmishers, in the form of stinging winds, and bitter snow-squalls. With it will come long evenings of leisure. Young men, what do you intend to do with these evenings?

There are a thousand inducements to squander them. The gayly lighted billiard-room, opens its doors and invites you to enter. The theater, the ball, solicit you. All sorts of similar temptations allure you to spend your time and money; and many of you will be drawn into extravagant expenditure, by these, in themselves, innocent amusements.

Another and worse class of temptations will beset you. The drinking saloon, the house of ill-fame, will invite you to enter, and with delusive excitements seek to blind your moral perceptions and lead you to ruin.

What are you going to do with these precious evenings? Will you throw away their golden opportunities, and take upon you a burden of vain regret for the years that are to come? Do you not see their value, if improved?

There are thousands of young mechanics who will see these words, and will, some of them, perhaps, resolve that *this* winter shall not be spent as was the last. This winter shall be devoted to neglected arithmetic, algebra, or book-keeping. They will seize the coming leisure to perfect their knowledge of drawing, or to complete their perusal of some scientific, historical, or literary work begun long ago, but still unfinished. They know the value of time and they will no longer squander it.

Alas! how few of these wise resolutions will be kept. Yet we are hopeful that some will be influenced by our exhortation to use their time in a more profitable manner than do the majority of pleasure-loving young men.

The means of self-improvement are now so widely diffused that no one seeking knowledge can fail to obtain them, and while we do not counsel the utter renunciation of innocent amusements, it is always wisdom to subordinate these things to higher purposes.

Young mechanics, and young men of whatever occupation you may be, you may refer your future success or failure to the way in which you employ this winter's leisure. Then what will you do with your evenings?

A HUGE JOKE IN BRASS.

The age of bronze has returned, although this time it manifests itself in morals rather than in mechanics. Mr. Cornelius Vanderbilt is a rich, shrewd financial operator, full of years, and—we were about to say wealth, but his still eager pursuit of dollars shows that, like Oliver Twist, he yet asks for "more." He is not full of honors, or at least was not, until the tenth instant at one P. M. when, as Mrs. Partington would say, his "brass figger" was unveiled to the world, and simultaneously inaugurated at the Hudson River Depot and the Stock Exchange.

Many celebrities were invited, but few assisted at the ceremonies at the depot. Many celebrities were not invited, but many were present at the Stock Exchange. Enthusiasm rose to the highest pitch at the absurd burlesque performed by Van Schaick and his *confreres* at the latter place, while at the equally absurd ceremonies at the depot it sunk to zero.

As our readers are aware, the depot is a large and commodious store house for the Hudson River Railroad freights, recently erected on the site of the old-time St. John's Park, formerly an aristocratic portion of New York city. Upon this building is placed the statue which is reported to have cost an immense sum of money.

An inaugural speech was made by Mayor Hall which reads as though his Honor—who is a philosopher and wit—must have meant to be bitterly ironical. When the canvas was removed from the statue, the sailors stationed on the roof of the depot to pull up the curtain took off their hats and cheered some, while a few straggling "Hurrays!" terminating in that peculiar cadence indicative of the absence of enthusiasm and carelessness to conceal the want, found vent from throats below. It is evident that the people do not love Vanderbilt intensely, and that the names of such philanthropists as Peabody, which Mayor Hall saw fit to associate with that of Vanderbilt in his fulsome eulogy on the great waterer of stocks, could not avail to wring a hearty cheer from the people at the show.

Of the statue itself as a work of art there is not much to be said in the way of commendation. The Commodore stands erect, arrayed in a driving coat of fur, ample to protect from frost a Siberian sledge driver. The surrounding *bas reliefs* are absurd, and in many respects ridiculously so. The position of the statue is badly chosen. The street is too narrow to afford a proper view of it. The figure appears to be making a bashful attempt to step out of its sheltering niche as if afraid of too much publicity. The *bas reliefs* portray immense birds more prominent than the ships and locomotives, and apparently struggling to fly away with the whole design.

The two trains of cars appear to move on very dangerous curves, suggesting the probability of an impending smash up. The bronze locomotive has its boiler and piston-rods apparently bent to fit the crook of the rails. The derrick in front of the locomotive is out of proportion, and would more prop-

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erly stand near the poor representation of the depot than in the way of the advancing train.

Commodore Vanderbilt is widely known as a "self-made man," and he has stuck to the one idea of self with wonderful pertinacity. On the whole, we conclude that this brassy compliment, in its gross unfitness in purpose and execution, can only be regarded as a huge joke in brass.

ELECTRO-PLATING WITH IRON.

The Hon. Cassius M. Clay, late U. S. Minister to Russia, has recently returned from St. Petersburg, bringing with him some fine specimens of iron electrotypes, done after the process of Prof. Jacobi and Klein. We have before alluded to this important discovery. By its use, nearly all forms of electro-plating, such as engravings, stereotypes, medallions and ornaments, may be done in iron, with a fineness of texture which is really surprising.

Its importance and value will be appreciated when we reflect that the iron electro-plates are about five times more durable than the ordinary copper electro-plates.

Mr. Clay has presented us with an iron electro-plate copy of a copperplate engraving of the Prince Imperial of Russia. This plate is six inches square, and beautifully done. It is one thirty-second of an inch in thickness, and has a color closely resembling that of zinc. These iron electrotypes are now used by the Russian Government with complete success for the printing of bank notes.

The process was patented in this country through the Scientific American Patent Agency, Sept. 29, 1868, and further information can be had by addressing C. M. Clay & Co., 45 Liberty St., New York.

The following description of the process we copy from the patent specification:

"Our invention consists in the application of a practical galvano-plastic process as to the deposits of iron on molds, or any other form, for reproducing engravings, stereotypes, and for other useful or ornamental purposes.

"The galvano-plastic bath we use is composed of sulphate of iron, combined with the sulphates of either ammonia, potash, or soda, which form, with sulphate of iron, analagous double salts.

"The sulphate of iron may also be used, in combination with the chlorides of the said alkalies, but we still prefer the use of sulphates.

"The bath should be kept as neutral as possible, though a small quantity of a weak organic acid may be added, in order to prevent the precipitation of salts of peroxide of iron.

"A small quantity of gelatin will improve the texture of the iron deposit.

"As in all galvano-plastic processes, the elevation of the temperature of the bath contributes to the uniformity of the deposit of iron, and accelerates its formation.

"For keeping up the concentration of the bath, we use, as anodes, large iron plates, or bundles of wire of the same metal.

"Having observed that the spontaneous dissolution of the iron anode is, in some cases, insufficient to restore to the bath all the iron deposited on the cathode, we found it useful to combine the iron anode with a plate of gas-coal, copper, platinum, or any other metal being electro-negative toward iron, and which we place in the bath itself.

"As a matter of course, this negative plate may also be placed in a separate porous cell, filled with an exciting fluid, as diluted nitric or sulphuric acid, or the nitrates or sulphates of potash and soda.

"For producing the current, we usually take no more than one or two cells of Daniels' or Smee's battery, the size of which is proportioned to the surface of the cathode.

"It is indispensable that the current should be regulated, and kept always uniform, with the assistance of a galvanometer, having but few coils, and therefore offering only a small resistance.

"The intensity of the current ought to be such as to admit only of a feeble evolution of gas-bubbles at the cathode, but it would become prejudicial to the beauty of the deposit if gas-bubbles were allowed to adhere to its surface.

"The same molds, as employed for depositing copper, may also be used for depositing iron, only it is advisable, in employing molds made of lead or gutta-percha, to cover them previously with quite a thin film of galvanic copper, formed, in a few minutes, in the usual way, and then oring them, after having washed the molds with water, immediately in the iron-bath.

"The film of copper may be removed from the deposit either by mechanical means, or by immersion into strong nitric acid.

"The deposited iron is very hard, and rather brittle, so that some precaution must be taken in separating it from the mold. By annealing, it acquires the malleability and softness of tempered steel.

Condensed Food.

Experiments have recently been made with satisfactory results to test the practicability of supplying the North German army and navy with compressed or condensed food. The principal object was to ascertain the best means of furnishing the soldier in the field with a three days' stock of provisions reduced to a minimum of weight and bulk. It has been found that a sort of meat-bread is admirably adapted for this purpose, as it may either be eaten dry in the form of cakes or can be converted with very little trouble into soup. Similar attempts have been made to compress hay and other provender for horses.

[We find the above item in a recent number of the *Evening Post*. The idea of using condensed food in the manner described was first patented in 1850, by Gail Borden, Jr., then a resident of Galveston, Texas, since better known in connexion with Borden's Condensed Milk, an article of large consumption in this and other cities. Mr. Borden has devoted a great deal of attention to the preparation of condensed food, and may be regarded as the pioneer in that branch. His patent of 1850 consisted in the concentrated extract of alimentary animal substances, combined with the vegetable flour and meal, made into cakes and baked into bread, and was readily converted into a wholesome food.—EDS.

AERIAL NAVIGATION.

NUMBER THREE.

Mr. Porter considers the proper form of an aerial float to be the "revoloidal spindle," round in its transverse section, its sides curving uniformly from end to end, and having its length ten times its diameter. But this may be varied according to the business for which it is intended, and made longer for great speed, or larger in diameter for carrying freight. It should be made of the strongest linen cloth, varnished on both sides with a varnish that will not injure the strength of the fiber; and the strips of cloth should be sewed together with double seams, the seams being covered with thick elastic varnish. The cloth is supported inside by twenty rods of white spruce, extending the entire length, the joints being secured by tin tubes, and the cloth being attached to the rods by tack nails, driven through strips of white oak or elm, half an inch wide and one-eighth thick; the tacks being two inches apart.

A medium-sized float should have a capacity of 266,796 cubic feet. The longitudinal rods for a float 400 feet long should be one and one half inches in diameter, but tapering to three fourths at the ends. The buoyant power of 266,796 cubic feet of hydrogen gas, is 19,051 lbs. The weight of the cloth, including two transverse partitions, is 2,000 lbs., and that of the rods 2,000 lbs., leaving a net buoyancy of 15,051 lbs. The proper proportional length of the saloon is 133 feet, and its diameter 10 feet; being square in its transverse section, and having its four sides covered with painted duck, and curving to a point at each end. The engine room should be in the center, 10 feet long by 6 feet wide, leaving a passage way of two feet on each side. There would then be space for two cabins 20 feet long, and a ladies' room, and kitchen, each 8 feet long. The spaces left forward and aft, would be used for baggage and stores. The saloon would have ten windows on each side, the central two being each seven feet long, and sufficiently prominent at the center to enable the pilot to look forward or downward. The engine room should have a large skylight. The sides of the saloon should be supported in their position by very light frame work, and 100 steel or copper wires, whereby it should be connected to various parts of the float. The floor should be made of spruce boards 3 inches wide and one eighth thick, supported by sleepers 40 inches long, 2 wide, and three eighths thick, and 6 inches apart; and these should be supported by four longitudinal sills, 28 feet long, 4 inches wide, and seven eighths thick. These sills should be supported at every ten feet by wires from the float above. The floor or platform which supports the boiler should also be connected to the float by wires, independent of the saloon, and so arranged as to be readily detached from the aeroport at any time. In the center of the forward cabin, there should be an elevating car, 10 feet long and 39 inches wide, surrounded with a balustrade and furnished with seats; the floor of this car constituting a part of the floor of the cabin, but not connected thereto. This car should be supported by four ropes attached to its four corners, passing up over four pulleys to a revolving windlass connected to the engine, which may be disconnected at pleasure. Upon this windlass shaft, should be placed a grooved wheel, around which is a coiled cord, one end of which should be attached to the grooved periphery, and the other end to a small crank windlass, in the center of the said car, so that parties may thereby, either lower or elevate themselves, as occasion may require.

The form of rudder preferred, is a hollow square, ten feet long and five feet in diameter, made of painted cloth stretched over a light frame, open at both ends, with a rod of wood in its longitudinal center, the forward end of which is connected to the float by a universal joint. From the four forward corners of this rudder, four cords, steering lines, extend forward, pass over four pulleys, and thence down to the pilot's window in the saloon below.

Every alternate longitudinal rod of the float is connected to the alternate nine at each end; but the other ten have a slight longitudinal liberty, so that they may occasionally be drawn toward the longitudinal center for the purpose of reducing the size and capacity thereof; and for this purpose a series of cords are attached to the free rods, and passing to the center, and over a corresponding number of central pulleys, unite in one cord, which, passing centerward and over another pulley, extends down toward the bottom of the float and connects to a vertical wire, which, passing through an air-tight stuffing box, goes down to the engine room. Other sets of cords and pulleys are arranged at different points, and all uniting at the main center as described, the engineer can at any time, compress either section of the float as occasion may so require.

In addition to this arrangement, two flexible pipes or hose, ascend from the engine room to the float, and passing to the interior, and longitudinal center, turn right and left, and extend to both ends of the float and up through the upper side; so that the exhaust steam from the engine may be occasionally turned into those pipes, for the purpose of warming and thus expanding the gas within the float; the compressing cords being slackened for that purpose. By these means the float may be made more or less buoyant, without increasing the quantity of gas, or discharging ballast. But in general the float may be readily made to ascend by means of the helm only.

The engine room should be furnished with a self-regulating gas replenisher, which may be described as follows: A square box, four feet long, two feet wide, and twenty inches deep, is made of pine boards fastened with copper nails, coated outside with shellac varnish and inside with beeswax. Within this box is another, in length and breadth two inches less than the first, and six inches deep, covered without and within with beeswax, and open at the top. This box should contain twenty plates of zinc, each plate being five inches wide, one fourth of an inch thick, and long enough to extend across, enter, and be secured to vertical grooves in the sides of the box. Both ends of this box should be half an inch higher than the sides, so that being inverted within the larger box, the ends only rest on the bottom. In the center of the top of the smaller box should be a hole one inch in diameter, to admit the end of a lead pipe, which, passing up through the top or lid of the large box, is to be cemented air-tight thereto, and the said lid is to be screwed down air-tight and covered with beeswax cement. This lid should have another hole near one end, through which a fluid may be poured in. A waxed cork or lead stopple may be used to stop this hole. This vertical lead pipe, ascending one inch above the lid, should have a lever valve at its top, mounted on a fulcrum pivot at or near the side of the pipe, and having an arm or beam of the lever extending horizontally eight inches. The valve end should be a flat plate, having attached to its under side a disk of leather, fitting and pressing upon the top of the pipe. Around this valve, and attached to the box lid, should be a circular ledge eighteen inches in diameter, two inches high, and one inch thick; and having attached to the top one edge of a flexible leather circular belt nine inches high; the upper edge being attached to the periphery of a disk of pine board of the same diameter, thus constituting a circular bellows that will collapse by the weight of its top. To this bellows' top the end of the valve lever should be connected by a cord or chain; so that by the inflation of the bellows and elevation of the disk, the valve would be closed. Through one side of the circular ledge, is to be pierced a horizontal hole, having one end of a small flexible pipe fitted to it, which extends up to the float. The box below is to be furnished with a mixture of one part sulphuric acid to five parts water, to the depth of from five to six inches; this immediately acts upon the zinc plates, and hydrogen gas is produced, and ascends through the bellows and flexible pipe to the float; but when the float is sufficiently full, so as to produce a reaction down through the pipe to the bellows, the top will be lifted and the valve thereby closed. The accumulation of gas within the box of plates will then expel the fluid from the box, and relieve the plates from the action of the acid, until the top of the bellows descends, and thus opens the valve, liberating the gas and allowing the acid to renew its action upon the plates. The effect of this arrangement is to hold the valve so nearly closed, that no more gas can be produced than sufficient to keep the float uniformly inflated. The zinc plates will require to be renewed about once a month.

The two propelling wheels would be each twelve feet in diameter, having each eight radial fans; each being four feet wide at the outward end, and set at an angle of 45 degrees with the shaft. Each fan would be also curved forward so as to counteract, in a measure, the tendency of the air encountered, to escape radially by its centrifugal force. The fans are best made of light-painted cloth, each stretched between two arms radiating from a shaft five feet long and six inches in diameter at the part where the arms are set, and tapering thence to the ends. Their pivots should be two inches long and half an inch in diameter, running in composition boxes, each of which has four short radial arms. Each arm should have a small hole through the end to receive a wire whereby it is supported; two of the wires ascending to the float, and two descending to the saloon. The pivots should have heads or nuts to prevent drawing out of the boxes; and upon each shaft should be a wheel 16 inches in diameter, with chain cogs six inches apart, to receive the links of a chain belt, whereby the fan wheels are made to revolve in contrary directions, the upper fans moving outward from the main center. Upon the top of the engine room, two other chain wheels should be placed to receive the lower bout of the chains, having cranks, which are operated by two pitmans connected to two engines below. The pitman cranks are to be placed at the rear ends of the wheel shafts, and at the forwards ends are two other six-inch cranks set in opposite directions and connected to each other by a rod of wood, the two ends of which are mounted upon the two crank pivots. To the center of this rod is connected by a pivot a vertical rod, suspended from a pivot six feet above. The horizontal rod is three inches wide and half an inch thick, sharpened at its edges to obviate resistance, and supported by wire braces above and below to give it the requisite stiffness. The effect of this arrangement is to cause the two-wheel shafts to revolve in contrary directions; and the two pitman cranks being adjusted at right angles with each other, the application of the power of the engines to the wheels is alternate, and consequently more uniform.

It has been remarked that one main obstacle to aerial navigation by steam power has been the excessive weight of steam boilers; but the boilers invented especially for this use have been repeatedly proved to produce five times as much power in proportion to their weight as any other boiler in use. A twelve-horse power boiler is described as follows by Mr. Porter: Two iron pipes, five feet long by an inch and one half in diameter, are placed parallel, three and a half feet apart, and each end of each pipe is screwed into one side of a three-inch cube of cast iron. Three other parallel pipes are

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arranged at equal distances between the two first, and each end of each is attached by a nipple to a transverse pipe three feet and four inches long, the ends of which are inserted into the corner cubes, and an iron rod three eighths of an inch in diameter, passes through each short pipe and through the corner cubes, and terminates in a screw nut at each end. Another like arrangement of seven pipes is placed four feet above the first, and secured in that position by one hundred vertical copper tubes, two inches in diameter, made of No. 24 copper plate; and each end of each copper tube has a brass head brazed in, with a projecting nipple one inch in diameter, extending an inch and a half from the end of the tube. These nipples are hollow nearly to the ends, and have a half-inch aperture on one side of each, in the center of an indenture curved to fit the sides of the long horizontal pipes above and below; one side of each pipe being perforated to match the corresponding holes in the sides of the nipples; and the nipples being attached to the side of each pipe by short brass straps, the two ends of each of which are fastened to the pipes by screws, while the center, being curved, passes over the nipple, holding it fast to the pipe. Twenty vertical tubes in each of five rows, are thus attached to the ten horizontal pipes above and below, and thus all the pipes and tubes have free communication with each other, and are so connected that one or more of the tubes may be readily detached without disturbing the others; or all the tubes and pipes may be taken apart for cleansing, and reconnected as occasion may require.

A grate nine inches wide, is placed between each two rows of pipes, at the bottom; and the lower portion of the tubes, to the hight of two feet, is incased in a double casing of sheet iron, lined with thin plates of soap-stone, or fire brick. Between each two rows of tubes, is a hollow lid two inches thick, with a handle, to be removed for feeding the fire with charcoal. The edges of these lids rest upon strips of iron plate, fitted to each side of each row of tubes, and plastered over with clay. The entire weight of this boiler is 550 lbs. The water required to fill it half full is 30 gallons. The amount of fire surface is 100 square feet; its working capacity, twelve-horse power. The smoke-pipe—four inch tin—extends horizontally 200 feet, rearward. The two light brass engines, are plain and common, possessing no special novelty.

The buoyant power of the float, as estimated, is 15,051 lbs. The weight of the saloon 1,000 lbs; weight of boiler 550 lbs.; weight of engines, propellers, and other machinery, 200 lbs.; weight of replenishers, 200 lbs.; weight of smoke-pipe, rudder and wires, 201 lbs.; weight of water, fuel, and furniture, 900 lbs; thus leaving a net balance of 12,000 lbs., sufficient to carry 140 passengers with light baggage.

When the float is inflated, the saloon must be partly freighted with boxes of sand provided for that purpose; and when passengers or freight are received, an equal weight of ballast will be discharged, and *vice versa*. When not in use, the aeroport will be safely moored at a convenient hight, to some permanent object. A large screw, on the principle of a cork-screw, to be screwed into the ground by means of a hand-spike, will be employed for holding the aeroport when moored. Moreover, for better security, a small line connected to the large safety valve of the float, will be brought to the ground with a small weight attached: so that should the aeroport escape by any means from its moorings, the weight will hold the valve open until it descends to the earth.

Whenever there is occasion to come to land, the rudder is depressed so as to turn the head of the float downward until the saloon comes near enough to the earth to send down the elevator. If there is wind, the aeroport will be brought to head to the wind, and the motion of the engine slackened until the aeroport becomes horizontally stationary, and descends vertically. When the float is inclined in either direction the tendency of the gas will be towards the highest part, and this tendency must be sometimes counteracted by means of the compressing ropes.

It will not be expedient, generally, to run higher than from 500 to 1000 feet; but in case of an approaching squall, or thunder gust, the aeroport may readily ascend high enough to pass over them. Prof. Wise has on several occasions, enjoyed a beautiful sunshine, and serene atmosphere, while a violent thunder-storm was raging below him. In case of running above the clouds, or in foggy weather, the altitude may be generally ascertained by the barometer; but it will be sometimes requisite, especially for the purpose of ascertaining the course, or direction of the wind, to drop an arrow-shaped rod of light wood, which will descend perpendicularly while the wheels are stopped; and as soon as it strikes the earth or water, the change of the direction of the twine attached to the rod, will show both the direction and velocity of the wind. But when the earth or water is in sight, a simple plano-convex lens, with a piece of semi-transparent paper placed in its focus will promptly show both the direction and velocity of the aerial vehicle.

With regard to guiding the aeroport, when a side wind prevails, the pilot has only to head the float to windward, according to the relative velocity of the aeroport and the wind. For instance, if the aeroport is running due west, with a speed of eighty miles an hour, while a gale from the north is traveling at the rate of forty miles, the float must be headed four points, or twenty-two degrees, to windward, in order to hold its westerly course. The pilot will know what direction he is moving, by the direction which the trees and other objects on the earth, *apparently* move.

A compass with a large dial, may be mounted at the hight of two feet from the floor of the saloon; and near it, an aperture, two inches in diameter, may be made through the floor, and a convex lens, of four feet focus, set therein. Then by adjusting a mirror one foot above the compass dial, the most conspicuous objects on the earth will be reflected upon the dial, and their movements thereon will plainly indicate both the direction and velocity of the aeroport; and the size of the objects upon the dial, will in measure indicate the altitude. For this purpose, the compass dial should be partly shaded from the direct light of the windows; and if the central part of the dial be crossed with lines one fourth of an inch apart, crossing each other at right angles, these indications will be the more readily comprehended.

Whirls or circular currents in the air will be readily indicated by the variation of the course of the aeroport, which will be counteracted by a change of helm; and if not, the aeroport will quickly shoot out of the whirl. And in case of encountering vertical currents in either direction, it is well known that they never occur suddenly, but so gradually as not to change materially the horizontal position of the float; and a ready counteraction may be effected by the rudder, without either expanding or compressing the float.

It has been supposed by some that common linen cloth, either French or Holland, would not be strong enough to sustain so much weight. To refute this conjecture, it may be proper to explain, briefly, the nature and principles of the buoyant power, which is to sustain the aeroport and its freight. Aerial buoyancy, does not, as generally supposed, consist in the tendency of the hydrogen gas to ascend, and press against the upper interior of the float; but in a greater pressure of the atmosphere against the bottom of the float, than upon the top thereof. The weight of a column of air, one square foot and forty feet high (the diameter of the float) is three pounds; therefore, the atmospheric pressure against the bottom of the float is greater by three pounds per square foot, than that upon the top, and this would be the true force with which the balloon would ascend were it not for the weight of the hydrogen gas which, being three ounces per forty cubic feet, reduces the buoyant force to about two and three-fourths pounds per foot of the central portion of the float, and this is the greatest force or pressure that is to be sustained by the cloth. Yet it is readily shown by experiment that the ordinary linen, will sustain more than twelve times that amount of pressure, when supported by the longitudinal rods of the float. Moreover, the float may be kept so full of the gas, by adding a little additional weight to the bellows of the replenisher, as to counteract, in measure, the atmospheric pressure upon the lower part.

It has been supposed by some, that if a rent should occur in the float, the whole apparatus would rapidly descend. But the float having several compartments, if a rent should occur in either one, the descent of the aeroport would be so moderate, that the pilot would have ample time to select his ground to land upon. And should such descent occur over water, the saloon is to be provided with an ample supply of inflated sacks attached to the floor under the seats, which constitutes it an excellent life-boat. A rent is readily and easily repaired, and a small balloon will be kept in readiness, and may readily be inflated, whereby a man or boy may ascend and repair the rent. But as only the bottom of the float is liable to get damaged, the gas would not readily escape. All parts of the saloon will be rendered incombustible by saturation with borate of soda, applied to the materials prior to its construction.

Mr. Porter thinks there would be no difficulty in constructing an aeroport or flying ship, capable of carrying 500 passengers safely to any part of Europe, in three days or less. Even if strong and heavy canvas should be employed in the construction of the float, there would be ample buoyant power to support it with an engine of 100-horse power, and fuel and provisions for ten days. That disasters *may* occur, he does not deny, but maintains that this mode of traveling will be incomparably more safe than by either marine vessels or railroads.

ORANGE MARMALADE.—Cut the oranges in half, then take out the pulp and juice, separating all the skins and pips. Put the rinds into salt and water for a night; the next morning put them into a stewpan with fresh water. Let them stew until soft, so that a straw can be run through them easily; cut the peels into thin strips. To every pound of fruit add one pound and a half of coarse white sugar. Put the juice, pulp, and peel, with the sugar, into the stewpan, and let it boil twenty minutes. Seville oranges must be used, and the marmalade is better if kept six months. The juice and grated rind of two lemons to every dozen oranges is a great improvement.—*Jessie Piesse.*

NEW PUBLICATIONS.

STRUGGLES AND TRIUMPHS; or, Forty Years' Recollections of P. T. Barnum. Written by Himself. 8vo., pp. 780. J. E. Burr & Co., Hartford, Conn.

Many years ago, Barnum, then in the heyday of his glory as a showman and manager of the American Museum, wrote and printed a book of life sketches, which had a large sale. Nevertheless its publication brought down upon him much undeserved criticism and abuse. The people knew that he styled himself the "Prince of Humbugs," and, moreover, they enjoyed the fun of his book, wherein he told them exactly how, and in what way he had prepared his curious feast of funny things to gratify their appetites; but somehow the newspaper critics made some people believe that it was a naughty thing in any man to humbug and then tell all about how it was done. Well! times have since changed. Barnum has passed through an eventful career, of much tribulation, and more success, and now at the age of sixty years he comes out on the successful side with a new book, very unlike the old one, wherein he tells the story of his career from boyhood, introducing for that purpose many spirited illustrations, unique and laughable anecdotes, and a great variety of personal experiences as a youthful trader. Editor, preacher, traveler, showman, farmer, politician, lecturer, financier—indeed it would be difficult to say what Barnum had not been up to during these 40 years of struggles and triumphs. His hospitality is princely; his fund of humor inexhaustible, and, taken altogether, Barnum is one of the rarest specimen of human nature to be met with. His book will afford instruction and amusement to the thousands who read it.

U. S. Patent Office.

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A model must be furnished, not over a foot in any dimension. Send model to MUNN & CO., 37 Park Row, New York, by express, charges paid, also, a description of the improvement, and remit $16 to cover first Government fee, and revenue and postage stamps.

The model should be neatly made, of any suitable materials, strongly fastened, without glue, and neatly painted. The name of the inventor should be engraved or painted upon it. When the invention consists of an improvement upon some other machine, a full working model of the whole machine will not be necessary. But the model must be sufficiently perfect to show with clearness the nature and operation of the improvement.

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MANUFACTURING, MINING, AND RAILROAD ITEMS.

The gross receipts of the American Institute Fair were $59,216·87; expenses, $37,212·52. Profits, in round numbers, $21,000.

The new Blackfriars Bridge and the Holborn Valley Viaduct, London, were opened by the Queen on November 6. Crowds of people thronged the streets, and the neighborhood was gaily decorated.

During the last fiscal year 760,000,000 letters passed through the United States mails—forty millions more than during any previous year, and an average of twenty for every man, woman, and child in the land.

Mr. Thornton, the British Minister at Washington, has intimated that the British Government is prepared to reduce the single rate of postage for prepaid letters between the United States and the United Kingdom to three pence. There is little doubt, therefore, of the early adoption of this measure of postal reform.

According to a Paris dispatch, dated November 6, the concession for the proposed cable between the United States and Belgium was signed on the 5th inst., in that city by the Belgian Minister. The grantees are W. C. Barney, E. E. Paulding, and J. S. Bartlett. The cable is to be laid from Ostend to some point between Maine and Georgia by an American company.

It is estimated that by the end of the year 1869 there will be laid in the United States, in round numbers, 110,000 tuns of steel rails, equal to 1,100 miles of steel road; and of this amount about 36,000 tuns, equal to 360 miles, will be laid during the present season. These rails are in use on more than fifty different roads, and are partly of American, principally of English, and to a small extent of Prussian manufacture.

A dispatch from San Francisco states that the restoration of public lands heretofore reserved for the Southern Pacific Railroad Company, will probably cause the Company to make its location through the San Joaquin Valley, connecting with the Western Pacific near Stockton, thus constituting the California and Oregon and the Southern Pacific Road, a grand trunk line from Columbia river north to Colorado south, passing through the richest agricultural valley of the State.

The New York *Commercial Advertiser* calls attention to the conflagrations that have resulted near Cairo, Illinois, and at other places from locomotive sparks. It says that farmers along the line of the North Missouri Road have been compelled to keep a constant watch to prevent their buildings, fences, stacks of grain, and fields of stubble from being ignited. Some effective contrivance, it sugests, should be employed on railway engines to confine the sparks which now fly about hither and thither along the path of the fiery locomotive.

While on a visit at a manufactory on the upper part of the river Saale which flows through Thuringia, M. Reichardt noticed a dark-brown colored incrustation appearing almost to consist of an oxide of iron and manganese. The analysis gave—Water, driven off at 100°, 2·10 per cent; insoluble in hydrochloric acid, 17·12; soluble therein, 80·78. Full analysis, in a hundred parts, gave the following results: Water, at 100°, 2·10; white clay and sand, 8·81; oil and pitch, 8·25; sulphate of lime, 1·30; peroxide of iron, 1·20; protoxide, 0·22; carbonate of lime, 68·52; carbonate of magnesia, 9·60. The dark color was due to the organic matter, decomposed by the high temperature and converted into a kind of pitch.

It is announced that England alone consumes every year at least two thousand tuns of beeswax valued at $2,100,000. With gold at 131, the best bright pressed yellow American beeswax is now selling in England at from 45 to 51 cents a pound. Wax candles are used extensively in the royal palaces of Europe, and in one palace alone it is stated that ten thousand wax candles are burned every night. The method of lighting this large number of candles instantaneously, is to connect the wicks by an inflammable and scented thread of gun cotton. On touching the end of the thread with a torch, the flame flashes like lightning round the connected candles, an agreeable odor is emitted, and the apartments are illuminated and perfumed as if by magic.

An investigation has recently been instituted in Paris with regard to the exemption from cholera of men engaged in working with copper. Statistics, obtained in such a way as to warrant entire reliance on their accuracy, appear to show that wherever the manipulation of copper was carried on, the men engaged in it almost invariably escaped unharmed, and, further, that the preservation varied in accordance with the degree in which the metal was handled by the operatives. During the epidemics in 1865 and 1866, the number of deaths was in the proportion of 3 to every 10,000 of the adult workmen employed in working copper in some form or other. Of goldsmiths, silversmiths, and watchmakers, there died one of every 719 employed; among founders, tap-makers, lamp-makers, workers in bronze, sham jewelry, and copper utensils, the mortality was 1 in 2,000; and among opticians, makers of mathematical instruments, dry polishers, stampers, turners, and musical instrument makers—the number of whom was 5,650—there was no case at all. The society known as the Bon Accord, founded in 1819, and entirely composed of bronze workers, had not a single death, and had been only called upon to pay for 106 days of sickness divided among ten members. If further inquiries establish the truth of the theory, results exceedingly valuable from a hygienic point of view will follow.

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.

D. G. O., of Mass.—Deby, in his "Steam Vade Mecum," gives the following rule for calculating the temperatures of steam at different pressures: "Substract the Cen. units of latent heat from 606·5 and divide the remainder by 0·695. This gives the temperature in Cen. degrees of the thermometer. This rule is based upon a law which that author claims to have discovered, namely, that the pressure of steam in atmospheres in a close vessel increases in a geometrical progression, the ratio of which is two, while the latent heat (so called) decreases (is in reality converted into other modes of motion) in a compound arithmetical progression, the constant of which is 17 Cen. units or 30·6 Fah. units, and the multipliers, respectively, as the numbers 1, 2, 3, 4, 5, etc. We do not regard this law as fully established. Since its publication, on page 246, Vol. XX., of the Scientific American, it has, however, met with neither denial nor confirmation. It is certain, however, that the rule above given, secures results which coincide with the results of previous experiments to within a very close approximation. You will find these results in tabulated form, in the work above mentioned, published by Willis, McDonald & Co., 141 Fulton street, New York, and nearly the same in other works on heat and steam. Loose sawdust would, we think, be more likely to take fire from proximity to hot steam pipes than solid wood.

J. T. K., of Wis.—The horse power of a boiler is computed from the extent of its heating surface. In good boilers, with furnaces so arranged, that good combustion and utilization of the heat is secured, it is common to allow for marine flue boilers, 8 square feet of heating surface per horse power; for marine tabular boilers, 9 to 10 square feet; and for locomotive boilers 6 square feet. Stationary boilers vary greatly in this respect. They oftener, we judge, require twelve feet of heating surface than less; and it is evident that the results attained with any boiler must depend in great measure upon collateral circumstances. The best constructed boiler might give poor results under unfavorable circumstances of setting, etc. You will now see that you have not given us the data for computing the heating surface of your boiler, and that we can not therefore give you the horse power. The amount of water which can be raised from 50 deg. Fah. to 212 deg. Fah. per horse-power of a boiler, by the use of a pipe and steam jet, is approximately six cubic feet per hour.

M. S., of Ill.—The horse-power of an engine is equal to the mean effective pressure per square inch of piston area in pounds multiplied by the number of square inches in that area, multiplied by the length of stroke in feet, multiplied by the number of strokes per minute, and divided by 33,000. It is rare that in engines worked non-expansively, the mean effective pressure in the cylinder can be considered as equal to the boiler pressure; but assuming it to be nearly so in your case, where the cylinder is 14 inches internal diameter and stroke 20 inches, boiler pressure 80 pounds, and number of strokes per minute 101·25, the horse-power would be $80 \times (14^2 \times 0{\cdot}7854) \times 1{\cdot}666 \times 101{\cdot}25 \div 33{,}000$, which you can work out for yourself.

S. R., of N. J.—You can bleach your ivory veneers by exposing them to the action of chlorine. To make this gas, put into a glass retort or flask, a mixture of 18 parts common salt and 15 parts finely pulverized binoxide of manganese, and pour upon the mixture a cold mixture of 45 parts strong sulphuric acid and 21 parts of water. The gas will immediately come over, and you may conduct it into a close cask, set out of doors and away from your shop, as this gas is injurious to inhale. When the evolution of gas slackens, a gentle heat applied to the retort will immediately increase it. The veneers should be laid on racks, or otherwise kept apart, so that they may be uniformly acted upon.

G. T., of Tenn.—Ink cannot be considered as a solution. It is a fluid containing coloring matter in suspension: Usually this coloring matter is gallate of iron, or a compound of gallic acid, extracted from the nutgalls employed in its manufacture, and the oxide of iron.

T. D. G., of Ohio.—The black color of *caoutchouc* (gum-elastic india-rubber) is acquired from the smoke of fires used in its desiccation after the juice is extracted from the trees. It is not a natural property of this substance, which, in a pure state, is of a white color.

J. K. A., of Mich.—The terms "nucleus" and "nebulosity," are used in astronomy to denote entirely distinct parts of a comet. The nucleus is what is commonly known as the head, and the nebulosity is the attenuated matter which surrounds the true nucleus.

R. M. Van N., of Neb.—A patent was taken out in 1823, for the use of cork tree bark, for dyeing cotton, wool, and other tissues, nankeen. We do not think the process was ever extensively used, and we see nothing new in the method you employ.

H. C. P., of Texas.—Your application of horn plates to a "coat of mail," a term which is hardly applicable, is very ancient. Such plates may be made quite effective as a protection from sword thrusts or bullets, but there is nothing new in the idea you have conceived.

D. B. L., of Ala.—Your toy gun is, we think, a decided novelty, and of course, as such, patentable. Large sums have been realized by patentees of toys. A unique and taking affair like yours would be sure to have a run.

R. T. M., of Mo.—The fact that sour apples attack the teeth more than vinegar, is owing to the presence of malic acid in such apples, which acts upon the enamel of the teeth much more than dilute acetic acid—vinegar.

A. B. F., of Mass.—As a "working engineer," you should be able to obtain the different brands, trade marks, etc., of boiler iron without expecting us to do a liberal amount of gratuitous advertising for your especial benefit.

A. C. B., of Mass.—We can recommend nothing as being better than plumbago, for coating insects, and other small and delicate objects, in the process of electro-plating.

J. R., of —, "Pallett's, Millers, Millwrights, and Engineers' Guide", is the book you need. Published by Henry Carey Baird, Philadelphia.

R. B., of Ala.—One part of Portland cement and eight of sand would make a good lining for an artificial duck pond.

Recent American and Foreign Patents.

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

Blade Guard.—Thomas T. Woodward, Ansonia, Conn.—This invention relates to a new and useful improvement in a detachable guard for cutting blades.

Steam Trap.—Samuel Bonser, Dover, N. H.—This invention relates to a device for discharging the waters of condensation from a steam-heating or other steam apparatus.

Corn Plow.—W. H. Bott, York, Pa.—The object of this invention is to construct a simple, light, and convenient plow, adapted to cultivating, plowing corn, etc., and which shall be readily adjustable to suit the work required of

Machine for Turning Rake Heads.—A. T. and N. M. Barnes, Tiffin, Ohio.—The object of this invention is to provide for public use a machine for turning heads for horse hay rakes and other shafts of similar construction, which shall perform the work more expeditiously and conveniently than any machine heretofore employed for the purpose.

Elevated Railway.—Wm. H. Rand, Brooklyn, N. Y.—The object of this invention is to improve the construction of elevated railways so as to reduce their cost and render them stronger and safer, more beautiful in appearance, and better adapted to the different methods of propulsion than any heretofore brought into public use.

Machine for Cutting off the Ends of Cigars.—J. G. Maier and G. W. Schaeffer, Baltimore, Md.—The object of this invention is to provide for public use a neat, simple, cheap, and easily operated machine, which will cut off the end of a cigar without breaking it. In connection with this machine are arranged a box for holding the cut-off cigar ends, roughened surfaces for igniting the match, and one or more match holders.

Wind Mill.—Isaac H. Sutton, Coon Rapids, Iowa.—This invention relates to improvements in wind mills, and has for its object to provide a wind-regulating, and stopping and starting device, or gate for increasing or diminishing the area of the buckets exposed to the wind.

Attaching Rudders to Propellers.—A. A. Scanlr, Nyack, N. Y.—This invention relates to improvements in attaching rudders to propellers, and consists in attaching two rudders in advance of the propellers, one under each quarter, for the better protection of the same against striking upon bars and rocks, and for insuring a better action of the water on the rudders before it has been divided and set into cross currents by the propeller.

Governor.—M. Murphy, Charlotte, N. C.—This invention relates to improvements in governors for valves of engines, water wheels, etc., the object of which is to provide a simple and cheap device, also to provide an arrangement whereby the same may be adjusted, while in motion, to vary the action for increasing or diminishing the speed of the engine or wheel.

Machine for Gumming, Punching, Upsetting, and Cutting.—S. D. Hicks, New London, Wis.—This invention relates to improvements in iron workers' apparatus, and consists in the arrangement, on one portable base, of gumming devices, punching devices, tire-upsetting devices, and shearing devices, the gumming and shearing devices being arranged to be operated by one and the same hand lever, and the upsetting and punching devices by another lever.

Portable Stove.—John Bannihr, Hempstead, N. Y.—This invention has for its object to furnish a simple, convenient, effective and inexpensive portable cooking apparatus, which may be used in the house or out of doors as may be desired or convenient.

Water Wheel.—J. G. Fredenburr and W. V. Andrews, Newcastle, Cal.—This invention consists in the form of the buckets and the manner of connecting them to the rim of the wheel. The faces of the buckets receiving the water represent spiral concave forms, so shaped as to give the water which is discharged against them when at the lowest position, first, an upward or radial direction, and then a lateral direction away from the wheel, calculated to utilize as much as possible the unspent force of the water, which is commonly lost in these wheels by the immediate escape of the impact, and also calculated to discharge the water away from the wheel so as not to clog or impede its motion.

Animal Trap.—J. L. Tusten, Winona, Miss.—This invention comprises the combination, in a box or case, of two compartments with a hinged and vertically swinging door between them, of a horizontally swinging door opening into the first compartment, a hinged platform within the said first compartment, suspended from a pair of knuckle-jointed bars, one of which is connected to the outer door for closing and opening it by the action of the weight of the animal on the platform, a counter weight for closing the door and a drop catch for securing it, under a simple and efficient arrangement whereby the animals secured are caused to reset the trap.

Traction Engine.—George N. Tibbles, Hudson City, N. J.—This invention relates to certain new and useful improvements in the construction of a traction engine, which is intended to take the place of the ordinary dummy engines now in use. The object of the invention is to avoid the necessity of putting on an extra pressure of steam to ascend a steep incline, by the use of a movable fulcrum in a slotted lever connected with the cross-head.

Windmills for Pumping.—L. D. Parsons, Tremont, N. Y.—This invention relates to new and useful improvements in windmills for pumping water and for other purposes.

Attachment to Spools or Bobbins.—Marcus Brown Westhead, and Robert Smith, Manchester, England.—This invention relates to a revolving drag placed upon the end of the spool or bobbin, and through which the thread or twine passes, whether such drag be adapted to the spool or bobbin or so as to be detached therefrom and applied to another spool or bobbin.

Sheet-Metal Hoops for Tubs, Buckets, and other Similar Vessels.—L. A. Fleming, New York city.—This invention consists in forming one end of a metallic hoop with rivet clips struck or cut from the end of the hoop, which fit into slots in the other end of the same hoop; these clips are then driven to a head like an ordinary rivet, and the hoop is firmly joined thereby; thus the use of rivets is avoided, and the hoop secured in a rapid and economical manner.

Thrashing Machine.—William H. Perry, Ripley, Ohio.—This invention relates to a new and useful improvement in upper shoes for grain-thrashing machines, and it consists in a novel construction of the same, whereby the blast is made to act more efficiently upon the grain than hitherto, and the grain deprived of smut and other light impurities, which are directed from, or not allowed to pass into the face of the feeder or operator, as is now the case.

Car Brake.—M. S. Borthwick, Montana, Iowa.—This invention relates to improvements in car brakes, and has for its object to provide a simple arrangement of devices, whereby the car brakes as now commonly arranged for operation by hand may be brought to bear, by power derived from the moving wheels of the truck, when required, the said devices being so arranged that they may be brought into contact with the wheels, either by the brakeman on the platform of each car or by one at either end of the train.

Mangle.—James B. Westwick, Galena, Ill.—This invention relates to new and useful improvements in mangles, and consists of improved arrangements of devices for working a table reciprocatingly under a pressing and smoothing roller, on which table the clothes to be mangled are spread, the pressing and mangling roller being provided with adjustable weights for varying the pressure.

Apparatus for Shaping Earthen Jars.—Joseph H. Baddeley, Greensboro, Pa.—This invention consists in the employment of a molding jar, wherein the clay is molded to the required exterior form, and in the employment therewith of a tool adapted to shape the interior of the jar, and to form the channel for the cover; also, in an arrangement of the support of the said tool for holding it while turning, and for removing it from the finished jar, for the removal of the latter from the lathe.

Securing Type in Forms.—Samuel Anderson and Thomas J. Folan, Stapleton, N. Y.—This invention relates to improvements in means for securing type in forms irregularly for fancy printing, and it consists in accomplishing the same by casting plaster of paris or other similar substance while in a plastic state, around the same when arranged in the order required, which solidifying holds the type sufficiently for the work required, and which may be readily broken up and separated from the type when they are to be changed.

Back Straps for Hames.—Charles Drew, Newark, N. J.—This invention relates to improvements in the construction of back straps of harnesses for horses and other animals, and has for its object to provide an improved manner of attaching the binding for the same.

Endless Chain Water Wheel.—H. S. Stewart, Yreka, Cal.—This invention has for its object to furnish an improved water wheel, which shall be so constructed as to utilize a much larger proportion of the power of the water than can be done with water wheels constructed in the ordinary manner; and which shall also be so constructed that it may be taken apart and transported from place to place as required.

Fire Shovel.—John Fox, New York city.—This invention has for its object to furnish an improved shovel, so constructed that it may be made with one blow, instead of its being necessary to strike it several times before it is brought to the proper shape, as is the case when the shovels are made in the ordinary manner, and which shall, at the same time, be a stronger and better shovel.

Sash Fastening.—Samuel Reed, Rising Sun, Md.—This invention has for its object to furnish an improved wire saw sash fastening, by means of which the sash may be fastened, closed, or opened to any desired extent, either at the top or bottom, or both, and which shall be simple in construction and effective in operation.

Gang Plow.—James B. Hunter, Ashley, Ill.—This invention has for its object to furnish an improved gang plow, simple in construction, effective in operation, and adjusted for larger or smaller plows, as the character of the plowing may require.

Car Starter.—T. S. E. Dixon, Janesville, Wis.—This invention has for its object to furnish an improved device for attachment to horse cars, and other wheeled vehicles, by the use of which the power will be first applied to revolve the wheels of the vehicle, and thus start it with less effort than when the draft is applied directly to the body of the car.

Furnace for Converting Pig Iron into Steel and for Purifying and Oxidizing other Metals and Minerals.—Alois Thoma, New Yorkcity.—This invention has for its object the construction of a converting furnace, which allows a continuous operation, and in which, therefore, a much larger quantity of material can be treated in a given time, than can be done in those furnaces which require removal of old contents before the new can be put in.

Organ Stop Handle.—William Boyrer, New York city.—This invention has for its object to so construct the handles of organ stops, that the notices painted or printed upon the same can be readily seen by the organist.

Machine for Shaping Boot and Shoe Soles.—S. D. Tripp, Lynn, Mass.—This invention comprises a method of compression, by rolling the soles between a last and former of peculiar construction, specially adapted for action upon all parts of the soles, whether of uniform or varying thickness.

Churn.—C. J. Miller, Jr., Richmond, Ky.—This invention relates to a new churn, which is so constructed that it will serve to produce butter with great rapidity and without loss of cream. The invention consists in the use

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of a fluted churn, and in the construction of the same with a peculiar double winged dasher.

MACHINE FOR BRANCHING ARTIFICIAL FLOWERS.—Ambrose Giraudat, New York city.—This invention relates to a new machine for securing branches, leaves, flowers, or other ornaments, to the stems of artificial flowers by means of two layers of threads applied to the wire stem. The small stems of the said branches, leaves, or flowers, are secured between the two layers of threads, of which the upper one is wound, in one or more threads, closely around the main stem.

BENCH VISE.—O. H. Gardner, Fulton, N. Y.—This invention consists in so shaping the shank of the rear jaw of a vise, that its lower pivot is in line with the center of the upper clamping plate, so that the said jaw will work on a center and not be thrown off the bench. The invention also consists in so shaping the shank of the front jaw, that the center of its ball will be in line with the face of the jaw, for the purpose of obtaining greater accuracy of motion.

PENCIL AND RUBBER HOLDER.—J. A. Kemmis, New Orleans, La.—This invention relates to improvements in cases for holding pencils and rubbers, designed to provide a convenient article for carrying in the pockets and for use. It consists in a peculiar arrangement of sliding spring pencil holder and spring rubber holder within a tubular case.

REAPING MACHINE.—Robert Morris, Salem, Ind.—This invention relates to improvements in reaping machines, having for its object to provide a simple and improved arrangement of means for obtaining the motion for the cutter bar; also an improved arrangement of means for raking and delivering the gavels; also, an improved arrangement for suspending the apron and cutter bar from the frame of the machine, so as to dispense with the wheels commonly applied at the outer side of the apron.

HOEING MACHINE.—H. W. Clapp, Northampton, Mass.—This invention onsists, first, in an arrangement upon a truck of two or more wheels, of wo or more hoes or spades moving to and from the row, as the machine m oves along by motion derived from the truck wheels, so as to scrape or oe the earth up to the roots of the plants, the said spades or hoes being aised above the ground when moving away from the plants, and down into contact with it when moving up towards it. The invention consists, secondly, in the combination with the said hoes or spades, of a shield for gathering the tops of the plants and holding them up, so as not to be covered or injured by the hoes. This invention consists, thirdly, in the combination of the said hoes of cultivators, arranged to operate in the ordinary way, and provided with means for raising and lowering them; also for guiding one pair of the said cultivators, which run close to the plants, laterally by the feet, and it consists, fourthly, in certain arrangements of parts for working, guiding, and adjusting the spades and cultivators.

HAND-SPINNING MACHINE.—James Rice, Prairie Creek, Ind.—The object of this invention is to provide a hand-spinning machine, which may be readily adjusted as to hight, so that the operator may work it when either standing or sitting. It is also arranged by inclosing the gearing in a case for safety ane for a better appearance.

COTTON CULTIVATOR.—R. I. Draughon, Claiborne, Ala.—This invention consists of a pair of rotary cutters for working on each side of the row, and another rotary cutter for working transversely thereto, for chopping out the plants at intervals; the said rotary cutters being suspended from a frame on two wheels by vibrating supporting frames, having means for raising or lowering them, as required, and deriving rotary motion from the axle of the said two wheels; they are also arranged for adjustment obliquely for discharging the earth directly behind or laterally.

CRANK, AXLE, AND TREADLE FOR VELOCIPEDE.—McClintock Young, Frederick, Maryland.—This invention relates to a new manner of constructing treadles for velocipede cranks, with an object of making them both light and reliable, as well as of cheap construction, and to a novel construction of crank axle and crank to enable the latter to be formed on the former.

PRESS FOR MOLDING BOOT AND SHOE SOLES.—S. D. Tripp, Lynn, Mass.—This invention relates to a machine for molding or forming the soles of boots and shoes so that they shall correspond in shape with the last.

VELOCIPEDE.—George Louden, Brooklyn, N. Y.—This invention relates to a new and useful improvement in velocipedes, and consists in the method of applying the power for driving it.

EXPLOSIVE PROJECTILE.—John Jobson, Derby, England.—The object of this invention is to admit of the head, or fore end or part of the projectile being split or broken up into a number of definite forms or parts, and to facilitate the separation and distribution of parts composing the cylindrical or parallel portion or body of the projectile.

CRANK FOR HARVESTERS.—H. L. Wanzer, Lanesville, Conn.—The object of this invention is to furnish means for varying the velocity of the cutters of harvesters to accommodate the machine to the nature of the work and speed of the team; and also to compensate for the wearing away of the knives by grinding.

ELECTRO-MAGNET.—W. E. Davis, Jersey City, N. J.—The object of this invention is to so construct the spools or cores of electro-magnets by a new system of winding the wires around them, that the electric current will move rapidly, and uniformly enter both spools, and thereby produce a more decisive action upon the same and the armature.

DITCHING MACHINE.—Henry Benett, Linden, Cal.—This invention consists of a large drum, having two end rims united by steel or other bars, suitable for cutters, arranged parallel with the shaft and pitched slightly out of the radial lines, between which are followers which recede and permit the cutters to settle into the earth to fill the spaces between them, and are then forced out to discharge the earth after it has been carried up by the wheel against a scraper following in the rear, and serving as a guide to prevent the discharge, until the earth has been carried to the proper point to be delivered to an elevating and spouting apparatus, which the invention also comprises.

ENVELOPES.—F. W. Eberman, West Salem, Ill.—This invention consists in making the flap, which is folded over on the body part in sealing, of two thicknesses, either by folding the edges of the flap, (intended for the purpose) over on itself, or by pasting other narrow strips thereon, and arranging the paste on the flap or the other part, so that it will be pasted down to the body part, at some distance from the edge of the flap, leaving a narrow strip of the outer edge free to be taken hold of by the thumb and finger for tearing open, the two thicknesses thus formed rendering the paper strong enough to overcome the adhesion of the paste. In some cases it is proposed, when the additional thickness of paper is to be formed by pasting on strips, to attach the said strips to the body of the envelope, and to seal the edge of the flap to the strips.

BISCUIT PANS.—J. C. Milligan, Brooklyn, N. Y.—This invention relates to an improved mode of uniting small biscuit pans together in clusters, and consists in providing the said pans with horizontal flanges around the top, and joining them together in rows, lapping the flanges and riveting them, joining two or more rows together in right lines, in both directions, or in zigzag lines, as may be preferred. The invention also consists in binding the whole together by wires or other bars, extending around or along the sides of the clusters, at the outer edges of the outer pans, and turning the edges of the flanges over them.

STEAM CUT-OFF.—H. Lombard, San Francisco, Cal.—This invention consists of a hollow conical or tapered valve, receiving the steam at one end, and delivering it at one side to ports in a circular tapered seat, leading to the cylinder, and exhausting through the other side from the same ports, and at the end opposite the receiving end, which valve is provided with a central auxiliary valve connected with the governor, and operating to vary the opening of the live steam passage; also to separate the passage of the said valve longitudinally to form the live steam and exhaust passages.

PLOWS.—W. R. Pool, Havanna, Ala.—This invention relates to an improved method of fastening plows detachably to the stocks, for the purpose of changing them for plows or shares of different shapes and kinds for different kinds of work.

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.

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96,534.—MODE OF SECURING TYPE IN FORMS.—Samuel Anderson and T. J. Folan, Stapleton, N. Y.
96,535.—DOUBLE-ACTING PRESS FOR "BLANKING" AND "FORMING UP" SHEET METAL.—John Annear and W. J. Gordon, Philadelphia, Pa.
96,536.—PORTABLE FENCE.—Albert Armitage, Phelps township, and J. H. Olmsted, Arcadia, N. Y.
96,537.—APPARATUS FOR SHAPING EARTHENWARE.—J. H. Baddeley, Greensborough, Pa.
96,538.—DETACHABLE BOOT AND SHOE HEEL.—C. W. Bailey, Boston, Mass.
96,539.—GAS HEATER.—John Bannihr, Hempstead, N. Y.
96,540.—DITCHING MACHINE.—Henry Benett, Linden, Cal.
96,541.—STEAM TRAP.—Samuel Bonser, Dover, N. H.
96,542.—RAILWAY CAR BRAKE.—M. S. Borthwick, Montana, Iowa.
96,543.—ORGAN-STOP HANDLE.—Wm. Boyrer, New York city.
96,544.—FASTENING FOR BUTTONS.—Edward Brady, Philadelphia, Pa.
96,545.—FAUCET-CONNECTION.—T. H. Brady, New Britain, Conn.
96,546.—SEED PLANTER.—James Campbell (assignor to himself and William Campbell), Harrison, Ohio.
96,547.—WATER ELEVATOR.—G. W. Carpenter, Butler, Ind.
96,548.—CHAIR.—Jefferson Chase, Orange, Mass.
96,549.—HOEING MACHINE.—H. W. Clapp, Northampton, Mass.
96,550.—KITE.—Samuel Clark, New York city.
96,551.—HINGE FOR A DOOR OR WINDOW FRAME OF A STOVE.—T. J. Coulston, Springville, assignor to E. S. Shantz, and Joseph Johnson, Royer's Ford, Pa.
96,552.—BOILER-TUBE CLEANER.—P. H. Coyle, Newark, N. J.
96,553.—JACQUARD MECHANISM FOR LOOMS.—E. K. Davis, New York city, assignor to Duckworth & Sons, Pittsfield, Mass.
96,554.—ELECTRO-MAGNET.—W. E. Davis, Jersey City, N. J.
96,555.—LATERAL OR DIVERGING CONNECTION FOR CEMENT WATER PIPES.—Edwin Dayton, Meriden, Conn.
96,556.—CARDING MACHINE.—James Dempster and Henry Holcroft, Media, Pa.
96,557.—STREET CAR STARTER.—T. S. E. Dixon (assignor to himself and W. H. Payne), Janesville, Wis.
96,558.—COFFEE-POT.—Johnson Dodge, New Orleans, La.
96,559.—HOSE BRIDGE.—William Donoghue and F. L. Charlton, Philadelphia, Pa.
96,560.—BALANCE SLIDE-VALVE.—David Dorman, Wheatland Furnace, Pa., assignor to himself and Thomas Johnston.
96,561.—FENCE.—J. G. Downer, Auburn, N. Y.
96,562.—COTTON CULTIVATOR.—R. I. Draughon, Claiborne Ala.
96,563.—HARNESS PAD.—Charles Drew, Newark, N. J.
96,564.—LOOM FOR WEAVING TAPE, ETC.—James Duckworth (assignor to Duckworth & Sons), Pittsfield, Mass.
96,565.—APPARATUS FOR GENERATING AND CARBURETING GASES.—C. F. Dunderdale, New York city.
96,566.—ENVELOPE.—F. W. Eberman, West Salem, Ill.
96,567.—PRINTING TELEGRAPH APPARATUS.—T. A. Edison (assignor to S. S. Laws), New York city.
96,568.—CAPSTAN.—Jacob Edson, Boston, Mass.
96,569.—BRIDGE.—Samuel Ensign, New Franklin, Ohio.
66,570.—LOOM FOR WEAVING PILE FABRICS.—Levi Ferguson, Lowell, Mass.
96,571.—EAR OF WOODEN BUCKETS.—L. A. Fleming, New York city. Antedated Nov. 1, 1869.
96,572.—MANUFACTURING SHOVELS.—John Fox, New York city.
96,573.—WATER-WHEEL.—J. G. Fredenburr and W. V. Andrews, Newcastle, Cal.
96,574.—FLY NET.—John Frymire, Orangeville, Pa.
96,575.—COULTER FOR PLOWS.—Conrad Furst, Chicago, Ill.
96,576.—HORSE HAY RAKE.—Horatio Gale, Albion, Mich.
96,577.—PRINTING PRESS.—Merritt Gally, Rye, assignor to Allen Carpenter, Rochester, N. Y.
96,578.—PRINTING PRESS.—Merritt Gally, Rye, assignor to Allen Carpenter, Rochester, N. Y.
96,579.—PRINTING PRESS.—Merritt Gally, Rye, assignor to Allen Carpenter, Rochester, N. Y.
96,580.—VISE.—O. H. Gardner, Fulton, N. Y. Antedated Nov. 1, 1869.
96,581.—HEAD BRACE FOR COFFINS.—Joseph Gawler, Washington, D. C.
96,582.—MACHINE FOR BRANCHING ARTIFICIAL FLOWERS.—Ambrose Giraudat, New York city.
96,583.—MANURE HOOK OR DRAG.—Henry Gross, Middletown, Pa. Antedated Oct. 26, 1869.
96,584.—BUTTER TUB.—J. M. Hale, Georgia Plains, Vt. Antedated Nov. 1, 1869.
96,585.—PIPE COUPLING.—J. M. Hale, Georgia Plains, Vt.
96,586.—CORN PLANTER.—J. A. Hamrick, Parnassus, Va.
96,587.—MANUFACTURE OF ARTIFICIAL AND PRESERVATION OF NATURAL FLOWERS.—E. S. Harris, Philadelphia, Pa.
96,588.—STOVE GRATE.—David Hathaway, Troy, N. Y.
96,589.—SLED.—R. H. Hawkins, Akron, Ohio, assignor to himself and T. H. Dodge, Worcester, Mass.
96,590.—BEER COOLER.—August Hitscherich, Milwaukee, Wis.
96,591.—DIAMOND HOLDERS FOR ENGRAVING PRINTERS ROLLERS.—John Hope (assignor to Hope & Co.), Providence, R. I.
96,592.—WATER WHEEL.—Franklin Hoyt, Montpelier, Vt.
96,593.—GANG PLOW.—James B. Hunter, Ashley, Ill.
96,594.—PUNCHING AND SHEARING MACHINE.—William H. Ivens and Wm. E. Brooke, Trenton, N. J.
96,595.—EXPLOSIVE PROJECTILE. — John Jobson, Derby, England.
96,596.—SAW SWAGE.—Nelson Johnson, Jasper, N. Y.
96,597.—PENCIL CASE.—J. A. Kemmis, New Orleans La.
96,598.—FOUNTAIN PEN. — J. Gardner Kenyon, Ferndale, Cal.
96,599.—TOILET BEDSTEAD.—George V. Leicester, Boston, Mass.
96,600.—METAL-ROLLING APPARATUS. — John Lippincott, Pittsburgh, Pa.
96,601.—ROTARY STEAM VALVE.—H. Lombard, San Francisco, Cal.
96,602.—CORN HARVESTER.—Charles B. Maclay, Delavan, Ill.
96,603—PADDLE WHEEL.—James Mahony, Newport, R. I.
96,604.—CHURN.—C. J. Miller, Jr., Richmond, Ky.
96,605.—BISCUIT PAN.—John C. Milligan, Brooklyn, N. Y.
96,606.—HARVESTER.—Robert Morris, Salem, Ind.
96,607.—STEAM RADIATOR.—James O. Morse, Englewood, N. J., and Gardner D. Hiscox, Brooklyn, N. Y.
96,608.—GOVERNOR FOR STEAM AND OTHER ENGINERY.—M. Murphy, Charlotte, N. C.
96,609.—STRAW CUTTER.—Harrison Ogborn, Richmond, Ind.
96,610.—WHIFFLETREE.—Anson W. Payne, Maine, N. Y.
96,611.—THRASHING MACHINE.—William H. Perry, Ripley, Ohio.
96,612.—ROCK-DRILLING MACHINE.—George B. Phillips (assignor to A. M. Cornell & Co.), Poughkeepsie, N. Y.
96,613.—HEAT RADIATOR.—S. Montgomery Pike, Cincinnati, Ohio. Antedated October 23, 1869.
96,614.—PLOW—Wm. R. Pool, Havanna, Ala.
96,615.—MODE OF TRANSMITTING MOTION.—Nelson Read, Jewett City, Conn.
96,616.—WINDOW-SASH FASTENING.—Samuel Reed, Rising Sun, Md.
96,617.—BOILER TUBE CLEANER.—John E. Regan, Chicago, Ill.
96,618.—TAP COCK.—Claude Renard, Michel Perret, and Jules César Voituret, Mâcon, France.
96,619.—HAND-SPINNING MACHINE. — James Rice, Prairie Creek, Ind.
96,620.—AXLE SKEIN.—Emry Rooks, Trenton, Tenn.
96,621.—MAKING TOY TORPEDOES.—Erastus B. Sample, and John Sparks, Brooklyn, N. Y.
96,622.—STEERING APPARATUS.—A. A. Scank, Nyack, N. Y.
96,623.—GAS HEATER.—Eilert O. Schartau, Philadelphia, Pa.
96,624.—LATCH.—George A. Seaver, New York city.
96,625.—WEEDING HOOK.—Thomas J. Secor and Charles E. Shumway, Phelps, N. Y. Antedated October 26, 1869.
96,626.—OIL CAN.—Franklin Skinner, Cleveland, Ohio.
96,627.—DOOR KNOB.—Thomas J. Sloan, Bronxville, N. Y Antedated October 30, 1869.
96,628.—RAILWAY-RAIL SPLICE.—Jasper Snell and John M. Crosland, Pottsville, Pa.
96,629.—ENDLESS-CHAIN WATER WHEEL.—H. S. Stewart, Yreka, Cal.
96,630.—GRAIN CLEANER.—Jacob Stroop, Joliet, Ill.
96,631.—WIND WHEEL. — Isaac H. Sutton, Coon Rapids Iowa.
96,632.—MANUFACTURE OF WATCH CASES.—Chas. L. Thiery Boston, Mass.
96,633.—PROCESS AND APPARATUS FOR CONVERTING CAST IRON INTO STEEL.—Alois Thoma, New York city.
96,634.—ENAMEL OR GLAZE FOR POTTERY, BRICK, TILES ETC.—Wm. S. Thomas, Carbon Cliff, Ill.
96,635.—WHEEL FOR SELF-MOVING CARRIAGES. — Robert William Thompson, Edinburgh, Great Britain. Patented in England April 21, 1868.
96,636.—TRACTION ENGINE. — George N. Tibbles, Hudson City, N. J.
96,637.—SIGNAL LANTERN.—David Todd, Detroit, Mich.
96,638.—MACHINE FOR SHAPING BOOT AND SHOE SOLES.—S. D. Tripp, Lynn, Mass.

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96,639.—DEVICE FOR MOLDING SOLES OF BOOTS AND SHOES.—S. D. Tripp, Lynn, Mass.
96,640.—DISTILLING ALCOHOLIC LIQUORS.—S. F. Van Choate, Boston, Mass.
96,641.—CABLE AND TESTING POST FOR SUBTERRANEAN TELEGRAPHS.—Silvanus Frederick Van Choate, Boston, Mass.
96,642.—KNIFE CLEANER.—Wm. Vine, Norwalk, Conn.
96,643.—CRANK FOR HARVESTERS.—Hiram L. Wanzer, Lanesville, Conn.
96,644.—WINDOW FRAME.—Otis Ward, Sunderland, Vt.
96,645.—LAMP BURNER.—Wm. Westlake, Chicago, Ill.
96,646.—MANGLE.—James B. Westwick, Galena, Ill.
96,647.—HAY ELEVATOR.—E. L. Yancy, Batavia, N. Y.
96,648.—CRANK AXLE FOR VELOCIPEDES. — McClintock Young, Frederick, Md.
96,649.—APPARATUS FOR CARBONIZING PEAT.—John Adams, Rochester, N. Y.
96,650.—COMPOUND VENEER AND ORNAMENTAL COVERING FOR ARTICLES.—Robert A. Adams, New York city.
96,651.—SASH LOCK.—P. A. Altmaeir, Harrisburg, Pa.
96,652.—FISHING REEL.—P. A. Altmaeir, Harrisburg, Pa.
96,653.—CENTERING TOOL.—Williston I. Alvord, Bridgeport, Conn.
96,654.—INDIA-RUBBER PACKING.—A. C. Andrews (assignor to The Water Proof Sole Company), New Haven, Conn.
96,655.—COMPOSITION PANEL FOR DOORS.—Russell B. Andrews, Poland, Me.
96,656.—CARRIAGE WHEEL.—Simeon Atha, West Liberty, Ohio.
96,657.—MOTIVE POWER.—Albert M. Bacon, Boston, Mass.
96,658.—GREEN CORN SHELLER.—Volney Barker, Otisfield, Me.
96,659.—WOOD-TURNING LATHE.—A. T. Barnes and N. M. Barnes (assignors to themselves and Tiffin Agricultural Works), Tiffin, Ohio.
96,660.—HARVESTER.—Samuel D. Bates, Lewisburg, Pa.
96,661.—PROCESS FOR COLORING MUSLIN, PAPER, ETC.—Frederick Beck, New York city.
96,662.—WAGON SEAT.—Wm. Beers, Milan, Ohio.
96,663.—CALORIC STREET ROLLER.—M. J. Bendall, New York city.
96,664.—LAMP.—Newton Benedict, Washington, D. C.
96,665.—CORSET SPRING.—A. Bennett, New York city.
96,666.—GAS RANGE.—A. L. Bgoart, New York city.
96,667.—CORN PLOW.—W. H. Bott, York, Pa.
96,668.—BEE HOUSE.—D. Burbank, Lexington, Ky.
96,669.—JEWELRY BOX.—L. L. Burdon, Providence, R. I.
96,670.—COUPLING FOR VEHICLES.—Upson Bushnell, Cleveland, Ohio. Antedated Oct. 27, 1869.
96,671.—CARDING ENGINE.—John Butterworth and Jas. Butterworth, Trenton, N. J.
96,672.—FLOATING DOCK.—Jas. Campbell, Founders' Court, London, England.
96,673.—INKSTAND.—W. E. Carlile, New York city.
96,674.—SAW TEETH.—Edward Colson, Fort Wayne, Ind.
96,675.—WEATHER STRIP.—G. W. Cretors and Enos Hoover, Clinton county, Ind.
96,676.—SHUTTLE FOR LOOMS.—George Crompton, Worcester, Mass.
96,677.—SHUTTLE FOR LOOMS.—George Crompton, Worcester, Mass.
96,678.—SASH HOLDER.—R. M. Dalbey, Springfield, Ohio.
96,679.—SLAW OR CABBAGE CUTTER.—D. F. Dietrich, Noblesville, Ind.
96,680.—PLOW.—H. B. Durfee, Decatur, Ill.
96,681.—AUTOMATIC ELECTRICAL SWITCH FOR TELEGRAPH APPARATUS.—T. A. Edison, New York city.
96,682.—HOSE PIPE.—Jacob Edson, Boston, Mass.
96,683.—SADIRON.—T. G. Eiswald, Providence, R. I.
96,684.—DEVICE FOR BENDING RAILROAD RAILS.—G. D. Emerson, Calumet, Mich.
96,685.—CORSET STEEL.—John L. Fitzpatrick, Waterbury, Conn.
96,686.—SPRING BED BOTTOM.—Julius Fox, Albion, Mich.
96,687.—PAPER BOSOM.—E. P. Furlong, Portland, Me.
96,688.—COMPOSITION FOR MANUFACTURE OF SCHOOL SLATES.—G. B. Garland, Gardiner, Me.
96,689.—FASTENING FOR BUTTONS.—Benedikt Geiger and Herman Wocher (assignors to themselves and J. J. C. Smith), Philadelphia, Pa. Antedated Nov. 4, 1869.
96,690.—MARTINGALE RING.—W. F. Gilbert, Birmingham, Conn.
96,691.—PHOTOGRAPHY.—Frederick Glessner (assignor to himself and John Stanton), Cincinnati, Ohio.
96,692.—BOBBIN WINDER FOR SEWING MACHINE.—Thos. Hall, Brooklyn, N. Y.
96,693.—CHURN DASHER.—M. A. Hamilton, Detroit, Mich.
96,694.—PUSHING JACK FOR RAILROADS. — Jesse Hamme, York, Pa.
96,695.—MACHINE FOR BENDING BAG FRAMES.—Geo. Havell, Newark, N. J. Antedated Nov. 1, 1869.
96,696.—WASHING MACHINE.—Chas. Hedges and C. S. Strayer, Bloomington, Ill.
96,697.—SAWING MACHINE.—N. F. Hersh, Round Hill, Pa.
96,698.—FIRE ESCAPE.—John Heuermann, Davenport, Iowa.
96,699.—UPSET, PUNCH, SHEARS, AND SAW-GUMMING DEVICE.—S. D. Hicks (assignor to himself and J. C. Wilcox), New London, Wis.
96,700.—TOOL FOR OPENING BOXES.—L. D. Howard, St. Johnsbury, Vt.
96,701.—SASH HOLDER.—Joshua Howland, Ashland, Ohio.
96,702.—BOOK HOLDER.—G. P. Johnson, Webster's Grove, Mo.
96,703.—DETACHING HORSES FROM CARRIAGES.—E. P. Jones, Shell Mound, Miss.
96,704.—MACHINE FOR SUPPLYING AIR TO CARBURETERS.—Patrick Kelley, Dayton, Ohio.
96,705.—PRESSURE GAGE. — Henry J. H. King, Glasgow, Great Britain.
96,706.—SPRING BED BOTTOM.—P. W. Kniskern, Fort Smith, Ark., assignor to himself and J. S. Tilton, Springfield, Mo.
96,707.—STREET LAMP.—J. H. Kramer and Alois Burger, New York city.
96,708.—ROCKING HORSE.—Gustav Lautenschlager (assignor to himself and Alexander S. Paterson), Cincinnati, Ohio. Antedated Oct. 29, 1869.
96,709.—APPARATUS FOR WARMING AND COOLING APARTMENTS.—W. A. Lighthall, New York city.
96,710.—FIRE LADDER.—Albert Lotz, Franklin, Tenn.
96,711.—ASH PAN.—C. H. Low, Cleveland, Ohio.
96,712.—BEEHIVE.—G. W. Lowry, Lavansville, Pa.
96,713.—SEWING MACHINE.—Lucius Lyon, New York city.
96,714.—MACHINE FOR CUTTING OFF THE ENDS OF CIGARS.—John G. Maier and C. W. Schaeffer, Baltimore, Md. Antedated Oct. 29, 1869.
96,715.—CRACKER MACHINE. — Cyrus Marsh, 2d, Natchez, Miss.
96,716.—PAD SADDLE.—Robert McClary, Crestline, Ohio.
96,717.—PATTERN FOR STOVE CASTINGS.—B. H. Menke, Cincinnati, Ohio.
96,718.—BELT TIGHTENER.—Rufus N. Meriam, Worcester, Mass.
96,719.—FENCE.—Cyrus Milner, Des Moines, Iowa.
96,720.—ANTI-FRICTION BOX.—Joseph L. Parry (assignor to himself and Samuel Zane; assignors to themselves and E. H. Bailey), Philadelphia, Pa.
96,721.—PROCESS FOR PURIFYING PYROLIGNEOUS AND ACETIC ACIDS.—C. C. Parsons, New York city. Antedated Oct. 27, 1869.
96,722.—RAILWAY CATTLE CAR.—Edward Payne and J. D. Cleghorn, Chicago, Ill.
96,723.—WINDOW SHUTTER.—Eliab Perkins, Fond Du Lac, Wis.
96,724.—EXCAVATOR.—A. E. Pierce, Gilroy, Cal.
96,725.—DISH DRAINER.—H. F. Pond, Franklin, Mass.
96,726.—FAUCET ATTACHMENT OR CASK STOPPER.—Chas. Raggio, Memphis, Tenn.
96,727.—ELEVATED RAILWAY. — William H. Rand, Brooklyn, N. Y.
96,728.—MACHINE FOR ROLLING PLANE IRONS.—A. R. Reynolds, Auburn, N. Y.
96,729.—ROTARY STEAM ENGINE.—Frank Rhind, Brooklyn, N. Y. Antedated Nov. 3, 1869.
96,730.—LATHE CHUCK.—John Rich, Painesville, Ohio.
96,731.—WAGON STANDARD.—Geo. Richards, Richland Center, Wis. Antedated Oct. 30, 1869.
96,732.—CAR COUPLING.—J. N. Robbins, Goshen, Ohio.
96,733.—SULKY CULTIVATOR.—Richard B. Robbins, Adrian, Mich.
96,734.—APPARATUS FOR RAISING SUNKEN VESSELS.—W. D. Robinson, Buffalo, N. Y.
96,735.—SUBMARINE ROCK-DRILLING MACHINE.—S. Franklin Schoonmaker, New York city. Antedated Nov. 3, 1869.
96,736.—GRINDING OR HULLING PLATE FOR GRINDING OR HULLING MILLS.—Henry Shaw, Cincinnati, Ohio.
96,737.—SHIELD FOR ARMS OF RAILWAY CAR SEATS.—O. L. Smith, Providence, R. I.
96,738.—COMPOSITION FOR PREVENTING RADIATION AND CONDUCTION OF HEAT.—James Spence, Newcastle-upon-Tyne, Great Britain, assignor to John Chalmers, New York city.
96,739.—HOE.—Spencer Springstead, Westchester, N. Y.
96,740.—WEEDING IMPLEMENT.—S. Springstead, Westchester, N. Y.
96,741.—HAY TEDDER.—Joseph A. Talpey, Somerville, Mass.
96,742.—APPARATUS FOR CLIPPING HORSES AND OTHER ANIMALS.—John Tidmarsh, Twickenham, England. Patented in England, Dec. 2, 1868.
96,743.—STOVE GRATE.—Charles Truesdale (assignor to himself and Wm. Resor & Co.), Cincinnati, Ohio.
96,744.—ANIMAL TRAP.—J. L. Tusten, Winona, assignor to Mrs. E. S. Tusten, Carrollton, Miss.
96,745.—WHIP SOCKET.—James Twamley, New York city.
96,746.—MECHANICAL MOVEMENT.—A. Van Guysling, West Albany, N. Y.
96,747.—VALVE PROTECTOR.—Joseph E. Watts, Lawrence, Mass.
96,748.—PENCIL SHARPENER.—W. N. Weeden, Boston, Mass. assignor to George Merritt, New York city.
96,749.—CAR COUPLING.—D. G. Whitmore, Bridgewater, assignor to himself and Osborn Wilson, Monterey, Va.
96,750.—BED BOTTOM.—George Widdicomb, Grand Rapids, Mich.
96,751.—FIREARM.—Jacob Widmer, Newark, N. J.
96,752.—CENTRIFUGAL MACHINE FOR DRAINING SUGAR.—Hyman Augustine Wilder, Millville, assignor to G. L. Squier, Buffalo, N. Y.
96,753.—WINDOW SCREEN AND BLIND.—Benj. J. Williams, Philadelphia, Pa.
96,754.—ADJUSTABLE WINDOW SCREEN.—Benj. J. Williams, Philadelphia, Pa.
96,755.—REDUCING ORES.—C. D. Williams and W. H. Nobles, St. Paul, Minn.
96,756.—MACHINE FOR GRINDING CORRUGATED KNIVES.—J. B. Wilson, New York city.
96,757.—PLOW AND CULTIVATOR COMB.—C. J. Woods and J. A. Phillips, Centreville, Ind.
96,758.—KNIFE GUARD.—T. T. Woodward (assignor to T. B. Smith Manufacturing Co.), Ansonia, Conn.
96,759.—COMBINED BAG HOLDER AND SCALE.—Wm. Zimmerman, Lebanon, Pa.
96,760.—PUMP.—Otto Zwietusch, Milwaukee, Wis.

REISSUES.

84,681.—FRICTION CLUTCH PULLEY.—Dated Dec. 8, 1868; reissue 3,713.—A. B. Clemons, Ansonia, Conn.
78,427.—RING FOR SPINNING MACHINES.—Dated June 2, 1868; reissue 3,714.—George Draper and W. F. Draper, Hopedale, Mass., assignees of W. T. Carroll.
94,096.—DRAWER OR TRAY.—Dated August 24, 1869; reissue 3,715.—Maurice Fitzgibbons, New York city, for himself and R. S. Jennings, assignee of M. Fitzgibbons.
12,791.—GANG PLOW.—Dated May 1, 1855; extended seven years; reissue 3,716.—T. J. Hall, Bryan, Texas.
46,437.—MECHANISM FOR CONVERTING ROTARY MOTION INTO OSCILLATING MOTION.—Dated Feb. 7, 1865; reissue 3,717.—Julius Hornig, Chicago, Ill.
62,342.—TOOL FOR MANUFACTURING PAPER BAGS.—Dated Feb. 26, 1867; reissue 3,718.—E. J. Howlett, Philadelphia, Pa., assignee of himself and Susan Kirk.
33,043.—HARVESTER CUTTER GRINDER.—Dated August 13, 1861; reissue 3,719.—E. F. Keeling, Amwell, Ohio.
38,406.—ATTACHING KNOBS TO THEIR SPINDLES.—Dated May 5, 1863; reissue 1,707, dated June 21, 1864; reissue 3,720.—E. Parker, New Britain, Conn.
77,542.—WATER METER.—Dated May 5, 1868; reissue 3,721.—Thomas Parsons, Brookline, Mass., assignee of Gerard Sickles.
65,607.—BREECH-LOADING FIREARM.—Dated June 11, 1867; reissue 3,562, dated July 20, 1869; reissue 3,722.—B. S. Roberts, United States Army.
62,729.—LIFTING HANDLE FOR COFFINS, ETC.—Dated March 12, 1867; reissue 3,723.—Sargent & Co., New Haven, Conn., assignees of Purmort Bradford.
79,905.—MACHINERY FOR MAKING WIRE HEDDLES.—Dated July 14, 1868; reissue 3,724.—E. T. Hertle and Richard Thompson, New York city.
22,572.—SPECTACLE FRAME.—Dated Jan. 11, 1859; reissue 3,725.—Albert Lorsch, Memphis, Tenn., assignee of T. Noel.
74,555.—SAFETY ATTACHMENT FOR UMBRELLAS. — Dated February 18, 1868; reissue 3,726.—Edmund Wright, John Wright, Joseph Wright, and John Noble, Philadelphia, Pa., and J. H. Filson, New York city, assignees of J. A. Lieb and E. W. Crane.
58,962.—STEAM SAFETY VALVE.—Dated Oct. 16, 1866; patented in England Jan. 21, 1864; reissue 3,727.—E. H. Ashcroft, Boston, Mass., assignee of William Naylor.

DESIGNS.

3,742.—LEG AND TREADLE OF A SEWING MACHINE.—Charles Greiff, New York city, assignee to Wilcox & Gibbs Sewing Machine Company.
3,743.—PRINTERS' TYPE CASE STAND.—N. C. Hawks, Milwaukee, Wis.
3,744.—DRAWER PULL.—E. J. Steele (assignor to P. & F. Corbin), New Britain, Conn.
3,745.—ELEVATOR BUCKET.—J. Storms and H. Dorer, Buffalo, N. Y.
3,746.—BRIDLE BIT.—J. B. Hoover, New York city.
3,747.—TRADE MARK.—David Neumann, New York city.
3,748.—CONVEX LID OF A DISH OR TUREEN, ETC.—Thomas Young, Philadelphia, Pa.
3,749.—LETTER BOX COVER.—Charles William Zaremba, Chicago, Ill.

EXTENSIONS.

LOOM.—J. O. Leach, of Ballston Spa, N. Y.—Letters Patent No. 13,724, dated Oct. 30, 1855.
LOOM.—J. O. Leach, of Ballston Spa, N. Y.—Petters Patent No. 13,724, dated July 8, 1856. Additional improvement No. 147.
LOOM.—J. O. Leach, of Ballston Spa, N. Y.—Letters Patent No. 13,724, dated March 3, 1857. Additional improvement No. 159.
LOCK.—Sarah A. Holmes, administratrix of R. G. Holmes, deceased, and W. H. Butler, New York city.—Letters Patent No. 13,722, dated Oct. 30, 1855.
POLICEMAN'S RATTLE.—Joseph McCord, of Philadelphia, Pa.—Letters Patent No. 13,823, dated Nov. 20, 1855.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,916.—FORM OF WHEEL FOR PROPELLING SHIPS, AND APPLICABLE ALSO TO PUMPS FOR RAISING OR FORCING WATER.—C. T. Finlayson, Albany, Oregon, and A. C. Loud, San Francisco, Cal. October 7, 1869.
2,939.—NAIL MAKING MACHINE.—F. Davidson, Richmond, Va. October 9, 1869.
2,945.—INDICATOR FOR STEAM BOILERS.—G. B. Massey, New York city. October 9, 1869.
2,957.—PERMANENT WAY OF RAILWAYS.—G. P. Rose, Elmira, N. Y. Oct 11, 1869.
2,069.—BELT JOINTS.—P. Murray, Quebec, Ontario. October 12, 1869.
3,005.—SEWING MACHINE.—A. Porter, Rochester, N. Y. Oct. 15, 1869.
3,022.—APPARATUS FOR HEATING AND DELIVERING METAL BARS.—S. A. Darrach, Newburgh, N. Y. October 16, 1869.
3,040.—SACKING AND FRAMES FOR BEDSTEADS AND COUCHES.—G. C. Perkins, Hartford, Conn. Oct. 18, 1869.
3,041.—NUTS FOR BOLTS.—R. Pratt, Worcester, Mass. Oct. 18, 1869.
3,048.—HEATING APPARATUS.—S. A. Hill and C. F. Thumm, Oil City, Pa. October 19, 1869.
3,058.—PURIFYING METALS.—Edward Brady, Philadelphia, Pa. October 20, 1869.
3,061.—PRESERVING ANIMAL OR VEGETABLE SUBSTANCES FROM DECAY.—N. Herrara y Obes, Montevideo, Uruguay, S. A. Oct. 20, 1869.
3,106.—MACHINERY FOR MANUFACTURING BRUSHES.—B. Lavary, New Haven, Conn. Oct. 26, 1869.

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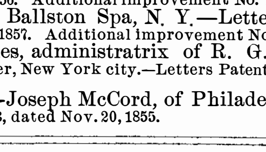

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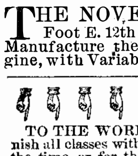

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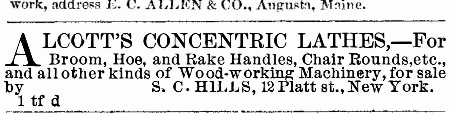

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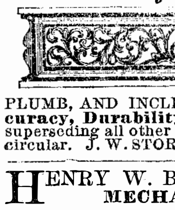

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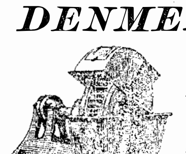

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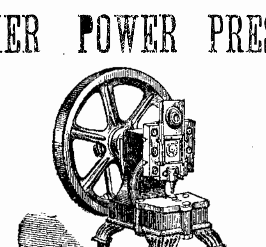

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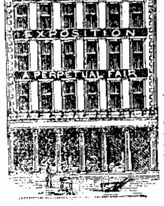

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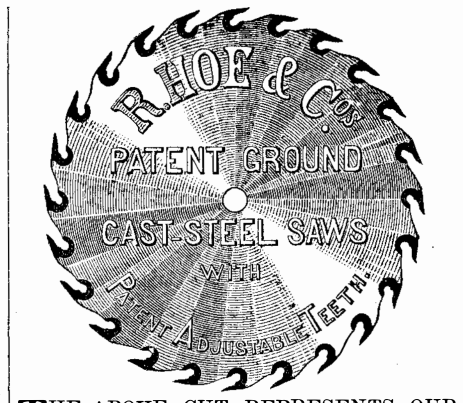

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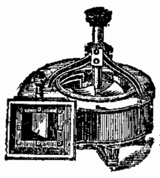

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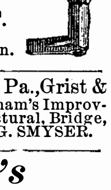

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